

Inventory of Natural Areas and Wildlife Habitats for Orange County, North Carolina

Dawson Sather and Stephen Hall (1988)
Updated by Bruce Sorrie and Rich Shaw (2004)



December 2004

Orange County Environment & Resource Conservation Department
North Carolina Natural Heritage Program
NC Natural Heritage Trust Fund

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* Updated in 2004

+ New or Expanded Site in 2004

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Preface

The initial inventory of the significant natural areas and wildlife habitats of Orange County was conducted from June 1987 to October 1988. The County contracted the Triangle Land Conservancy, a non-profit land trust, to produce the systematic inventory of the county's remaining unique and exemplary natural ecosystems, rare species habitats, special wildlife habitats, and scenic areas. The 1988 survey was conducted by Dawson Sather and Stephen Hall, both experienced field biologists and ecologists. Supplemental funding for the original inventory was provided by an anonymous donor and by the towns of Chapel Hill and Carrboro.

The 2004 update to the inventory was conducted by Bruce A. Sorrie, consulting biologist, for the Orange County Environment and Resource Conservation Department (ERCD). Fieldwork occurred from June 2001 to 2002. Rich Shaw and Margaret Jones (ERCD) updated the narrative and each site's protection status and map. Funding for the update was provided by the NC Natural Heritage Trust Fund and by Orange County, North Carolina.

The North Carolina Natural Heritage Program provided supervisory support for the study. The Natural Heritage Program is a unit of the North Carolina Department of Environment and Natural Resources and is responsible for statewide inventory and protection planning for North Carolina's exceptional natural areas and biological resources. The *Inventory of Natural Areas and Wildlife Habitats for Orange County*, including the entire site reports and data records, follows the specifications of the Natural Heritage Program. The format of the original report was changed to conform with the more recent inventories developed under supervision of the Natural Heritage Program.

Acknowledgements

This project would have been impossible without the assistance of various people who work in Orange County or know its natural features well. Among the many people to whom we owe our thanks are: Joe Bailey, Tom Barnett, Joe Bernardo, Amy Bleckinger, Marj Boyer, Alvin Braswell, Robert Butler, Gloria Caddell, Laura Cotterman, Don Cox, Judd Edeburn, Jim Hill, Barry Jacobs, Charlotte Jones-Roe, Hervey McIver, Livy Murrell, Jeff Nekola, staff of the North Carolina Natural Heritage Program (especially Judy Ratcliff and Harry LeGrand), staff of the North Carolina Forest Service, staff of the North Carolina Museum of Natural Sciences, Margaret Nygard, staff of the Orange County Environment and Resource Conservation Department (especially Margaret Jones and Carol Melton), Mike Palmer, Quentin Patterson, Bob Peet, Jim Petranka, Jeffrey Pippen, George Pyne, Albert Radford, Johnny Randall, Randle Sather, Jean Stewart, Pearson Stewart, Rob Sutter, Carol Tingley, Brad Torgan, Jamie White, Brenda Wichmann, and Haven Wiley. Cover photo of Upper Morgan Creek by Johnny Randall.

Introduction

Orange County is within the Research Triangle region of North Carolina—one of the most rapidly developing areas in the nation. A national study completed in 2002 found that the Triangle region (comprised of seven counties) ranked as the third most sprawling metropolitan area in the nation. Sprawling development—that is, the rapid conversion of rural open space to urban and suburban land uses—is reducing open space in North Carolina at the rate of 277 acres per day (NCDENR, 2004). Essential wildlife habitat is lost and the connectivity of wildlife corridors is broken when development is allowed to proceed without adequate open space planning.

Initial Orange County Inventory (1988)

In 1987 the Triangle Land Conservancy recognized the need for an inventory of the remaining natural areas within Orange County in order to protect the important sites that contain rare species, unique habitats, wildlife, and scenic areas. The Orange County Board of Commissioners and the Town boards of Carrboro and Chapel Hill responded to the recommendations by the Triangle Land Conservancy and others by providing funds to initiate the survey.

The initial *Inventory of Natural Areas and Wildlife Habitat of Orange County, North Carolina* was completed by Dawson Sather and Stephen Hall in 1988. The report identified 64 sites that were described to be the most significant of the many locations visited during the course of this survey. Collectively, the sites portray much of the natural diversity of the county, from dry upland ridges to river bluffs and bottomland forests. There are several national, state and regionally significant areas, sites for rare plants and animals, along with habitats and corridors for plants and wildlife.

Update to the Orange County Inventory (2004)

In 2000, Orange County established a new department charged with working, through various means, to protect the county's most important natural and cultural resource lands. The Environment and Resource Conservation Department (ERCD) works with landowners and conservation partners to protect those sites through its Lands Legacy Program. One source of data used by ERCD to identify priority sites is the 1988 county inventory of natural areas. Because that inventory was over 12 years old, ERCD sought matching funds for an update from the North Carolina Natural Heritage Trust Fund, by way of the NC Natural Heritage Program. Funds were awarded and biologist Bruce Sorrie was hired to conduct the update, which he did from 2001 to 2003. Sorrie visited a total of 22 priority sites, including four new sites. The results of his findings are incorporated into the original (1988) report, along with updated maps by ERCD and data from the NC Natural Heritage Program.

Collectively, the authors have documented several extirpations of species that once lived in this area, but have been wiped out by the various habitat modifications associated with urban growth and development and reservoir construction. For the remaining natural areas, the information and recommendations presented here can be used by various jurisdictions and

agencies to guide future development so that these significant natural features and wildlife remain.

Of the 53 natural areas identified in this inventory, over 50% lie in the southeastern quarter of the county, which is the most heavily populated and shows the most probability of further, accelerated suburban development. It is ironic that the most geologically and topographically diverse part of the county is also the one in which the pressure of habitat modification is the greatest. However, there are no areas identified in this report that are “unthreatened.” Where possible, the authors have identified specific threats to the sites and the surrounding land, and have incorporated a discussion of threats and habitat integrity, along with biological significance, into the overall significance ranking.

Since 1988, this information has been used by land trusts, state and local governments, area universities, and others—including private landowners—to identify significant natural areas and wildlife habitat in need of protection. The authors hope that this update to the original inventory will assist conservation partners in protecting the remaining sites before they vanish from the landscape of Orange County.

Information Sources

The information presented in this report was gathered from a variety of existing sources and from field investigations. Records from the database, map files and literature collection at the North Carolina Natural Heritage Program were initially used to consolidate the information on the previously documented distribution of rare plants, rare animals, and natural areas in the county. Additional references and information were compiled from the following collections: North Carolina Museum of Natural Sciences, Duke University Herbarium, Duke University Vertebrate Collection, NC State University Insect Collection, UNC-CH Herbarium, and the UNC-CH Insect Collection. Site reports and scientific literature were assembled, and several biologists familiar with natural areas of the Triangle were consulted. Literature references and personal communications are cited in the literature references section.

This pre-existing data base was large, but most of it represented reports and specimen documentation from those areas of the county that were already recognized as natural areas, such as Duke Forest, Eno River State Park, and the UNC Mason Farm Biological Reserve. The search for natural areas in the rest of the county was aided by topographic maps, soil maps, geologic maps, and aerial photographs. Using these materials, the authors pinpointed areas that would possibly contain unique habitats and visited them in the preliminary phases of the survey. Many of these sites are not included in our final report because they were heavily disturbed or lacked certain required elements. However, these visits were valuable in building the knowledge of Orange County’s natural landscape and in evaluating sites for inclusion in this document.

Methods and Data

During the initial 1988 survey, the authors spent 108 full or partial days in the field (roughly one third of those days they worked together) along with approximately 20 days of “unsuccessful” searching in the preliminary phase. Additionally, they spent approximately 60 days in preparing site evaluations and compiling this report.

To supplement routine explorations for plants and animals at each site, searches for rare and indicator species were undertaken at critical times of the year. Rich bottomland herbs such as Dutchman’s breeches and Atlantic isopyrum wither soon after they flower in early spring, whereas many plants of the diabase rock areas bloom much later and are best looked for in early summer. Much of the bird distribution data were collected in the early morning (until 10 am) during the breeding season from mid-May to the end of July. Four-toed salamanders were searched for in March, gray petaltail dragonflies from May to July, and butterflies during their various flight seasons.

Fieldwork for the 2004 update to the inventory occurred in 2001 and 2002. Instead of visiting all 64 natural areas from the original Sather and Hall report, it was agreed that only those sites that met certain criteria would be visited by Sorrie and that changes from 1988 conditions would be noted. The most important criteria that guided the selection process were the following: (1) the site was threatened by development or other impacts, (2) the site contained elements (rare plants, animals, natural communities, geological features, etc.) that were very rare or unique within Orange County, (3) the property was recently acquired by the county or was slated for acquisition, and therefore needed inventory, and (4) the property was a potentially important link to other conservation lands.

A total of priority 39 sites were identified for a site visit by Bruce Sorrie in 2001-02. They were divided into high (10 sites), medium (14 sites), and low (10 sites) priority, plus a fourth category termed “other” (5 sites). Of the 39 sites that were targeted, 32 had been included in the 1988 inventory, two were described in a report by Oakley, LeGrand, & Schafale (1995), and five (the “other” category) were sites recognized as significant since the 1988 report.

Due to time constraints and the difficulties of obtaining landowner consent, only 22 of the 39 targeted sites were visited and evaluated by Sorrie. The Orange County Environment and Resource Conservation Department (ERCD), in consultation with the NC Natural Heritage Program, intends to update the inventory on a more regular basis. ERCD intends to enlist the services of area biologists—some of whom serve on the County’s Commission for the Environment—to monitor the status of significant natural areas so that the Orange County inventory stays current.

*Inventory of Natural Areas and Wildlife Habitats
Orange County, NC*

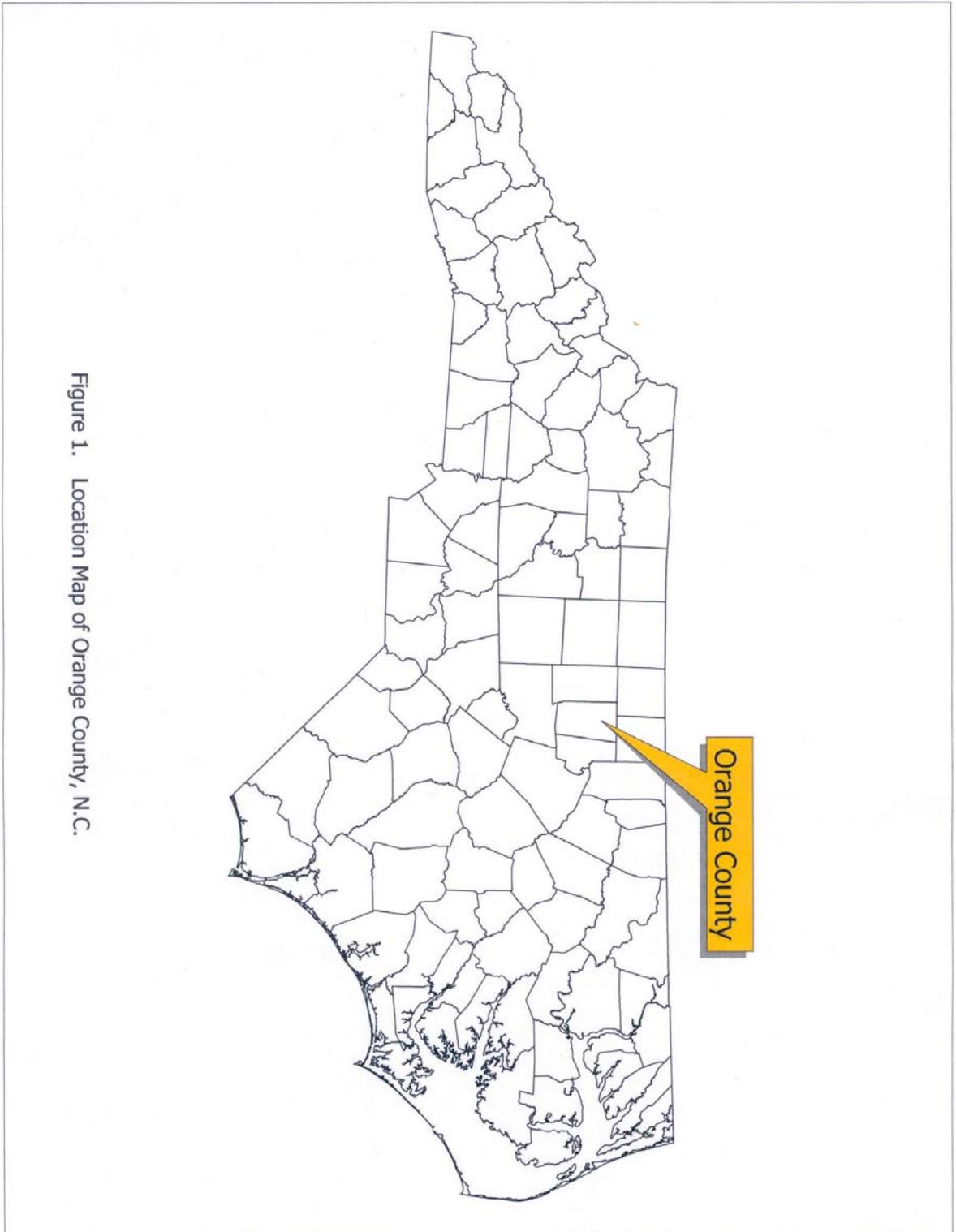
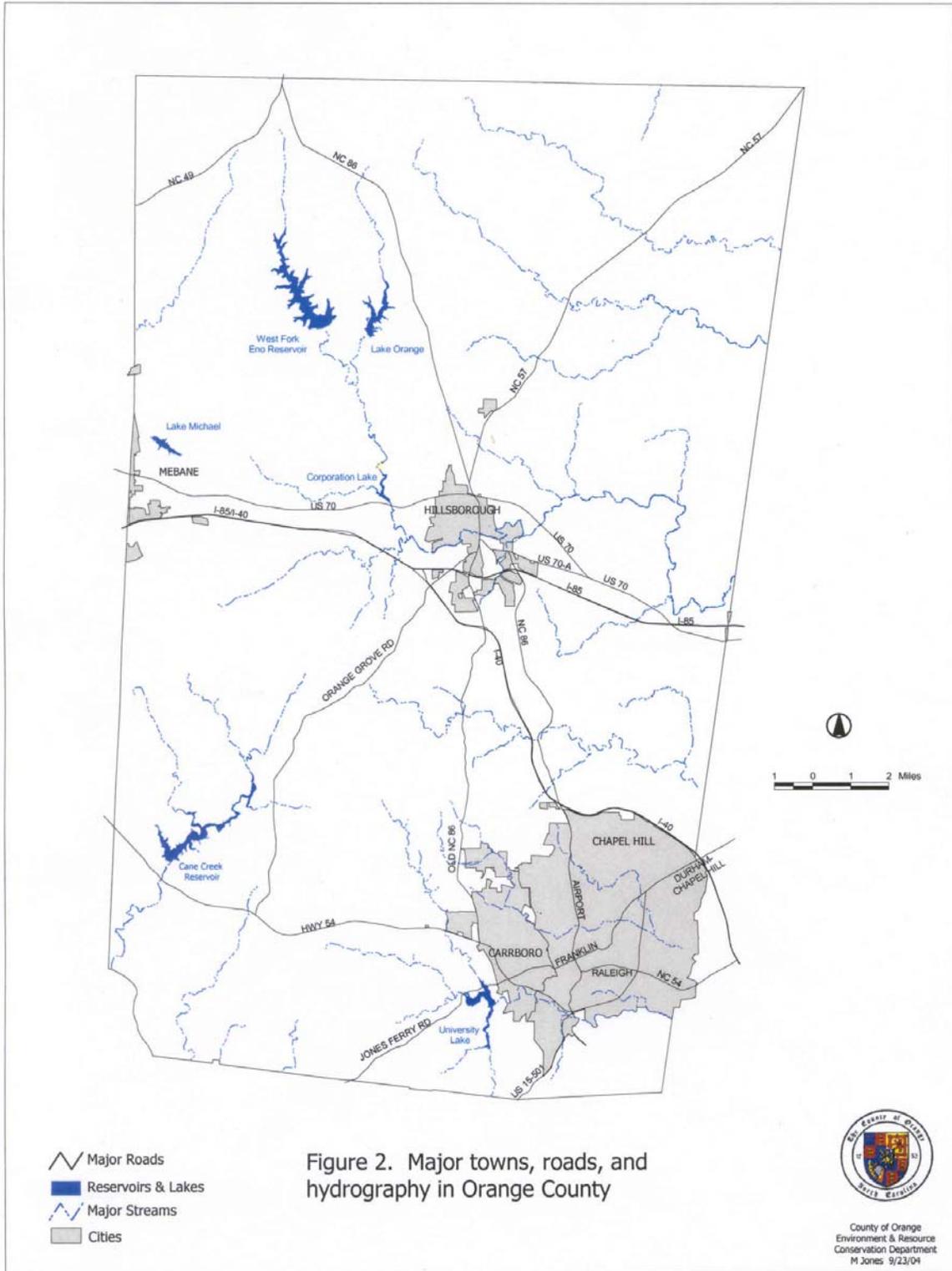
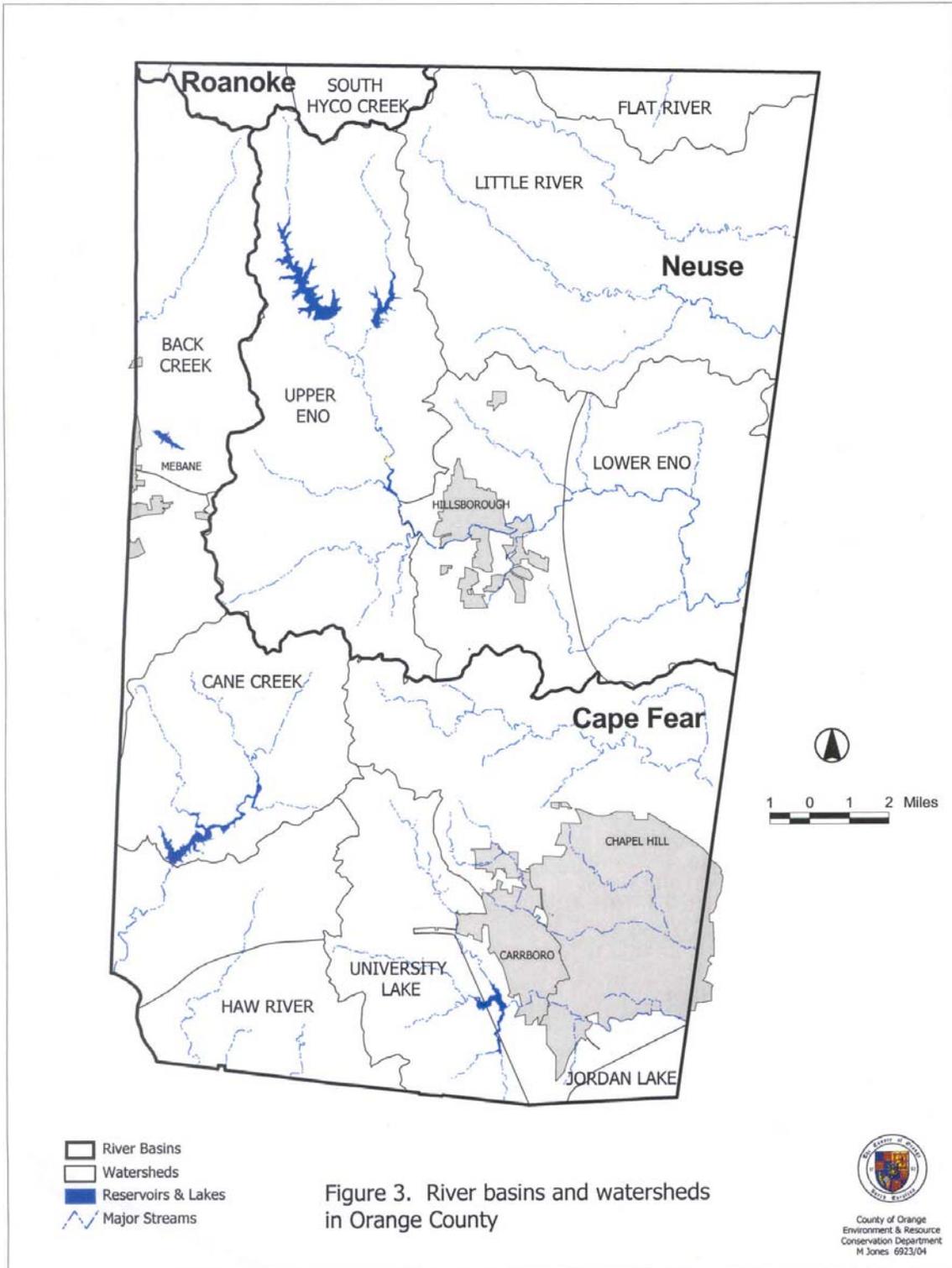


Figure 1. Location Map of Orange County, N.C.

*Inventory of Natural Areas and Wildlife Habitats
Orange County, NC*



*Inventory of Natural Areas and Wildlife Habitats
Orange County, NC*



*Inventory of Natural Areas and Wildlife Habitats
Orange County, NC*

Description of the Study Area Orange County, NC

Orange County was formed in 1752 from Johnston, Bladen, and Granville counties. It is in the central section of the state and is bounded by Durham, Chatham, Alamance, Caswell, and Person counties (Figure 1). Orange County is comprised of three incorporated municipalities, a portion of Mebane (which is mostly in Alamance County) and about 24 other small communities (i.e., hamlets or crossroads). The county is divided into seven townships: Cedar Grove, Little River, Cheeks, Hillsborough, Eno, Bingham, and Chapel Hill.

Orange County has a population of 118,227 (2000 census)—an increase of 53% since 1980 when the population was 77,055. Chapel Hill, which is the largest incorporated town, has a population of 48,715. Carrboro, adjacent to Chapel Hill, has a population of 16,782; and Hillsborough, the county seat, 5,446. The other communities include Blackwood Station, Buckhorn, Caldwell, Calvander, Carr, Cedar Grove, Dodsons Crossroads, Efland, Eubanks, New Hope, Oaks, Orange Grove, Schley, and White Cross.

Topography, Physiography and Geology

Orange County lies near the eastern edge of the Piedmont physiographic province in North Carolina. Geologically, much of the 396 square miles of the county is in the Carolina Slate Belt, which is composed of diverse, generally metamorphosed volcanic rocks. The southeasternmost corner dips into the Triassic Basin, which is an area of sedimentary, easily eroded rock.

Most of the terrain of the Slate Belt portion of the county is broad, upland ridges, with low energy streams cutting narrow floodplains. No large streams originating in other counties cross through Orange; rather, the county serves as the upper watershed for three of the major river systems in North Carolina. New Hope Creek, Morgan Creek, Cane Creek, and Back Creek flow into the Cape Fear River system via the Haw River (which forms the county's southwestern corner). In the north, the Eno River and Little River (North and South forks) flow into the Neuse River. South Hyco Creek and Lynch Creek, in Cedar Grove Township, flow north into the Roanoke River system, which soon enters Virginia.

There are no natural lakes in Orange County. Small examples of marshy terrain are found in some of the larger semi-permanent beaver ponds, and around the margins of University Lake and several other long-established reservoirs. Seeps and springs have generally been altered by humans, except in situations directly within floodplains, where these important amphibian breeding habitats still exist. Narrow bottomland forests are found along many of the streams, but in the southeastern corner of the county, several units of swamp forest occupy the western margin of the Durham Triassic Basin. These areas, ranging down to 240 feet elevation, are the lowest in elevation in the entire county.

The highest elevation in Orange County is the summit of Occonechee Mountain, which is over 860 feet high. Occonechee is one of the last of a series of monadnocks that run in a

northeasterly direction in a line through the southwestern portion of the county. These monadnocks are generally capped with a highly resistant layer of rock. Several of the more scenic peaks in the county are monadnocks, including Occoneechee, Bald, Blackwood, and Crawford mountains.

Apart from these monadnocks, there are a very few areas of high relief in the county. Along the three major streams of Morgan Creek, New Hope Creek, and the Eno River, steep slopes have been cut by water action, but these rarely exceed 150 feet in relief. Many of the most unique natural areas of the county, such as rhododendron communities, pine – oak bluffs, and all of the dry, rocky slopes are restricted to these steep, stream-cut slopes.

The most unique geologic formations in the county are the few areas where diabase rock is exposed on the surface. This rock, fairly common in the neighboring Triassic Basin of Durham and Granville Counties, is quite rare in Orange. Soils of the county are generally acid, although units of the more circumneutral Enon, Iredell, and Orange soil are found at scattered locations.

Natural Communities

The natural communities of Orange County are strongly associated with the variety of topographic, geologic, soil, and hydrologic conditions found throughout the county. Table 1 lists the types of natural communities identified in this survey, and the natural area site numbers where those communities are found. The following descriptions of natural communities are from Schafale and Weakley (1990) and are capitalized.

The Mesic Mixed Hardwood Forest and Dry-Mesic Oak—Hickory Forest are the two most common natural communities in the county. The Mesic Mixed Hardwood Forest is found on moderate to steep lower slopes, above the bottomland communities that adjoin streams. The soil is above the floodplain, but is generally moist and rich from colluvium and moisture input from the slopes above. Beech (*Fagus grandifolia*), tulip poplar (*Liriodendron tulipifera*), and red oak (*Quercus rubra*) are common trees, and the understory and herb layers are very diverse. Many of these types of forest are in good condition, due perhaps to their occurrence on the relatively non-arable part of the slopes. Over one third of the natural areas in this report contain some portion of this forest type.

Upslope of the Mesic Mixed Hardwood Forest the community often grades into the Dry-Mesic Oak—Hickory Forest, which is common on these upper slopes and on uplands. White oak (*Quercus alba*) is generally the most common oak species, though other oaks and several hickories are almost always present. The herb layer is less diverse than in the moister and richer Mesic Mixed Hardwood Forest. In the gentle upland terrain of Orange County, the Dry-Mesic Oak—Hickory Forest is the most common natural community.

On slightly drier sites, the Dry Oak—Hickory forest is found, usually indicated by an increase in the dominance of post oak (*Quercus stellata*). On sites where the soil is nutrient poor, especially over siliceous rock types, the Piedmont Monadnock Forest occurs. Dominated by chestnut oak (*Quercus prinus*), species diversity is usually low, with several

species of heath shrubs common in the understory. Many of the species are those that are also found on nutrient poor sites in the mountains. This natural community is found in several upland sites in Orange County, especially those that are extremely exposed or very nutrient poor, though it becomes much less common to the east.

In very extreme situations at the dry edges of steep bluffs and again on nutrient poor sites, the Pine—Oak / Heath community can develop. Also a community with many affinities to similar sites in the mountains, it is very rare in the Piedmont and is found at only two sites in Orange County. Plant species characteristic of this unusual formation include Virginia pine (*Pinus virginiana*), mountain laurel (*Kalmia latifolia*), various heath species, and bracken fern (*Pteridium aquilinum*).

In positions where steep, nutrient poor slopes are facing north and are thus relatively cool and moist, rhododendron slopes (Piedmont Heath Bluff community) can occur. *Rhododendron catawbiense*, common in the mountains, is restricted in the Piedmont to these steep sites. There are 9 such rhododendron slopes in Orange County, more than in any other of the Triangle counties surveyed to date. The very rare Acidic Cliff community occurs on steep to near-vertical bluffs, which although nearly devoid of dense shrubs contain herbs growing on rocks or bare soil. Such sites are drier than Heath Bluffs, and may be south-facing (such as Piney Mountain in E11).

Several other terrestrial forest communities are found on soils that are circumneutral in pH. Natural areas containing such forests are very rare in Orange County. The Basic Mesic Forest at Sevenmile Creek (E06), with a large number of southern sugar maples (*Acer barbatum*) and other woody species that thrive in circumneutral soils, is the only example of this forest type that was located in this survey. The Basic Oak—Hickory Forest is likewise rarely found in good condition in the county. The best examples are located on the few undisturbed large formations of diabase rock. A tree species found at these sites is the southern shagbark hickory (*Carya carolinae-septentrionalis*). Where circumneutral clay soils such as Enon or Iredell series develop an impermeable hardpan, the Xeric Hardpan Forest may develop. Quite rare and restricted to the Piedmont, these forests have a stunted canopy and are dominated by post oak (*Quercus stellata*) and blackjack oak (*Quercus marilandica*). The Xeric Hardpan Forest in the Blackwood Division of Duke Forest (N03) is one of the better examples of this natural community.

There are several types of palustrine (wetland) communities in Orange County. The most common of these are the Piedmont Alluvial Forest and the Piedmont Bottomland Forest, which are common in stream valleys of various sizes. Standing water is absent most of the time, but regular seasonal inundation and deposition of sediments are characteristic. Many of the streamside natural areas identified in this report contain at least a small representative area of these natural communities.

Much more uncommon is the Piedmont Swamp Forest, which is restricted to the Triassic Basin areas found only on the easternmost edge of the county. A superlative example of this natural community, indeed one of the best remaining representatives in the eastern Piedmont, is the old growth swamp forest of the Big Oak Woods (M11).

<p>Table 1. Natural Communities in Orange County and the Natural Areas in which they occur <i>Names of the communities from Schafale and Weakley (1990)</i></p>	<p>Page 1 of 2</p>
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TERRESTRIAL COMMUNITIES

<u>Community, Abundance, and General Location</u>	<u>Selected Sites</u>
Basic Mesic Forest Rare; moist slopes on circumneutral soils	E06
Basic Oak—Hickory Forest Rare; on circumneutral soils on diabase and other mafic rocks	C05, E08, E09, M10, N06
Dry-Mesic Oak—Hickory Forest Very common; uplands	B01, B02, C01, C03, C04, E03, E05, E07, E10, E11, H02, M01, M03, M04, M08 M09, N04, N11, N12
Dry Oak—Hickory Forest Fairly common; upland ridges, hilltops	C04, E11, M08, N04, N05, N08, N11
Mesic Mixed Hardwood Forest Common; moist, moderate to steep slopes	B01, B02, C01, C03, E02, E07, E11, E13, H01, L04, M01, M02, M04, M07, M08, M09, N04, N05, N07, N10, N11
Piedmont Acidic Cliff Rare; on steep bluffs	E07, E12, E13, M08, N11
Piedmont Heath Bluff Uncommon; on steep slopes and bluffs	E07, E12, E13, M02, M07, M08, N11
Piedmont Monadnock Forest Rather rare; rocky ridges of steep bluffs, generally on siliceous rock	C01, E04, E05, E07, E10, M01, M07, N01, N04, N09
Pine—Oak / Heath Rare in Piedmont; on exposed dry sites on siliceous rock	E07, E13
Xeric Hardpan Forest Rare, on circumneutral clay hardpan soils	E09, L03, N03

<p>Table 1. Natural Communities in Orange County and the Natural Areas in which they occur <i>Names of the communities from Schafale and Weakley (1990)</i></p>	<p>Page 2 of 2</p>
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PALUSTRINE COMMUNITIES

<u>Community, Abundance, and General Location</u>	<u>Selected Sites</u>
Floodplain Pool Rare to uncommon; in floodplains	N10
Low Elevation Seep Uncommon; at bases of slopes	E10, E14, N10
Piedmont Alluvial Forest Common in stream valleys	C03, E08, E11, E13, E14, M08, N11
Piedmont Bottomland Forest Common in broad stream valleys	B01, E05, E10, M12, N11
Piedmont Levee Forest Rare due to absence of large streams	C02
Piedmont Swamp Forest Rare; found here only in Triassic Basin areas	B03, M11, M12
Rocky Bar and Shore Uncommon in small streams; mainly in Eno River	E11
Semipermanent Impoundment Rare; mostly beaver ponds	L01, L02, M05
Upland Depression Swamp Forest Uncommon; in flat, poorly drained upland areas	E11, N02

Since Orange County is a headwater region, large streams are lacking. Only at the southwestern corner, where the Haw River forms about two miles of the county border, is there a large enough river system to deposit the amount of sediments needed for the development of the Piedmont Levee Forest community. This community, dominated by river birch (*Betula nigra*), box elder (*Acer negundo*), and ash (*Fraxinus* sp.), occurs only along a narrow portion of the Haw River that had been, until the late 1980s, managed by the NC Wildlife Resource Commission as a gameland.

Five other palustrine communities have a restricted distribution in Orange County. The Rocky Bar and Shore, dominated by perennial herbs such as justicia (*Justicia americana*), is present only on shoals in the Eno River at Cate's Ford (E11). Several beaver ponds, classified as Semipermanent Impoundments, occur on smaller streams throughout the county, most notably in places where the natural topography allows for the development of a wide impoundment, as at sites L01 and L02 on tributaries of the Little River and at Morgan Creek Swamp (M12). At both of these locations, marshes have developed in the wetland produced by the beaver ponds. A third uncommon palustrine community, the Upland Depression Swamp Forest, is found in flat or depressed upland areas that hold water for long periods of time. Such upland depressions vary in size: one depression in the Blackwood Division of Duke Forest (N02) covers dozens of acres, while several much smaller pools near the Eno River (E11) are less than an acre. These depressions are characterized by species that are more common to low-lying swamp forest, such as overcup oak (*Quercus lyrata*) and buttonbush (*Cephalanthus occidentalis*). Both Low Elevation Seeps and Floodplain Pools occur as tiny wetlands within floodplains or at bases of slopes. They are important breeding sites for amphibians, dragonflies, and other scarce animals.

Biogeography, Land Use, and Plant Life

An understanding of the present and past distributional relationships of the flora and fauna is necessary to understand the significance of the occurrence of various species and communities within the Triangle region. It is equally important to comprehend the processes at work, both natural and artificial, that modify these distributional patterns; this is of vital importance in any effort to decide on preservation or other management strategies.

Orange County lies completely within the Piedmont Biotic Province. The landscape consists typically of gently rolling hills, draining generally towards the southeast. For terrestrial species, no major geographic barriers occur either to the north or south. The major biome of the area is the Eastern Deciduous Forest. The typical vegetation of this biome is a forest dominated by oaks and hickories. The characteristic successional stages of this vegetation range from old fields to pine woods to hardwoods. More than one thousand plant species have been recorded from Orange County.

Typical woodland animals include mammals such as the white-tailed deer, raccoon, gray fox, eastern gray squirrel, white-footed mouse, short-tailed shrew, and red bat. Some of the common birds of the woodlands are the downy and red-bellied woodpeckers, barred owls, Carolina chickadees, tufted titmice, Carolina wrens, ovenbirds, wood thrushes, red-eyed vireos, and northern cardinals. Reptiles and amphibians include the eastern fence lizard, five-lined skink, eastern box turtle, brown snake, worm snake, black rat snake, copperhead, American toad, gray treefrog, and slimy salamander.

Due to the absence of any significant biogeographic partitions, few species are endemic (found here and nowhere else) to localized areas within the Piedmont or even to the Piedmont itself. Most animals, for instance, range widely over the Eastern Deciduous Forest Biome, from the Mississippi Valley to the Coastal Plain. Plant species show more regional differentiation than animals due to their generally more restricted powers of dispersal and narrower habitat requirements, but again few can be considered endemic to the Piedmont. Two exceptions here include the Piedmont endemics Lewis' heartleaf (*Hexastylis lewisii*) and southern shagbark hickory (*Carya carolinae-septentrionalis*).

For aquatic species, the ladder-like arrangement of rivers up the Atlantic Slope has resulted in much more significant isolation than is true for terrestrial species. Apart from man-mediated introductions, the primary means of inter-basin transfer has been stream-capture or lowland flooding. Compared to the terrestrial biota, there are significantly more endemic freshwater species in this area, and more species with restricted ranges.

Though a small area, Orange County has an unusually high degree of diversity in its aquatic species, due to the presence of three different river basins (Cape Fear, Neuse, and Roanoke) within its limits. The Cape Fear drainage includes the Haw River, Cane Creek, Morgan Creek, and New Hope Creek. The Neuse Drainage in Orange County is composed of the Little River (North and South forks), the Eno River, and the Eno tributaries Sevenmile Creek and Buckwater Creek. The Roanoke drainage, only a small portion in the northern part of the county, includes South Hyco Creek and Lynch Creek.

Two geographic features in Orange County stand out against the background of typical Piedmont formations and each plays a significant role in our local biogeography. The first of these are the monadnocks, which are hills capped with rock that is more resistant to erosion than the surrounding countryside. These monadnocks, such as Occonechee Mountain, project above the Piedmont peneplain and are rare in the outer Piedmont. Their flora and fauna often show distinctly montane affinities. The group of monadnocks nearest to Orange County is in the Uwharrie range, and their summits have a similar montane biota. Our monadnocks are smaller in area. This factor, along with the great distances separating our monadnock communities from their nearest neighbors, has resulted in a reduced diversity of species and a decreased likelihood of their replacement by dispersal if they were to be destroyed. While the habitat on Occonechee Mountain is the most unique and important, Orange County has a significant cluster of these isolated hills, including Blackwood, Bald, Pickards, McCauley, Crawford, and Mitchells “mountains.”

The second large geographic feature that is different from the normal landscape of Orange County is the Durham Triassic Basin. Located on the southeastern edge of the county, it is a unique part of our landscape with its low elevation and flat swampy terrain. This is the only part of the county containing Piedmont Swamp Forests, and many of the animals found here are normally distributed in the Coastal Plain.

Other local features of biogeographic interest include restricted soil formations, north-facing slopes, vernal pools, and springs. Each of these possesses biotic communities that are equally restricted and often widely separated from related communities by miles of inhospitable terrain.

Steep north-facing slopes occur especially along the margins of the Triassic Basin, due to the sharp drop in elevation and consequent increased stream cutting. Three streams enter the Triassic Basin near the county’s eastern border: Morgan Creek downstream of US 15-501; New Hope Creek, in the Korstian Division of Duke Forest; and the Eno River in Eno River State Park.

Another feature associated with the Triassic Basin is diabase outcrops. Diabase dikes are linear areas of igneous rock that formed along fault lines of the Basin. Diabase sills are narrow, horizontal igneous rock layers that formed between layers of sedimentary rock. This rock weathers to a circumneutral soil, different in chemistry and texture than the normal acidic Piedmont soils. These diabase areas provide habitat for a unique natural community. While such geologic formations are found mostly in neighboring Durham and Granville counties, several exposures of diabase occur near Orange County’s eastern border. Recent urban development has disturbed most of these habitats.

The presence of several of the more unique communities in Orange County can only be explained by natural climatic events approximately 10,000 years ago, during the Pleistocene glaciation. The Pleistocene created cooler conditions in the Piedmont, and consequently the vegetation of the region was more like that which is today found in the mountains. As the climate warmed, elements of these montane communities remained on the cooler, steep,

Table 2. Significant Plant Species of Orange County

Endangered:

- | | |
|------------------------------|-----------------------|
| * <i>Rhus michauxii</i> | Michaux's Sumac |
| * <i>Echinacea laevigata</i> | Smooth Coneflower |
| * <i>Isotria medeoloides</i> | Small Whorled Pogonia |

Threatened:

- | | |
|-------------------------|--------------------------|
| * <i>Baptisia minor</i> | Prairie Blue Wild Indigo |
|-------------------------|--------------------------|

Significantly Rare:

- | | |
|--|---------------------------|
| <i>Anemone berlandieri</i> | Southern Anemone |
| * <i>Asplenium bradleyi</i> | Bradley's Spleenwort |
| <i>Berberis canadensis</i> | American Barberry |
| * <i>Buchnera americana</i> | American Bluehearts |
| <i>Cardamine douglassii</i> | Douglass's Bittercress |
| <i>Carex bushii</i> | Bush's Sedge |
| * <i>Carex woodii</i> | Wood's Sedge |
| * <i>Collinsonia tuberosa</i> | Piedmont Horsebalm |
| * <i>Desmodium ochroleucum</i> | Creamy Tick-trefoil |
| * <i>Dichanthium annulum</i> | a witch grass |
| * <i>Dodecatheon meadia</i> var <i>meadia</i> | Eastern Shooting Star |
| * <i>Enemion biternatum</i> | Eastern Isopyrum |
| <i>Eupatorium godfreyanum</i> | Godfrey's Thoroughwort |
| <i>Fothergilla major</i> | Large Witch-Alder |
| * <i>Gnaphalium helleri</i> var <i>helleri</i> | Heller's Rabbit Tobacco |
| <i>Hexastylis lewisii</i> | Lewis' Heartleaf |
| <i>Hexalectris spicata</i> | Crested Coralroot |
| * <i>Liatris squarrulosa</i> | Earle's Blazing Star |
| * <i>Matelea decipiens</i> | Glade Milkvine |
| <i>Monotropsis odorata</i> | Sweet Pinesap |
| * <i>Panicum flexile</i> | Wiry Panic Grass |
| * <i>Parthenium auriculatum</i> | Glade Wilde Quinine |
| <i>Platanthera peramoena</i> | Purple Fringeless Orchid |
| * <i>Porteranthus stipulatus</i> | Indian Physic |
| <i>Pycnanthemum torrei</i> | Torrey's Mountain-mint |
| * <i>Ranunculus ambigens</i> | Water-plantain Spearwort |
| * <i>Reullia purshiana</i> | Pursh's Wild-petunia |
| * <i>Scutellaria australis</i> | Southern Skullcap |
| * <i>Scutellaria leonardii</i> | Shale-barren Skullcap |
| * <i>Thermopsis mollis</i> sensu stricto | Appalachian Golden-banner |
| * <i>Hygrohypnum closteri</i> | Closter's Brook-hypnum |

* Historical record exists for Orange County, but not documented within the last 20 years.

north-facing slopes, many of which are found along the margin of the Triassic Basin where the streams have cut deeply. These areas now harbor remnant, relictual communities that are quite rare in the Piedmont. Since the glacial events responsible for this phenomenon occur on a time scale of thousands of years, the natural communities generated by these forces should be seen as irreplaceable.

Landscape manipulations by humans have had a tremendous impact on the natural communities of this area. The cutting of much of the eastern deciduous forest and draining of wetlands removed an unknown number of plant species from local areas. Destruction of some of the larger animal species is better documented. The Carolina parakeet, passenger pigeon, and ivory-billed woodpecker are now extinct. [Only the parakeet might have nested in Orange County.] Extirpation, or local extinction, of large carnivores removed the gray wolf, mountain lion, and black bear from this area. Larger game species such as the woodland bison and elk are no longer found here, though white-tailed deer, wild turkey and beaver, once extirpated, have now been re-introduced.

Local extirpations are still occurring due to habitat manipulation by humans. Smooth coneflower and blue wild indigo once grew on the diabase soils near the Durham and Orange County line near US 15-501. The Cane Creek Reservoir has inundated the county's only known population of Eastern isopyrum. The proposed Sevenmile Creek Reservoir—no longer under consideration—would have removed the only known population of blue cohosh from the county.

Orange County has a more than 200-year history of agriculture. In the northern portion of the county, where the topography is more gently rolling, agriculture and associated irrigation impoundments are most extensive. In the southwestern quadrant of the county, many dairy farms add to this agricultural landscape. In the southeastern quadrant, many farms were abandoned in the post-Depression era and large portions of that land reverted to woodland. Today, however, this southeastern corner of the county is undergoing exceptionally rapid urban and suburban development. Many of the most scenic features here, including hilltops and sites along streams, were relatively little disturbed during the previous era of agriculture, since they are not arable farmland. Today, the hilltop forest, the forests along streamside slopes, and the upper edges of stream bluffs are highly sought as home sites.

When these sites are developed, the effect on the natural landscape can exceed the boundary of the residential clearing. Openings introduce new light and temperature regimes, and forest interior species face increased competition from species of openings and forest edges, especially from exotic species. Predation by domestic animals increases pressure on native animal populations, and expanded road networks allow for higher mortality by automobiles and greater fragmentation of natural habitats.

Such residential development also increases the distribution of exotic species, which compete with the native plants and animals. Japanese honeysuckle, periwinkle, and English ivy commonly invade the forest near home sites, and the introduced Japanese browntop grass (*Microstegium vimineum*) has replaced native bottomland grasses in many areas of the Piedmont. Introduced animals such as European Starlings compete with other native birds

for nesting cavities, while in our streams, introduced carp and Asiatic clams compete with native fishes and mussels. Increased siltation loads in streams may also result in the elimination of mussel and fish species.

Animal Life

Compared to plants, there are relatively few animals that exist in highly isolated, numerically small populations. Animals generally need more space than plants and for the most part lack the option to reproduce asexually, which allows clonal population of plants to persist in one spot for decades or even centuries. Moreover, the greater individual mobility of animals permits them to maintain contacts between populations over greater distances than is usual among plants. These differences, however, do not mean that animals are generally less “rare” than plants or that they deserve less attention in conservation efforts. Quite the contrary: these very features of animals often make them more vulnerable to habitat fragmentation or other human-caused disturbance than is true for even some of the rarest plants. Somewhat different criteria must be used, therefore, in evaluating the status of animal populations within the county, as will be discussed in this section; different preservation strategies may also be called for, as will be described in the section on wildlife habitats.

There are, in fact, a few isolated or rare populations of animals comparable to those found among plants; they generally occur among the least mobile or most habitat-specific groups. While there are no species that are confined solely to Orange County and a few that are endemic even to the Piedmont, there are several aquatic animals that are found primarily in North Carolina and nowhere else on earth. All these species are state listed as *threatened* or of *special concern* (see Table 3), mainly due to the restricted nature of their distributions.

The Neuse River waterdog (*Necturus lewisi*) is probably the most restricted animal that occurs within Orange County. It is found only within the Neuse and Tar river systems of North Carolina and reaches its westernmost limit in the Eno River within Orange County (Braswell and Ashton, 1985). Another species with a similar state-distribution and status is the Carolina madtom (*Noturus furiosus*), but this fish has yet to be documented upstream from the confluence of the Eno and the Little rivers, just east of the Orange County line (Lee et al, 1980).

Two other species of fishes possessing slightly wider distributions are the Roanoke bass (*Ambloplites cavifrons*), which occurs in the Neuse, Tar and Roanoke drainages, and the Carolina darter (*Etheostoma collis*), which is found above the Fall Line from the Pee Dee River system north to the Roanoke drainage (Lee et al, 1980). One Orange County population of this darter is especially noteworthy: the only known location for this species in the Cape Fear Basin was from the site cleared for the Cane Creek Reservoir and from an area immediately upstream (NC Natural Heritage Program). This species is listed as *special concern* within the state, but this particular population should be considered *threatened* or even *endangered*.

All four of these vertebrate species are adversely affected by the construction of impoundments, reduced stream flow, and pollution, but perhaps even more threatened by

these disturbances are various species of freshwater mussels. Even though they have less restricted ranges nationally, several of the species occurring in the county are listed as *threatened* or even *endangered* within North Carolina. The rarest of these is the Federally endangered dwarf wedgemussel (*Alasmidonta heterodon*). A search by Shelley (1987) failed to relocate the Eno population described by Walter (1956) from the vicinity of Hillsborough, near the southern limit of this species' distribution along the Atlantic Slope, nor did the authors find it during their 1988 survey of several sites along the Eno. They also failed to locate any of the threatened Atlantic pigtoe (*Fusconaia masoni*) reported from the Eno, but this species probably still exists within the region (Shelley 1987). The shell of a dwarf wedgemussel was found in the upper Eno River in 1996.

The other endangered species of mussel occurring within Orange County, the Savannah lilliput (*Toxolasma pullus*), seems to be holding its own. A thriving population still exists in University Lake (site M06), the only large concentration known for the state, and is likely to persist unless the lake is drained for dam repairs or dredged to increase its capacity. Also seemingly safe for the moment is the notched rainbow (*Villosa constricta*), a species of *special concern* for which the 1988 survey added three new sites within the county (E03, E06, and C03). At none of these sites was this species common. One of the populations found in Cane Creek (C03) was located just downstream from the then new Cane Creek Reservoir and could have been affected by sedimentation during the construction or reduced stream flow following the completion of the project.

While most terrestrial animals in the region are not quite so restricted in terms of their statewide distributions as the aquatic species just mentioned, there are still a number of regionally-rare land animals plus a few state-listed species (Table 3) that have very narrow habitat tolerances and are consequently vulnerable to local extirpation. Again, most of these are small animals with very limited powers of mobility.

As is the case with the county's rarest plant species, several of its most localized animals appear to be montane or northern disjuncts, existing in this area far from their main areas of distribution. As mentioned in the section on Biogeography, they probably represent relictual populations left over from the cooler times of the Pleistocene when their communities were widespread; they hold out now only in small groups along cool, moist, north-facing bluffs in close association with rhododendrons and other cool-mesic plant species.

Probably the best known of these animals is the red-backed salamander (*Plethodon cinereus*), one of the widest ranging of northern salamanders but a species that exists in this area on the very southern edge of its range. In Orange County it has been found in only two widely separated rhododendron communities along Morgan Creek (Kings Mill and Mason Farm Pond portions of site M08) and along the Eno River (E12).

Less well-documented are two invertebrates that appear to share the red-backed salamander's habitat preferences. A large and colorful species of velvet mite (*Allothrombium* sp.), which is referred to as the "sumo mite" due to the wrestling tournaments held among males, is likewise a member of a genus that occurs throughout the northern hemisphere (Moss, 1960) but in this area appears to be restricted to rhododendron or mountain laurel bluffs. A large

Table 3. Significant Animal Species of Orange County (Page 1 of 2)

Endangered:

Alasmidonta heterodon	Dwarf Wedgemussel
Alasmidonta varicosa	Brook Floater [mussel]
Fusconaia masoni	Atlantic Pigtoe [mussel]
Lampsilis cariosa	Yellow Lampmussel
Lasmigona subviridis	Green Floater [mussel]
Picoides borealis	Red-cockaded Woodpecker
Toxolasma pullus	Savannah Lilliput [mussel]

Threatened:

Haliaeetus leucocephalus	Bald Eagle
Alasmidonta undulata	Triangle Floater [mussel]
Lampsilis radiate conspicua	Carolina Fatmucket [mussel]
Strophitus undulates	Creeper [mussel]

Special Concern:

Etheostoma collis	Carolina Darter
Hemidactylum scutatum	Four-toed Salamander
Necturus lewisi	Neuse River Waterdog [amphibian]
Tachopteryx thoreyi	Gray Petaltail [dragonfly]
Villosa constricta	Notched Rainbow [mussel]

Significantly Rare:

Accipiter striatus	Sharp-shinned Hawk
Ambloplites cavifrons	Roanoke Bass
Lythrurus matutinus	Pinewoods Shiner
Vireo gilvus	Warbling Vireo
Diacyclops jeanneli putei	Carolina Well Diacyclops
Cambarus davidi	Carolina Ladle Crayfish

Regionally Rare:

Acantharchus pomotis	Mud Sunfish
Allothrombium sp.	Sumo Mite
Amblyscirtes hegon	Pepper and Salt Skipper
Ameiurus brunneus	Snail Bullhead
Amia calva	Bowfin
Ammodramus savannarum	Grasshopper Sparrow
Anolis carolinensis	Green Anole
Bombycilla cedrorum	Cedar Waxwing
Buteo lineatus	Red-shouldered Hawk
Buteo platypterus	Broad-winged Hawk
Callophrys augustinus	Brown Elfin
Callophrys henrici	Henry's Elfin
Callophrys niphon	Eastern Pine Elfin
Centrarchus macropterus	Flier [fish]
Chlosyne nycteis	Silvery Checkerspot [butterfly]
Dendroica petechia	Yellow Warbler
Elaphe guttata	Corn Snake

Table 3. Significant Animal Species of Orange County (Page 2 of 2)

Enneacanthus gloriosus	Bluespotted Sunfish
Enneacanthus obesus	Banded Sunfish
Erynnis brizo	Sleepy Duskywing [butterfly]
Etheostoma fusiforme	Swamp Darter
Etheostoma serrifer	Sawcheek Darter
Eumeces inexpectatus	Southeastern Five-lined Skink
Eumeces laticeps	Broadhead Skink
Falco sparverius	American Kestrel
Helmitheros vermivorus	Worm-eating Warbler
Limnothlypis swainsonii	Swainson's Warbler
Lontra canadensis	Northern River Otter
Lynx rufus	Bobcat
Melanerpes erythrocephalus	Red-headed Woodpecker
Meleagris gallopavo	Wild Turkey
Mephitis mephitis	Striped Skunk
Mesomphix sp.	(land snail)
Mniotilta varia	Black-and-white Warbler
Mustela frenata	Long-tailed Weasel
Mustela vison	American Mink
Necturus punctatus	Dwarf Waterdog
Nerodia erythrogaster	Rebelly Water Snake
Plethodon cinereus	Northern Redback Salamander
Pontia protodice	Checkered White [butterfly]
Protonotaria citrea	Prothonotary Warbler
Pseudemys concinna	Eastern River Cooter
Scaphiopus holbrookii	Eastern Spadefoot [toad]
Setophaga ruticilla	American Redstart
Sylvilagus palustris	Marsh Rabbit
Tantilla coronata	Southeastern Crowned Snake
Trachemys scripta	Yellowbelly Slider
Tyto alba	Barn Owl
Vanessa cardui	Painted Lady [butterfly]

land snail of the genus *Mesomphix* also belongs to a group whose main distribution is in cooler regions. This genus is highly diversified in the Southern Appalachians where many endemic species exist, but it generally is absent this far to the east (Hubricht, 1985). Although the authors are uncertain as to exact identity of this species, it nonetheless is probably the rarest of the montane animal species occurring in Orange County; it was found at only one site, the Mason Farm Rhododendron Bluff (M08). In 1988 this population was seriously endangered by the proposed Laurel Hill Parkway, but fortunately for the snail that planned roadway was later eliminated from consideration.

In addition to these small, slow-moving ground-dwellers, there are several, more motile animals that appear to be disjuncts from the mountains. The brown elfin butterfly (*Incisalia augustinus*) is another animal known from just one site within Orange County, the summit of Occoneechee Mountain (E07). Its main limitation appears to be the distribution of extensive heath thickets, which are food source for its larvae. Although this is another species that has a wide range in the mountains and north, in the lower Piedmont it is only known from the pine-oak-heath communities found on the tops of monadnocks; in addition to Occoneechee, it has been reported only for the Uwharries (Opler and Krizek, 1984) and the Sauratown Mountains (Jeff Nekola, pers. comm.). Slightly more common – known from two sites within the county (M10 and E11) – the pepper and salt skipper (*Amblyscirtes hegon*) has likewise been rarely observed this far to the southeast (Opler and Krizek, 1984). It occurs mainly in openings in rich woods or bottomlands, such as along woodland dirt roads and trails.

Other species more typical of the mountains than the Piedmont, but which should not be thought of as true disjuncts, include such species as the cedar waxwing (*Bombycilla cedrorum*), worm-eating warbler (*Helmitheros vermivorus*), broad-winged hawk (*Buteo platypterus*), and sharp-shinned hawk (*Accipiter striatus*). All nest sparingly in the Outer Piedmont (all but the worm-eating warbler were recorded in Orange County during the breeding season in 1988), but none can be considered long-term residents at any particular locality as can the true relict species mentioned above. They are good indicators of mature forest habitats, nonetheless.

At the opposite extreme from the montane-like habitats are the swamps and lowlands typical of the Coastal Plain. Within the Piedmont as a whole, these habitats are possibly even scarcer than cool-mesic sites, but the most numerous group of regionally rare animals occurring within Orange County occupies just these sorts of environments (see Table 4). Their presence here is due to the low-lying swamplands of the Triassic Basin, cutting across the southeastern corner of the county.

Even though many populations of this category of animals are quite large compared to the montane relicts and may, in fact, be continuous with populations in the Coastal Plain (the separation between the Coastal Plain and Triassic Basin is very narrow in Chatham County), Orange County nonetheless appears to possess a more thriving community of these organisms than occurs elsewhere in the Piedmont. Many of these species have indeed been seldom, if ever, recorded above the Fall Line. Like the montane species, they deserve special consideration within the region even if they cannot be considered threatened statewide.

Two other bottomland animals, however, merit additional attention. The four-toed salamander (*Hemidactylium scutatum*) and gray petaltail dragonfly (*Tachopteryx thoreyi*) are species that require certain kinds of springs or bogs for breeding and have only incompletely known distributions within the Southeast.

The dragonfly, which in 2002 was removed by the NC Natural Heritage Program from the rare list to the watch list (an unofficial advisory list) due to an increase in known populations, is one of the last of a line of dragonflies that was dominant during the times of the dinosaurs; only two species in this family still remain within the United States. Today it holds on only through avoiding competition with more modern dragonflies by occupying a marginal, semi-terrestrial niche at the upper edges of springs, a habitat where the normally aquatic larvae of other dragonflies cannot exist (Dunkle, 1981).

The four-toed salamander, a state-listed species, likewise appears to be marginal, at least within this area; it was first discovered within the state only in the 1940s, at a site within Duke Forest (Gray, 1941). Unlike the dragonfly, however, it is fairly common in the North and its widely scattered populations in the South may represent Pleistocene relicts like those of the red-backed salamander (Means, 1978).

On the other hand, both of these animals are highly inconspicuous and perhaps not as rare as previously thought (see Braswell and Murdoch, 1979, for range extensions for *Hemidactylium*). The 1988 survey found seven new sites for the salamander in Orange County (two thanks to Jim Petranka) and eight for the dragonfly. Nonetheless, the kinds of habitats these species prefer are quite fragile and easily disrupted by sewer line construction, lowered watertables due to increased well use, or stream channelization for flood control. One site along Bolin Creek (B01) where the salamander was previously known to occur (Stenhouse, 1984) was, in fact, destroyed in 1987 by the construction of a sewer line. These species are definitely not sufficiently common that we can afford to lose their populations needlessly.

The same is true for a number of species taken for granted due to their widespread occurrence within the eastern deciduous forest. In addition to the animals that are uncommon due to the narrowness of their habitat requirements, there are a number of other species – perhaps the majority of our native animals – that are becoming increasingly scarce due to human caused disruptions of their habitat or to direct persecution by man. This applies not only to the wolves, bears, mountain lions, and rattlesnakes, which we have actively exterminated from the county (and most of the eastern United States), but other carnivores or game species, such as bobcat, otter, mink, and wild turkey, which need large areas of wildlands either for their own hunting or to avoid being overhunted by humans. It also includes such species as Cooper's and sharp-shinned hawks, loggerhead shrikes, and American kestrels, all of which may have declined in this region due to pesticide poisoning, and even such inoffensive animals as Kentucky warblers, ovenbirds, and box turtles, which are adversely affected by roads penetrating their forest environments or predation by domestic cats and dogs.

There are some animal species in Orange County that characteristically inhabit the interiors of forests or require large tracts of undisturbed land for their existence; conversely, those same animals that are most sensitive to forest fragmentation or inroads of urbanization. Finding healthy populations of bobcat, wild turkeys, or pileated woodpeckers is one of the best indications of the relative lack of disturbance of a “natural” area. On the negative side, the absence of species such as ovenbirds, hooded warblers, or eastern hognose snakes indicates that the site has lost most of its wild qualities, even if large trees or other unusual plant species remain. As mentioned at the outset of this section, for conservation of our natural areas and their animal populations to be effective, we need to be aware of the habitat requirements not only of the species that are rare now, but those that may become rare if we simply take our natural heritage for granted. A list of animals indicative of special habitats in Orange County is provided as Appendix A.

Site Significance and Ranking

Each natural area in this report is assigned a ranking of overall site significance. The significance ranking reflects the presence of an important biological or geomorphic element of the site and the rarity of that element. The NC Natural Heritage Program designates four levels of Significance: National, State, Regional, and Local. For this inventory, Orange County substitutes the term “County” for “Local.”

National Significance

The sites considered to be of National significance are natural areas that contain examples of natural communities, rare plant or animal populations, or geologic features that are among the highest quality or best of their kind in the nation, or clusters of such elements that are among the best in the nation. Three sites in Orange County are considered to be of National significance: Eno River Aquatic Habitat (E01), University Lake Aquatic Habitat (M06), and Meadow Flats (N02).

State Significance

The North Carolina Natural Heritage Program recognizes the sites of State significance as natural areas that possess outstanding natural features such as a very rare plant or animal, or one of the best examples of a community type or geomorphic feature in the state. For example, Mason Farm Oak-Hickory Forest (M10) contains the largest known population of mature southern shagbark hickories in the state. Eleven sites in Orange County are considered to be of State significance: Occoneechee Mountain (E07), Eno River/Cates Ford and Uplands (E11), Middle Eno River Bluffs and Slopes (E13), Little River Aquatic Habitat (L05), Morgan Creek Bluffs (M08), Mason Farm Oak-Hickory Forest (M10), Big Oak Woods (M11), Bald Mountain (N01), Currie Hill (N06), and New Hope Creek Slopes (N11).

Regional Significance

Sites of Regional significance possess outstanding natural features or rare plant or animal species, and are one of the best examples of such a site in the eastern Piedmont, but not the best within the entire state. For example, the rhododendron communities are habitat for species that are very rare in the Piedmont region. Seven sites in Orange County are considered Regionally significant: Persimmon Nursery Flats (C05), Sevenmile Creek Sugar Maple Bottoms (E06), Cates Creek Hardwood Forest (E09), ERSP Mountain Spleenwort and Rhododendron Bluff (E12), Berryhill Rhododendron Bluff (M07), Morgan Creek Floodplain Forest (M12), Henry J. Oosting Natural Area (N10), and Couch Mountain (N12).

County Significance. Sites of County significance are noteworthy sites within Orange County, although similar sites may occur in other counties in the region or state. The site may or may not contain a rare plant or animal species, but is considered to be one of the better of its type in the county, based on uniqueness of the habitat within the county, or species diversity, or overall aesthetic appeal. A few sites are recognized for their aesthetic appeal, or, because of their location near population centers, have extra value because of their natural condition in close proximity to an urban or suburban setting. Thirty-two sites in Orange County are considered to be of County significance.

Table 4. List of Orange County Natural Areas and their Significance (Page 1 of 2)

		National significance (3 sites)	Regional significance (8 sites)
		State significance (10 sites)	County significance (32 sites)
<u>Site Name (by Watershed)</u>	<u>Site #</u>	<u>Significance</u>	<u>Features</u>
Bolin Creek Watershed			
Bolin Creek *	B01	County	Mature hardwood forest
Battle Park *	B02	County	Mature hardwood forest, rare plant
Cedar Terrace Bottoms *	B03	County	Swamp forest, rare dragonfly
Cane Creek Watershed			
Cane Creek Reservoir	C01	County	Mature hardwood forest, wildlife habitat
Haw River Alluvial Terrace *	C02	County	Floodplain levee forest
Lower Cane Creek Slopes and Bottom	C03	County	Mature forest, rare mollusk, otter, nesting black vultures
OWASA Mitigation Tract	C04	County	Mature hardwood forest, wildlife habitat
Persimmon Nursery Flats *	C05	Regional	Unusual hardpan soil, species mix
Eno River Watershed			
<i>Sevenmile Creek / Cane Creek Macrosite¹</i>		<i>Regional</i>	
Camp Chestnut Ridge	E04	County	Mature chestnut oak forest
Crabtree Creek Monadnock Ridge	E05	County	Upland wildlife habitat
Sevenmile Creek Sugar Maple Bottoms	E06	Regional	Mature forest, rare plants
<i>Upper Eno River Macrosite</i>		<i>National</i>	
Eno River Aquatic Habitat	E01	National	Rare aquatic species
McGowan Creek Preserve & Floodplain	E02	County	Hardwood forest, wildlife habitat
Eno River Duke Forest Mesic Slopes	E03	County	Rich hardwood forest, excellent wildflowers, rare aquatic animals
Occoneechee Mountain	E07	State	Numerous rare plants, rare butterflies; pine-heath-bracken community, mature chestnut oak forest
Poplar Ridge Slopes and Bottom	E10	County	Rare animals, extensive bottomland forest
Eno River / Cates Ford and Uplands	E11	State	Rare plants, rare dragonfly, upland depressions, hardwood forest, mature post oak forest, extensive bottomland
ERSP Mountain Spleenwort & Rhododendron Bluff	E12	Regional	Rare plants, rare salamander
Middle Eno River Bluffs and Slopes	E13	State	Rare plants, rare animals
Cates Creek Hardpan Forest *	E08	County	Bottomland forest
Cates Creek Hardwood Forest *	E09	Regional	Rare plant community
Stony Creek Spring *	E14	County	Large spring, rare salamander, rare dragonfly
Hyco Creek Watershed			
Cedar Grove Heartleaf Ravine *	H01	County	Rare plant
Penecost Road Nestronia Flat *	H02	County	Rare plants

¹ The Sevenmile Creek / Cane Creek Macrosite also includes standard sites C01, C03, and C04

* Stand-alone standard site (not within a larger macrosite)

Table 4. List of Orange County Natural Areas and their Significance (Page 2 of 2)

<u>Site Name (by Watershed)</u>	<u>Site #</u>	<u>Significance</u>	<u>Features</u>
Little River Watershed			
South Fork Little River Marsh *	L01	County	Beaver pond and marsh
Forrest Creek Beaver Pond *	L02	County	Beaver pond and marsh
Jimmy Ed Road Heartleaf Flat *	L03	County	Rare plant
Breeze Road Heartleaf Ravine *	L04	County	Rare plant
Little River Aquatic Habitat *	L05	State	Rare aquatic species
Morgan Creek Watershed			
Pickards Mountain *	M01	County	Excellent chestnut oak forest
Calvander Laurel Bluff and Bottom *	M02	County	Rare salamander
<i>University Lake Macrosite</i>		<i>National</i>	
McCauley Mountain	M03	County	Mature upland forest
University Lake Slopes and Wetlands	M04	County	Rare plants, rare mollusk, mature forest
University Lake Marsh	M05	County	Marsh, good birdlife
University Lake Aquatic Habitat	M06	National	Rare mussel
Berryhill Rhododendron Bluff	M07	Regional	Rare plants, rhododendron bluff
<i>Jordan Lake Macrosite</i>		<i>State</i>	
Morgan Creek Bluffs	M08	State	Mature hardwood forest, rare plants & animals, rhododendron bluffs, excellent birdlife
Laurel Hill Ridge and Vernal Pool	M09	County	Large upland forest, rare plant
Mason Farm Oak-Hickory Forest	M10	State	Rare forest type on diabase rock
Big Oak Woods	M11	State	Old growth swamp forest
Morgan Creek Floodplain Forest	M12	Regional	Swamp forest, rare animals
New Hope Creek Watershed			
<i>Bald Mt./Meadow Flats/Currie Hill Macrosite</i>		<i>National</i>	
Bald Mountain	N01	State	Mature chestnut oak forest, nesting turkey vultures
Meadow Flats	N02	National	Rare plant, rare animals, upland depression
Eubanks Rd Xeric Hardpan Forest	N03	County	Xeric hardpan forest
Blackwood Mountain	N04	County	Mature upland forest
Steep Bottom Branch	N05	County	Mature forest
Currie Hill	N06	State	Basic forest on diabase rock
Camp Pipsissewa *	N07	County	Mature bottomland forest
New Hope Church Road Basic Forest *	N08	County	Forest on basic rock
New Hope Chestnut Oak Forest *	N09	County	Chestnut oak forest
<i>New Hope Creek Floodplain Macrosite</i>		<i>State</i>	
Henry J. Oosting Natural Area	N10	Regional	Mature hardwood forest, rare animals
New Hope Creek Slopes	N11	State	Mature forest, rare plants and animals, rhododendron bluffs, sandstone outcrops, mature alluvial forest, xeric bluff forest
<i>Mud Creek / Couch Mountain Macrosite</i>		<i>Regional</i>	
Couch Mountain	N12	Regional	Mature upland forest, very large trees

* Stand-alone standard site (not within a larger macrosite)

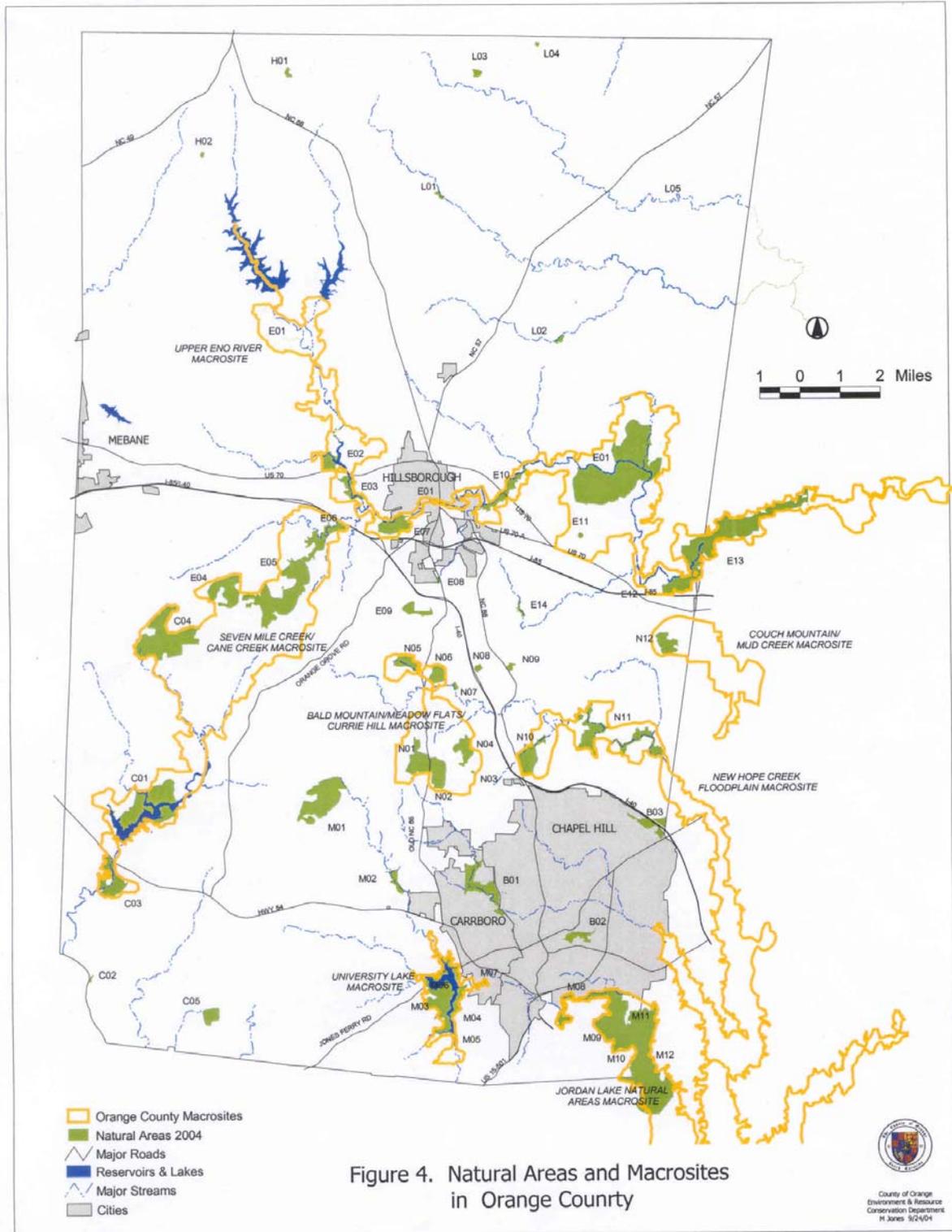
Introduction to Site Descriptions

This section describes 53 biologically significant sites in Orange County. The sites total just over 10,000 acres and they range in size from four acres to 892 acres. The sites are arranged by watershed, and generally ordered from upstream to downstream. Each site has been given a name and a site number. The site name is brief but is descriptive of the location or a significant feature of the site. The site number is composed of a single letter identifying the watershed in which the site is located, followed by two numerical digits. The seven watersheds are Bolin Creek (B), Cane Creek (C), Eno River (E), Hyco Creek (H), Little River (L), Morgan Creek (M), and New Hope Creek (N).

In addition to the 53 individual (or “standard”) sites, this section also contains groupings or clusters of standard sites into seven larger areas of significance referred to as “macrosites.” Macrosites are delineated and described by the NC Natural Heritage Program as areas that support the integrity and vitality of the smaller, standard sites. Macrosites are broad, natural habitats with relatively little or no human alteration. Of the seven macrosites, three are considered to be of National significance (Upper Eno River, University Lake, and Bald Mountain/Meadow Flats/Currie Hill macrosites) and two are of State significance (Jordan Lake and New Hope Creek Floodplain macrosites.)

For each individual site (and macrosite) provided there is a USGS topographic map with site boundaries; the scale is 1:24,000 for all sites except for macrosites and aquatic habitats, which are at a different scale. The site description lists the site significance, USGS quadrangle, approximate size (acreage), and ownership. The site significance is determined by the NC Natural Heritage Program as National, State, Regional, or County (see Table 5). A summary of the reasons for significance is followed by the natural community type(s) represented by the site, a general description of the site, the protection status, management recommendations, and a list of references.

Those sites that have been revisited and re-evaluated since the original 1988 survey are identified as “Updated 2004” on the site description. New sites are also identified as “New Site 2004.” They are also identified with asterisks in the Table of Contents.



Bolin Creek Watershed

Orange County Natural Areas Inventory

BOLIN CREEK

Updated 2004

Site Number: B01

Size: 282 acres

Site Significance: County

USGS Quadrangle: Chapel Hill

SIGNIFICANT FEATURES: This is one of the few remaining wooded stream corridors in the vicinity of Chapel Hill and Carrboro and the best remaining natural area along Bolin Creek. It includes one of only 9 sites where the four-toed salamander (*Hemidactylium scutatum*), a state-listed species, is recorded in Orange County.

The northern portion includes two large tracts of undeveloped forest within an urban setting. They serve to provide passive recreation opportunities for local residents, to provide habitat for a variety of animals and plants. At least a dozen species of neotropical migrant birds breed here, as do red-shouldered hawks (*Buteo lineatus*).

NATURAL COMMUNITIES: Dry-Mesic Oak—Hickory Forest, Mesic Mixed Hardwood Forest

GENERAL DESCRIPTION: During the last 25 years, this relatively narrow upland stream valley has been encroached upon by development at an ever-increasing pace. Nonetheless, it remains wooded throughout its length, with some areas remaining in fairly good condition. The forest cover is composed primarily of mixed mesic hardwoods along the narrow bottomland and lower slopes, grading into dry-mesic oak-hickory forest on areas farther above the stream. The original boundary drawn for this natural area in 1988 encompassed the stream bottom to the confluence with the unnamed tributary from Calvander, along with an area of dry upland oaks in the northeast corner. That boundary circumscribed the core of the area well known as one of the most attractive walking areas within the Chapel Hill-Carrboro limits. A survey of the site in 2001 found that it has been encroached upon by a few more roads and many more houses, all southwest of the creek. The boundary has been revised to exclude the new development, but to include the steep slopes along the southwest side of the creek. It has also been expanded further north to include more of the Bolin Creek corridor flowing through the large tract owned by the University of North Carolina.

One of the most outstanding aesthetic features is the small bluff just upstream from the Southern Railway trestle, where the stream takes a 90-degree bend. Above this rocky bend, the forest is dominated by beech trees (*Fagus grandifolia*) and other hardwoods, which descend to the creek. Devil's bit (*Chamaelirium luteum*), trillium (*Trillium catesbaei*), dwarf crested iris (*Iris cristata*), spring beauty (*Claytonia virginica*), windflower (*Thalictrum thalictroides*), and bluets (*Houstonia caerulea*) are some of the wildflowers that are seen here in the spring. A well-worn trail continues upstream from here, passing through relatively mature mixed mesic hardwood forest. Species seen along this bottom are tulip poplar (*Liriodendron tulipifera*), cherrybark oak (*Quercus falcata* var. *pagodaefolia*), white oak (*Q. alba*), red oak (*Q. rubra*), willow oak (*Q. phellos*), sweetgum (*Liquidambar styraciflua*), pignut hickory (*Carya glabra*), and mockernut hickory (*C. tomentosa*). On the steep slope to the west is a mesophytic forest supporting the following hardwoods: beech, white oak,

shagbark hickory (*Carya ovata*), tulip poplar, sourwood (*Oxydendrum arboreum*), and umbrella magnolia (*Magnolia tripetala*). The latter is a very uncommon tree in the county. On the small upland area in the northeast corner of this site, dry oaks, including post oak (*Quercus stellata*) and blackjack oak (*Q. marilandica*) dominate the canopy.

The Bolin Creek area had been used by UNC zoologists for years as a salamander research site, especially a large deep pool located along a tributary. It was here that the four-toed salamander (*Hemidactylium scutatum*) was found, along with the spotted salamander (*Ambystoma maculatum*), marbled salamander (*A. opacum*), and several other species of amphibians (Stenhouse, 1984). Unfortunately this pool was destroyed (prior to 1988) by the construction of a sewer-line, as has much of the adjoining bottomland required by the adults of these species for foraging. Moreover, Japanese browntop grass (*Microstegium vimineum*) is now (2001) abundant along the sewerline right-of-way and in adjacent floodplain terraces. This aggressive alien easily outcompetes many native herbs and grasses. Additional species normally associated with mature hardwoods may also have disappeared, particularly such low-nesting birds as the ovenbird (*Seiurus aurocapillus*), hooded warblers (*Wilsonia citrina*), or Kentucky warblers (*Oporornis formosus*). All of these are sensitive to the effects of forest fragmentation. Deer sign is also noticeably missing, although this species usually does well in disturbed habitats (the abundant dog tracks suggest a possible explanation).

In 2001 another disturbance was noted, one that has serious consequences: mountain bikes. These rugged bicycles not only travel the main trails but also have made some of their own trails off into what used to be pure forest. The effect of repeated passes by knobby tires has been excessive rutting and widening of all trails (some of this may be from lots of hikers, but it appears that bikes are proportionately far more damaging). Siltation into Bolin Creek and tributaries is evident at crossing points. Moreover, the rate of speed at which bikers go can be potentially dangerous to walkers and people with dogs.

On the positive side, many animals do still occur here, particularly those that occur in younger or more open forest. These include the flicker (*Colaptes auratus*), great crested flycatcher (*Myiarchus crinitus*), phoebe (*Sayornis phoebe*), brown-headed nuthatch (*Sitta pusilla*), pine warbler (*Dendroica pinus*), rufous-sided towhee (*Pipilo erythrophthalmus*), and goldfinch (*Carduelis tristis*). Even barred owls (*Strix varia*) and hairy woodpeckers (*Picoides villosus*) persist since they are species that require extensive woodlands. Several smaller animals may be capable of surviving into the future so long as some minimum of the mature mesic hardwoods remains uncut. The regionally rare purseweb spider (*Sphodros* sp.) is a good example of this group of animals.

The northern section of this site is within the large property known locally as the “Horace Williams Tract.” That property is owned by the State of North Carolina will be developed for an expansion of the University of North Carolina. Large portions of the original hardwoods of the so-called “Horace Williams Tract” have been replaced by loblolly pine plantations. Mature pines are over a foot in diameter and 80 feet tall. However, management of the tract has allowed abundant regeneration of native hardwoods beneath the pines. In places the hardwoods are approaching the dimensions of the pines and have become co-dominant in the canopy layer. In mesic sites these hardwoods include sweetgum (*Liquidambar styraciflua*), tulip poplar (*Liriodendron tulipifera*), shagbark hickory (*Carya ovata*), white oak (*Quercus alba*), southern red oak (*Q. falcata*), and white ash (*Fraxinus*

americanus). Drier sites upslope support post oak (*Quercus stellata*), southern red oak, red maple (*Acer rubrum*), pignut and mockernut hickories (*Carya glabra* and *C. alba*), and scattered shortleaf pine (*Pinus echinata*). Understory trees include dogwood (*Cornus florida*), sourwood (*Oxydendrum arboreum*), persimmon (*Diospyros virginiana*), and scattered red cedar (*Juniperus virginiana*). The herb layer is sparse in the uplands but dense down on the terraces of Bolin Creek and Crow Creek.

The most mature and natural part of this property occurs in the northwest portion, on the slope west of Bolin Creek. Towering hardwoods nearly two feet in diameter dominate the forest, with some giants measuring 3.5 feet dbh: beech (*Fagus grandifolius*), white oak, red oak, bitternut hickory (*Carya cordiformis*), tulip poplar, and sweetgum (*Liquidambar styraciflua*). Although usually a subcanopy tree, some black walnuts (*Juglans nigra*) here reach the canopy. Understory trees include redbud (*Cercis canadensis*), dogwood, basswood (*Tilia caroliniana*), umbrella magnolia (*Magnolia tripetala*) - rare in the county, and red mulberry (*Morus rubra*). Painted buckeye (*Aesculus sylvatica*) and spicebush (*Lindera benzoin*) are common in the shrub layer.

A few small natural depressions hold water for short periods and support willow oak (*Quercus phellos*). None of these, however, hold water long enough to provide breeding sites for amphibians.

MANAGEMENT AND PROTECTION: This site is of prime value as greenspace for residents of Chapel Hill and Carrboro, and should be protected as a "natural area" within the proposed greenway system. Hiking trails already provide opportunity for nature observation, walking dogs, and simply to get away from the hectic pace of everyday life. Japanese browntop grass has invaded lowlands along many of the creeks as well as along some upland trails; it is a threat to native herbs.

A southeastern portion of this site (part of the "Adams Tract") was acquired by Town of Carrboro in 2004 for a low-impact park and natural area. A conservation easement is held by Orange County. The portion of the Bolin Creek corridor flowing through University property (future Carolina North) is being considered for possible open space and recreational use.

OWNERSHIP: Private; University of North Carolina; Town of Carrboro

REFERENCES:

Otte, D.K.S. and L. Otte. 1980. Iron Mine Hill Natural Area. Pages 259-315 In Radford, A.E. (ed). Natural Heritage: Classification, Inventory, and Information. UNC Press, Chapel Hill.

Stenhouse, S. L. 1984. Coexistence of the salamanders *Ambystoma maculatum* and *Ambystoma onacum*: predation and competition. PhD. dissertation, UNC Chapel Hill.

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Orange County Natural Areas Inventory

BATTLE PARK

Site Number: B02
Site Significance: County

Size: 81 acres
USGS Quadrangle: Chapel Hill

SIGNIFICANT FEATURES: Together with Mason Farm, this is one of the longest-protected natural areas in Chapel Hill; the University has maintained this site as an undeveloped park since the mid 1800s. This is the only known locality for the moss species *Hygrohynnum closteri*. The forest is aesthetically very pleasing, and has been used by generations of students and town residents for recreational purposes.

NATURAL COMMUNITIES: Dry-Mesic Oak—Hickory Forest, Mesic Mixed Hardwood Forest

GENERAL DESCRIPTION: This is an isolated tract of forest, surrounded on all sides by residential areas of Chapel Hill. Since it has been left undisturbed for such a long time, the remnant forests within its boundaries are a good example of upland hardwoods, containing many trees of large size. Along the small stream running the length of the natural area grows a mesic hardwood forest, consisting of beech (*Fagus grandifolia*), walnut (*Juglans nigra*), sycamore (*Platanus occidentalis*), and tulip poplar (*Liriodendron tulipifera*). On the slopes above the ravine is a drier forest composed of post oak (*Quercus stellata*), white oak (*Q. alba*), blackjack oak (*Q. marilandica*), black oak (*Q. velutina*), mockernut hickory (*Carya tomentosa*), and pignut hickory (*C. glabra*). Many large shortleaf pines (*Pinus echinata*) are also scattered through the drier forest. The older pines represent a late stage of forest succession not often seen in today's Piedmont, since these trees are usually removed by selective harvesting before they reach this size. Thus, within the limits of this small natural area can be found some of the most typical forests of our region, successional as well as mature.

Despite its long history of protection, however, this forest also illustrates the decay of natural values that occurs in isolated tracts when they are not provided with sufficient buffer areas along their perimeter. The forest is aesthetically pleasing to the eye, but a close examination of the species composition reveals the presence of many exotic, naturalized plants invading from surrounding yards. These include English ivy (*Hedera helix*), mahonia (*Mahonia bealei*), and periwinkle (*Vinca minor*), to name but a few. This "suburbanized" aspect of this forest applies equally to the animal community. Many of the birds observed here are characteristic of back yards and rarely occur in mature forest. These include the American robin (*Turdus migratorius*), catbird (*Dumatella carolinensis*), brown thrasher (*Toxostoma rufum*), and rufous-sided towhee (*Pipilo erythrophthalmus*). Two more unusual species falling into this category include the red-headed woodpecker (*Melanerpes erythrocephalus*), which appears to be on the decline in the Piedmont, and the fish crow (*Corvus ossifragus*), whose numbers are increasing. Several deep forest birds, conversely, appear to be missing from Battle Park, including the ovenbird (*Seiurus aurocapillus*) and hooded warbler (*Wilsonia citrina*), both of which nest on or close to the ground and thus offer easy prey to cats and other domestic animals.

Despite these shortcomings, the value of this natural area must be assessed in terms of its proximity to a major population center. The large trees, pleasant brook, and general "feel" of the deep forest is still inviting to the many local residents whose recreational needs can be served by this natural area.

MANAGEMENT AND PROTECTION: Historically protected by the University as a natural area, and managed and maintained as a Town of Chapel Hill greenway. The park came under the administration of the NC Botanical Garden in 2004. Should continue to be maintained as a public natural area.

OWNERSHIP: University of North Carolina

REFERENCES:

Wickland, D. 1973. Pages 110-112 In A. E. Radford, ed. 1976. *Vegetation, Habitats, Floras: Natural Areas in the Southeastern United States -- Field Data and Information*. Department of Biology, UNC Chapel Hill, North Carolina.

Solberg, R. M. and N. G. Miller. 1979. A Floristic Catalog of Battle Park, University of North Carolina Campus, Chapel Hill. I. Bryophyta. *Journal of the Elisha Mitchell Scientific Society* 95(1):1-16.

Smith, S. M. 1986. *Vascular Flora of Battle Park*. Report to the director of the Herbarium, Department of Biology, UNC Chapel Hill.

Sather, D. and S. Hall. 1988. *Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina, Appendix B: Biological Documentation of Sites*. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Orange County Natural Areas Inventory

CEDAR TERRACE BOTTOMS

Site Number: B03
Site Significance: County

Size: 115 acres
USGS Quadrangle: Chapel Hill

SIGNIFICANT FEATURES: This area includes a large tract of relatively mature bottomland swamp forest located on the westernmost limits of the Durham Triassic Basin. The regionally rare gray petaltail dragonfly (*Tachopteryx thoreyi*), removed from the state rare list in 2002, breeds in seepage areas at the margins of this forest.

NATURAL COMMUNITIES: Piedmont Swamp Forest

GENERAL DESCRIPTION: The wide and gentle bottoms of the Triassic Basin touch only the easternmost portion of Orange County. Except for Big Oak Woods and Morgan Creek Swamp (M17 and M18), this is the best example of swamp forest in the county. Along the unnamed tributary of New Hope Creek, which flows through this site, the forest cover is composed mostly of red maple (*Acer rubrum*), white ash (*Fraxinus americanus*), and sweetgum (*Liquidambar styraciflua*). Other important trees are willow oak (*Quercus phellos*), Shumard's oak (*Q. shumardii*), overcup oak (*Q. lyrata*), sycamore (*Platanus occidentalis*), and tulip poplar (*Liriodendron tulipifera*), with hop hornbeam (*Ostrya virginiana*) and ironwood (*Carpinus caroliniana*) occurring in the subcanopy. Many of the herbaceous species are those restricted to wet bottomlands, and include water hemlock (*Cicuta maculata*), lizard's tail (*Saururus cernuus*), false nettle (*Boehmeria cylindrica*), aneilema (*Aneilema keisak*), lycopus (*Lycopus virginicus*), and jewelweed (*Impatiens capensis*).

These bottomland forests are often prime nesting sites for birds; 33 species were recorded here over only two brief visits in 1988. Some of the typical bottomland species include the green heron (*Butorides striatus*), acadian flycatcher (*Empidonax virescens*), and northern parula (*Parula americana*), while the hooded warbler (*Wilsonia citrina*) and scarlet tanager (*Piranga olivacea*) represent species that simply prefer extensive hardwood forests especially where the cover is fairly dense. The tracks of deer (*Odocoileus virginianus*), raccoon (*Procyon lotor*), red fox (*Vulpes vulpes*), and groundhog (*Marmota monax*) are also conspicuous, while large pools provide breeding habitat for marbled salamanders (*Ambystoma opacum*) and other amphibians. The most noteworthy animal is the regionally rare gray petaltail dragonfly (*Tachopteryx thoreyi*), which breeds in the shallow seeps located where the crystalline rock of the Piedmont meets the flat sediments of the Triassic Basin.

MANAGEMENT AND PROTECTION: Portions have been acquired for open space protection by the Town of Chapel Hill. These bottomlands should be protected from development under the Floodplain Protection Ordinance of the Town of Chapel Hill. Care needs to be taken, however, that development on the adjoining slopes does not spill over, especially where the grayback seeps occur. A conservation easement should be negotiated with the landowners for the protection of the forest.

OWNERSHIP: Town of Chapel Hill; Private

REFERENCES: Sather, D. and S. Hall. 1988. Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina, Appendix B: Biological Documentation of Sites. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Cane Creek Watershed

Orange County Natural Areas Inventory

CANE CREEK RESERVOIR

Updated 2004

Site Number: C01

Size: 850 acres

Site Significance: County

USGS Quadrangle: White Cross

SIGNIFICANT FEATURES: Three of the low peaks surrounding the Cane Creek Reservoir are still relatively undeveloped and possess good examples of upland hardwood forests typical of the Piedmont. Collectively, these uplands are extensive enough to provide good habitat for several animals sensitive to human disturbance. Situated in the Cane Creek valley, it is an important habitat node within an extensive wildlife corridor connected to the Haw River system.

NATURAL COMMUNITIES: Dry-Mesic Oak—Hickory Forest, Mesic Mixed Hardwood Forest, Piedmont Monadnock Forest

GENERAL DESCRIPTION: The three peaks of Mitchell Mountain, Crawford Mountain, and the unnamed hill just north of Crawford Mountain are the steepest areas within the southwest corner of the county. For this reason they have escaped cultivation and retain their forest cover; the steepest slopes in particular have many large trees.

The summits of Mitchell and Crawford Mountains are cloaked in second-growth oak-hickory-beech forest. Major components are chestnut oak (*Quercus montana*), black oak (*Q. velutina*), pignut hickory (*Carya glabra*), mockernut hickory (*C. alba*), beech (*Fagus grandifolia*), and red maple (*Acer rubrum*). Some of the largest chestnut oaks in the county occur on steep middle and upper slopes of Mitchell Mountain. Sourwood (*Oxydendrum arboreum*) is prominent in the understory. Hurricane treefalls are scattered on all three peaks, but are especially numerous on east and north slopes of Crawford Mountain (2002 survey).

Before dam construction and creation of the reservoir in the early 1990s, some of the area's finest stands of mesic mixed hardwoods occurred on lower slopes and along Cane Creek. Particularly noteworthy was the abundance of large red oaks (*Quercus rubra*) and tulip poplar (*Liriodendron tulipifera*) and the large number of mesic herbs, including black cohosh (*Cimicifuga racemosa*), trillium (*Trillium catesbaei*), and bloodroot (*Sanguinaria canadensis*). The most outstanding floral areas were also inundated. These included a site for the regionally rare yellow lady's slipper (*Cypripedium calceolus* var. *pubescens*), and the only known location within Orange County for the state rare false rue anemone (*Enemion biternatum* = *Isopyrum biternatum*). Only very small remnants of this mesophytic flora remain, mostly along several small tributary creeks, and the rare plant species appear to have been extirpated (2002 survey).

Animals observed in this area are, for the most part, typical of upland forests in the Piedmont and include red-tailed hawk (*Buteo jamaicensis*), great horned owl (*Bubo virginianus*),

scarlet and summer tanagers (*Piranga olivacea* and *P. rubra*), yellow-throated vireo (*Vireo flavifrons*), white-tailed deer (*Odocoileus virginianus*), and gray squirrel (*Sciurus carolinensis*). Red foxes (*Vulpes vulpes*) were also seen denning on one of these hills and a population of eastern chipmunks (*Tamias striatus*), a localized species within the eastern Piedmont, was found on a rocky bluff just above the creek.

Additionally noteworthy are the black vulture (*Coragyps atratus*) roosts that occur in the more open woodlots just to the southeast of the reservoir; due to the increasing rarity of undisturbed roosting sites, this species is considered of special concern within the state. The locally uncommon grasshopper sparrows (*Ammodramus savannarum*) also nest in hayfields in the same area. One state-listed fish of special concern, the Carolina darter (*Etheostoma collis*), was known from the Cape Fear drainage only from the site cleared for the reservoir and from an area immediately upstream.

Along with the potential for wildlife habitat that such a large, forest-covered area can offer, the aesthetic value of these slopes is also a significant feature. Of all the reservoirs in the county, this area around Cane Creek Reservoir and the slopes surrounding University Lake (site M04) have the most outstanding scenic values.

MANAGEMENT AND PROTECTION: Most of the site is now owned and protected by Orange Water and Sewer Authority; small portions are privately owned, but regulated by watershed protection ordinance. Several houses have been built along Mitchell Mountain Road, but have removed a minimum of the tree canopy. At the east end of the dam OWASA has developed an extensive open area for parking lots, a boat ramp, an interpretive facility, and maintenance facilities. It is likely that more houses will be built along Mitchell Mt. Rd.

Included within the natural area are only the slopes considered to be the most significant portion within the much larger forested area surrounding the Cane Creek Reservoir. Any development around the reservoir should be steered away from these more sensitive slopes.

OWNERSHIP: Orange Water and Sewer Authority; Private

REFERENCES: Sather, D. and S. Hall. 1988. Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina, Appendix B: Biological Documentation of Sites. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Orange County Natural Areas Inventory

HAW RIVER ALLUVIAL TERRACE

Site Number: C02
Site Significance: County

Size: 6 acres
USGS Quadrangle: Saxapahaw

SIGNIFICANT FEATURES: The levee forest at this site is the county's only example of this community type occurring along a high-energy stream.

NATURAL COMMUNITIES: Piedmont Levee Forest

GENERAL DESCRIPTION: The Haw River is the broadest and highest energy stream in the county but forms only several miles of our southwest boundary. Most of the bottomlands along this strip are in cultivation, but the alluvial terrace described here has remnants of the vegetation that once dominated the levees of large rivers in the Piedmont. Even this strip, however, has been reduced to a narrow band by adjacent cultivation.

This is the only place in the county where alluvial deposits have built up to such an extent and are still forested. Tributary streams slice straight down through these deposits, forming steep-walled gullies up to 15 feet deep. The trees growing on the deep, sandy soils are characteristic of levee forests. Dominant species are box elder (*Acer negundo*), sycamore (*Platanus occidentalis*), American elm (*Ulmus americana*), river birch (*Betula nigra*), and hackberry (*Celtis laevigata*). Some of these trees are between two and three feet in diameter. The understory is fairly open and consists of species such as Florida maple (*Acer saccharum* ssp. *floridanum*), bladdernut (*Staphylea trifolia*), ironwood (*Carpinus caroliniana*), spicebush (*Lindera benzoin*), and slippery elm (*Ulmus rubra*). Conspicuous herbaceous species are violet (*Viola papilionacea*) and wood nettle (*Laportea canadensis*), along with several grasses.

Among the animal species characteristic of riparian forests are barred owl (*Strix varia*), acadian flycatcher (*Empidonax virescens*), yellow-throated warbler (*Dendroica dominica*), beaver (*Castor canadensis*), raccoon (*Procyon lotor*), and pickerel frog (*Rana palustris*). Probably more significant would be several species of fish that only occur in rivers as deep as the Haw, and consequently are absent in the rest of the county.

MANAGEMENT AND PROTECTION: This site has no formal protection (previously managed as gamelands administered by NC Wildlife Resources Commission). The area immediately upslope was harvested for timber and subdivided for housing. The clearing and disturbance directly adjacent to the natural area may be associated with that development. Owners should be alerted to the natural values of this levee forest.

OWNERSHIP: Private

REFERENCES: Sather, D. and S. Hall. 1988. Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina, Appendix B: Biological Documentation of Sites. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Orange County Natural Areas Inventory

LOWER CANE CREEK SLOPES AND BOTTOM

Site Number: C03
Site Significance: County

Size: 247 acres
USGS Quadrangles: White Cross
Saxapahaw

SIGNIFICANT FEATURES: Although the plant communities along this section of Cane Creek are mostly in young second growth, there are several important animal species here, including the state-listed notched rainbow mussel (*Villosa constricta*) and the regionally rare otter (*Lutra canadensis*). A large roost of black vultures (*Coragyps atratus*) was also observed in the forest next to the creek; this species is considered special concern state-wide, and the only known roosting population of this species in Orange County occurs in the Cane Creek valley, both here and upstream near the reservoir (CO1). This is one of the most important wildlife corridors within Orange County, due to its connection to the Haw River and Cape Fear system. The water quality in Cane Creek is excellent, and supports one of the best remaining fish and mussel faunas in the Piedmont.

NATURAL COMMUNITIES: Dry-Mesic Oak—Hickory Forest, Mixed Mesic Hardwood Forest, Piedmont Alluvial Forest

GENERAL DESCRIPTION: This site includes three types of habitats: a riparian strip; a steep, dry west-facing bluff; and mesic slopes with a more sheltered, gentler aspect. The most unique of these botanically is a dry, 30-foot bluff of felsic volcanic tuff supporting a stunted forest composed mainly of beeches (*Fagus grandifolia*) and white oaks (*Quercus alba*). This is the driest situation where the usually mesic beech is found. Other species here include red maple (*Acer rubrum*), dogwood (*Cornus florida*), and red cedar (*Juniperus virginiana*). The most abundant herbs are beechdrops (*Epifagus virginiana*), woodrush (*Luzula acuminata*), hepatica (*Hepatica americana*), and Christmas fern (*Polystichum acrostichoides*). One interesting zoological feature is a large den, possibly of a groundhog (*Marmota monax*) or fox (*Vulpes vulpes* or *Urocyon cinereoargenteus*). Contiguous with this bluff is a large forested area covering the gentle slopes and ravines, which rise approximately two hundred feet in elevation from the creek. Parts of this forest are disturbed, but the section downstream from the bluff is a particularly good example of mixed mesic hardwoods. Rich mesic herbs are abundant here, including bloodroot (*Sanguinaria canadensis*), trout lily (*Erythronium americanum*), spring beauty (*Claytonia virginica*), toothwort (*Cardamine angustata*), hepatica (*Hepatica americana*), trillium (*Trillium catesbaei*), and extensive colonies of wild ginger (*Asarum canadense*). Upland animals seen here in addition to the groundhog are red-tailed hawks (*Buteo jamaicensis*), yellow-throated vireos (*Vireo flavifrons*), ovenbirds (*Seiurus aurocapillus*), summer and scarlet tanagers (*Piranga rubra* and *P. olivacea*), and gray squirrels (*Sciurus carolinensis*).

The more important habitat for animals, however, is the riparian area along the creek. The forest here is mainly in young second growth, consisting of such species as walnut (*Juglans nigra*), sycamore (*Platanus occidentalis*), sweetgum (*Liquidambar styraciflua*), and tulip

poplar (*Liriodendron tulipifera*). Though heavily disturbed, the presence of pawpaw (*Asimina triloba*) and spicebush (*Lindera benzoin*) thickets attest to the richness of the alluvial Chewacla soil. These thickets also provide habitat for two low-nesting warblers, the Kentucky (*Oporornis formosus*) and hooded (*Wilsonia citrina*), the first being exceptionally abundant here.

An outstanding feature of this site is the creek itself; the water quality of Cane Creek has been widely recognized as one of the best within the Piedmont. Reflecting these prime conditions are the rich mussel beds, which include the rare notched rainbow (*Villosa constricta*), and fish diversity. This watershed was formerly the only place within the Cape Fear drainage where the state-listed Carolina darter (*Etheostoma collis*) was found. Although most of its habitat was destroyed by the Cane Creek Reservoir, this species could still persist within this section downstream.

Other riparian animals of interest include the regionally rare river otter (*Lutra canadensis*), which was observed denning here, as well as beaver (*Castor canadensis*), great blue heron (*Ardea herodias*), northern parula (*Parula americana*), and Louisiana waterthrush (*Seiurus motacilla*). One non-riparian species of interest is the black vulture (*Coragyps atratus*), which roosts in the trees on the west bank of the creek. While this species is still found fairly commonly in neighboring Chatham County, it is quite rare and declining throughout the rest of the state. This is the only site within Orange County (except for a winter roost observed just upstream) where they are still known to roost.

MANAGEMENT AND PROTECTION: The site has no formal protection. Landowners should be alerted to the significance of the natural values of their property. A conservation easement should be negotiated for this site.

OWNERSHIP: Private

REFERENCES: Sather, D. and S. Hall. 1988. Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina, Appendix B: Biological Documentation of Sites. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Orange County Natural Areas Inventory

OWASA MITIGATION TRACT

New Site 2004

Site Number: C04
Site Significance: County

Size: 682 acres
USGS Quadrangle: Efland

SIGNIFICANT FEATURES: The main significance of this parcel is that it is a large piece of protected open space in a section of the county that has virtually none. Although obtained as a mitigation tract from a timber company in 1982, it had not been converted to a pine plantation and much of the site is in natural condition.

NATURAL COMMUNITIES: Dry-Mesic Oak—Hickory Forest, Dry Oak—Hickory Forest

GENERAL DESCRIPTION: This site includes four types of habitats: pine forest, mixed hardwood-pine forest, oak-hickory forest, and streamhead bottomland forest. The first is composed of shortleaf (*Pinus echinata*), Virginia (*P. virginiana*), and loblolly (*P. taeda*) pines in dense stands with sprout hardwoods beneath. Previous forest management may have favored these few areas as pine dominated. One area supports a small population of pink lady's-slipper (*Cypripedium acaule*).

The second forest type here is mixed hardwood-pine, which covers about half of the site. Prominent are white oak (*Quercus alba*), southern red oak (*Q. falcata*), mockernut hickory (*Carya alba*), red maple (*Acer rubrum*), and shortleaf and Virginia pines. Black gum (*Nyssa sylvatica*) and loblolly pine are scattered. Understory trees include sourwood (*Oxydendrum arboreum*) and sassafras (*Sassafras albidum*). The percentage of pines varies considerably across the site, and in places reaches 50 %. Canopy trees average 15 inches dbh and 80 feet tall. A huge colony of ground cedar (*Lycopodium flabelliforme*) occurs here.

Oak-hickory forest covers about a third of the site. It occurs at the highest elevations on flattish ridges and gentle slopes. Dominants include white oak, black oak, mockernut hickory, and red maple. Virginia pines are scarce to scattered. Sourwood and dogwood (*Cornus florida*) occur in the understory. This forest type is typical of many on acid soils in Orange County. In two localized spots, the composition changes due to soil differences, resulting in a Basic Oak-Hickory Forest. Dominants include white oak, shagbark hickory (*Carya ovata*), mockernut hickory, and Biltmore ash (*Fraxinus americana* var. *biltmoreana*). Virginia pine and red maple are scattered. Understory trees are red cedar (*Juniperus virginiana*), southern sugar maple (*Acer barbatum*), redbud (*Cercis canadensis*), and dogwood. Shrubs include blue or shiny haw (*Viburnum rufidulum*) and fringe-tree (*Chionanthus virginicus*).

The fourth forest type is a bottomland forest, found at headwaters of streams and along Turkey Hill Creek, a tributary of Cane Creek. Tall tulip poplar (*Liriodendron tulipifera*), sweet gum (*Liquidambar styraciflua*), red maple, and river birch (*Betula nigra*) dominate over dogwood and spicebush (*Lindera benzoin*). Vines are frequent, including grape, poison ivy, virginia creeper, trumpet vine, Japanese honeysuckle. Several species of ferns cover the

ground, along with abundant Japanese browntop grass (*Microstegium vimineum*). One area where water stands for short periods supports willow oak (*Quercus phellos*).

Upland birds seen here include hairy woodpecker (*Picoides villosus*), blue-headed vireo (*Vireo solitarius*), ovenbird (*Seiurus aurocapillus*), and summer tanager (*Piranga rubra*). Gray squirrels (*Sciurus carolinensis*) also occur.

MANAGEMENT AND PROTECTION: The Orange Water and Sewer Authority (OWASA) owns and manages most of the site as a protected area. ATVs have made rutted trails through a portion of site. Motorized vehicles should be banned or curtailed.

OWNERSHIP: Orange Water and Sewer Authority; Private

REFERENCES: None

Orange County Natural Areas Inventory

PERSIMMON NURSERY FLATS

New Site 2004

Site Number: C05

Size: 95 acres

Site Significance: Regional

USGS Quadrangle: White Cross

SIGNIFICANT FEATURES: This is an unusual hardpan that contains a mixture of wetland and upland species. It appears to be a Mixed Moisture Variant of Basic Oak—Hickory Forest, which is poorly known or described in the state.

NATURAL COMMUNITIES: Basic Oak—Hickory Forest (Mixed Moisture Variant)

GENERAL DESCRIPTION: This flat upland area with Iredell soils and some hardpan development contains a fair quality, mature Basic Oak—Hickory Forest (Mixed Moisture Variant) with a mixture of wetland and upland species. The canopy contains willow oak (*Quercus phellos*) as a dominant, but white oak (*Q. alba*), southern red oak (*Q. falcata*), post oak (*Q. stellata*), and uncommon swamp white oak (*Q. bicolor*), as well as mockernut hickory (*C. tomentosa*) and sweetgum (*Liquidambar styraciflua*) are present. The understory contains flowering dogwood (*Cornus florida*), winged elm (*Ulmus alata*), red maple (*Acer rubrum*), red mulberry (*Morus rubra*), Virginia red-cedar (*Juniperus virginiana*), white ash (*Fraxinus americana*), and southern sugar maple (*Acer barbatum*). Sphagnum moss occurs in patches at scattered locations in the site. There do not appear to be any rock outcrops.

MANAGEMENT AND PROTECTION: This site is unprotected and under high threat of development.

OWNERSHIP: Private

REFERENCES:

Sather, D. and S. Hall. 1988. Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina, Appendix B: Biological Documentation of Sites. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Oakley, S.C., H.E. LeGrand, Jr., and M.P. Schafale. 1995. An Inventory of Mafic Natural Areas in the North Carolina Piedmont. North Carolina Natural Heritage Program, Division of Parks and Recreation, DENR, Raleigh, NC.

Eno River Watershed

Orange County Natural Areas Inventory

SEVENMILE CREEK/CANE CREEK MACROSITE

New Site 2004

Site Number: Macrosite #1

Size: 5,795 acres

Site Significance: Regional

USGS Quads: Efland, White Cross, and
Saxapahaw

The Sevenmile Creek/Cane Creek Macrosite provides a vital cross-watershed link between Cane Creek, which flows into the Haw/Cape Fear River drainage, and Sevenmile Creek, which flows into the Eno/Neuse drainage. The area encompasses a broad diversity of habitat types, from dry chestnut oak forest on high hilltops to wet bottomland forest and from a reservoir lake to rich mesophytic forest. Six standard sites are included in this macrosite.

The Sevenmile Creek/Cane Creek Macrosite is of regional significance. The large size of the tract provides sufficient habitat for wide-ranging species like bobcat, red fox, gray fox, turkey, and roosting black vultures. Several species are very local or rare in the lower piedmont, such as eastern chipmunk (*Tamias striatus*), blue cohosh (*Caulophyllum thalictroides*), and yellow lady's slipper (*Cypripedium calceolus* var. *pubescens*). High hills at Camp Chestnut Ridge (E04) and Crabtree Creek Monadnock Ridge (E05) support extensive oak-hickory forests on slopes and mature chestnut oak forests on summit ridges. Sevenmile Creek Sugar Maple Bottom (E06) has the richest deciduous forest in the county, with basic-soil plants like southern sugar maple (*Acer barbatum*), maidenhair fern (*Adiantum pedatum*), a small population of the state-rare ginseng (*Panax quinquefolius*), and blue cohosh. Cane Creek and Sevenmile Creek are still relatively clean, as evidenced by otter and a state-rare mussel, the notched rainbow (*Villosa constricta*). A state-rare fish, Carolina darter (*Etheostoma collis*), used to occur where the Cane Creek Reservoir now exists and may well still exist elsewhere in Cane Creek. The macrosite provides breeding habitat for many neotropical migrant birds.

In addition to those named above, species rare in North Carolina that have been documented within the macrosite include eastern isopyrum or false rue-anemone (*Enemion biternatum*), last seen prior to damming of Cane Creek, and purple fringeless orchid (*Platanthera peramoena*), last seen in 1988 near Sevenmile Creek.

Orange County Natural Areas Inventory

CAMP CHESTNUT RIDGE

Updated 2004

Site Number: E04

Size: 281 acres

Site Significance: County

USGS Quadrangle: Efland

SIGNIFICANT FEATURES: This setting for this camp is an important link in a chain of ridges that form an upland corridor between the Cape Fear and Neuse River systems. It also preserves a good example of chestnut oak forest, a habitat type that is rapidly disappearing throughout the county due to increased residential development of the ridgetops.

NATURAL COMMUNITIES: Piedmont Monadnock Forest

GENERAL DESCRIPTION: The knoll on which this camp sits is part of a larger system of ridges and monadnocks that run northeast from Chatham County to Oconeechee Mountain. Since these uplands are currently more-or-less undeveloped and still forested, they form both an important wildlife reservoir as well as an overland link between the Cape Fear and Neuse River Basins. Many of our larger or wariier species of animals, such as bobcat and wild turkey, require such extensive tracts due to their own foraging needs and their susceptibility to human disturbance. The connection of these uplands to the even more extensive corridor systems along the Haw and Eno rivers further enhances the survival chances of these species within the county, both along the ridges and in the river valleys themselves.

Although this particular site is somewhat disturbed by the camp setting, it nonetheless preserves a good example of chestnut oak forest, the typical community occurring on the rockier, poorer (mainly siliceous) soils of the ridgetops. The canopy is composed primarily of the chestnut oak (*Quercus prinus*), an important forage (mast) producer for wild turkey (*Meleagris gallopavo*) and other wildlife. Many large trees are still present due to the relatively natural setting maintained by the camp. While this forest type in general has escaped much of the earlier cutting and development seen on "better," more mesic sites, they are now under heavy pressure due to the building of prestige homes on top of scenic ridges. Any opportunity to protect such woodlands, such as provided by Camp Chestnut Ridge, should be encouraged.

MANAGEMENT AND PROTECTION: The western half of the site is managed as a camp in a natural setting; the eastern half is in private ownership, and thus vulnerable to residential development. Camp management and adjacent private landowners should be informed of the significance of the chestnut oak community. Present management practices should be maintained.

OWNERSHIP: Private

REFERENCES: Sather, D. and S. Hall. 1988. Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina, Appendix B: Biological Documentation of Sites. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Orange County Natural Areas Inventory

CRABTREE CREEK MONADNOCK RIDGE

Updated 2004

Site Number: E05

Size: 825 acres

Site Significance: County

USGS Quadrangle: Efland

SIGNIFICANT FEATURES: Although somewhat cut over, this area includes some of the largest undeveloped tracts south of I-85, and serves thus as one of the more important wildlife reservoirs in the county. Stretching several miles from Camp Chestnut Ridge (EO4) to Sevenmile Creek (EO6), this tract also forms an important link in an overland wooded corridor connecting the Cape Fear (Haw) and Neuse (Eno) River systems. The presence of several mature stands of chestnut oak (*Quercus prinus*) in combination with the younger successional stands provides optimal habitat for turkey, bobcat, deer, and other upland game animals.

NATURAL COMMUNITIES: Dry-Mesic Oak—Hickory Forest, Piedmont Monadnock Forest

GENERAL DESCRIPTION: Although this tract shows signs of having been recently cut in many places, several mature stands of chestnut oak forest still persist along this ridge and even within the pine stands a thick seedling layer of chestnut oaks (*Quercus prinus*) testifies to the eventual return of this community if left alone. For wildlife, this type of disturbance is not so severe as would be the development of the ridge for residences. Although many species remain undocumented for this site, the presence of woodland edges, old fields, and younger stands of forest, in combination with the mature tracts, should enhance the area for many species of game animals, including deer (*Odocoileus virginianus*), cottontail (*Sylvilagus floridanus*), groundhog (*Marmota monax*), wild turkey (*Meleagris gallopavo*), bobwhite (*Colinus virginianus*), and mourning dove (*Zenaida macroura*). As a consequence of abundant prey, carnivores also do well in such situations and this site should provide optimal habitat for red fox (*Vulpes vulpes*), gray fox (*Urocyon cinereoargenteus*), and bobcat (*Lynx rufus*).

MANAGEMENT AND PROTECTION: Orange County protects a small portion as part of the larger Seven Mile Creek Preserve. Landowners should be informed of the significance of the natural values of their property. Forest culture practices should involve selective cutting to allow, for regeneration of native chestnut oak forest.

OWNERSHIP: Orange County, Private

REFERENCES: Sather, D. and S. Hall. 1988. Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina, Appendix B: Biological Documentation of Sites. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Orange County Natural Areas Inventory

SEVENMILE CREEK SUGAR MAPLE BOTTOM

Updated 2004

Site Number: E06

Size: 88 acres

Site Significance: Regional

USGS Quadrangle: Efland

SIGNIFICANT FEATURES: This is the richest bottomland remaining in the county. All other rich, basic bottomlands along upland streams have been brought under cultivation. Nowhere else occurs such a large stand of southern sugar maple (*Acer barbatum*), hackberry (*Celtis laevigata*), and swamp chestnut oak (*Quercus michauxii*). The most important value of this site, however, is the amazingly profuse herb layer. Particularly impressive are the large patches of such regionally rare species as maidenhair fern (*Adiantum pedatum*) and blue cohosh (*Caulophyllum thalictroides*); this is, in fact, the only known site for the blue cohosh in Orange County and much of the surrounding Piedmont. Two other state-listed plants also found here are ginseng (*Panax quinquefolius*), which is documented from only five sites in the county, and purple fringeless orchid (*Platanthera peramoena*), which has been documented only at this site within the county; (however not re-verified in 2001 because permission to access site was not granted by landowner).

The creek also possesses a well-developed fish and freshwater mussel fauna, including the notched rainbow mussel (*Villosa constricta*), a state-listed species. River otter (*Lutra canadensis*) and red-shouldered hawk (*Buteo lineatus*), two regionally rare species, are also present.

NATURAL COMMUNITIES: Basic Mesic Forest

GENERAL DESCRIPTION: Most of the natural area is on the southeast side of the creek, but also included on the northwest side is a mucky drainage ditch containing the purple fringeless orchid (*Platanthera peramoena*). Several of the prime features of this site are associated with its topographic occurrence as a narrow bottomland located within an upland stream valley. The deep and rich circumneutral soil is the result of a long, gentle alluvial deposition on the floodplain and lower slopes, and the richness and depth of this soil in turn are responsible for the outstanding growth of plant life. The trees illustrating the lush condition of the bottomland include southern sugar maple (*Acer barbatum*), swamp chestnut oak (*Quercus michauxii*), hackberry (*Celtis laevigata*), black walnut (*Juglans nigra*), and shagbark hickory (*Carya ovata*), while the shrub layer is likewise composed of such basophilic species as bladdernut (*Staphylea trifolia*), redbud (*Cercis canadensis*), spicebush (*Lindera benzoin*), and hazelnut (*Corylus americana*). By 2001, much of the northeastern portion of the site, including where the blue cohosh and ginseng grow, had suffered from hurricanes and many canopy and understory trees had blown down. That has created areas of treefalls and abundant new saplings, making passage difficult.

The basic pH of the soil together with the cool, moist conditions provided by the lengthy north-facing lower portion of the slope (which is directly adjacent to the floodplain and thus receives occasional alluvial deposition), also accounts for the rich herbaceous flora. Particularly noteworthy is the large growth of blue cohosh (*Caulophyllum thalictroides*), a

species disjunct from the mountains and found only in this site in Orange County; over 500 individuals of this species were counted in 1987 and similar numbers existed in 2001. Growing amid the cohosh are other species more typical of the mountains than of the eastern Piedmont, including thick growths of maidenhair ferns (*Adiantum pedatum*) and scatterings of ginseng (*Panax quinquefolius*), a species considered of special concern within the entire state. Other spring wildflowers adding to the luxuriance of this slope are foamflower (*Tiarella cordifolia* var. *collina*), windflower (*Thalictrum thalictroides*), bloodroot (*Sanguinaria canadensis*), hepatica (*Hepatica americana*), and toothwort (*Cardamine angrustata*). One other noteworthy species included in this natural area, although growing in a drainage ditch located across the creek from the other montane plants, is the purple fringeless orchid (*Platanthera peramoena*), a species listed as state rare-peripheral within North Carolina.

In addition to indirectly contributing to the rich plant life of this natural area, the stream flowing through this site provides a diversity of habitats for animals, including extensive areas of riffles as well as sandy-bottomed pools. Despite some degree of siltation due to runoff from fields upstream, this portion of Sevenmile Creek still harbors healthy populations of darters, shiners, pickerels, and other species of fish, along with abundant mussels. Included in this fauna is the notched rainbow (*Villosa constricta*), a state rare mussel, which has been found at only four other sites within the county. Reflecting the good fishing in the creek is the presence of river otter (*Lutra canadensis*), a regionally rare species. Resident great horned owls (*Bubo virginianus*) and red-shouldered hawks (*Buteo lineatus*) similarly reflect the good condition of the bottomland forest.

Altogether, the aesthetic quality of the site is excellent; many of the trees exceed two feet in diameter, indicating a long history without disturbance. The fact that it adjoins the protected lands of the historic Moorefields estate further adds to its attractiveness as one of the best of the county's natural areas.

MANAGEMENT AND PROTECTION: The county-owned portion is managed for permanent protection as part of the Seven Mile Creek Preserve; the adjoining Moorefields historic site is managed as a wildlife preserve. The site should be preserved as county owned natural area in conjunction with adjacent Moorefields historic site.

OWNERSHIP: Orange County, Private

REFERENCES:

Mansberg, L. 1986. Site Survey Report: Sevenmile Creek. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Sather, D. and S. Hall. 1988. Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina, Appendix B: Biological Documentation of Sites. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Orange County Natural Areas Inventory

UPPER ENO RIVER MACROSITE

New Site 2004

Site Number: Macrosite #1

Size: 9,617 acres in Orange County
[1,759 acres in Durham County]

Site Significance: National

USGS Quads: Cedar Grove, Efland,
Hillsborough, NW Durham

The Upper Eno River Macrosite encompasses the most important ecological area in Orange County. A total of eight standard sites in Orange County are included within the macrosite, including over 22 miles of Eno River Aquatic Habitat (E01). The macrosite stretches linearly from the West Fork Eno River headwaters northwest of Hillsborough, south to McGowan Creek Preserve (E02) and the Duke Forest Mesic Slopes (E03), and eastward to Occoneechee Mountain (E07) and sections of Eno River State Park (E11 – E13). Additional standard sites are included within the Durham County portion of this linear macrosite.

The Upper Eno River Macrosite is of national significance. Of prime importance is the Eno River Aquatic Habitat (M01), which supports populations of eight rare freshwater mussels and three rare fish. One of these is federally *endangered*, the dwarf wedgemussel (*Alasmidonta heterodon*), and five are federal *species of concern*: brook floater (*Alasmidonta varicosa*), yellow lampmussel (*Lampsilis cariosa*), green floater (*Lasmigona subviridis*), Carolina darter (*Etheostoma collis*), and pinewoods shiner (*Lythrurus matutinus*). Another federal *species of concern* mollusk, the panhandle pebblesnail (*Somatogyrus virginicus*), occurs in the Durham portion and is also likely to occur in Orange County.

Uplands within the macrosite contain some of the most scenic and ecologically important natural areas in the eastern piedmont of the state. At 867 feet, Occoneechee Mountain (E07) is the highest point in the county (and in the entire Triangle region). Overall, the diverse array of habitats in the macrosite include steep rhododendron bluffs, riffles and rocky pools, mesic forests, cool shaded cliffs, bottomland forests, a high monadnock hill, dry oak and oak-heath forests, and slow-moving river reaches.

Many rare animal species occur within the macrosite. In addition to those listed above, there are the Neuse River waterdog (*Necturus lewisi*), four-toed salamander (*Hemidactylum scutatum*), and Roanoke bass (*Ambloplites cavifrons*).

Four rare plant species occur in the macrosite: Bradley's spleenwort (*Asplenium bradleyi*), mountain spleenwort (*Asplenium montanum*), sweet pinesap (*Monotropsis odorata*), and ginseng (*Panax quinquefolius*). The two ferns occur nowhere else in Orange County. Steep north-facing slopes and cliffs on Occoneechee Mountain and ledges scattered along the Eno provide cool microhabitats suitable for montane species rarely found in the lower piedmont. Examples are cedar waxwing (*Bombycilla cedrorum*), red-backed salamander (*Plethodon cinereus*), brown elfin butterfly (*Incisalia augustus*), mountain spleenwort, interrupted fern (*Osmunda claytoniana*), wild sarsaparilla (*Aralia nudicaulis*), and Catawba rhododendron (*Rhododendron catawbiense*).

Orange County Natural Areas Inventory

ENO RIVER AQUATIC HABITAT

New Site 2004

Site Number: E01

Site Significance: National

Size: West Fork: ~2.25 river miles;

Unnamed tributary: ~1 river mile;

Eno River: ~19 river miles (in county)

USGS Quads: Cedar Grove, Efland,
Hillsborough, NW Durham

SIGNIFICANT FEATURES: The Orange County portion of this river contains a significant number of rare aquatic species, including the federally endangered dwarf wedgemussel (*Alasmidonta heterodon*), the federal species of concern and state endangered brook floater (*Alasmidonta varicosa*), Atlantic pigtoe (*Fusconaia masoni*), yellow lampmussel (*Lampsilis cariosa*), and green floater (*Lasmigona subviridis*), the federal species of concern and state significantly rare pinewoods shiner (*Lythrurus matutinus*), the federal and state species of concern Carolina darter (*Etheostoma collis*), the state threatened triangle floater (*Alasmidonta undulata*), eastern lampmussel (*Lampsilis radiata*) and creeper (*Strophitus undulatus*), the state special concern Neuse River waterdog (*Necturus lewisi*), notched rainbow (*Villosa constricta*) and the state significantly rare Roanoke bass (*Ambloplites cavifrons*).

LANDSCAPE RELATIONSHIPS: This site runs in two narrow east-southeast corridors in the central to eastern portion of the county (the site continues over the Durham County line). Several terrestrial sites are adjacent to the Eno River, including Eno River Duke Forest Mesic Slopes, Eno River/Cates Ford Slopes and Uplands, Middle Eno River Bluffs and Slopes, Occoneechee Mountain, Poplar Ridge Slopes and Bottom, and Eno River State Park Mountain Spleenwort and Rhododendron Bluff.

SITE DESCRIPTION: The Eno River is a large tributary of the Neuse River. The headwaters of the East and West Forks of the Eno River begin in northern Orange County near Cedar Grove. The site begins on both the West Fork of the Eno River and an unnamed tributary and flows southeast through central Orange County. The upper portion of the site is separated from the lower portion by two impoundments (Corporation Lake and Ben Johnson Lake). The lower portion of the site is the Eno River, and it flows east over the Orange/Durham county line. The West Fork portion of the site begins just upstream of the SR 1004 crossing (Carr Store Road), and the unnamed tributary portion of the site begins just downstream of the SR 1004 crossing. The lower portion starts just upstream of US 70 and continues across the Orange/Durham county line.

The Eno River has an extremely diverse aquatic fauna, including nine rare mussel species, three rare fish species and one rare amphibian. The Orange County portion of the Eno River contains one federally endangered mussel species—the dwarf wedgemussel (*Alasmidonta heterodon*). It has been found at one location in the county. In addition, the federal species of concern and state endangered brook floater (*Alasmidonta varicosa*), Atlantic pigtoe (*Fusconaia masoni*), yellow lampmussel (*Lampsilis cariosa*) and green floater (*Lasmigona subviridis*) have all been found in the Orange County portion of the Eno River. Additional

rare mussels found in this portion are the state threatened triangle floater (*Alasmidonta undulata*), eastern lampmussel (*Lampsilis radiata*) and creeper (*Strophitus undulatus*), and the state special concern notched rainbow (*Villosa constricta*). Several more common mussel species (*Elliptio* spp.) have also been found in this portion of the site. Furthermore, rare fish at this site include the federal and state species of concern Carolina darter (*Etheostoma collis*), the federal species of concern and state significantly rare pinewoods shiner (*Lythrurus matutinus*), and the state significantly rare Roanoke bass (*Ambloplites cavifrons*). The Neuse River waterdog (*Necturus lewisi*) is a rare amphibian that inhabits this site.

MANAGEMENT AND PROTECTION: Because of the importance of the stream for rare aquatic species, the Eno River should be designated as a High Quality Water. The Neuse River Buffer Rules apply to this site, however wider riparian buffers are needed for the survival of the aquatic species. No new point source discharges should be permitted in the river, and measures need to be taken to control or prevent sedimentation into the river.

OWNERSHIP: North Carolina public waters

REFERENCES:

Alderman, J.M. 1991. North Carolina Status Surveys for *Fusconaia masoni*, *Elliptio lanceolata*, and *Toxolasma pullus*. Nongame Project Report to U.S. Fish and Wildlife Service. Nongame and Endangered Wildlife Program, NC Wildlife Resources Commission, Division of Wildlife Management, Raleigh, NC.

Alderman, J.M. 1992. Station locations by species for proposed critical habitats. NC Wildlife Resources Report. Nongame and Endangered Wildlife Program, NC Wildlife Resources Commission, Division of Wildlife Management, Raleigh, NC.

Smith, I.K., H.E. LeGrand, S.P. Hall, Z.E. Murrell, C.W. Nordman, and M.P. Schafale. 1993. Regional inventory for critical natural areas, wetland ecosystems, and endangered species habitats, of the Albemarle-Pamlico Estuarine region: Phase 3. NC Natural Heritage Program, Division of Parks and Recreation, Dept. of Environment, Health, and Natural Resources, Raleigh, NC.

Orange County Natural Areas Inventory

MCGOWAN CREEK PRESERVE AND FLOODPLAIN

New Site 2004

Site Number: E02

Size: 102 acres

Site Significance: County

USGS Quadrangle: Efland

SIGNIFICANT FEATURES: This predominantly county-owned site provides a continuous forest connection with that of Eno River Duke Forest Mesic Slopes (E03) and other Duke Forest lands to the southeast. It provides habitat for turkey, deer, and other upland game animals, as well as providing them with forested corridors along the Eno River and across US 70. It provides habitat for neotropical migrant birds.

NATURAL COMMUNITIES: Mesic Mixed Hardwood Forest

GENERAL DESCRIPTION: The site occupies gentle slopes south of McGowan Creek at its confluence with the Eno River. A smaller, intermittent creek splits the site in two. Formerly, most of this site was a loblolly pine (*Pinus taeda*) plantation. Over the past couple of decades, natural regeneration of hardwoods has occurred and they will eventually replace the pines. They include yellow poplar (*Liriodendron tulipifera*), sweetgum (*Liquidambar styraciflua*), beech (*Fagus grandifolia*), and mockernut hickory (*Carya alba*), with occasional northern red oak (*Quercus rubra*) and white oak (*Q. alba*). Understory trees include red maple (*Acer rubrum*), redbud (*Cercis canadensis*), and ironwood (*Carpinus carolinianus*).

Disturbance from prior logging and thinning has allowed abundant growth of Japanese browntop grass (*Microstegium vimineum*) to occupy lowlands and even some of the uplands. This alien weed has the ability to suppress native herbaceous species and should be controlled. However, despite this threat, there are encouraging signs of natural herbaceous growth. Species such as bottlebrush grass (*Elymus hystrix* = *Hystrix patula*), black cohosh (*Cimicifuga racemosa*), hound's tongue (*Cynoglossum virginianum*), and showy orchis (*Galearis spectabilis*) indicate the presence of nutrient-rich, basic soil. These and other species requiring such soils will increase in the future as the hardwoods mature.

MANAGEMENT AND PROTECTION: Most of the site is owned by Orange County and managed as a wildlife preserve. Japanese browntop grass needs to be controlled if possible, as does Brazilian waterweed (*Egeria densa*), an aggressive alien aquatic weed, in McGowan Creek.

OWNERSHIP: Orange County, Orange-Alamance Water System, Private

REFERENCES: None

Orange County Natural Areas Inventory

ENO RIVER DUKE FOREST MESIC SLOPES

Updated 2004

Site Number: E03

Size: 102 acres

Site Significance: County

USGS Quadrangle: Efland

SIGNIFICANT FEATURES: This site features an unbroken stretch of forest that extends almost two miles along the Eno River. Along with the adjacent McGowan Creek Preserve, it is the first large undeveloped tract that the river flows through just downstream from its headwaters. This area, along with the surrounding Duke Forest lands, forms the most significant wildlife reservoir upstream from Hillsborough. It is thus a very significant component of the wildlife corridor system along the Eno River. Two state-listed animals are present: the notched rainbow (*Villosa constricta*) and the Carolina darter (*Etheostoma collis*).

NATURAL COMMUNITIES: Dry-Mesic Oak—Hickory Forest

GENERAL DESCRIPTION: The east-facing slopes along the river are relatively undisturbed, whereas the west-facing slopes (on the opposite side of the river) have been partly clearcut and are now (2002) regenerating. Several small rock bluffs are present, some with stands of mountain laurel (*Kalmia latifolia*) beneath oaks, hickories, and red cedar. The forest is middle-aged mixed mesic hardwoods with some large trees. Common are tulip poplar (*Liriodendron tulipifera*), bitternut hickory (*Carya cordiformis*), pignut hickory (*C. glabra*), red oak (*Quercus rubra*) and white oak (*Q. alba*). Dogwood (*Cornus florida*), ironwood (*Carpinus carolinianus*), and spicebush (*Lindera benzoin*) are common beneath the canopy. In several rich pockets there are abundant spring wildflower displays. Upper slopes support a drier forest of oaks, hickories, beech (*Fagus grandifolia*), red maple (*Acer rubrum*), and scattered shortleaf pine (*Pinus echinata*).

Growing in a marshy spot along the east bank is a small population of golden club (*Orontium aquaticum*), which is unusual for this part of the Piedmont. A small population of wild sarsaparilla (*Aralia nudicaulis*) was found in 2002 on the steep slope by the old quarry; it is only the second known population in NC away from the mountains (the other is on Occoneechee Mountain).

This site offers good habitat for a number of interesting animals. Breeding birds include the red-shouldered hawk (*Buteo lineatus*), a regionally rare species typical of mature bottomlands, and the cedar waxwing (*Bombycilla cedrorum*), a species that commonly nests in the mountains but only rarely in the Piedmont. A number of neotropical migrant songbirds nest here, including Kentucky Warbler (*Oporornis formosus*). Dusting areas of wild turkeys (*Meleagris gallopavo*) were noted in 2002.

Several riffle areas are present in the stream, containing one of the county's most abundant mussel beds; one state-listed species of special concern is present, the notched rainbow (*Villosa constricta*). The Carolina darter (*Etheostoma collis*), a state-listed fish of special concern, has also been recorded from the pool habitat interspersed between the riffles. The presence of river otter (*Lutra canadensis*), a regionally rare species that requires healthy fish

and mussel populations for sustenance, further testifies to the habitat quality of this section of the Eno. In 2002, two beaver dams were noted in the river, but both leak enough that not much water is held back.

MANAGEMENT AND PROTECTION: This site is managed as part of the Duke Forest multiple use lands. The riverine strip along both shores of the Eno should be protected from timbering (pre-1988 clearcuts on the east bank went all the way to the edge of the river). Selective cutting (instead of the apparent past clearcutting practice) in the larger tracts away from the river would increase the area's potential for game species and other wildlife.

OWNERSHIP: Duke University, Private

REFERENCES:

Palmer, M. 1987. Communication to NC Natural Heritage Program.

Sather, D. and S. Hall. 1988. Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina, Appendix B: Biological Documentation of Sites. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Orange County Natural Areas Inventory

OCCONEECHEE MOUNTAIN

Site Number: E07

Size: 166 acres

Site Significance: State

USGS Quads: Efland, Hillsborough

SIGNIFICANT FEATURES: Occoneechee Mountain is one of the most important natural areas in the Triangle. The 2004 update to this report combines two distinct communities on Occoneechee Mountain—the lower, more mesic north-facing slope and the upper slopes and summit, which the original (1988) inventory had treated as separate sites. The north-facing slope includes the area traditionally known locally as the Panther's Den.

Mesic Slopes Portion

The Panther's Den ravine has long been recognized as state significant by naturalists because of the several disjunct plant species that reach their easternmost limits at this site. These include the Bradley's spleenwort (*Asplenium bradleyi*) and wild sarsaparilla (*Aralia nudicaulis*); the mountain spleenwort (*Asplenium montanum*) was formerly thought to have its eastern limit here but was discovered further downstream (E13) during the course of this study. Catawba rhododendron (*Rhododendron catawbiense*) is present atop the steep rock outcrop adjacent to the ravine, while along the slope ascending from the Panther's Den is the best mountain laurel-galax community in the Triangle. This population of the regionally rare galax (*Galax aphylla*) is strikingly large, and covers a far greater area than any other galax population in the county. The significantly rare sweet pinesap (*Monotropsis odorata*) also occurs in this community, along with the regionally rare large witch-alder (*Fothergilla major*). Interrupted fern (*Osmunda claytoniana*) inhabits wet areas at the base of the slope; this is the only Piedmont record for this montane species. One other unusual montane species that has been reported for this area but not confirmed is the purple fringeless orchid (*Platanthera peramoena*).

As part of the overall massif of Occoneechee Mountain, this area forms an important wildlife reservoir; its position along the Eno further enhances its value since the valley of the Eno is one of the most significant wildlife corridors in the county. Among the many animal species observed here, the most significant is the Cooper's hawk (*Accipiter cooperii*), which is state-listed as a special concern breeding bird. Since the individual seen at this site was an adult and the observation was made during the middle of the breeding season, it is relatively safe to assume it was nesting either on the lower slopes of Occoneechee or the adjacent riparian strip along the Eno. An animal more closely associated with the montane community of plants is the regionally-rare sumo mite (*Allothrombium* sp.), which likewise appears to be disjunct within our area.

Dry Slopes and Summit

The summit of Occoneechee Mountain is the highest point in Orange County, and in the entire Triangle Region. Rising over 350 feet from the Eno, the mountain presents the most dramatic ridgeline in the area and the view from the summit towards historic Hillsborough is equally unmatched. From a biological viewpoint, the most significant aspect of this rise is that it encompasses a range of montane community types, from the cool, moist community at the Panther's Den to the dry Virginia pine-heath-bracken fern and chestnut oak communities

at the summit. This range of communities at a single locale is found nowhere else in the Triangle. It should be noted, however, that the summit is disturbed by a radio communications tower and associated facilities.

The Virginia pine-heath-bracken fern community, characteristic of the dry slopes of the Blue Ridge, reaches its best development within the Triangle on the summit of Occoneechee. Much of the summit is covered in one of the best remaining chestnut oak forest in the county; though this forest is not undisturbed, many individuals up to two feet in diameter persist. The easternmost knob of Occoneechee is particularly noteworthy in that it presents the driest extreme of this community found anywhere in the county.

The dry forests on the summit provide habitat for several butterflies with restricted distributions. Most surprising of these is the brown elfin (*Incisalia augustinus*), a northern and montane species which feeds on heaths, and which had previously been known in the Piedmont only from the heath-covered monadnocks of the Uwharries (Jeff Nekola, who documented the population on Occoneechee, also discovered a new population in similar conditions at Hanging Rock State Park). The sleepy duskywing (*Erynnis brizo*), whose population in Occoneechee's chestnut oak forest is quite large, has been found in only two other places within Orange County.

The mast (acorns and berries) produced by the chestnut oaks and heaths also provide an important food source for many upland game animals such as deer, groundhog, and wild turkey (which has not been documented from this site). The size of its undeveloped forested area makes Occoneechee one of the county's most significant wildlife reservoirs.

NATURAL COMMUNITIES: Dry-Mesic Oak—Hickory Forest, Mesic Mixed Hardwood Forest, Piedmont Acidic Cliff, Piedmont Heath Bluff, Piedmont Monadnock Forest, Pine—Oak / Heath, Piedmont Bottomland Forest

GENERAL DESCRIPTION: Originally two adjacent sites (1988 inventory), the NC Natural Heritage Program later combined the areas into one site. Occoneechee Mountain is located at the northern end of a series of ridges and more isolated knobs that run northeast from Chatham County, but unlike these and most other ridges in the county, Occoneechee runs east to west, providing the largest extent of north-facing slope anywhere in the region. At over 860 feet, it is also the highest point in the county.

These topographic features, in turn, account for the great diversity of montane species found here so far away from their normal ranges. The mesic slopes include both the Panther's Den ravine and adjoining slopes, together with the bottomlands along a levee on the south bank of the Eno.

The bottomland forest is not in as good condition as some others in the county due to historical disturbance associated with a now-vanished mill village. Nevertheless, it contains large specimens of river birch (*Betula nigra*), box elder (*Acer negundo*), sycamore (*Platanus occidentalis*), sweetgum (*Liquidambar styraciflua*), black walnut (*Juglans nigra*), and tulip poplar (*Liriodendron tulipifera*). Thickets of pawpaw (*Asimina triloba*) and spicebush (*Lindera benzoin*) are also present, along with large vines of wild grape (*Vitis rotundifolia*).

The most important feature of the mesic slope is the Panther's Den Ravine, located on the west side of an abandoned quarry and extending from the bottomland up to approximately 700 feet on the north-facing slope of Occonechee Mountain. This site is marked by the presence of a massive rock wall jutting vertically above the levee forest. The north face of this wall never receives direct sunlight, even in the summer when the sun is directly overhead. Consequently this cliff and the steep ravine next to it are cool and damp year round, with a constant trickle of water flowing over the rocks at one point. These conditions explain the presence of the mountain spleenwort (*Asplenium montanum*), which is found only here and on a similar sheer rock wall located downstream. Scattered around the base of this outcrop is the only population of wild sarsaparilla (*Aralia nudicaulis*) in the Piedmont, while on top of the rock grows a small amount of the regionally-rare catawba rhododendron (*Rhododendron catawbiense*). On drier outcrops located a short distance upstream is a population of the Bradley's spleenwort (*Asplenium bradleyi*), a state-listed species considered significantly rare, while in a wet area located at the base of the slope grows the Piedmont's only known population of interrupted fern (*Osmunda claytoniana*). One final montane disjunct occurring just above the Panther's Den is the sweet pinesap (*Monotropsis odorata*), a state-listed species considered significantly rare.

Above the cooler base of Occonechee's northern slope, the forest grades from levee forest and mixed mesic hardwoods into dry-mesic oak-hickory forest. The most outstanding features of this community are the great thickets of mountain laurel (*Kalmia latifolia*) and galax (*Galax aphylla*) covering most of this face of Occonechee. Scattered at several places in this mid-slope forest is the regionally rare large witch-alder (*Fotherailla major*).

Animals characteristic of this natural area include the sumo mite (*Allothrombium* sp.), a species confined to sheltered north-facing slopes, plus many riparian species including woodcock (*Scolopax minor*), yellow-throated warbler (*Dendroica dominica*), eastern mole (*Scalopus aquaticus*), beaver (*Castor canadensis*), and hackberry butterfly (*Asterocampa celtis*). The most noteworthy animal is the Cooper's hawk (*Accipiter cooperii*), an adult of which was observed here during the middle of its nesting period. This species had been nearly extirpated from the state due to DDT poisoning and direct persecution by man. Today it is listed as special concern as a breeding bird within the entire state.

While the Panther's Den has received the most attention from naturalists over the years, the dry montane community present on the siliceous rock formations of the summit and upper slopes of Occonechee is equally unique within the Triangle. Although only a remnant of what must have existed prior to the excavation of the now-abandoned quarry, the Virginia pine-heath-bracken fern community on the northern edge of the ridgeline retains many of the species characteristically present on siliceous, nutrient-poor soils in the mountains. The canopy dominated by Virginia pines (*Pinus virginiana*) is sparse and open. Only the driest of woody species are present in the subcanopy, including serviceberry (*Amelanchier arborea*), sourwood (*Oxydendrum arboreum*), and red maple (*Acer rubrum*). The shrub layer consists mainly of blueberries (*Vaccinium vacillans*, *V. tenellum*, and *V. stamineum*), huckleberries (*Gaylussacia baccata*), and staggerbush (*Lyonia mariana*), with scattered mountain laurel (*Kalmia latifolia*). Bracken fern (*Pteridium aquilinum*), which occurs spottily throughout the county, exists here in great patches mixed in with the heaths. The herb layer is dry and sparse, composed of various grasses such as broom straw (*Andropogon scoparius*) and oat grass (*Danthonia* sp.). One animal that is restricted to this community is the regionally rare

brown elfin (*Incisalia augustinus*), whose larvae eat several species of the heath family. As mentioned above, it is almost unknown elsewhere in the eastern Piedmont, but on Occoneechee its population is quite large and extends from the ridge above the quarry to the easternmost knob on the mountain (elevation 767 feet).

On the relatively flat summit and gentler upper slopes of the mountain, the forest is dominated by chestnut oak (*Quercus prinus*) and scarlet oak (*Q. coccinea*) with sourwood and red maple occurring in the subcanopy. The heath layer in this forest has many of the species found in the adjacent Virginia pine stands, including along with the huckleberry, staggerbush, blueberries mentioned previously, wintergreen (*Gaultheria procumbens*) and trailing arbutus (*Epigaea repens*). The sleepy duskywing butterfly (*Erynnis brizo*) is the characteristic animal of this community, its larvae feeding on the leaves of the chestnut oak.

The easternmost knob (elevation 767 feet) has a more stunted and open canopy than the surrounding chestnut oak forest. Only the driest trees dominate the canopy here: chestnut oak, blackjack oak (*Q. marilandica*), Virginia pine, and shortleaf pine. Blueberries, huckleberries, and bracken ferns are again present, but herbs are nearly absent. One indicator of the dry, nutrient-poor conditions of this knob is the abundance of reindeer lichen (*Cladonia* sp.), which covers the numerous cobbles and boulders of siliceous rock. This is the most xeric phase of the chestnut oak community type found within the county.

MANAGEMENT AND PROTECTION: Portions of this area are owned by the Town of Hillsborough, the State of North Carolina, and the Eno River Association, and are managed by the State as the Occoneechee Mountain State Natural Area.

This is the most significant area in the county, and therefore the site at which decisions about landscape modification should be made most conservatively in order to maintain the area as natural as possible.

The State of North Carolina, in cooperation with local conservation partners, should continue its efforts to acquire the remaining privately owned portions of the natural area, including the Panther's Den area. Once acquired, Panther's Den area should be given the highest level of protection, including the construction of alternative trails to steer traffic away from this most sensitive ravine; any increase in trampling could easily destroy the populations of wild sarsaparilla and mountain spleenwort. No trail should be constructed until each individual plant of these species (which are directly adjacent to the existing trail) is carefully mapped.

OWNERSHIP: State of NC, Town of Hillsborough, Eno River Association, Private

REFERENCES:

Wood, E. 1973. Pages 84-85 In A. E. Radford, ed. 1976. Vegetation, Habitats, Floras: Natural Areas in the Southeastern United States -- Field Data and Information. Department of Biology, UNC Chapel Hill, North Carolina.

Otte, D. K. S. 1976. Occoneechee Mountain Natural Area. Botany 235 class report, UNC, Chapel Hill, NC.

Whetstone, D. 1977. Occoneechee Mountain Natural Area. Evaluation Report to National Landmarks Program.

Sather, D. and S. Hall. 1988. Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina, Appendix B: Biological Documentation of Sites. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Overview of Natural Areas of the Lower Eno River

The Eno River is the largest stream draining Orange County. Along with New Hope Creek and Morgan Creek, it is one of the three major streams along which this inventory has identified a large proportion of the county's natural areas. As a major waterway, with some of the steepest slopes and greatest amount of topographic variation in the county, the Eno is one of the corridors most deserving of protection.

The boundaries of the Eno River State Park encompass several, but not all, of the significant sites along the Eno River. This inventory identifies four natural areas all or partially within Eno River State Park (E10 - E13). A large part of the natural area associated with Occoneechee Mountain (E07) is also protected and managed by the State. Ranging from bottomland to dry upland forest, these areas encompass the best sites that occur from the park's upstream boundary to the Durham County line.

The upstream boundary of this following series of natural areas along the lower Eno begins downstream from Hillsborough at the confluence with Cates Creek. Extensive bottomland forests and slopes dominated by chestnut oak occur here (E10), along with bluffs with mountain laurel and galax, which offer scenic views of the surrounding area. Several seeps here are breeding habitat for the gray petaltail [dragonfly], and the entire stretch of river for these several miles is documented habitat for the river otter.

Along the portion of the river that flows west to east, several slopes (E11) offer habitat for regionally rare plant species such as ginseng, yellow lady's slipper, monkshood, showy orchis, and maidenhair fern. The upland area (E11) south of the large bend of the river is a large undeveloped forest with upland habitats that, prior to being purchased by the State in late 2003, was not well represented within the boundaries of the state park. Two of the county's three upland depressions are also found here.

Several other sites within the Eno River State Park have outstanding natural features. At the confluence of the Eno River and Buckwater Creek (E11), the county's best upland post oak forest is found, along with one of the three best south-facing bluffs. The bottomlands along Buckwater Creek are one of the richest of such sites in the county. The riparian forest along the river between here and Cates Ford (E11) is in excellent condition. Just downstream of Pleasant Green Road, a steep rhododendron bluff (E12) is habitat for the easternmost population of mountain spleenwort known from North Carolina. Farther downstream (E13), another bluff supports a Virginia pine – heath community, one of only two such sites in the county.

Orange County Natural Areas Inventory

POPLAR RIDGE SLOPES AND BOTTOM

Updated 2004

Site Number: E10

Size: 132 acres

Site Significance: County

USGS Quadrangle: Hillsborough

SIGNIFICANT FEATURES: This two-mile stretch of the Eno River has extensive bottoms that abut slopes with mature chestnut oak forest and large areas of mountain laurel (*Kalmia latifolia*). Galax (*Galax aphylla*), a regionally rare species, grows within the mountain laurel stands. There are documented breeding sites for amphibians in several seeps present at the base of the slope. The gray petaltail [dragonfly] (*Tachopteryx thoreyi*), a regionally rare animal, also breeds in these seeps. Other noteworthy animals include red-tailed hawk (*Buteo jamaicensis*), which probably nests on the slopes and river otter (*Lutra canadensis*), whose home ranges overlap this section of the river. Additionally, there is a record for the Carolina darter (*Etheostoma collis*), a state-listed species of special concern, at the downstream terminus of the site at Lawrence Road.

NATURAL COMMUNITIES: Dry-Mesic Oak—Hickory Forest, Piedmont Monadnock Forest, Piedmont Bottomland Forest, Low Elevation Seep

GENERAL DESCRIPTION: This site is the longest undisturbed stretch of the Eno River outside the Eno River State Park. It includes several wide bottomlands along the river, and slopes that rise as much as 140 feet. The forest on both the bottoms and adjacent slopes are relatively undisturbed and contain many tree specimens over two feet in diameter. Dominants include southern sugar maple (*Acer barbatum*), beech (*Fagus grandifolia*), shagbark hickory (*Carya ovata*), and sweetgum (*Liquidambar styraciflua*). Ironwood (*Carpinus carolinianus*) is a common understory tree.

North of US 70 Bypass, the bottomland forest grades into extensive hardwood forest on slopes, dominated by oaks, hickories, tulip poplar (*Liriodendron tulipifera*), beech, and red maple (*Acer rubrum*), with dogwood (*Cornus florida*), redbud (*Cercis canadensis*), and southern sugar maple in the understory. Canopy trees average 15 inches dbh and 85 feet tall, with some up to 30 inches dbh. By the 2001 visit, large numbers of mature trees had blown down as a result of hurricanes and violent thunderstorms during the 1990s. It will be many years before walking through this forest will be easy.

South of US 70 Bypass, the bottomland forests grade quickly into chestnut oak forest in places where the adjacent slopes are steepest and rockiest. Associated with the chestnut oak-sourwood (*Oxydendrum arboreum*) forests are two extensive populations of mountain laurel with galax interspersed.

At five locations along the length of the natural area, springs (Low Elevation Seeps) issue from the base of the slopes, forming mucky runs leading to the river. These sites offer habitat for arrow arum (*Peltandra virginica*), lizardtail (*Saururus cernuus*), jewelweed (*Impatiens capensis*), and water hemlock (*Cicuta maculata*). They are also excellent breeding sites for amphibians; we have documented the presence of mud salamanders

(*Pseudotriton montanus*) and three-lined salamanders (*Eurycea guttolineata*) and others are certainly present as well. A regionally rare animal, the gray petaltail [dragonfly] (*Tachopteryx thoreyi*), also breeds here, as demonstrated by the presence of a nymph in one of the seeps.

Other noteworthy animals include the sumo mite (*Allothrombium* sp.), an animal strongly associated with steep north-facing slopes, river otters (*Lutra canadensis*), red-tailed hawks (*Buteo jamaicensis*), and an unusually dense population of eastern box turtles (*Terrapene carolina*) on the upper slopes and adjoining ridge. The rocky shallows of the river offer good habitat for the panhandle pebblesnail (*Somatogyrus virginicus*), state-listed significantly rare and a federal species of concern. It has been documented from the Eno River State Park downstream, and future inventory in Orange County should target this rare animal. A very impressive scenic feature is a large quartzitic promontory near the confluence of Cates Creek, rising vertically for approximately 60 feet, affording an excellent view of the river and bottomlands.

MANAGEMENT AND PROTECTION: Most of the site located south of US 70 is owned and protected by Classical American Homes Preservation Trust. Most of the site north of US 70 was purchased by the Eno River Association in 2003 and soon after conveyed to Eno River State Park. This site will be part of the western gateway into the state park.

The small, unprotected section of the natural area located north of US 70 should be incorporated into the Eno River State Park. A buffer area should be included along the top of the slopes in order to preserve the mesic environment of the bluff community. Construction of water main or any other transactions of the vegetation, including the proposed connector road, should be steered away from the bluffs for the same reason.

This site abuts a very large piece of private property, which runs along the south side of the Eno east of Lawrence Road and provides a direct link with the state park. Both properties are extremely valuable in providing ecological integrity to the park, as well as providing a corridor for animal movements and plant dispersal.

OWNERSHIP: Classical American Homes Preservation Trust, State of NC, Private

REFERENCES: Sather, D. and S. Hall. 1988. Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina, Appendix B: Biological Documentation of Sites. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Orange County Natural Areas Inventory

ENO RIVER / CATES FORD AND UPLANDS

Site Number: E11

Size: 1,487 acres

Site Significance: State

USGS Quad: Hillsborough

SIGNIFICANT FEATURES: This large site hosts many significant areas that described below. This 2004 update to the Orange County inventory combines five contiguous sites that had been listed separately in the original 1988 inventory.

Rich Mesic Slopes – The rich slopes on this stretch of the Eno River support populations of ginseng (*Panax quinquefolius*).

Uplands and Vernal Pools – This site contains two of only three upland depressions in the county that are large enough to appear on the USGS topographic maps (a third was destroyed by an impoundment). Both of the depressions are outside of the state-owned portion of the site. These habitats are quite rare and provide prime breeding sites for salamanders and other amphibians, as well as upland habitat for overcup oak (*Quercus lyrata*) and buttonbush (*Cephalanthus occidentalis*), species that are normally restricted to lowland swamps.

Buckwater Creek Ridge and Slopes – The massive outcrop that rises above the river on the south-facing slope has outstanding xerophytic (dry) vegetation and is one of only several sites within the county where the regionally rare pepper-and-salt skipper butterfly (*Amblyscirtes hegon*) is known to occur. On the ridgetop is the best mature post oak forest (*Quercus stellata*) in the county; this is also important as an upland wildlife reservoir. The adjoining extensive bottomlands have additional potential importance for wildlife. Scattered large walnut trees (*Juglans nigra*) attest to the richness of this wide bottom; if allowed to recover to maturity, this site could provide the best example of this forest type in the county.

Cox's Mountain – Cox's Mountain provides a good example of mixed mesic hardwoods and dry mesic oak-hickory forest. Upstream there is a large spring above which ginseng (*Panax quinquefolius*), a state-listed species of special concern, grows; the gray petaltail [dragonfly] (*Tachopteryx thoreyi*), a regionally rare animal, inhabits the spring itself. Doll's eyes (*Actaea pachypoda*), another regionally rare plant species, is reportedly present in the area (Smith and Deyle, 1976) and is known from no other location in Orange County.

Cate's Ford – The Cate's Ford area contains some of the best-developed riparian communities in Orange County. Two state-listed animals of special concern have been reported as occurring here, the Neuse River waterdog (*Necturus lewisi*) and Roanoke bass (*Ambloplites cavifrons*). Of geological significance, the shoal at Cate's Ford is "one of the best natural exposures of a pyroclastic rock which is widespread through the Piedmont of the Carolinas" (Butler et al., 1975).

NATURAL COMMUNITIES: Dry-Mesic Oak—Hickory Forest, Dry Oak—Hickory Forest, Low Elevation Seep, Mesic Mixed Hardwood Forest, Piedmont Alluvial Forest, Rocky Bar and Shore, Upland Depression Swamp Forest

GENERAL DESCRIPTION: Originally five adjacent sites (1988 inventory), the areas were combined and renamed by the NC Natural Heritage Program. The five distinct portions of the larger site are described below:

Rich Mesic Slopes

This stretch of the Eno possesses some of the richest forest slopes in Orange County. The north-facing slopes support a mesic mixed hardwood forest with an outstandingly diverse herb layer. Species include ginseng (*Panax quinquefolius*), a state-listed species of special concern, yellow lady's slipper (*Aconitum uncinatum*), and monkshood maidenhair fern (*Adiantum pedatum*).

Uplands and Vernal Pools

The upland areas located south of the river consist of several flat-topped ridges divided by relatively deep ravines. This large expanse of uplands contains mature second growth forest along with areas that were timbered in the 1980s. The hardwood forest is composed mostly of oaks and hickories: red oak (*Quercus rubra*), white oak (*Q. alba*), black oak (*Q. velutina*), post oak (*Q. stellata*), spanish oak (*Q. falcata*), scarlet oak (*Q. coccinea*), mockernut hickory (*Carya tomentosa*), pignut hickories (*C. glabra* and *C. ovalis*), and others. The vegetation of this site is thus representative of the oak-hickory forest that historically predominated in the Piedmont. Although this type of habitat cannot be considered unique, it is this very "representativeness" that should be protected.

Also present on this site are two large vernal pools [Upland Depression Swamp Forests], depressions that fill solely with rainwater and have no stream inlet or outlet. Although each pool is unique in its vegetation, collectively they contain characteristic hydric species such as willow oak (*Quercus phellos*), overcup oak (*Q. lyrata*), buttonbush (*Cephalanthus occidentalis*), highbush blueberry (*Vaccinium* sp.), leucothoe (*Leucothoe racemosa*), and sphagnum (*Sphagnum* sp.). Two salamanders that characteristically breed in these types of pools and are documented for this site are the spotted salamander (*Ambystoma maculatum*) and marbled salamander (*A. opacum*); both require long-lasting, fish-free ponds for their larval development, and are thus restricted to these types of pools (although they also occur in lowland areas with rain-filled pools).

Buckwater Creek Ridge and Slopes

Near the confluence of the Eno River and Buckwater Creek the river takes a 90-degree bend from running east to running south. The south-facing bluff at this point is the most extensive slope of its kind in the county. A massive outcrop, composed of felsic dacitic tuff, is exposed as a series of sunny ledges that rise 50 feet above the river and supports such xerophytic plants as the woolly lipfern (*Cheilanthes tomentosa*) and goat's rue (*Tephrosia virginiana*). On the slope directly above this outcrop grows an open forest dominated by post oak (*Quercus stellata*), many of which are over one foot in diameter. Other dry oaks include blackjack oak (*Q. marilandica*), black oak (*Q. velutina*), and white oak (*Q. alba*). Other woody species indicating the dryness of this area are sourwood (*Oxydendrum arboreum*), red cedar (*Juniperus virginiana*), scattered mountain laurel (*Kalmia latifolia*), and several species of blueberries (*Vaccinium* spp.).

Above this dry community the slopes become less steep, forming a long ridge running one and a half miles to the north. The forest here is less dry than the post oak forest to the south,

forming a dry-mesic oak-hickory community. The dominant species are white oak, red oak (*Q. rubra*), southern red oak (*Q. falcata*), mockernut hickory (*Carva tomentosa*), and pignut hickory (*C. glabra*). The openness of the understory makes this a pleasant place to hike, and an existing bridle trail runs the entire length of the ridge.

The unbroken expanse of this forest along the level ridgetop further provides excellent habitat for wildlife. Typical open forest birds include eastern wood-pewee (*Contopus virens*), white-breasted nuthatch (*Sitta carolinensis*), yellow-throated vireo (*Vireo flavifrons*), and summer tanager (*Piranga rubra*). Species that are indicative of the extent of this forest are the red-tailed hawk (*Buteo jamaicensis*), pileated woodpecker (*Dryocopus pileatus*), and hairy woodpecker (*Picoides villosus*), which was especially abundant on this site. This was also the only site within the county where we documented the presence of striped skunk (*Mephitis mephitis*).

Several of the ravines that descend to Buckwater Creek along the east-facing slope provide good examples of mixed mesic hardwood forest. Mature beeches (*Fagus grandifolia*) of large size are frequent and reproducing, as evidenced by the abundance of seedlings and saplings. The extensive understory thickets of beech are the most conspicuous feature of these ravines.

The bottomlands adjoining this ridge along Buckwater Creek are also significant. Even though the forest has been cut within the last 70 years, the floodplain here contains the widest uncultivated expanse of Chewacla loam soil within the county. If this site is left undisturbed as part of Eno River State Park, its potential for regrowth into a prime example of wide bottomland forest is excellent. Black walnut (*Juglans nigra*) is common on this site and is but one indicator of the richness of the area. The presence of the Kentucky warbler (*Oporornis formosus*), a bird requiring extensive bottomland forest, similarly indicates the potential for wildlife.

Cox's Mountain

The lower, north-facing slope of Cox's Mountain and the slopes upstream form one of the longest stretches of mesic habitat along the Eno. The mixed mesic hardwood forest here is mature, and offers habitat for moisture-loving herbs such as yellow lady's-slipper (*Cypripedium calceolus* var. *pubescens*), a regionally rare species, Catesby's trillium (*Trillium catesbaei*), and wild ginger (*Asarum canadense*), which grows in profusion. At one point where a large outcrop occurs, there is a large stand of mountain laurel (*Kalmia latifolia*); among this heath community is found the regionally rare sumo mite (*Allothrombium* sp.), an animal that is restricted to cool north-facing slopes.

One large spring located along the base of the slope is particularly noteworthy. The gray petaltail (*Tachopteryx thoreyi*), a species requiring this type of environment for breeding, was observed here. An adult grayback was also observed farther downstream, opposite a large isolated pool containing the larvae of the spotted salamander (*Ambystoma maculatum*); the dragonfly may have originated at this pool or at the spring upstream. A population of ginseng grows adjacent to this spring.

On the upper slopes and summit of Cox's Mountain, the woodland is composed of relatively undisturbed dry-mesic oak-hickory forest. Canopy species include white oak (*Quercus*

alba), red oak (*Q. rubra*), southern red oak (*Q. falcata*), black oak (*Q. velutina*), scarlet oak (*Q. coccinea*), post oak (*Q. stellata*), pignut hickory (*Carya glabra*), and mockernut hickory (*C. tomentosa*). Woody species in the subcanopy and shrub layers are serviceberry (*Amelanchier arborea*), hazelnut (*Corylus americana*), hop hornbeam (*Ostrya virginiana*), fringe tree (*Chionanthus virginicus*), and several species of haw (*Viburnum spp.*). Typical herbs are false foxglove (*Aureolaria virginica*), New Jersey tea (*Ceanothus americanus*), mountain-mint (*Pycnanthemum incanum*), and broomstraw (*Andropogon sp.*).

Bobcat (*Lynx rufus*), long-tailed weasel (*Mustela frenata*), turkey (*Meleagris gallopavo*) and other upland species have been reported for this area but were not documented in the present study. Since it is contiguous with the large upland area on private lands to the southwest, this area should be prime habitat for such wide-ranging, wary species.

Cate's Ford

This area includes a riparian strip contained within the relatively steep-walled gorge, which extends from Cate's Ford to the powerline upstream from the park boundary. The bottomland is fairly narrow for most of this stretch and the forest is dominated primarily by riverine species such as river birch (*Betula nigra*), sycamore (*Platanus occidentalis*), box elder (*Acer negundo*), and white ash (*Fraxinus americana*).

The river here is full of riffles and exposed gravelly shoals, many of which are covered with thick growths of justicia (*Justicia americana*). Mussel beds are common, as are many other riverine animals such as the northern water snake (*Nerodia sipedon*), river turtle (*Chrysemys concinna*), and raccoon (*Procyon lotor*). River otter (*Lutra canadensis*), which is present only along the larger and wilder streams in the Piedmont, also occurs here regularly. Representative birds of this community are the belted kingfisher (*Megaceryle alcyon*), yellow-throated warbler (*Dendroica dominica*), and northern parula (*Parula americana*).

MANAGEMENT AND PROTECTION: The rich mesic forest slopes was purchased by the State in 2003 for Eno River State Park. Any future trails should be situated to reduce impact upon the unique vegetation. The previously unprotected uplands located south of the river was also added to the state park in late 2003; however, the northern vernal pool was deleted from the acquisition by the owners. Another notable exception was an isolated vernal pool located south of and apart from the larger natural area. It lies within an area that was clearcut in 1987. Efforts should be made to protect that isolated vernal pool so that it can recover naturally. Buffer areas should be established in order to preserve water quality of the drainage into both the northern and southern pools.

A southern portion of the Buckwater Creek ridge and slopes is protected by the state park, but a large portion remains in private ownership. Bottomlands along Buckwater Creek should be left alone for development of natural potential. Cox's Mountain and Cate's Ford are on state park property. Trail construction should avoid the area of the spring to protect the breeding habitat for the rare dragonfly and to prevent exploitation of the ginseng.

OWNERSHIP: State of NC (Eno River State Park), Private

REFERENCES:

Boufford, D., and Whetstone, D. 1974. Pages 98-99 In A. E. Radford, ed. 1976. *Vegetation, Habitats, Floras: Natural Areas in the Southeastern United States -- Field Data and Information*. Department of Biology, UNC Chapel Hill, North Carolina.

Butler, R. J., Custer, E. S. Jr., and W. A. White. 1975. *Potential Geological Landmarks, Piedmont Region, Eastern United States*. Department of Geology, UNC Chapel Hill, NC.

Smith, E. L. and R. Deyle. 1976. *Eno River State Park (Shaw Tract)*. Report to NC State Parks, Raleigh, North Carolina.

Harrison, E. 1978. *Report on natural areas in Eno River State Park to NC State Division of State Parks*, Raleigh, NC.

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Orange County Natural Areas Inventory

ERSP MOUNTAIN SPLEENWORT AND RHODODENDRON BLUFF

Site Number: E12

Size: 22 acres

Site Significance: Regional

USGS Quadrangle: Hillsborough

SIGNIFICANT FEATURES: This is the easternmost known location in the Carolinas for the mountain spleenwort (*Asplenium montanum*), a regionally rare plant species disjunct from the mountains. This is one of only two known locations for this species in the eastern Piedmont (the other is located at Occoneechee Mountain, site E07). Additionally, the steep north-facing bluff on this bend of the Eno is the location of one of only nine populations of catawba rhododendron (*Rhododendron catawbiense*) in the county, which is likewise disjunct from the mountains and considered regionally rare in our area. A regionally rare disjunct animal, the red-backed salamander (*Plethodon cinereus*), is found here and at only two other sites in Orange County (Kings Mill and Mason Farm Pond: M08).

NATURAL COMMUNITIES: Piedmont Acidic Cliff, Piedmont Heath Bluff

GENERAL DESCRIPTION: The outcrop at this point of the Eno forms one of the most dramatic and impassable river bluffs in the county. Facing due north and overhanging the river in places, it offers one of the moistest and coolest sites within the region. Such montane conditions help to explain the presence of the mountain spleenwort (*Asplenium montanum*) at its easternmost limit; similar conditions are found only at the Panther's Den Ravine on Occoneechee Mountain. A regionally rare animal species, the red-backed salamander (*Plethodon cinereus*), is also found here. It is a northern species reaching its southern limit in the Carolina Piedmont; like the plant disjuncts at this site, it requires cool, moist conditions.

Although timbering above the bluff has reduced the forest adjoining this community, the species are still typical of those that occur at Piedmont sites where catawba rhododendron (*Rhododendron catawbiense*) is found. Trees emergent above the evergreen rhododendrons include chestnut oak (*Quercus prinus*), scarlet oak (*Q. coccinea*), white oak (*Q. alba*), beech (*Fagus grandifolia*), and black gum (*Nyssa sylvatica*). Witch hazel (*Hamamelis virginiana*), hop hornbeam (*Ostrya virginiana*), evergreen holly (*Ilex opaca*), and storax (*Styrax grandifolia*) are important members of the subcanopy. Among the ferns that inhabit the rocky crevices are Christmas fern (*Polystichum acrostichoides*), rock cap fern (*Polypodium virginianum*), and marginal shieldfern (*Dryopteris marginalis*), which is common in the mountains but found only on cooler rocky slopes in restricted areas of the Piedmont. Another noteworthy herbaceous species is the regionally rare galax (*Galax aphylla*).

The dominant shrub along this one-mile stretch of river is mountain laurel (*Kalmia latifolia*). Whereas the rhododendron and spleenwort are restricted to the sharp north-facing bend at the western end of this site, the mountain laurel extends downstream along the slope all the way to where the river bends again to the southeast.

With the exception of the red-backed salamander, the animals observed at this site are typical riparian species: river cooter (*Chrysemys concinna*), painted turtle (*Chrysemys picta*), beaver (*Castor canadensis*), raccoon (*Procyon lotor*), belted kingfisher (*Megaceryle alcyon*), and

eastern phoebe (*Sayornis phoebe*); largemouth bass (*Micropterus salmoides*) and bluegill (*Lepomis macrochirus*) are two of the more conspicuous fish.

MANAGEMENT AND PROTECTION: The site is part of Eno River State Park. A wider buffer strip should be provided, either through state park acquisition or through a conservation easement negotiated with the landowners. Trails along this section of the park are not recommended, due to the fragility of the habitat, unless they can be accommodated within the buffer along the top of the bluff, avoiding the rhododendrons.

OWNERSHIP: State of NC (Eno River State Park), Private

REFERENCES: Sather, D. and S. Hall. 1988. Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina, Appendix B: Biological Documentation of Sites. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Orange County Natural Areas Inventory

MIDDLE ENO RIVER BLUFFS AND SLOPES

Site Number: E13

Size: 396 acres in Orange County
[614 acres in Durham County]

Site Significance: State

USGS Quads: Hillsborough, NW Durham

SIGNIFICANT FEATURES: Several state-listed species are present here, including ginseng (*Panax quinquefolius*, which is possibly extirpated from this site), Neuse River waterdog (*Necturus lewisi*), and Roanoke bass (*Ambloplites cavifrons*). Catawba rhododendron (*Rhododendron catawbiense*), maidenhair fern (*Adiantum pedatum*), galax (*Galax aphylla*), sumo mite (*Allothrombium* sp.), and pileated woodpecker (*Dryocopus pileatus*) are all regionally rare species occurring in this section of the state park.

NATURAL COMMUNITIES: Mesic Mixed Hardwood Forest, Piedmont Acidic Cliff, Piedmont Heath Bluff, Pine—Oak / Heath, Piedmont Alluvial Forest

GENERAL DESCRIPTION: Originally known as “ERSP Cabelands and Rhododendron Bluff” (1988 inventory), the site was later expanded and renamed by the NC Natural Heritage Program. Several different habitats are found along the nearly two-mile stretch of the site in Orange County. At the driest extreme is a community of Virginia pine (*Pinus virginiana*), mountain laurel (*Kalmia latifolia*), sparkleberry (*Vaccinium arboreum*), galax (*Galax aphylla*), and trailing arbutus (*Epigaea repens*) growing on a steep, 80-foot bluff near the reservoir near the western boundary of this natural area. On gentler, less-exposed slopes occur mixed mesic hardwoods, such as beech (*Fagus grandifolia*), red oak (*Quercus rubra*), bitternut hickory (*Carya cordiformis*), and tulip poplar (*Liriodendron tulipifera*). At the bottom of these slopes, the herbaceous layer is very rich, as evidenced by the presence of maidenhair fern (*Adiantum pedatum*), wild ginger (*Asarum canadense*), and bloodroot (*Sanguinaria canadensis*). Ginseng (*Panax quinquefolius*) was reported from this area as late as 1972, but now appears to be extirpated from the Cabelands.

Another mesic community, a catawba rhododendron bluff on a steep northwest-facing slope, is located about one-half mile downstream from the area traditionally recognized as the Cabelands. Beech (*Fagus grandifolia*) and white oak (*Quercus alba*) form the canopy of this community. In addition to the three relatively undisturbed communities just described, there exists a mosaic of successional forest stands as a result of historic cultivation of the Cabelands. Black et al. (1972) mapped the forest stands of this area and listed over 110 vascular plant species that are present.

Along the mesic north-facing slopes are found the sumo mite (*Allothrombium* sp.), slimy salamander (*Plethodon glutinosus*), ovenbird (*Seiurus aurocapillus*), hooded warbler (*Wilsonia citrina*), and scarlet tanager (*Piranga olivacea*). The bottomlands, although narrow and somewhat disturbed, contain a large oxbow pool, which is the breeding site for spotted salamander (*Ambystoma maculatum*), marbled salamander (*A. opacum*), and several frog species. Birds inhabiting the bottomland and riparian strip include the barred owl (*Strix varia*), pileated woodpecker (*Dryocopus pileatus*), acadian flycatcher (*Empidonax virescens*),

Louisiana waterthrush (*Seiurus motacilla*), northern parula (*Parula americana*), and yellow-throated warbler (*Dendroica dominica*).

MANAGEMENT AND PROTECTION: Most of the site lies within Eno River State Park. Periwinkle (*Vinca minor*) and English ivy (*Hedera helix*), both escaped remnants from previous settlement, threaten to overwhelm the richest herbaceous flora on this site (as previously mentioned, ginseng has already disappeared from the Cabelands). Hand removal of these plant pests is required for the long-term integrity of the site. Trail construction should be sited to avoid trampling this herbaceous community and the rhododendron bluff downstream.

OWNERSHIP: State of NC (Eno River State Park), Private

REFERENCES:

Black, M. L., Moul, R. L., and D. F. Weaver. 1974. A study of the Rhine property for the North Carolina Natural Areas Survey. Duke Environmental Center. Durham, NC.

Sather, D. and S. Hall. 1988. Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina, Appendix B: Biological Documentation of Sites. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Orange County Natural Areas Inventory

CATES CREEK HARDPAN FOREST

Site Number: E08

Size: 7 acres

Site Significance: County

USGS Quadrangle: Hillsborough

SIGNIFICANT FEATURES: The natural area contains a remnant example of bottomland forest on Iredell soil.

NATURAL COMMUNITIES: Piedmont Alluvial Forest, Basic Oak—Hickory Forest

GENERAL DESCRIPTION: The name of this site was changed from “Cates Creek Montmorillonite Forest” in the 1988 inventory report to reflect the change in the natural community name from “Montmorillonite Forest” to “Xeric Hardpan Forest.” The soils here are not xeric, however; rather they are a Mixed Moisture Hardpan variant of the Basic Oak—Hickory Forest.

This site, though reduced in size by surrounding development, is a good example of bottomland forest occurring over basic clay soils. The impermeability of this clay and the circumneutral pH provide habitat for such basophilic species as slippery elm (*Ulmus rubra*) and redbud (*Cercis canadensis*). The atamasco lily (*Zephyranthes atamasco*), found at scattered locations throughout the county on wet clay soils, is also present here. The canopy of this second-growth forest is composed of sweetgum (*Liquidambar styraciflua*), white ash (*Fraxinus americana*), tulip poplar (*Liriodendron tulipifera*), and hackberry (*Celtis laevigata*). Typical understory species present include ironwood (*Carpinus caroliniana*), dogwood (*Cornus florida*), and hazelnut (*Corylus americana*), along with the more unusual slippery elm and redbud. As is the case in many of the county's bottomland forests, Japanese honeysuckle (*Lonicera japonica*) and Japanese browntop grass (*Microstegium vimineum*) have invaded the herb layer, but characteristic bottomland species such as Canada avens (*Geum canadense*), cornflower (*Rudbeckia laciniata*), and atamasco lily occupy the wetter ground around occasionally flooded pools.

MANAGEMENT AND PROTECTION: None. Should alert landowner to the natural values of the property.

OWNERSHIP: Private

REFERENCES:

Sather, D. and S. Hall. 1988. Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina, Appendix B: Biological Documentation of Sites. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Oakley, S.C., H.E. LeGrand, Jr., and M.P. Schafale. 1995. An Inventory of Mafic Natural Areas in the North Carolina Piedmont. North Carolina Natural Heritage Program, Division of Parks and Recreation, Raleigh, NC.

Orange County Natural Areas Inventory

CATES CREEK HARDWOOD FOREST

New Site 2004

Site Number: E09

Size: 82 acres

Site Significance: Regional

USGS Quadrangle: Hillsborough

SIGNIFICANT FEATURES: The site is one of the best examples in the state of a rare plant community: the Basic Oak-Hickory Forest (Dry Variant). It provides habitat for turkey, deer, and neotropical migrant birds.

NATURAL COMMUNITIES: Basic Oak-Hickory Forest (Dry Variant), Xeric Hardpan Forest (Basic Variant).

GENERAL DESCRIPTION: This site occupies fairly flat topography that is underlain by metavolcanic intermediate rock. This rock weathers into Enon, Iredell and Wilkes soils. The majority of the site supports Basic Oak-Hickory Forest (Dry Variant), whose dominants are Carolina shagbark hickory (*Carya carolinae-septentrionalis*) and white oak (*Quercus alba*), with some white ash (*Fraxinus americana*), sweetgum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), and scattered yellow poplar (*Liriodendron tulipifera*). Common understory trees include winged elm (*Ulmus alata*), dogwood (*Cornus florida*), redbud (*Cercis canadensis*), and southern sugar maple (*Acer barbatum*). Canopy trees are mixed aged and relatively densely spaced, except in the western portion where trees are larger and widely spaced. Greenbrier (*Smilax rotundifolia*) is frequent. Herbs are relatively scarce, but oatgrass (*Danthonia spicata*) and rattlesnake orchid (*Goodyera pubescens*) are frequent; Christmas fern (*Polystichum acrostichoides*) and black cohosh (*Cimicifuga racemosa*) are occasional.

Also present are a couple of small areas of rocky Xeric Hardpan Forest (Basic Variant), dominated by post oak (*Quercus stellata*) and Carolina shagbark hickory, with some red cedar (*Juniperus virginiana*).

The northwest side of the site borders a pond and an area of planted loblolly pines (*Pinus taeda*). Much of the eastern portion of the site has been logged (some of this may be on adjacent property). Disturbance from logging and a trail has allowed abundant growth of Japanese browntop grass (*Microstegium vimineum*). This alien weed has the ability to suppress native herbaceous species and should be controlled. However, it was not seen within the natural plant communities.

MANAGEMENT AND PROTECTION: The site has no formal protection. A large portion of the site identified by LeGrand in the mid-1990s (Oakley, et al., 1995) was clearcut in 2002-03. The site boundaries were revised in 2004 to exclude that portion. Japanese browntop grass needs to be controlled if possible.

OWNERSHIP: Private

REFERENCES: Sather, D. and S. Hall. 1988. Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina, Appendix B: Biological Documentation of Sites. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Oakley, S.C., H.E. LeGrand, Jr., and M.P. Schafale. 1995. An Inventory of Mafic Natural Areas in the North Carolina Piedmont. North Carolina Natural Heritage Program, Division of Parks and Recreation, Raleigh, NC.

Orange County Natural Areas Inventory

STONY CREEK SPRING

Site Number: E14
Site Significance: County

Size: 22 acres
USGS Quadrangle: Hillsborough

SIGNIFICANT FEATURES: The extremely large spring-bog present in this area of Duke Forest supports one of the three largest concentrations in the county of four-toed salamanders (*Hemidactylium scutatum*), a state-listed species. A regionally rare animal, the gray petaltail [dragonfly] (*Tachopteryx thoreyi*), also breeds in the restricted habitat offered by this spring.

NATURAL COMMUNITIES: Low Elevation Seep, Piedmont Alluvial Forest

GENERAL DESCRIPTION: The most significant feature of the Eno Division of Duke Forest is the large spring and adjoining bottomland that occurs along Stony Creek. The spring itself issues from the base of an east-facing slope into a wide and flat boggy area covered with an extensive growth of sphagnum moss. The presence of this moss is essential for the breeding of four-toed salamanders, which lay their eggs only under clumps of moss adjacent to shallow springs or pools; multiple nests were observed at this site in March of 1988. Mucky hillside seeps are also the only habitat for the gray petaltail [dragonfly], whose semi-terrestrial nymph hides within wet leaf-litter; adults were observed at this site in May of 1988. In addition to these state-listed animals, other species can be expected to occur here that also are restricted to spring habitats, including the mud salamander (*Pseudotriton montanus*) and red salamander (*P. ruber*).

The vegetation occupying the wet areas here is characterized by species highly typical of wetlands. The canopy is composed almost solely of the red maple (*Acer rubrum*) and sweetgum (*Liquidambar styraciflua*), while the subcanopy contains hop hornbeam (*Ostrya virginiana*), Virginia willow (*Itea virginica*), spicebush (*Lindera benzoin*) and American elm (*Ulmus americana*). Much more diverse is the luxuriant herb layer. Among the numerous species are royal fern (*Osmunda regalis*), cinnamon fern (*O. cinnamomea*), shield fern (*Dryopteris* sp.), lizard's tail (*Saururus cernuus*), jewelweed (*Impatiens capensis*), swamp rose (*Rosa palustris*), false nettle (*Boehmeria cylindrica*), lycopus (*Lycopus virginicus*), clearweed (*Pilea pumila*), and abundant sphagnum moss (*Sphagnum* sp.).

This habitat extends down a spring run that parallels Stony Creek for 100 yards before spreading out into the bottomland. This area also needs to be protected as part of the natural area since the adults of both the salamanders and dragonflies use it for foraging.

MANAGEMENT AND PROTECTION: This site is Duke Forest multiple use land. Duke Forest managers should be notified as to the significance of the spring and adjoining bottomland forest. It should be recommended that Duke register the site with the NC Natural Heritage Program or dedicate as a state nature preserve.

OWNERSHIP: Duke University

REFERENCES: Sather, D. and S. Hall. 1988. Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina, Appendix B: Biological Documentation of Sites. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Hyco Creek Watershed

Orange County Natural Areas Inventory

CEDAR GROVE HEARTLEAF RAVINE

Site Number: H01
Site Significance: County

Size: 20 acres
USGS Quad: Cedar Grove

SIGNIFICANT FEATURES: This is one of four documented sites in Orange County for Lewis' heartleaf (*Hexastylis lewisii*). [The name of this site has been changed in this 2004 report from "Allison Road Heartleaf Ravine" (1988 report) to conform to the site name used by the NC Natural Heritage Program—"Cedar Grove Plant Site."]

NATURAL COMMUNITIES: Mesic Mixed Hardwood Forest

GENERAL DESCRIPTION: At this site along a tributary of South Hyco Creek, a population of Lewis' heartleaf is growing in a mixed mesic hardwood forest along the gentle slopes of a small ravine. Facing north, this ravine supports medium-aged hardwood species such as beech (*Fagus grandifolia*), red oak (*Quercus rubra*), white oak (*Q. alba*), tulip poplar (*Liriodendron tulipifera*), shagbark hickory (*Carya ovata*), pignut hickory (*C. glabra*), mockernut hickory (*C. tomentosa*), and blackgum (*Nyssa sylvatica*). The shrub and herb layer is sparse, and contains such species as maple-leaved viburnum (*Viburnum acerifolium*), hearts-a-bustin' (*Euonymus americana*), blueberry (*Vaccinium vacillans*), cranefly orchid (*Tipularia discolor*), and bellwort (*Uvularia perfoliata*). Lewis' heartleaf occurs in eight to ten scattered patches through this forest, ranging in size from one to 50 square meters (Mansberg, 1986).

MANAGEMENT AND PROTECTION: Most of the site is owned by The Nature Conservancy, and is expected to be conveyed to Orange County in 2004.

Beaver dams downstream should be monitored for possible inundation of the heartleaf population.

OWNERSHIP: The Nature Conservancy; Private

REFERENCES:

Mansberg, L. 1986. Site Survey Report: Cedar Grove Lewis' heartleaf habitat. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Sather, D. and S. Hall. 1988. Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina, Appendix B: Biological Documentation of Sites. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Orange County Natural Areas Inventory

PENECOST ROAD NESTRONIA FLAT

Site Number: HO2

Size: 8 acres

Site Significance: County

USGS Quad: Cedar Grove

SIGNIFICANT FEATURES: This is one of the county's few sites for nestronia (*Nestronia umbellula*), a *watch list* plant species (formerly state-listed plant species). Nestronia is endemic to the Southeastern US; however the only other known Orange County population of this species exists at three sites along Morgan Creek (M08). Lewis' heartleaf (*Hexastylis lewisii*), a state-listed species, is also found at this site and is one of only four populations known in Orange County.

NATURAL COMMUNITIES: Dry-Mesic Oak—Hickory Forest

GENERAL DESCRIPTION: The woodlands comprising this habitat are surrounded by a patchwork of fields and woodlot blocks in a long-used agricultural area. The woodland is a surprisingly mature forest dominated mostly by drier oaks and hickories. Post oak (*Quercus stellata*), white oak (*Q. alba*), southern red oak (*Q. falcata*), black oak (*Q. velutina*), mockernut hickory (*Carya tomentosa*), pignut hickory (*C. glabra*), and loblolly pine (*Pinus taeda*) occur in the canopy. Sourwood (*Oxydendrum arboreum*), fringe tree (*Chionanthus virginicus*), azalea (*Rhododendron nudiflorum*), and serviceberry (*Amelanchier arboreal*) are the major species of the subcanopy, while squaw-huckleberry (*Vaccinium stamineum*) and black haw (*Viburnum rafinesquianum*) are the most common shrubs. Nestronia (*Nestronia umbellula*) is apparently restricted to the eastern edge of the forest. Herbs are almost non-existent except for the Lewis' heartleaf, which is common on the forest floor. Much of this herb layer is dominated by trailing vines, including Virginia creeper (*Parthenocissus quinquefolia*), greenbrier (*Smilax rotundifolia*), and two species of grape (*Vitis labrusca* and *V. rotundifolia*).

MANAGEMENT AND PROTECTION: This site receives no formal protection, and the landowner needs to be alerted to the significance of the site. The nestronia is growing on the ecotonal margins of the block of forest; increased clearing into the forest margin may decimate the population.

OWNERSHIP: Private

REFERENCES: Sather, D. and S. Hall. 1988. Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina, Appendix B: Biological Documentation of Sites. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Little River Watershed

Orange County Natural Areas Inventory

SOUTH FORK LITTLE RIVER MARSH

Site Number: L01

Size: 18 acres

Site Significance: County

USGS Quad: Caldwell

SIGNIFICANT FEATURES: The topography of this site offers the best situation in the county for natural beaver impoundments and associated marshland.

NATURAL COMMUNITIES: Semipermanent Impoundment

GENERAL DESCRIPTION: In this wide basin along the South Fork of the Little River, beaver (*Caster canadensis*) have taken advantage of the natural topography and created an impoundment that has developed into marshland. Historically, such marshes were probably very common along gentler areas of Piedmont streams. With the recent return of beaver to these streams, marshlands such as this one (the best we have seen in the county) are again providing habitat for many species characteristic of such wet, low-lying areas.

Within the deeper water toward the center of the marsh there are many large standing dead trees, remnants of the bottomland forest that was here before the beaver dammed the basin. Nearer the margins, hydric woody species abound, including such canopy trees as American elm (*Ulmus americana*), white ash (*Fraxinus americana*), sycamore (*Platanus occidentalis*), sweetgum (*Liquidambar styraciflua*), black willow (*Salix nigra*), and willow oak (*Quercus phellos*). Shrubs are especially numerous, including buttonbush (*Cephalanthus occidentalis*), swamp dogwood (*Cornus amomum*), tag alder (*Alnus serrulata*), elderberry (*Sambucus canadensis*), swamp rose (*Rosa palustris*), and bladdernut (*Staphylea trifolia*). Areas of open water alternate with patches of extensive herb cover, dominated by bur-reed (*Sparganium americanum*) and several kinds of sedges (*Carex* spp.). Other herbs of these wet areas include clearweed (*Pilea pumila*), false nettle (*Boehmeria cylindrical*), sensitive fern (*Onoclea sensibilis*), jewelweed (*Impatiens capensis*), water plantain (*Alisma subcordata*), arrowhead (*Sagittaria* sp.), cattail (*Typha latifolia*), and golden club (*Orontium aquaticum*).

Beaver ponds like this one support large numbers of animal species in addition to the beavers themselves. At this marsh we observed a large population of wood ducks (*Aix sponsa*), perhaps the species most benefiting from the return of the beaver, as well as great blue herons (*Ardea herodias*), belted kingfishers (*Megaceryle alcyon*), green frogs (*Rana clamitans*), and bluegill sunfish (*Lepomis macrochirus*). Given time, the diversity and abundance of wildlife can only increase at this site.

MANAGEMENT AND PROTECTION: This site has no formal protection in place. A conservation easement should be sought from the landowners.

OWNERSHIP: Private

REFERENCES: Sather, D. and S. Hall. 1988. Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina, Appendix B: Biological Documentation of Sites. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Orange County Natural Areas Inventory

FORREST CREEK BEAVER POND

Updated 2004

Site Number: L02

Size: 19 acres

Site Significance: County

USGS Quad: Caldwell

SIGNIFICANT FEATURES: This is one of only two braided stream sites in the county, and the topography offers an excellent situation for natural beaver impoundments and associated marshland.

NATURAL COMMUNITIES: Semipermanent Impoundment

GENERAL DESCRIPTION: This is the older of the two beaver ponds included in this inventory. Grazing has destroyed some of the "naturalness" of this site, but it nonetheless retains several of the qualities normally present at such ponds. There is less open water here than at the younger South Fork Little River Marsh (L01), due to siltation (trapping of eroded sediments is one main value of beaver ponds) and organic buildup. Woody species are mostly restricted to the margins of the marsh, and include tag alder (*Alnus serrulata*), red maple (*Acer rubrum*), willow (*Salix* sp.), sweetgum (*Liquidambar styraciflua*), buttonbush (*Cephalanthus occidentalis*), elderberry (*Sambucus canadensis*), and ironwood (*Carpinus caroliniana*). The lush herbaceous vegetation includes numerous grasses, sedges, and rushes, along with typical open marsh herbs such as jewelweed (*Impatiens capensis*), monkeyflower (*Mimulus ringens*), tearthumb (*Polygonum sagittatum*), lycopus (*Lycopus virginiana*), cardinal flower (*Lobelia cardinalis*), and lizard's tail (*Saururus cernuus*).

The thick vegetation growing on these sediments supports common yellowthroats (*Geothlypis trichas*) and butterflies such as the Appalachian brown (*Satyrodes appalachia*), least skipper (*Ancyloxypha numitor*), zabulon skipper (*Poanes zabulon*), and dun skipper (*Euphyes vestris*). The standing dead trees around the margins of beaver ponds are usually prime habitat for woodpeckers; in mid-August, we saw a number of flickers (*Colaptes auratus*), and additional species, such as hairy (*Picoides villosus*), downy (*P. pubescens*), red-bellied (*Melanerpes carolinus*), and red-headed woodpeckers (*Melanerpes erythrocephalus*) can be expected to nest here in the spring.

The site was revisited in July 2002, entering from Ericka Drive at the west end of the natural area. Although we followed the creek (now dry except for scattered pools) eastward for a considerable distance, we found no evidence of a beaver pond or recent beaver activity. Trees in the floodplain are too old to have grown up since 1988, assuming abandonment of the beaver pond. Willow oaks (*Quercus phellos*) measured up to 3 feet dbh, and other species averaged 1 to 1.5 feet. Possibly the pond lies at the extreme east end of the natural area, or possibly farther east.

Floodplain dominants are box elder (*Acer negundo*), willow oak, green ash (*Fraxinus pennsylvanicus*), and sweetgum. Red maple, black walnut (*Juglans nigra*), bitternut hickory (*Carya cordiformis*), and hackberry (*Celtis laevigata*) are scattered. We noted a number of

neotropical migrant bird species, plus turkey sign, raccoon, deer, box turtle, and chipmunk (local in the lower Piedmont).

MANAGEMENT AND PROTECTION: This site receives no formal protection. Biologists need to determine the extent of the beaver impoundment and negotiate future protection with conservation easements.

OWNERSHIP: Private

REFERENCES: Sather, D. and S. Hall. 1988. Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina, Appendix B: Biological Documentation of Sites. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Orange County Natural Areas Inventory

JIMMY ED ROAD HEARTLEAF FLAT

Site Number: L03

Size: 25 acres

Site Significance: County

USGS Quad: Caldwell

SIGNIFICANT FEATURES: This site contains one of the county's four known populations of Lewis' heartleaf (*Hexastylis lewisii*).

NATURAL COMMUNITIES: Xeric Hardpan Forest

GENERAL DESCRIPTION: The population of Lewis' heartleaf (*Hexastylis lewisii*) at this site is growing in a small woodland surrounded by agricultural lands. The area is underlain by Orange soil, a soil type of high shrink-swell capacity and low agricultural potential. The xeric hardpan forest developed here is surprisingly mature and diverse. The canopy is dominated by a mixture of post oak (*Quercus stellata*), blackjack oak (*Q. marilandica*), willow oak (*Q. phellos*), white oak (*Q. alba*), black oak (*Q. velutina*), and red cedar (*Juniperus virginiana*). Subcanopy and shrub species include serviceberry (*Amelanchier arborea*), persimmon (*Diospyros virginiana*), black gum (*Nyssa sylvatica*), sassafras (*Sassafras albidum*), huckleberry (*Gaylussacia baccata*), and several blueberries (*Vaccinium* spp.). The herb layer is sparse, and includes stiff-leaved aster (*Aster linarifolius*), stipa (*Stipa avenacea*), hawkweed (*Hieraceum venosum*), baptisia (*Baptisia tinctoria*), bastard toadflax (*Comandra umbellata*), and partridge berry (*Mitchella repens*). Lewis' heartleaf is abundant, growing throughout the woodland.

MANAGEMENT AND PROTECTION: This site is unprotected and is posted as hunt club lands. This block of woodland is surrounded by cleared land on all sides. The woodland should be protected from timbering.

OWNERSHIP: Private

REFERENCES: Sather, D. and S. Hall. 1988. Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina, Appendix B: Biological Documentation of Sites. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Orange County Natural Areas Inventory

BREEZE ROAD HEARTLEAF RAVINE

Site Number: L04

Size: 7 acres

Site Significance: County

USGS Quad: Caldwell

SIGNIFICANT FEATURES: This is one of the county's four populations of Lewis' heartleaf (*Hexastylis lewisii*), a plant species state listed as significantly rare.

NATURAL COMMUNITIES: Mesic Mixed Hardwood Forest

GENERAL DESCRIPTION: The remnant woodland here that supports a population of Lewis' heartleaf has been selectively cut and is surrounded by agricultural development. The moist Iredell soil offers habitat for a rather unique forest made up of shagbark hickory (*Carya ovata*), beech (*Fagus grandifolia*), tulip poplar (*Liriodendron tulipifera*), sweetgum (*Liquidambar styraciflua*), red cedar (*Juniperus virginiana*), willow oak (*Quercus phellos*), white oak (*Q. alba*), post oak (*Q. stellata*), and loblolly pine (*Pinus taeda*). Several of the herb species are those often found in moist or saturated environments, including atamasco lily (*Zephyranthes atamasco*) and golden alexander (*Zizia aurea*). This is the most mesic habitat in the county where Lewis' heartleaf is known.

MANAGEMENT AND PROTECTION: This site has no formal protection, but the landowner practices selective timbering. The present management of the woodland seems not to be harming the Lewis' heartleaf population.

OWNERSHIP: Private

REFERENCES: Sather, D. and S. Hall. 1988. Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina, Appendix B: Biological Documentation of Sites. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Orange County Natural Areas Inventory

LITTLE RIVER AQUATIC HABITAT

New Site 2004

Site Number: L05

Site Significance: State

Size: North Fork - about 6.75 river miles

(in county); South Fork - about 8 river miles (in county)

USGS Quads: Caldwell, Rougemont, Hillsborough, NW Durham

SIGNIFICANT FEATURES: The Orange County portion of this river contains several rare aquatic species, including the federal species of concern and state endangered Atlantic pigtoe (*Fusconaia masoni*) and yellow lampmussel (*Lampsilis cariosa*), the federal species of concern and state significantly rare pinewoods shiner (*Lythrurus matutinus*), the state threatened eastern lampmussel (*Lampsilis radiata*) and creeper (*Strophitus undulatus*), and the state special concern notched rainbow (*Villosa constricta*).

LANDSCAPE RELATIONSHIPS: This site runs in two narrow west-to-east bands in the eastern portion of the county. The North Fork and South Fork of the Little River converge just east of the Durham County line to form the Little River. There are no other Natural Heritage Sites associated with this site.

SITE DESCRIPTION: The Little River is a tributary of the Neuse River. The North Fork Little River, beginning in Person County, and the South Fork Little River, beginning in Orange County, flow southeast through northeastern Orange County until they converge and become the Little River just over the Orange/Durham county line. The Little River converges with the Flat River to form the Neuse River in eastern Durham County, and then flows into Falls Lake. Both forks of the Little River are free flowing in Orange County. The North Fork portion of the site begins just upstream of the NC 57 crossing, and the South Fork portion of the site begins just downstream of the NC 57 crossing, and both portions continue across the Orange/Durham county line.

The North Fork Little River portion of the site has a relatively diverse aquatic fauna, including several mussel species. The federal species of concern and state endangered Atlantic pigtoe (*Fusconaia masoni*) and yellow lampmussel (*Lampsilis cariosa*) have both been found in the North Fork. Additional rare mussels found in this portion are the state threatened eastern lampmussel (*Lampsilis radiata*) and creeper (*Strophitus undulatus*), and the state special concern notched rainbow (*Villosa constricta*). An undescribed *Lampsilis* species and several more common species (*Elliptio* spp., *Elliptio complanata*, *Elliptio icterina* and *Pyganodon cataracta*) have also been found in this portion of the site. Furthermore, rare fish at this site include the federal species of concern and state significantly rare pinewoods shiner (*Lythrurus matutinus*).

The South Fork Little River portion of the site has records for some of the same species as the North Fork, with the exception of the yellow lampmussel, eastern floater (*Pyganodon cataracta*), the undescribed *Lampsilis* species, and the pinewoods shiner.

MANAGEMENT AND PROTECTION: Because of the importance of the stream for rare aquatic species, the Little River (including the North and South Forks) should be designated as a High Quality Water. The Neuse River Buffer Rules apply to this site, however wider riparian buffers are needed for the survival of the aquatic species. No new point source discharges should be permitted in the river, and measures need to be taken to control or prevent sedimentation into the river.

OWNERSHIP: North Carolina public waters

REFERENCES:

Alderman, J.M. 1991. North Carolina Status Surveys for *Fusconaia masoni*, *Elliptio lanceolata*, and *Toxolasma pullus*. Nongame Project Report to U.S. Fish and Wildlife Service. Nongame and Endangered Wildlife Program, NC Wildlife Resources Commission, Division of Wildlife Management, Raleigh, NC.

Alderman, J.M. 1992. Station locations by species for proposed critical habitats. NC Wildlife Resources Report. Nongame and Endangered Wildlife Program, NC Wildlife Resources Commission, Division of Wildlife Management, Raleigh, NC.

Smith, I.K., H.E. LeGrand, S.P. Hall, Z.E. Murrell, C.W. Nordman, and M.P. Schafale. 1993. Regional inventory for critical natural areas, wetland ecosystems, and endangered species habitats, of the Albemarle-Pamlico Estuarine Region: Phase 3. NC Natural Heritage Program, Division of Parks and Recreation, Dept. of Environment, Health, and Natural Resources, Raleigh, NC.

Morgan Creek Watershed

Orange County Natural Areas Inventory

PICKARDS MOUNTAIN

Updated 2004

Site Number: M01

Size: 491 acres

Site Significance: County

USGS Quad: White Cross

SIGNIFICANT FEATURES: This is the largest tract of chestnut oak forest in the county; it is second only to Occoneechee Mountain in terms of the maturity of the canopy and the density of its heath cover. The abundant forage provided by this forest together with the size of this tract helps to explain the presence of wild turkey and bobcat. It serves as both an important wildlife reservoir and an overland link between two stream corridor systems: Morgan Creek and Cane Creek. This is one of the more scenic knobs located within the rural buffer due to its high visibility from several nearby roads.

NATURAL COMMUNITIES: Dry-Mesic Oak—Hickory Forest, Mesic Mixed Hardwood Forest, Piedmont Monadnock Forest

GENERAL DESCRIPTION: This site is about 500 acres of mainly undisturbed upland hardwood forest located along the headwaters of Morgan Creek and Cane Creek. The flat summit of Pickards Mountain and the upper slopes support a chestnut oak forest covering at least 150 acres. This forest is also surprisingly mature, with stems averaging approximately a foot in diameter; one excellent specimen measured three feet. Along with the dominant chestnut oak (*Quercus prinus*), other canopy trees are white oak (*Q. alba*), black oak (*Q. velutina*), scarlet oak (*Q. coccinea*), post oak (*Q. stellata*), blackjack oak (*Q. marilandica*), southern red oak (*Q. falcata*), and pignut hickory (*Carya glabra*). Sourwood (*Oxydendrum arboreum*) and red maple (*Acer rubrum*) are prominent in the understory, with scattered red cedar (*Juniperus virginiana*). Some of the herbs that indicate the dryness of the site are goat's rue (*Tephrosia virginiana*), veined hawkweed (*Hieracium venosum*), and reindeer lichen (*Cladonia* sp.). Particularly noteworthy, the shrub layer in this forest is composed of dense thickets of heaths (mainly *Vaccinium pallidum* and *V. stamineum*), quite comparable to similar communities found on the summit of Occoneechee Mountain, although lacking some of the species of the montane chestnut oak community, such as mountain laurel (*Kalmia latifolia*), galax (*Galax aphylla*), and bracken fern (*Pteridium aquilinum*). In the mid 1990s Hurricane Fran felled many adult trees and opened up the canopy, but the forest's ecological integrity remains intact.

Farther downslope the forest grades into a dry-mesic oak-hickory forest, with a mesic mixed hardwood forest occurring along the small streams. The latter supports beech (*Fagus grandifolia*), tulip poplar (*Liriodendron tulipifera*), sweetgum (*Liquidambar styraciflua*), and oaks. The large ravine located on the east slope held water even at the height of the 1988 drought, and supports a luxuriant growth of ferns over most of its length; species present include lady fern (*Athyrium asplenoides*), royal fern (*Osmunda regalis* var. *spectabilis*), cinnamon fern (*O. cinnamomea*), grape fern (*Botrychium* sp.), and sensitive fern (*Onoclea sensibilis*).

Animals present on Pickards Mountain include the wild turkey (*Meleagris gallopavo*), bobcat (*Lynx rufus*), and pileated woodpecker (*Dryocopus pileatus*), all characteristic of large tracts of mature forest. Other species typical of dry, open woodlands include eastern wood-pewee (*Contopus virens*), yellow-shafted flicker (*Colaptes auratus*), white-breasted nuthatch (*Sitta carolinensis*) and eastern fence lizard (*Sceloporus undulatus*). Within the eastern ravine occur the hooded warbler (*Wilsonia citrina*) and barred owl (*Strix varia*), birds that also require extensive wooded areas but are generally more common in bottomlands.

MANAGEMENT AND PROTECTION: A large portion of Pickards Mountain is now protected by conservation easements granted by five private landowners to Orange County, Triangle Land Conservancy and the Conservation Trust for North Carolina. Efforts should be made by those entities to bring the remaining portions of the natural area under formal protection with conservation easements.

OWNERSHIP: Private

REFERENCES: Sather, D. and S. Hall. 1988. Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina, Appendix B: Biological Documentation of Sites. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Orange County Natural Areas Inventory

CALVANDER LAUREL BLUFF AND BOTTOM

Site Number: M02

Size: 66 acres

Site Significance: County

USGS Quadrangle: Chapel Hill

SIGNIFICANT FEATURES: The north-facing slope of the small knob named Laurel Hill contains the largest pure stand of mountain laurel (*Kalmia latifolia*) and the only known site for galax (*Galax aphylla*) along Morgan Creek. In the bottomland downstream from this knob is a large oxbow pool, which is the breeding site for several salamander species, including the four-toed salamander (*Hemidactylium scutatum*), a state-listed species.

NATURAL COMMUNITIES: Mesic Mixed Hardwood Forest, Piedmont Heath Bluff

GENERAL DESCRIPTION: The bluff on the north-facing slope of Laurel Hill is the site of the farthest upstream stand of mountain laurel (*Kalmia latifolia*) on Morgan Creek. It is similar in aspect to other montane communities downstream, but lacks catawba rhododendron and other disjunct species that distinguish those sites. The canopy here is composed of beech (*Fagus grandifolia*), white oak (*Quercus alba*), and red oak (*Q. rubra*). Sourwood (*Oxydendrum arboreum*), red maple (*Acer rubrum*), and blackgum (*Nyssa sylvatica*) are important members of the subcanopy. The regionally rare galax (*Galax aphylla*), restricted to such acidic soil situations, grows in the herb layer, along with several species of heartleaf (*Hexastylis* spp.) and pipsissewa (*Chimaphila maculata*).

Approximately 0.3 mile downstream from this laurel bluff is a fairly mature stretch of bottomland forest located below a steep slope with a mixed mesic hardwood forest. In the spring, this area is covered with wildflowers, including trout lily (*Erythronium americanum*), Catesby's trillium (*Trillium catesbaei*), bloodroot (*Sanquinaria canadensis*), hepatica (*Hepatica americana*), and crested iris (*Iris cristata*).

A major feature of the bottomland is a large and deep oxbow pool that contains water into the summer months; it thus offers prime breeding habitat for several species of salamanders with long larval stages, including the spotted salamander (*Ambystoma maculatum*), marbled salamander (*A. opacum*), and the rare four-toed salamander (*Hemidactylium scutatum*). During the spring and summer of 1988, when many salamander pools dried out before the larvae matured, this pool held over a foot of water even in June, allowing all species to metamorphose and depart into the surrounding forest.

MANAGEMENT AND PROTECTION: The Triangle Land Conservancy (TLC) protects a small upstream portion of this area. The rest is unprotected. Conservation easements should be sought to cover both the laurel bluff and the downstream bottomlands (the existing conservation easement held by TLC lies between these two more significant sites).

OWNERSHIP: Private

REFERENCES: Sather, D. and S. Hall. 1988. Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina, Appendix B: Biological Documentation of Sites. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Orange County Natural Areas Inventory

UNIVERSITY LAKE MACROSITE

New Site 2004

Site Number: Macrosite #3

Site Significance: State

Size: 1,110 acres

USGS Quads: Chapel Hill,
Farrington

The University Lake Macrosite protects critical wetlands, forests, and open space in the Morgan Creek drainage in Carrboro, and extends northwestward to provide a link to the Cane Creek watershed. Around the lake, a number of distinct habitat types occur in close proximity, yielding impressive numbers of flora and fauna, including three state-rare species. Upstream, a large block of undeveloped land supports bobcat, wild turkey, and other wide-ranging species, while another parcel contrasts mountain laurel (*Kalmia latifolia*) bluffs with wildflower-rich bottomland forest and breeding habitat for salamanders, including one state-rare species. The macrosite provides breeding habitat for a number of neotropical migrant birds. Habitats range from a lake to freshwater marshes, forested slopes, cool ravines, steep rocky bluffs, alluvial forest, chestnut oak forest, and an oxbow pool.

The University Lake Macrosite includes five standard sites and is of state significance, primarily due to the thriving population of a state-rare mussel (Savannah lilliput, *Toxolasma pullus*), which occurs in only four counties in North Carolina. McCauley Mountain (M03) supports extensive hardwood forests on its upper slopes, with mature oak-hickory around the summit. Some old white oaks (*Quercus alba*) measure two feet in diameter. Over 90 species of vertebrates have been documented from this hill, including regionally-rare species such as broad-winged hawk, worm-eating warbler, long-tailed weasel, green anole, and southeaster five-lined skink.

Slopes elsewhere around the lake support dry to mesic hardwoods; the former has a population of the state-rare sweet pinesap (*Monotropsis odorata*), while ravines with the latter have regionally rare maidenhair fern (*Adiantum pedatum*) and umbrella magnolia (*Magnolia tripetala*). The relative lack of beaver in Orange County means that natural marshes are very uncommon, but creation of University Lake led to the development of several marshes, especially in the south lobe of the lake (M05). These harbor a number of marsh and riparian plants, birds, turtles (seven species), and others. Berryhill Rhododendron Bluff (M07) is the only place where Catawba rhododendron (*Rhododendron catawbiense*) grows in Carrboro; this disjunct from the mountains grows at other sites in the gorge of Morgan Creek southeast of Chapel Hill. Also at Berryhill is one of very few populations of ginseng (*Panax quinquefolius*) in the county. In mesic ravines and along the creek grow impressive hardwoods, which support abundant spring wildflowers and provide a sense of “old-growth.”

Orange County Natural Areas Inventory

MC CAULEY MOUNTAIN Updated 2004

Site Number: M03

Size: 81 acres

Site Significance: County

USGS Quad: Chapel Hill

SIGNIFICANT FEATURES: The summit of McCauley Mountain is still relatively undisturbed, and covered with a mature dry-mesic oak-hickory forest; its unbroken ridgeline provides a scenic knob easily visible from several vantage points in the vicinity of Chapel Hill and Carrboro. The designated natural area and lower slopes outside of the natural area provide important watershed protection for University Lake.

NATURAL COMMUNITIES: Dry-Mesic Oak—Hickory Forest

GENERAL DESCRIPTION: Several portions of the lower slopes of McCauley Mountain are managed as pine plantations or have been disturbed, but the upper slopes, summit, and several of the ravines are still covered with good examples of typical hardwood forest. The vegetation on the summit and upper north slope is composed primarily of white oak (*Quercus alba*) and mockernut hickory (*Carya tomentosa*). Other species include pignut hickory (*C. glabra*), red oak (*Q. rubra*), redbud (*Cercis canadensis*), black gum (*Nyssa sylvatica*), sourwood (*Oxydendrum arboreum*), and four species of viburnum (*Viburnum* spp.). The average trunk diameter of the canopy species is approximately one foot, and several of the white oaks are up to two feet in diameter, indicating the relative maturity of this summit forest. A return visit in 2002 showed some forest cutting on lower slopes, no doubt to remove some trees felled by Hurricane Fran and ice storms. But the upper slopes are in fine condition and had less treefall than other exposed knobs in the county.

Animals reported for McCauley Mountain (this list was kindly supplied by Helmut Mueller, a noted ornithologist and long-time resident on McCauley Mountain) include several notable species, such as the regionally rare broad-winged and red-shouldered hawks (*Buteo platypterus* and *B. lineatus*), red-headed woodpecker (*Melanerpes erythrocephalus*), black-and-white and worm-eating warblers (*Mniotilta varia* and *Helmitheros vermivorus*), long-tailed weasel (*Mustela frenata*), green anole (*Anolis carolinensis*), and southeastern five-lined and broad-headed skinks (*Eumeces inexpectatus* and *E. laticeps*). More typical of mature upland forests are the red-tailed hawk (*Buteo jamaicensis*), hairy and pileated woodpeckers (*Picoides villosus* and *Dryocopus pileatus*), flicker (*Colaptes auratus*), great-crested flycatcher (*Myiarchus crinitus*), eastern wood-pewee (*Contopus virens*), yellow-throated vireo (*Vireo flavifrons*), ovenbird (*Seiurus aurocapillus*), scarlet and summer tanagers (*Piranga olivacea* and *P. rubra*), eastern chipmunk (*Tamias striatus*), eastern fence lizard (*Sceloporus undulatus*), box turtle (*Terrapene carolina*), and copperhead (*Agkistrodon contortrix*).

Although this list was compiled over a longer time period than most of the others included in this survey, the total of 90 vertebrate species nonetheless illustrates the prime condition of the relatively extensive forest cover on this knob.

MANAGEMENT AND PROTECTION: The slopes are within the University Lake watershed protection district, which restricts land use and development activities to protect the water supply reservoir. The Triangle Land Conservancy protects the summit. Conservation entities should alert landowners to the natural values of their properties and explore conservation easements and other protection measures.

OWNERSHIP: Triangle Land Conservancy, Private

REFERENCES: Sather, D. and S. Hall. 1988. Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina, Appendix B: Biological Documentation of Sites. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Orange County Natural Areas Inventory

UNIVERSITY LAKE SLOPES AND WETLANDS

Updated 2004

Site Number: M04

Size: 478 acres

Site Significance: Regional

USGS Quad: Chapel Hill

SIGNIFICANT FEATURES: The steep slopes bordering University Lake give the area great scenic value, especially as viewed from the water. The forest on these slopes is, except for a few patches, virtually undisturbed, having been long protected as part of the watershed. Two significant plant species that occur here are the regionally rare maidenhair fern (*Adiantum pedatum*) and the sweet pinesap (*Monotropsis odorata*), which is considered significantly rare within North Carolina. A particularly noteworthy animal (mussel) that occurs within the lake itself is the Savannah lilliput (*Toxolasma pullus*), a species that ranges as far north as the Neuse drainage but which is listed as endangered within North Carolina; its only known thriving population in the entire state is the one located in University Lake.

NATURAL COMMUNITIES: Dry-Mesic Oak—Hickory Forest, Mesic Mixed Hardwood Forest

GENERAL DESCRIPTION: At one time this must have been one of the steepest gorges within the county; the flooding of University Lake destroyed what must have been habitat for many mesic species, such as the maidenhair fern, now found in only the most sheltered ravines. At the same time, the protection of the remaining forest as part of the watershed has allowed the slopes above the waterline to retain something of their original natural and aesthetic value.

The forest cover here is typical mixed mesic hardwood and dry-mesic oak - hickory forest. Protected from cutting for the past 65 years, many of the tree specimens are now good-sized. Representative trees include beech (*Fagus grandifolia*), tulip poplar (*Liriodendron tulipifera*), white ash (*Fraxinus americana*), red oak (*Quercus rubra*), black oak (*Q. velutina*), scarlet oak (*O. coccinea*), and white oak (*O. alba*), along with the less common umbrella magnolia (*Magnolia tripetala*). The various slope aspects, which offer a range of light and moisture conditions, contribute to the overall high species diversity of this area; ninety plant species were seen within the course of one short walk.

Apart from the highly unusual Savannah lilliput, the fauna of this site is fairly typical of the Piedmont. Five other species of mussels have been recorded within the lake itself, while large mussel beds also occur in the well-aerated riffles just below the dam (due to siltation and competition with the introduced clam (*Corbicula*), these species are nearly extirpated downstream all the way to Jordan Lake). Twenty-seven birds were recorded during the breeding season, including upland species such as red-tailed hawks (*Buteo jamaicensis*), flickers (*Colaptes auratus*), yellow-throated vireos (*Vireo flavifrons*), ovenbirds (*Seiurus aurocapillus*), hooded warblers (*Wilsonia citrina*), scarlet and summer tanagers (*Piranga olivacea* and *P. rubra*), as well as waterbirds and riparian species such as green heron (*Butorides striatus*), belted kingfisher (*Megaceryle alcyon*), acadian flycatcher (*Empidonax virescens*), and Louisiana waterthrush (*Seiurus motacilla*).

MANAGEMENT AND PROTECTION: The site is protected in part by development restrictions administered by Orange County for the University Lake watershed. The existing protection afforded to this site as part of the water supply watershed for Chapel Hill and Carrboro should be continued. Tree cutting should be avoided to further enhance the old-growth character of this forest.

OWNERSHIP: State of NC (UNC); Private

REFERENCES:

Johnson, R. I. 1967. *Carunculina pulla* (Conrad), an overlooked Atlantic drainage Unionid. *Nautilus* 80:127-131.

Shelley, R. M. 1987. Unionid mollusks from the upper Cape Fear River Basin, North Carolina, with a comparison of the faunas of the Neuse, Tar, and Cape Fear Drainages (Bivalvia: Unionacea). *Brimleyana* 13:67-90.

Sather, D. and S. Hall. 1988. Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina, Appendix B: Biological Documentation of Sites. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Orange County Natural Areas Inventory

UNIVERSITY LAKE MARSH

Site Number: M05

Size: 28 acres

Site Significance: County

USGS Quad: Chapel Hill

SIGNIFICANT FEATURES: This is a long-established marsh, with large willows (*Salix* spp.) and introduced bald cypress (*Taxodium distichum*) growing along the margins. This marsh offers good habitat for a number of waterbirds and other wildlife. A state-listed endangered mollusk, the Savannah lilliput (*Toxolasma pullus*), occurs in the lake itself.

NATURAL COMMUNITIES: Semipermanent Impoundment

GENERAL DESCRIPTION: Since the construction of University Lake more than a half century ago, wetland conditions have developed at various sites along the perimeter of the impounded area. While this is not a "natural" marsh, many of the plants and animals that occur here are typical of habitats that are periodically flooded. Willows (*Salix* spp.), sweetgum (*Liquidambar styraciflua*), alder (*Alnus serrulata*), buttonbush (*Cephalanthus occidentalis*), swamp rose (*Rosa palustris*), and numerous grasses and sedges (*Echinochloa crus-galli*, *Agrostis* sp., *Eleocharis obtusa*, *Cyperus* spp., and others) dominate the mucky areas where water levels fluctuate according to periodic lake drawdown.

The shallow arms of the lake are home to a number of marsh and riparian animal species. Birds observed during the breeding season include great blue heron (*Ardea herodias*), green heron (*Butorides striatus*), Louisiana waterthrush (*Seiurus motacilla*), common yellowthroat (*Geothlypis trichas*), and yellow-throated warbler (*Dendroica dominica*). In addition to the large numbers of mussels and fish, the most conspicuous aquatic animals are turtles, seven species of which are known to occur here. Particularly interesting are the thriving populations of the red-eared turtle (*Chrysemys scripta elegans*), a species native to the Mississippi valley and present here due to the release of pets, and its close relative, the yellow-bellied turtle (*Chrysemys scripta scripta*), a species common in our own Coastal Plain but confined to the borders of the Triassic Basin in the Piedmont. A number of hybrids between these two subspecies have also been reported from University Lake.

MANAGEMENT AND PROTECTION: The site is protected in part by development restrictions administered by Orange County for the University Lake watershed. The existing protection afforded to this site as part of the water supply watershed for Chapel Hill and Carrboro should be continued.

OWNERSHIP: State of NC (UNC); Private

REFERENCES: Sather, D. and S. Hall. 1988. Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina, Appendix B: Biological Documentation of Sites. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Orange County Natural Areas Inventory

UNIVERSITY LAKE AQUATIC HABITAT New Site 2004

Site Number: M06

Size: 163 acres

Site Significance: National

USGS Quad: Chapel Hill

SIGNIFICANT FEATURES: This lake contains one of the few populations of the federal species of concern and state endangered Savannah lilliput (*Toxolasma pullus*).

LANDSCAPE RELATIONSHIPS: This entire site is located in southern Orange County. The University Lake Slopes terrestrial site encompasses the University Lake aquatic site, and the Berryhill Rhododendron Bluff terrestrial site is just east of University Lake.

GENERAL DESCRIPTION: University Lake is a man-made impoundment on Morgan Creek in the Cape Fear River drainage. Tributaries to the lake include Neville Creek, Phils Creek, Pritchards Mill Creek, Price Creek and Morgan Creek.

University Lake is the most significant site in North Carolina for the federal species of concern and state endangered Savannah lilliput (*Toxolasma pullus*). Several more common mussel species (*Elliptio* spp., *Elliptio complanata*, *Pyganodon cataracta*, *Utterbackia imbecillis*) have also been found in University Lake.

MANAGEMENT AND PROTECTION: This site is protected because it serves as the water supply for the towns of Carrboro and Chapel Hill. Wider riparian buffers need to be maintained for the survival of the aquatic species, and maintenance of clean water. Clearly, no new point source discharges should be permitted in any of the tributaries leading into University Lake, and measures need to be taken to control or prevent sedimentation into the tributaries and lake itself.

OWNERSHIP: North Carolina public waters

REFERENCES: None

Orange County Natural Areas Inventory

BERRYHILL RHODODENDRON BLUFF

Updated 2004

Site Number: M07

Size: 15 acres

Site Significance: Regional

USGS Quad: Chapel Hill

SIGNIFICANT FEATURES: This site contains a large stand of catawba rhododendron (*Rhododendron catawbiense*) and over two dozen individuals of ginseng (*Panax quinquefolius*). The rhododendron is disjunct from the mountains and locally rare in the lower Piedmont; the ginseng is a state-listed species of special concern. This is the only site where either of these species occurs in the Town of Carrboro.

NATURAL COMMUNITIES: Mesic Mixed Hardwood Forest, Piedmont Heath Bluff, Piedmont Monadnock Forest

GENERAL DESCRIPTION: This community of catawba rhododendron (*Rhododendron catawbiense*) and mountain laurel (*Kalmia latifolia*) is growing on a steep north-facing slope, which rises 100 feet above Morgan Creek. Among the six isolated rhododendron communities located along Morgan Creek, this is the only one where these two heath species are growing together. On the gentler upper slope and small ravines on the east and west side of this natural area, the mixed mesic hardwood forest provides habitat for a large population of ginseng (*Panax quinquefolius*), which is found nowhere else along Morgan Creek. Ginseng is a species that typically grows only in the richest soils; the surprising abundance of spring wildflowers further indicates the soil condition of this site. These species include bloodroot (*Sanguinaria canadensis*), spring beauty (*Claytonia virginica*), toothwort (*Cardamine* sp.), trout lily (*Erythronium americanum*), foamflower (*Tiarella cordifolia*), hepatica (*Hepatica americana*), and windflower (*Thalictrum thalictroides*).

The forest canopy on the mesic upper slopes is composed of numerous individuals up to two feet in diameter. Tree species include beech (*Fagus grandifolia*), red oak (*Quercus rubra*), white oak (*Q. alba*), and tulip poplar (*Liriodendron tulipifera*). Emergent locally above the rhododendron bluff are chestnut oak (*Quercus prinus*), scarlet oak (*Q. coccinea*), red maple (*Acer rubrum*), hop hornbeam (*Ostrya virginiana*), and witch hazel (*Hamamelis virginiana*).

Except for the natural area along Bolin Creek (B01), nowhere else in Carrboro is there as much mesic hardwoods as here. It is surrounded by development but is extensive enough so that visitors can feel like they are walking in a large mature forest. This aspect, along with the rhododendron bluff and riparian species growing along the creek, make this the most significant site in Carrboro.

MANAGEMENT AND PROTECTION: Construction of multifamily housing immediately upslope of the bluff has left very little forest to buffer part of the ginseng population; a trail passes perilously close. Alien invasive plants threaten to replace many native species. The worst culprits are spring silverberry (*Elaeagnus umbellata*) and oriental bittersweet (*Celastrus orbiculatus*). Silverberry is becoming common along trails and other disturbances. The bittersweet has totally covered lower portions of the rhododendron ledge

and is covering trees and shrub thickets on the adjacent floodplain. Both species must be eradicated quickly before they do further damage.

The rhododendron bluff and the ginseng population upslope deserve the highest degree of protection. Although much of the natural area is under the protection of the Triangle Land Conservancy, restrictions are still needed for the upslope area, since this site is completely surrounded by development and hence vulnerable to runoff from parking lots, lawn chemicals, and heavy foot traffic. Invasive alien plants are already damaging the ecosystem; volunteers from nearby residences could be enlisted (under supervision of TLC) to remove the invasives and to monitor them in the future to prevent recurrences.

OWNERSHIP: Private, Triangle Land Conservancy

REFERENCES: Sather, D. and S. Hall. 1988. Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina, Appendix B: Biological Documentation of Sites. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Orange County Natural Areas Inventory

JORDAN LAKE MACROSITE

New Site 2004

Site Number: Macrosite #4

Size: 983 acres in Orange County
[7,963 acres in Durham & Chatham counties]

Site Significance: State

USGS Quads: Chapel Hill, Farrington

The Jordan Lake Macrosite sprawls over portions of three counties. Aside from the obvious recreational benefits of the lake, the area features a diversity of plants, animals, and natural communities that is unmatched in the northeastern piedmont of North Carolina. This is especially true along the streams entering from the north and northwest, such as Morgan Creek and New Hope Creek.

In the Orange County portion of the macrosite, Morgan Creek flows through a deep rocky gorge past several bluffs supporting Catawba rhododendrons (*Rhododendron catawbiense*), here disjunct from the mountains, and spills out into a broad floodplain replete with magnificent bottomland and swamp forests. The geological transition from the broken topography of the Carolina Slate Belt to the smoother contours of the Triassic Basin is sharp; many plants and animals that occupy one do not occur in the other, thus creating an overall diversity that is very high. Morgan Creek is a critical corridor for the movement of animals, be they permanent residents, summer breeders, migrants, or winter residents. These movements follow connections throughout the Triangle and beyond. Decades of observations and research along Morgan Creek and at the Mason Farm Biological Reserve have yielded impressive numbers of carnivores (including bobcat), raptors, amphibians, reptiles, and breeding neotropical birds.

The Jordan Lake Macrosite is of state significance. The Orange County portion includes five standard sites, from Morgan Creek Bluffs (M08) down to the Morgan Creek Floodplain Forest (M12). Additional standard sites are included within the Durham and Chatham county portions. Among the many natural community types represented, most notable are the extensive floodplain forests (three distinct kinds) which include some of the oldest trees in the county and which support nesting Swainson's warblers (*Limnothlypis swainsonii*). The state's best example of a Basic Oak-Hickory Forest occurs at Mason Farm (M10). Other communities of note include vernal pools vital for amphibian breeding, rhododendron bluffs, and cultivated fields which may be 200 years old and which provide abundant edge and clearing habitats.

Rare species documented from the Orange County portion of the macrosite include nesting sharp-shinned hawks (*Accipiter striatus*), four-toed salamander (*Hemidactylum scutatum*), sweet pinesap (*Monotropsis odorata*), and large witch-alder (*Fothergilla major*).

Overview of the Morgan Creek Valley

Along an approximately 1.5 mile stretch of Morgan Creek, from its confluence with Stillhouse Bottom to its entry into the Triassic Basin, occurs one of the richest areas for disjunct plant communities in the region. Eight significant areas have been identified within the areas described as Morgan Creek Bluffs (M08) and Laurel Hill Ridge and Vernal Pool (M09)

Topographically, this is one of the steepest ravines (or gorges) in the county, quite comparable to the steep-walled gorge formed by New Hope Creek as it flows through the Korstian Division of Duke Forest. Located right at the edge of the Triassic Basin lowlands, the stream-cutting action has been as intense as along the Fall Line, which divides the Piedmont from the Coastal Plain. The stream itself falls approximately 50 feet as it travels through the ravine and along the ravine walls the drop is 150 feet in some places, with slopes of up to 60 to 70 degrees. This steepness is further accentuated at several points where the strong cutting action of the stream has resulted in the exposure of numerous rock outcrops, including slates, diabase, and pyroclastic flows. Some of those form sheer cliffs rising up from the creek.

Due to the general east-west orientation of streams within our region, the slopes of the gorges formed along these sharp drops in elevation often have exposures directly to the north and south. The nature of these extreme exposures, together with the frequency of rock outcrops, accounts in turn for the unusual biological communities found in these sites.

Along the north-facing slopes occur three of the county's largest stands of catawba rhododendrons and associated montane disjuncts, both plant and animal (see site M08 for details). Collectively these communities possess one plant that is state-listed as significantly rare, the sweet pinesap (*Monotropis odorata*), along with the regionally rare rhododendrons and at least two animal species that are similarly restricted to cool-mesic conditions. In 2000 another state significantly rare species, large witch-alder (*Fothergilla major*), was added to the list of rarities here.

At the opposite extreme, on two south- or southwest-facing rock outcrops (Stillhouse Bend Glade and Hunt Arboretum Rhododendron Bluff within site M08) occur two of the most xeric communities in the county, and some of the most unusual plant species, including the very rare *Anemone berlandieri*, whose only populations in the county exist at this site on Morgan Creek. In addition to the state-listed anemone, three plants are found here that are regionally rare and one butterfly that only has been found at the driest sites in the county. The dramatic contrast between these xeric communities and the cool-mesic slopes on the opposite walls of the gorge is one of this area's foremost features.

While not in the same class as the bluff communities, the riparian area itself is one of the better ones remaining in the county and adds to the overall attractiveness of the valley. The absence of large agricultural areas or sewage treatment plants upstream has kept the water relatively clean compared to other small streams within the county and the fish community is fairly diverse, 12 species having been collected. Birds are also still numerous; 35 species were recorded during the 1988 breeding season, including one bird of special concern, the Cooper's hawk (*Accipiter cooperii*).

Despite many houses along the creek, this stream valley, which begins at Stillhouse Bottom and terminates at Finley Golf Course where Morgan Creek enters the Triassic Basin, still supports a large variety of wildlife. Particularly noteworthy are several birds of prey, including the Cooper's hawk (*Accipiter cooperii*), a species of special concern, the red-shouldered hawk (*Buteo lineatus*), a declining species typical of mature bottomland forests, and the great horned owl (*Bubo virginianus*). Another animal more closely associated with the rhododendrons is the sumo mite (*Allothrombium* sp.), which appears in huge numbers every other year along all the north-facing slopes of the Morgan Creek Valley.

The mussel fauna, however, appears to be on the decline; the authors saw no beds along this entire stretch, and several species observed in the past may now be gone (Johnson, 1970; Shelley, 1987; Hall, pers. obs.). This may be due to the heavy development upstream and along the gorge, since these organisms are particularly sensitive to both sedimentation and pollution from stormwater runoff. A contributing factor may be the abundant presence of the exotic asiatic clam (*Corbicula*), which has been implicated in the decline of our native mussels elsewhere. This species occurs in our other watersheds without the inroads seen along Morgan Creek, however, suggesting that the other factors are the most critical.

Administratively, the area is somewhat unified by a thread of land owned by the State of North Carolina and managed by the NC Botanical Garden, running primarily along the creek, sometimes on just one side or the other; extensions of Garden land also include the bluffs on which the catawba rhododendron grows, although there are some portions of these communities that are owned privately. One other tract administered by the Garden is a small parcel of land owned by the Botanical Garden Foundation located at the upper extremity of Stillhouse Bottom.

Private lands constrict the Botanical Garden's holdings along this entire stretch of Morgan Creek and must also be considered in any effort to define the overall natural area within the valley. The two xeric bluffs are located on these private lands; one of them contains the entire population of *Anemone berlandieri*. Although the rhododendron bluffs are mostly on Garden property, the slopes above all these stands are in private ownership; in some cases the property line is located right at the edge of the rhododendrons. Even along the creek, where the Garden owns a continuous strip, private property comes all the way down to the creek bank on one side or the other, from the Hunt Arboretum Rhododendron Bluff (part of site M08) upstream. In general, the setting is still quite natural, but the proximity of dwellings and artificial landscaping intrude upon the scene along the uppermost slopes and crest.

With its steep-walled gorge, pleasant stream, abundant fauna and unusual biological communities, this is one of the most aesthetic stretches of natural area remaining in the vicinity of Chapel Hill. Although we cannot recommend that this area be used as a developed greenway, due to the narrowness of the valley and the fragility of its features, some regulated visitation might be possible through an arrangement between the landowners and the Botanical Garden.

Orange County Natural Areas Inventory

MORGAN CREEK BLUFFS

Site Number: M08

Size: 187 acres

Site Significance: State

USGS Quadrangle: Chapel Hill

SIGNIFICANT FEATURES: This large site hosts many significant areas that are described below. This 2004 update to the Orange County inventory combines eight sites that had been listed separately in the original 1988 inventory.

Stillhouse Bottom – This is the only undisturbed, steep, north-facing ravine left in the county. For a hillside ravine, it displays a strikingly high plant diversity with over 100 species recorded.

Stillhouse Bend (Graybluff) Rhododendron Slope – This is one of only 9 sites for catawba rhododendron (*Rhododendron catawbiense*) in Orange County. Rock spikemoss (*Selaginella rupestris*), regionally rare, has been reported from the site (unconfirmed in 2002).

Stillhouse Bend Glade – This west-facing rocky bluff is one of the driest cliff sites in the county and supports many xeric plant species, including the hairy lipfern (*Cheilanthes lanosa*), a regionally rare species near the edge of its range.

Morgan Creek Anemone Glade – This is the driest site within Orange County. Two species are found in this stretch of Morgan Creek and nowhere else in the county: southern thimbleweed (*Anemone berlandieri*), a state-listed significantly rare species, and rock spikemoss, which is regionally rare. Two species of lipfern (*Cheilanthes lanosa* and *C. tomentosa*), both regionally rare, are also found here.

Three noteworthy animals observed at this site include the Cooper's hawk (*Accipiter cooperii*), a species of special concern, the red-shouldered hawk (*Buteo lineatus*), a regionally rare species, and the sleepy duskywing (*Erynnis brizo*), an uncommon butterfly that appears to be restricted to dry habitats.

Hunt Arboretum Rhododendron Bluff – This is one of the five large slopes of Catawba rhododendron along Morgan Creek (one of only nine within Orange County), and one of only three in prime condition, with no development upslope yet. Also here is a small population of the state rare large witch-alder (*Fothergilla major*), discovered in 2000 and only the second known in Orange County.

King's Mill Rhododendron Slope – This one of the five large slopes of catawba rhododendron along Morgan Creek (one of only nine within Orange County), and one of only three in prime condition, with no development upslope. Additionally, this is one of only three sites within the county where the regionally rare red-backed salamander (*Plethodon cinereus*) is known to occur.

Mason Farm Pond Rhododendron Slope – This is one of the five rhododendron slopes occurring along Morgan Creek (only nine occur in Orange County), and the only one of these communities that does not have private lands impinging upon its upslope margin. One state listed plant species occurs here, the significantly rare sweet pinesap (*Monotropsis odorata*). There are also large populations of three regionally rare animal species associated with the disjunct rhododendron communities: the red-backed salamander, the sumo mite (*Allothrombium* sp.), and a rare land snail (*Mesomphix* sp.). Although this is one of the smaller of the rhododendron bluffs, its inclusion within the Mason Farm Biological Reserve contributes to the overall habitat diversity of this important site for scientific studies.

NATURAL COMMUNITIES: Dry-Mesic Oak—Hickory Forest, Dry Oak—Hickory Forest, Mesic Mixed Hardwood Forest, Piedmont Acidic Cliff, Piedmont Heath Bluff

GENERAL DESCRIPTION: Eight distinct portions of the site are described below.

Stillhouse Bottom

This ravine forms a deep cleft in a long east-west running ridge; facing due north, it is much cooler than the surrounding countryside. Along the narrow brook bottom and lowest slopes are found tree species of the mixed mesic hardwood assemblage; this community grades into Dry-Mesic Oak—Hickory Forest farther upslope. Throughout the ravine, many of the trees are over 18 inches in diameter. Sycamore (*Platanus occidentalis*) is common along the gravelly stream bottom, and especially abundant along the lower slopes are beech (*Fagus grandifolia*), tulip poplar (*Liriodendron tulipifera*), and red oak (*Quercus rubra*). Other oaks and hickories found here include white oak (*Quercus alba*), black oak (*Q. velutina*), shagbark hickory (*Carya ovata*), and pignut hickory (*C. glabra*).

The "montane" aspect of Stillhouse Bottom is striking, and numerous non-canopy species found on the richer, cooler, moister sites in the Piedmont are particularly abundant here. These include umbrella magnolia (*Magnolia tritata*), southern sugar maple (*Acer tripetala floridanum*), painted buckeye (*Aesculus sylvatica*), wild hydrangea (*Hydrangea arborescens*), toothwort (*Cardamine* sp.), foamflower (*Tiarella cordifolia* var. *collina*), alumroot (*Heuchera americana*), hepatica (*Hepatica americana*), hog peanut (*Amphicarpa bracteata*), Catesby's trillium (*Trillium catesbaei*), windflower (*Thalictrum thalictroides*), and bloodroot (*Sanguinaria canadensis*).

Despite the fact that this area is completely surrounded by residential development, houses have not yet encroached upon the ravine to any significant extent. Due to this low level of disturbance, the animal community is still typical of mature hardwoods. Several bird species whose presence indicates the quality of this habitat are the red-tailed hawk (*Buteo jamaicensis*), yellow-billed cuckoo (*Coccyzus erythrophthalmus*), white-breasted nuthatch (*Sitta carolinensis*), ovenbird (*Seiurus aurocapillus*), and scarlet tanager (*Piranga olivacea*). The purity of the brook's waters is likewise demonstrated by the healthy amphibian community, made up of such species as the dusky salamander (*Desmognathus fuscus*), two-lined salamander (*Eurycea bislineata*), and green frog (*Rana clamitans*).

Stillhouse Bend (Graybluff) Rhododendron Slope (Updated 2004)

This is the driest of all the rhododendron slopes in the county, since the orientation and drainage of the rock substrate is such that there are few crevices for soil and root buildup.

The canopy consequently is very open, and composed of beech (*Fagus grandifolia*), shortleaf pine (*Pinus echinata*), sweetgum (*Liquidambar styraciflua*), shagbark hickory (*Carya ovata*), loblolly pine (*Pinus taeda*), white oak (*Quercus alba*), and red maple (*Acer rubrum*). Hop hornbeam (*Ostrya virginiana*) is a common understory tree. Individual specimens of the catawba rhododendron descend down to the edge of the sandy soil along Morgan Creek, mixing in with the alluvial species at the base of the bluff. Common along the alluvial bench are fetterbush (*Leucothoe racemosa*), ironwood (*Carpinus caroliniana*), painted buckeye (*Aesculus sylvatica*), yellow-root (*Xanthorrhiza simplicissima*), wild azalea (*Rhododendron nudiflorum*), and tag alder (*Alnus serrulata*). Herbaceous species characteristic of this dry bluff community are trailing arbutus (*Epigaea repens*), hawkweed (*Hieracium venosum*), five-fingers (*Potentilla canadensis*), cross-vine (*Anisostichus capreolata*), and yellow jessamine (*Gelsemium sempervirens*). The lowest slopes support lots of trout lilies (*Erythronium americanum*).

Due to the presence of houses directly upslope on the lip of the bluff and the large amount of trail usage along this part of the creek, this is the most disturbed of all the rhododendron bluffs inventoried. Exotic plants intruding into the natural area are privet (*Ligustrum sinense*) and silverberry (*Elaeagnus umbellata*), along with the ubiquitous Japanese honeysuckle (*Lonicera japonica*); all should be eliminated.

The 2001/02 re-survey of this area noted no significant ecological changes at this site.

Stillhouse Bend Glade (Updated 2004)

This site is located on a steep, west-facing slope, where the rock is exposed as numerous outcrops of volcanic tuff. Very little soil has developed on this dry cliff, so that vines and herbaceous species predominate under a sparse canopy. The woody species dominating the low canopy are shortleaf pine (*Pinus echinata*), black oak (*Quercus velutina*), white oak (*Q. alba*) and post oak (*Q. stellata*). In the subcanopy are Carolina holly (*Ilex ambigua*), black haw (*Viburnum prunifolium*), fringe tree (*Chionanthus virginicus*), Georgia hackberry (*Celtis tenuifolia*), and service berry (*Amelanchier arborea*). Vines clambering over the exposed rocks include crossvine (*Anisostichus capreolata*), poison ivy (*Rhus radicans*), and yellow jessamine (*Gelsemium sempervirens*). Noteworthy xerophytic herbs are hairy lipfern (*Cheilanthes lanosa*), resurrection fern (*Polypodium polypodioides*), ebony spleenwort (*Asplenium platyneuron*), two species of tickseed (*Coreopsis major* var. *stellata* and *C. verticillata*), yellow star-grass (*Hypoxis hirsuta*), wild oregano (*Cunila origanoides*), pussytoes (*Antennaria plantaginifolia*), and trailing arbutus (*Epigaea repens*).

Although not as unique a site as the nearby Morgan Creek Anemone Glade, this is a bluff that belongs to the same geologic formation, has similar steep slopes, and is less dry only because it is not facing due south. It is still one of the most xeric sites within the county.

The 2001/02 re-survey of this area noted no significant ecological changes at this site.

Morgan Creek Anemone Glade (Updated 2004)

This south-facing bluff along Morgan Creek is a steep outcrop of volcanic tuff that rises almost 100 feet above the creek. The crumbly, rocky soil produced by the combination of harsh exposure and this rock type supports the most xeric vegetation found anywhere within the county. The canopy is sparse and stunted: red cedar (*Juniperus virginiana*) and hop

hornbeam (*Ostrya virginiana*) are the most numerous; black oak (*Quercus velutina*), post oak (*Q. stellata*), white oak (*Q. alba*), Virginia pine (*Pinus virginiana*), shortleaf pine (*P. echinata*), mockernut hickory (*Carya tomentosa*), and pignut hickory (*C. glabra*) are also present. Subcanopy and shrub species, also sparsely distributed, include persimmon (*Diospyros virginiana*), fringe tree (*Chionanthus virginiana*), sourwood (*Oxydendrum arboreum*), and Georgia hackberry (*Celtis tenuifolia*). Overall, this site has an open, glade-like aspect.

The herb layer is likewise sparse and scattered, but those species present are ones found only on very dry sites. Among these interesting herbs are the state-listed southern thimbleweed (*Anemone berlandieri*)—40 plants seen in 2002, rock spikemoss (*Selaginella rupestris*)—not verified in 2002, and both the hairy and woolly lipferns (*Cheilanthes lanosa* and *C. tomentosa*), which grow here in a profusion unmatched in the county. Other xerophytic species include beggar's ticks (*Desmodium* spp.), whorled milkweed (*Asclepias verticellata*), black needle grass (*Piptochaetium (Stipa) avenacea*), reindeer lichen (*Cladonia* sp.), and eastern agave (*Manfreda (Agave) virginica*), which is known from only a few other locations in the county. Along the sandy alluvial soils at the base of this bluff, another historical record exists for nestronia (*Nestronia umbellula*), a watch list species in the state. This population of nestronia was apparently destroyed during the construction of sewer lines along Morgan Creek, but a current population exists just across the creek on land managed by the NC Botanical Garden.

An animal that seems to be associated with the dry vegetation present on this bluff is the sleepy duskywing (*Erynnis brizo*), a butterfly that has been observed only on the summit of Occoneechee Mountain and one other dry oak forest within the county. Two other noteworthy species that were observed from this site but which make use of the entire riparian area along the creek are the Cooper's hawk (*Accipiter cooperii*), a species of special concern, and the regionally rare red-shouldered hawk (*Buteo lineatus*). The Cooper's hawk may be nesting nearby because it was seen mobbing the larger red-shouldered hawk during the middle of its normal breeding period (June 1988); the red-shouldered hawk is known as a common resident at the Mason Farm Biological Reserve located downstream.

Hunt Arboretum Rhododendron Bluff (Updated 2004)

This is one of the largest of the rhododendron bluffs within the county, extending approximately 75 yards along the creek; a satellite population also exists just across the ravine to the west. The Catawba rhododendron (*Rhododendron catawbiense*) forms a solid thicket along a large rock outcrop, with few other shrub species present. Emergent above the thick cover of rhododendrons is a canopy composed of chestnut oak (*Quercus prinus*), white oak (*Q. alba*), beech (*Fagus grandifolia*), Virginia pine (*Pinus virginiana*), pignut hickory (*Carya glabra*), and red maple (*Acer rubrum*). Subcanopy trees include dogwood (*Cornus florida*), sourwood (*Oxydendrum arboreum*), witch hazel (*Hamamelis virginiana*), black gum (*Nyssa sylvatica*), hop hornbeam (*Ostrya virginiana*), and sassafras (*Sassafras albidum*). The few shrubs present in addition to the rhododendron include serviceberry (*Amelanchier arborea*), maple-leaved viburnum (*Viburnum acerifolium*), and two species of blueberry (*Vaccinium tenellum* and *V. stamineum*). The herbs here are typical of those found on rhododendron slopes in the North Carolina Piedmont: trailing arbutus (*Epigaea repens*), ebony spleenwort (*Asplenium platyneuron*), pipsissewa (*Chimaphila maculata*), beech drops (*Epifagus virginiana*), heartleaf (*Hexastylis virginica*), devil's bit (*Chamaelirium luteum*),

rattlesnake orchid (*Goodyera pubescens*), woodrush (*Luzula acuminata*), and hepatica (*Hepatica americana*).

Only one animal was observed that is strongly associated with this type of community, the sumo mite (*Allothrombium* sp.). Other animals observed were the riparian species found along the length of Morgan Creek “canyon.”

The 2001/02 re-survey of this area noted no significant ecological changes at this site.

King’s Mill Rhododendron Slope

This is perhaps the largest rhododendron slope within the county. Close to the point where Morgan Creek enters the Triassic Basin, the stream turns abruptly from its eastward course and travels due north, carving a steep north-facing bluff that rises 150 feet above the creek. As is true for other steep north-facing slopes on the edge of the Basin (see Hollow Rock Rhododendron Bluff (N15) for another example), the entire bluff is covered with a thick stand of catawba rhododendron (*Rhododendron catawbiense*) and other species reminiscent of the mountains.

Emergent above the rhododendrons is a canopy of chestnut oak (*Quercus prinus*), red oak (*Q. rubra*), scarlet oak (*Q. coccinea*), white oak (*Q. alba*), beech (*Fagus grandifolia*), red maple (*Acer rubrum*), and pignut hickory (*Carya glabra*), and a subcanopy of sourwood (*Oxydendrum arboreum*), witch hazel (*Hamamelis virginiana*), hop hornbeam (*Ostrya virginiana*), ironwood (*Carpinus caroliniana*), and storax (*Styrax grandifolia*). In addition to the dominant catawba rhododendron, shrubs include maple-leaved viburnum (*Viburnum acerifolium*), fringe tree (*Chionanthus virginicus*), strawberry bush (*Euonymus americanus*), and serviceberry (*Amelanchier arborea*). Beneath the dense shrub layer only a few herbs are present, including bluets (*Houstonia caerulea*), ebony spleenwort (*Asplenium platyneuron*), Christmas fern (*Polystichum acrostichoides*), trailing arbutus (*Epigaea repens*), wild oregano (*Cunila origonoides*), pipsissewa (*Chimaphila maculata*), and resurrection fern (*Polypodium polypodioides*).

One noteworthy animal that occurs in this community is the red-backed salamander (*Plethodon cinereus*). This is a primarily northern and montane species that reaches the southern limit of its distribution in the Piedmont at approximately this point. Like the rhododendron, its populations here are widely isolated disjuncts; it is known to occur in Orange County only on this slope, on the nearby bluff located at Mason Farm Pond, and on a similar bluff at Cox’s Mountain along the Eno (E11). Another animal occurring with the rhododendron is the sumo mite (*Allothrombium* sp.), which also appears to be disjunct in its distribution, although it is more widespread in our area than is the salamander.

Mason Farm Pond Rhododendron Slope

This is the farthest downstream of the rhododendron communities along Morgan Creek, situated right where the crystalline rock formations typical of the Piedmont give way to the flat sediments of the Triassic Basin. The site is dominated by an impressive outcrop of metamorphic rock, which provides both the acidic soil and steep northern exposure required by Piedmont populations of catawba rhododendron (*Rhododendron catawbiense*). Other plants occurring here that are found along steep, stream-cut bluffs include wintergreen (*Gaultheria procumbens*), trailing arbutus (*Epigaea repens*), and the significantly rare sweet

pinemap (*Monotropsis odorata*). In addition, an uncommon orchid found here is large whorled pogonia (*Isotria verticillata*).

The canopy above this interesting shrub and herb community is dominated by beech (*Fagus grandifolia*), red maple (*Acer rubrum*), and red oak (*Quercus rubra*), with scattered white oak (*Q. alba*), black oak (*Q. velutina*), and pignut hickory (*Carya glabra*). The subcanopy is composed of dogwood (*Cornus florida*), sourwood (*Oxydendrum arboreum*), hop hornbeam (*Ostrya virginiana*), red cedar (*Juniperus virginiana*), witch hazel (*Hamamelis virginiana*), and ironwood (*Carpinus caroliniana*). On the rocky slope above the creek occur wildflowers such as saxifrage (*Saxifraga virginensis*), toothwort (*Cardamine angustata*), hepatica (*Hepatica americana*), aster (*Aster divaricatus*), and false solomon's seal (*Smilacina racemosa*). Other herbaceous species are beech drops (*Epifagus virginiana*), rock cap fern (*Polypodium virginianum*), pinemap (*Monotropa hypopithys*), and two heartleafs (*Hexastylis minor* and *H. arifolia*).

Several interesting animal species occur along this bluff, probably due to the same conditions responsible for the presence of the rhododendrons; they are not, however, confined to the same boundaries as the plant community and extend all the way to the bend in Morgan Creek below the wastewater treatment plant. The red-backed salamander is right on the southern limits of its distribution here in the Piedmont and occurs in our area only as widely disjunct populations. In addition to the population found here, this species has only been recorded elsewhere in the county immediately upstream at the King's Mill Rhododendron Slope and at the ERSP Mountain Spleenwort and Rhododendron Bluffs (E12).

Similarly, the sumo mite (*Allothrombium* sp.) also appears to be a disjunct in our area, occurring only along steep north facing bluffs and representing a generally northern genus (this species is probably undescribed). Its populations, however, are somewhat more frequent than the salamander's, occurring in conjunction with a few mountain laurel slopes in addition to the other rhododendron communities in the county. One additional and particularly intriguing animal falling into this category is a land snail (*Mesomphix* sp.). This genus is endemic to the Appalachians and contains several threatened species there; it has not been previously recorded as far east in the Piedmont as Orange County, and the exact identity of the species occurring on this bluff has not yet been established. So far as known, this is the only site in the county where it occurs and thus deserves particular attention.

Other animals typical of stream-cut bluffs include the folding-door spider (*Antrodiaetus unicolor*) and two species of trap-door spiders (*Myrmekiaphila fluviatilis* and *Ummidia carabivorus*). These populations are of historic interest since an early description of their behavior was written by Atkinson (1887) while he was a student at Chapel Hill; indeed, this bluff appears to be the site of his collections and may represent the type locality of *Ummidia carabivorus*, which Atkinson was the first to describe. All three of these spiders appear to be rare elsewhere in the county.

MANAGEMENT AND PROTECTION: Portions of this large site are owned by the State of North Carolina and managed by the NC Botanical Garden as a natural area; other portions are protected by conservation easements held by the Botanical Garden Foundation. The majority of the site (including some areas owned by the State/UNC) is unprotected.

Conservation entities should alert the University and other landowners of the significance of the natural values of their property. Some areas should be purchased outright for conservation purposes; other areas should be protected with conservation easements.

Specific recommendations:

A conservation easement should be acquired that would include the entire present extent of **Stillhouse Bottom**, since any further encroachment would quite probably eliminate the old growth forest birds.

Part of the **Stillhouse Bend** rhododendron population is on Botanical Garden land; a small part is privately owned and unprotected. Any trail development should remain along the alluvial flat and away from the very sensitive rhododendron stand.

Control invasive exotic plants and other encroachments on the **Anemone Glade**.

The steepest face of the **Hunt Arboretum Rhododendron Slope** is protected by the NC Botanical Garden as natural area; privately owned land located upslope is unprotected. This site should be protected in its natural state; no trails should be constructed near this fragile community and a sufficient buffer area should be included upslope in order to preserve the cool and moist conditions of the slope.

The **Kings Mill Rhododendron Bluff** is protected as a natural area by the NC Botanical Garden; the slope above the bluff is unprotected. Trail construction near this fragile community should be avoided, and a sufficient buffer area should be provided upslope to preserve the cool, moist conditions of the slope.

Mason Farm Pond Rhododendron Bluff is protected as a natural area by the NC Botanical Garden; the slope above the bluff is unprotected. Garden staff should maintain its current protection as a natural area, should avoid trail construction near this fragile community, and should provide sufficient buffer area upslope to preserve cool, moist conditions of the slope.

OWNERSHIP: State of North Carolina (NC Botanical Garden), Private

REFERENCES:

Michener, D. C. and S. Morgan, 1976. Ecosystematic Survey of Morgan Creek Rhododendron slopes. Botany 235 class report, UNC Chapel Hill, NC.

Jones, C. A. 1980. An interpretive plan and resource inventory for the North Carolina Botanical Garden. Master's thesis, Goddard College, Plainfield, VT.

Sather, D. and S. Hall. 1988. Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina, Appendix B: Biological Documentation of Sites. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Wichmann, B.L., A.L. Wally, and P.S. White. 2000. Conservation Project: The Laurel Hill Nature Preserve and "Billy Hunt's Garden" with an Update on the Rare Species and Exotic Species of the Hunt Arboretum, Gray Bluff Garden, and the Mason Farm Biological Reserve. NC Botanical Garden, University of North Carolina, Chapel Hill.

Orange County Natural Areas Inventory

LAUREL HILL RIDGE AND VERNAL POOL

Site Number: M09

Size: 230 acres

Site Significance: County

USGS Quadrangle: Chapel Hill

SIGNIFICANT FEATURES: This is one of the last large unbroken tracts of mature upland forest habitat remaining in the vicinity of Chapel Hill, and indeed in the entire county. It serves as a buffer for two of the rhododendron slopes along Morgan Creek (M08) and more importantly for the Mason Farm Biological Reserve. Included within this tract are the heads of the brooks feeding into the Big Oak Woods and the Botany Pond research area. Additionally, this ridge possesses one of the county's three large vernal pools occurring in an upland situation. One significant plant species is also present: the sweet pinesap (*Monotropsis odorata*), which is state-listed as significantly rare.

NATURAL COMMUNITIES: Dry-Mesic Oak—Hickory Forest, Mesic Mixed Hardwood Forest

GENERAL DESCRIPTION: This long, north-south running ridge was once settled and cultivated, but due to its abandonment for over 75 years has now reverted to woodlands. Although several patches of pine forest are still present, most of the ridge is now covered in Dry-Mesic Oak—Hickory Forest, some of it fairly mature. The common canopy species in the hardwood forest are white oak (*Quercus alba*), red maple (*Acer rubrum*), mockernut hickory (*Carya tomentosa*), post oak (*Q. stellata*), and pignut hickory (*Carya glabra*). Important members of the subcanopy include sourwood (*Oxydendrum arboreum*), dogwood (*Cornus florida*), red maple (*Acer rubrum*), black gum (*Nyssa sylvatica*), and red mulberry (*Morus rubra*). The shrub layer in some areas is densely covered with thickets of downy arrow-wood (*Viburnum rafinesquianum*) and maple-leafed viburnum (*Viburnum acerifolium*); in other places the shrubs are more scattered and consist of several species of blueberries (*Vaccinium* spp.), serviceberry (*Amelanchier arborea*), black cherry (*Prunus serotina*), black haw (*Viburnum prunifolium*), and blue haw (*V. rufidulum*). The herbaceous cover, for the most part, is quite sparse, at least along the ridge and upper slopes covered by the dry-mesic oak - hickory forest.

Within the ravines, such as along Yancey Brook, and on the north-facing slopes above Morgan Creek, the conditions are much more mesic. The forest in these situations grades into mesic mixed hardwoods, with the canopy including such species as beech (*Fagus grandifolia*) and red oak (*Quercus rubra*). Both the shrub and herbaceous layers in these sites are more diverse, and include species such as painted buckeye (*Aesculus sylvatica*), pawpaw (*Asimina* sp.), bellwort (*Uvularia perfoliata*), false solomon's seal (*Smilacina racemosa*), black cohosh (*Cimicifuga racemosa*), and rattlesnake root (*Prenanthes* sp.). In the deep ravine just to the west of the King's Mill Rhododendron Bluff (M08), grows the sweet pinesap (*Monotropsis odorata*), a montane disjunct in our area that is considered significantly rare within the state.

A unique habitat present in this tract is an extensive vernal pool, filling only with rainwater and having no inlet or outlet. Probably situated on a clay pan, few plants grow here. The

only trees present are willow oak (*Quercus phellos*) and sweetgum (*Liquidambar styraciflua*), both typical bottomland species and rarely present on dry ridge crests. The shrub and herb layers are nearly absent, composed primarily of tangles of greenbrier (*Smilax rotundifolia*); sparkleberry (*Vaccinium arboreum*) occurs along the margin.

In the winter, this pool serves as an important breeding site for the spotted salamander (*Ambystoma maculatum*) and marbled salamander (*A. opacum*), both of which require isolated, fish-free ponds for their larval development; like the willow oaks, they are uncommon on dry ridge crests. Wildlife more typical of the uplands include the ovenbird (*Seiurus aurocapillus*), scarlet tanager (*Piranga olivacea*), red-tailed hawk (*Buteo jamaicensis*), hairy woodpecker (*Picoides villosus*), and pileated woodpecker (*Dryocopus pileatus*), all of which serve as indicators for the extent of this forested area. The eastern box turtle (*Terrapene carolina*) also occurs here in large numbers, again indicating the relative lack of disturbance; this population served as the subject for the doctoral research of one of the current authors (Hall, 1987). Other animals worth noting are the hooded warblers (*Wilsonia citrina*), present on this upland tract due to the extensive viburnum thickets (occurring especially at the head of Yancey Brook), and the well-developed community of amphibians also present in Yancey Brook, including the dusky salamander (*Desmognathus fuscus*), red salamander (*Pseudotriton ruber*), two-lined salamander (*Eurycea bislineata*), three-lined salamander (*E. guttolineata*), and green frog (*Rana clamitans*). Wild turkey (*Meleagris gallopavo*) has also been reported to occur in this area.

MANAGEMENT AND PROTECTION: There is no formal protection of this site. A large northern section of the site as delineated in the original (1988) inventory was removed from the site boundaries in 2004 due to the construction of more than 90 houses.

Nevertheless, several sites on this ridge deserve special protection, including the vernal pool, the ravine in which the sweet pinesap occurs, and the slopes bordering the Mason Farm Oak-Hickory Forest (M10) and the rhododendron communities (M08). Conservation easements should be negotiated for these sites in particular. The ideal scenario would be to purchase these areas for additions to the Mason Farm Biological Reserve; the Reserve does not itself include any ridge top habitats.

OWNERSHIP: State of NC (NC Botanical Garden), Private

REFERENCES:

Jones, C. A. 1980. An interpretive plan and resource inventory for the North Carolina Botanical Garden. Master's thesis, Goddard College, Plainfield, VT.

Sather, D. and S. Hall. 1988. Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina, Appendix B: Biological Documentation of Sites. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Overview of the Mason Farm Biological Reserve

One of the premier natural areas in the eastern Piedmont, the Mason Farm Biological Reserve is a tract of 367 acres of undeveloped, State-owned lands located in the southeast corner of Orange County. Although the property was one of the first to be settled in the Piedmont, originally homesteaded in the 1740s by the Morgan family, it has remained largely undisturbed since 1894 when it was willed to the University by Mary Mason, one of the last descendants of the Morgans. Since the time of the bequest, much of the area has reverted to woodlands. Some of the forests are now at least 150 years old (some individual trees are certainly much older), and are the most mature stands remaining in the county. Somewhat less "natural" but preserving a fast-disappearing element of the rural Piedmont, several of the historic fields of the Mason Plantation are now maintained in an early successional state with a combination of mowing and prescribed fire.

Since the 1960s, several portions of this tract were set aside specifically for biological uses by the UNC Board of Trustees, and the Mason Farm Biological Reserve was officially established in 1984. Today the area is administered by the North Carolina Botanical Garden as both a natural area and biological field station. From 1975 to 1988, 48 research projects have been conducted in the natural areas of the Reserve, including 28 graduate projects, 18 of which resulted in doctoral degrees in biology.

In addition to the large amounts of land contained within the Reserve itself, the value of the natural area is further enhanced by the even larger tracts of undeveloped land that surround and buffer the Reserve on all sides. To the north lies the Finley Golf Course, also a part of the Mason bequest to the University of North Carolina, while to the west lies the extensive wooded ridge of Laurel Hill (M09). Much of the privately-owned section of the ridge was developed into home sites in the 1990s. The University also owns a large tract at the south end of the ridge ("Parker Tract" and a strip along the north end above Morgan Creek (M08).

Somewhat more secure, to both the east and south lie federal lands within the Jordan Lake floodplain. These lands extend all the way south to Jordan Lake and are unbroken except by one road located nearly 1.25 miles south of the Reserve. This tract is leased from the Army Corps of Engineers to the NC Wildlife Commission as gameland, and located within the Jordan Lake floodplain it cannot be developed.

In addition to its extent, age, and integrity, several other features combine to make the Reserve one of the most significant natural areas in the Piedmont. Five of the sites discussed in this report are located partly or wholly within the limits of the Mason Farm Biological Reserve and two of these in particular (M10 and M11) have such unique features that they have been recognized as having state-level significance by the NC Natural Heritage Program. The Big Oak Woods (M11) is the largest tract of old growth forest in the county and also the largest mature tract of bottomland swamp forest remaining in the entire Piedmont of North Carolina. No less unusual, the forested slopes along the western margin of the Reserve (M10) occur over a dike of basic igneous rock and contain many uncommon basophilic plant species. The most significant element of this tract is the population of mature southern shagbark hickories, the largest found in the state and perhaps anywhere within the range of this species.

The area described as Morgan Creek Floodplain Forest (M12) has regional significance within both Orange County and the greater Triangle area. On the bluff located at the northwest corner of the Reserve (Mason Farm Pond) is located one of only nine communities of catawba rhododendron found in the county, while directly opposite this bluff along the north side of Morgan Creek is a small tract of one of the most mature bottomland forests left in the county (Hackberry Bottom). Less mature but possibly the most important wildlife area in the region, the forest extends southward from the southern and eastern margins of the Reserve, and is the largest expanse of unbroken swampland in the Triangle; it is untransected even by sewer or powerlines.

In addition to the forested natural areas, the lands maintained in cultivation add yet another important element to the Reserve's habitat diversity, especially since the traditional agricultural practice of dividing fields by means of hedgerows has not-yet given way to the agro-technology involving vast monocultures and gigantic farm machinery. These fields have been present since the mid 18th Century and many of our wildlife species have prospered in the field or edge habitats they offer. Sixty-five of the 78 species of butterflies recorded for the entire county occur at Mason Farm, the presence of all but a handful being due to the old-field and edge habitats (no wooded "natural" area within the county is likely to achieve a similar count). The hedgerows also offer wintering habitat for vast numbers of white-throated, song, swamp, fox, and several other species of sparrows, all of which would have been rarely found in the primeval forest. The same is true for abundant cotton rats, voles, cottontail rabbits, and bobwhite quail, all of which are permanent residents of the hedgerows and field edges.

The presence of such a large concentration of prey species attracts, in turn, many raptors and carnivores that are typically quite scarce elsewhere around the region. Sharp-shinned and Cooper's hawks, and northern harriers all winter commonly at Mason Farm, while red-tailed, red-shouldered, and broad-winged hawks nest within the Reserve. Mason Farm is also one of the few places in the Triangle where barred, screech, and great horned owls can all be heard calling at the same time. Common mammalian predators include the red and gray foxes, otter, mink, and raccoon, but perhaps the most noteworthy resident is the bobcat, an animal whose numbers are dwindling throughout our area and which will require large sanctuaries like Mason Farm if it is to persist.

Altogether, the habitat diversity within the Reserve and adjacent lands make this one of the premier wildlife areas in the Piedmont; it is certainly the best-studied area in terms of its animal populations. The bird community by itself can only be described in terms of superlatives:

As of 1988, the total number of bird species that has been observed at Mason Farm during the approximately 50 years records have been kept is 215 (Hall, Jones-Roe, and Wiley, 1986). This is only one less than for the entire county (only the extremely rare northern goshawk has not been seen there), and is an incredible number for such a small inland area. Eighty-two of these species are considered breeding birds, as documented by thirteen years of censuses, while 74 species have been recorded as wintering at Mason Farm.

Particularly noteworthy are 10 of the breeding species found here that are considered regionally rare in this report. Five of these, in fact, were not observed nesting elsewhere in

Orange County during 1988, while at the same time, two of these five, the American redstart and prothonotary warblers, occurred in large or substantial numbers at Mason Farm. Perhaps even more impressive, the extremely rare Swainson's warbler has maintained a regular presence of up to six breeding pairs within the Reserve and on the adjacent gamelands.

No less outstanding is the list of 100 species of other vertebrates that has been compiled for the Reserve (Hall et al., 1986). One species, the four-toed salamander (*Hemidactylium scutatum*), is state-listed as special concern and an additional 15 are considered regionally rare in this report; six, in fact, were not documented as occurring elsewhere in Orange County. Three species of regionally rare invertebrates also occur at Mason Farm as do two regionally rare plant species plus one that is state-listed as significantly rare.

Because of its great natural values and the aesthetic qualities of its open fields and dense forests, Mason Farm is one of the three most familiar natural areas in the county (along with the Korstian Division of Duke Forest and Eno River State Park). The natural history of the Preserve was made nationally famous through John Terres' *From Laurel Hill to Siler's Bog; the Walking Adventures of a Naturalist*, and dozens of organized field trips take place at Mason Farm each year, sponsored by such groups as the Audubon Society, Sierra Club, Chapel Hill Bird Club, and NC Botanical Garden.

Orange County Natural Areas Inventory

MASON FARM OAK-HICKORY FOREST

Site Number: M10

Size: 272 acres

Site Significance: State

USGS Quadrangle: Chapel Hill

SIGNIFICANT FEATURES: This is the largest forested area on diabase rock in the county. The southern shagbark hickories (*Carya carolinae-septentrionalis*) growing in this tract are particularly numerous and this stand has been recognized by the NC Natural Heritage Program as the best in the state, if not the entire range of this species. One specimen tree had been designated in 1988 by the Society of American Foresters as the national champion sized southern shagbark hickory, but it blew down in 1996 as a result of Hurricane Fran. The golden alexander (*Taenidia integerrima*), another plant that prefers the relatively basic soils produced by diabase, also has its largest county population in this tract. Five regionally-rare animals observed here are the broad-winged hawk (*Buteo platypterus*), bobcat (*Lynx rufus*), green anole (*Anolis carolinensis*), broad-headed skink (*Eumeces laticeps*), and the pepper-and-salt skipper butterfly (*Amblyscirtes hegon*).

NATURAL COMMUNITIES: Basic Oak—Hickory Forest

GENERAL DESCRIPTION: The distinctive features of this site (formerly referred to as the “Mason Farm Southern Shagbark Hickory Forest” in the 1988 inventory) are due to the presence of two long dikes of diabase, running from north of Morgan Creek southward past the county line. These structures occur right at the junction of the crystalline rock formations of the Piedmont and the sediments of the Triassic Basin; they represent linear intrusions of igneous rock that welled up along a fault line created around the time when North America pulled away from Africa some two hundred million years ago, as the Triassic Basin itself was formed by down-slipping. They are commonly associated with the Durham Basin in our area.

The soil weathered from this rock formation is more basic than those more typical of the Piedmont and many plant species grow over these formations that occur nowhere else in the region. At Mason Farm the most distinctive of these is the southern shagbark hickory (*Carya carolinae-septentrionalis*), whose presence almost always indicates the presence of a basic soil. Due to the protection given this tract since 1894, when the University acquired it as part of the Mason Bequest, the forest has grown to maturity, in contrast with other diabase areas in the county now under cultivation or covered with houses. The shagbarks are both numerous and quite large, several approaching two feet in diameter. The extent and maturity of this stand of shagbarks combine to make it one of the best examples in the entire Southeast, as has been recognized by the NC Natural Heritage Program.

Also characteristic of basic soils is the subcanopy composed of numerous maples (*Acer floridanum*), redbuds (*Cercis canadensis*), and red cedars (*Juniperus virginiana*), and the dense shrub layer made up of viburnums (*Viburnum rafinesquianum* and *V. dentatum*). While the herb layer is fairly sparse due to the poor drainage and summer dryness of this site, the golden alexander (*Taenidia integerrima*) reaches its greatest abundance in the county on a small knoll among numerous boulders of diabase. On the flats below this knob, the flood/drought-hardy sphagnum moss (*Sphagnum* sp.) and greenbrier (*Smilax* spp.) form

extensive patches reminiscent of the situation seen at Meadow Flats (N02), another extensive area of basic soil in Orange County.

One animal possibly also associated with the dry, basic conditions of this tract is the pepper-and-salt skipper (*Amblyscirtes hegon*), whose host plants are grasses growing in open woodlands, including uniola grass (*Uniola latifolia*), which often occurs on diabase dikes. This butterfly has been found at only one other site in Orange County, the dry forest on the south slope of Buckwater Ridge (E11); elsewhere it has rarely been recorded for the Piedmont of North Carolina (and is considered threatened in Maryland).

Other animals abound in this forest due both to its own maturity and large size and to its connection to the even more extensive upland woods of Laurel Hill (M09) and bottomland tracts of the Big Oak Woods (M11) and Morgan Creek Floodplain Forest (M12). This is the site of the longest-running breeding bird census in the entire Southeast (since 1976), and the average number of bird species nesting within the census plot is 28, second in Orange County only to the Morgan Creek Swamp with 31 species; its average density of nesting pairs is 591/km², second only to the Big Oak Woods with 667/km².

The presence of several resident species of raptors is especially noteworthy, since all require large tracts of forest relatively free from human disturbance. These include the broad-winged hawk (*Buteo platypterus*), which is a montane bird rarely breeding now in the Piedmont; the red-shouldered hawk (*B. lineatus*), a bird requiring extensive areas of bottomlands for feeding, the red-tailed hawk (*B. jamaicensis*), screech owl (*Otus asio*), great horned owl (*Bubo virginianus*), and barred owl (*Strix varia*). In winter the number of raptors increases with the addition of numerous sharp-shinned and Cooper's hawks (*Accipiter striatus* and *A. cooperii*). There is also at least one report suggesting that sharp-shins may breed here, a very rare occurrence in today's Piedmont.

Other notable species are the bobcat (*Lynx rufus*), which has been frequently seen here but rarely elsewhere in the county, and the broad-headed skink (*Eumeces laticeps*), which maintains a colony on the old caretaker's cabin next to these woods but which was not recorded for any other site in this survey. The 28 species of butterflies documented for this forest is quite unusual for a woodland habitat in our area.

MANAGEMENT AND PROTECTION: A portion is owned by the State and managed as a natural area by the NC Botanical Garden. A large portion remains in private ownership and is thus unprotected. The private portion should be purchased for conservation and dedicated as a state nature preserve. In particular, the State should acquire a buffer strip upslope, especially along Yancey Brook and other watersheds of Mason Farm Biological Reserve.

OWNERSHIP: State of NC (Mason Farm Biological Reserve), Private

REFERENCES:

Wiley, R. H. 1977. Breeding bird census: mixed deciduous forest. Am. Birds 31:41.

Hall, S. P. and Wiley, R. H. 1978. Breeding bird census: floodplain forest. Am. Birds 32:64.

Hall, S. P. and Wiley, R. H. 1978. Breeding bird census: mixed deciduous forest. *Am. Birds* 32:63.

Hall, S. P. and Mueller, H. C., 1979. Breeding bird census; floodplain forest. *Am. Birds* 33:62.

Hall, S. P. and Mueller, H. C. 1979. Breeding bird census; mixed deciduous forest. *Am. Birds* 33:62.

Hall, S. P. and Mueller, H. C. 1980. Breeding bird census; floodplain forest. *Am. Birds* 33:62.

Hall, S. P. and Mueller, H. C. 1980. Breeding bird census; mixed deciduous forest. *Am. Birds* 33:62.

Hall, S. P. and Mueller, H. C. 1981. Breeding bird census; floodplain forest. *Am. Birds* 33:62.

Hall, S. P. and Mueller, H. C. 1981. Breeding bird census; mixed deciduous forest. *Am. Birds* 33:62.

Hall, S. P. and Mueller, H. C. 1982. Breeding bird census; floodplain forest. *Am. Birds* 33:62.

Hall, S. P. and Mueller, H. C. 1982. Breeding bird census; mixed deciduous forest. *Am. Birds* 33:62.

Hall, S. P. and Mueller, H. C. 1983. Breeding bird census; floodplain forest. *Am. Birds* 33:62.

Hall, S. P. and Mueller, H. C. 1983. Breeding bird census; mixed deciduous forest. *Am. Birds* 33:62.

Hall, S. P. and Mueller, H. C. 1984. Breeding bird census; floodplain forest. *Am. Birds* 33:62.

Hall, S. P. and Mueller, H. C. 1984. Breeding bird census; mixed deciduous forest. *Am. Birds* 33:62.

Howard, A. 1984. Mason Farm Preserve southern shagbark hickory mixed hardwoods and adjacent communities. Class report, Botany 235, UNC Chapel Hill, NC.

Sather, D. and S. Hall. 1988. Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina, Appendix B: Biological Documentation of Sites. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Orange County Natural Areas Inventory

BIG OAK WOODS

Site Number: M11

Size: 57 acres

Site Significance: State

USGS Quadrangle: Chapel Hill

SIGNIFICANT FEATURES: This is the largest tract of old growth forest in the county, and probably the largest in the entire Triangle. It is certainly the largest tract of mature bottomland swamp forest remaining in the Piedmont and has been recognized as having state-level significance by the NC Natural Heritage Program. The breeding density of birds is the highest in the county, reflecting the prime conditions present in this mature bottomland forest.

NATURAL COMMUNITIES: Piedmont Swamp Forest

GENERAL DESCRIPTION: Growing on a wide expanse of rich Chewacla soil and protected by the University since 1894, the Big Oak Woods is one of the most magnificent tracts of forest remaining in the region. The many stately willow oak (*Quercus phellos*), swamp chestnut oak (*Q. michauxii*), cherrybark oak (*Q. falcata* var. *pagodaefolia*), Shumard's oak (*Q. shumardii*), overcup oak (*Q. lyrata*), and shagbark hickory (*Carya ovata*) illustrate the classical composition of a mature bottomland forest, seldom seen today given the intense cutting that has taken place over the past 250 years. The wide spacing and large size of these trees, several of which approach three feet in diameter, give this forest a cathedral-like atmosphere, while great masses of atamasco and trout lilies (*Zephyranthes atamasco* and *Erythronium americanum*), toothworts (*Cardamine bulbosa*), and spring beauties (*Claytonia virginica*) carpet the forest floor in the spring.

Along with the other tracts of the Mason Farm Biological Reserve, this is one of the best-known birding areas in the Piedmont. Due to its complex canopy stratification, the Big Oak Woods is especially outstanding with regard to the densities recorded for its breeding birds. Over an eight-year period, the number of breeding pairs averaged 667/km², the highest for any site in the North Carolina Piedmont. Its average number of 27 species is also impressive, reflecting the presence of several species typical of bottomland forests in addition to the more widespread birds of the Piedmont. The black-and-white warbler (*Mniotilta varia*), which occurs only sparsely in the Piedmont, has been recorded here several times during the breeding season. More regular and abundant are the hooded (*Wilsonia citrina*) and Kentucky warblers (*Oporornis formosus*), both of which nest either on the ground or close to it, and thus require large tracts of undisturbed forest for breeding; together with the adjoining Mason Farm Shagbark Forest and Morgan Creek Swamp, 30 pairs of hooded warblers and 15 pairs of Kentucky warblers were recorded for this area in 1988 alone (R.H. Wiley, pers. comm.), an extremely impressive number when compared to their sparse occurrence in the rest of the county. Also present as breeding species are the American redstart (*Setophaga ruticilla*), Louisiana waterthrush (*Seiurus motacilla*), northern parula (*Parula americana*), yellow-throated (*Dendroica dominica*) and prothonotary warblers (*Protonotaria citrea*), all species characteristic of bottomland forests, as are the red-shouldered hawk (*Buteo lineatus*), barred owl (*Strix varia*), wood duck (*Aix sponsa*), and woodcock (*Scolopax minor*), which also nest here regularly.

Equally typical of bottomland forests are mammals such as the southeastern shrew (*Sorex longirostris*), golden mouse (*Ochrotomys nuttalli*), and the regionally rare marsh rabbit (*Sylvilagus palustris*), which only occurs in Orange County here and in the Morgan Creek Swamp (the only other Piedmont record is for the nearby New Hope Swamp). Two large vernal pools, together with several smaller ones, provide important breeding habitat for several species of amphibians, including the marbled salamander (*Ambystoma opacum*) and spotted salamander (*A. maculatum*), both of which require such isolated, long-lasting, and fish-free pools for their larval development. In addition to the vertebrates, 21 species of butterflies have been recorded here, including the zebra swallowtail (*Eurytides marcellus*), whose host plant is the pawpaw, and other bottomland species such as Appalachian brown (*Satyrodes appalachia*), Common wood-nymph (*Cercyonis pegala*) and zabulon skipper (*Poanes zabulon*).

MANAGEMENT AND PROTECTION: This State-owned site is managed as a natural area by NC Botanical Garden, but not registered with NC Natural Heritage Program. The entire site should be registered with the NC Natural Heritage Program or be dedicated as a state nature preserve.

OWNERSHIP: State of NC (Mason Farm Biological Reserve)

REFERENCES:

Hall, S. P. and Wiley, R. H. 1978. Breeding bird census: floodplain forest. Am. Birds 32:64.

Hall, S. P. and Wiley, R. H. 1978. Breeding bird census: mixed deciduous forest. Am. Birds 32:63.

Hall, S. P. and Mueller, H. C., 1979. Breeding bird census; floodplain forest. Am. Birds 33:62.

Hall, S. P. and Mueller, H. C. 1979. Breeding bird census; mixed deciduous forest. Am. Birds 33:62.

Hall, S. P. and Mueller, H. C. 1980. Breeding bird census; floodplain forest. Am. Birds 33:62.

Hall, S. P. and Mueller, H. C. 1980. Breeding bird census; mixed deciduous forest. Am. Birds 33:62.

Hall, S. P. and Mueller, H. C. 1981. Breeding bird census; floodplain forest. Am. Birds 33:62.

Hall, S. P. and Mueller, H. C. 1981. Breeding bird census; mixed deciduous forest. Am. Birds 33:62.

Hall, S. P. and Mueller, H. C. 1982. Breeding bird census; floodplain forest. Am. Birds 33:62.

Hall, S. P. and Mueller, H. C. 1982. Breeding bird census; mixed deciduous forest. *Am. Birds* 33:62.

Hall, S. P. and Mueller, H. C. 1983. Breeding bird census; floodplain forest. *Am. Birds* 33:62.

Hall, S. P. and Mueller, H. C. 1983. Breeding bird census; mixed deciduous forest. *Am. Birds* 33:62.

Hall, S. P. and Mueller, H. C. 1984. Breeding bird census; floodplain forest. *Am. Birds* 33:62.

Hall, S. P. and Mueller, H. C. 1984. Breeding bird census; mixed deciduous forest. *Am. Birds* 33:62.

Sather, D. and S. Hall. 1988. *Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina, Appendix B: Biological Documentation of Sites*. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Orange County Natural Areas Inventory

MORGAN CREEK FLOODPLAIN FOREST

Site Number: M12

Size: 105 acres in Orange County
[1,001 ac. in Durham County]

Site Significance: Regional

USGS Quads: Chapel Hill, Farrington

SIGNIFICANT FEATURES: This 2004 update to the Orange County inventory combines portions of two sites that had been listed separately in the original 1988 inventory as *Morgan Creek Swamp* and *Morgan Creek Hackberry Bottom*.

Morgan Creek Swamp – This site forms part of one of the largest and least broken tracts of swamp forest remaining in the Piedmont. Except for one secondary road, it extends undivided for over two miles from the Mason Farm Biological Reserve to Jordan Lake. [By contrast, New Hope Swamp is transacted by several major highways, sewerlines and powerlines.] Along the southern border of Mason Farm the swamp is over ¾-mile wide.

Several animal species occur here that are far more typical of the coastal plain than the Piedmont, reaching their westernmost limit in these broad lowlands of the Triassic Basin. Most notable of these are the Swainson's warbler (*Limnothlypis swainsonii*) and marsh rabbit (*Sylvilagus palustris*), both of which are nearly unknown as breeding species in the Piedmont. One important Piedmont species that also breeds here is the four-toed salamander (*Hemidactylium scutatum*), which is state-listed as special concern.

Morgan Creek Hackberry Bottom – The floodplain along this stretch of Morgan Creek contains one of the oldest stands of alluvial forest in Orange County; particularly noteworthy is the number of large hackberries (*Celtis laevigata*) that occur here, forming the county's best stand of this species. This strip of riparian forest also provides a scenic entranceway into the Mason Farm Biological Reserve, as well as an important buffer for the Reserve's wildlife and aesthetic values. It is an area well known to the area's birders, many of whom visit it each year, especially during the spring and fall migrations when thousands of migrating warblers and other songbirds pass through.

NATURAL COMMUNITIES: Piedmont Alluvial Forest, Piedmont Bottomland Forest, Piedmont Swamp Forest

GENERAL DESCRIPTION: Two distinct portions of the site are described below.

Morgan Creek Swamp

Although far younger than many forests in the county (some sections having been cut within the last 15 years [as of 1988]), the Morgan Creek Swamp is far more extensive in unbroken area than most others in the Piedmont; given protection as part of the Jordan Lake floodplain, it could develop into one of the Triangle's premier forests. Even now it contains a forest type that is rare within the county, the alluvial terrace woodlands found only along the widest floodplains. The dominant species here are sycamore (*Platanus occidentalis*), boxelder (*Acer negundo*), sweetgum (*Liquidambar styraciflua*), tulip poplar (*Liriodendron tulipifera*), and bitternut hickory (*Carya cordiformis*), a composition different from the Big Oak Woods,

which has a different sort of flooding regime. A dense shrub layer of privet (*Ligustrum sinense*), an introduced species, is almost impenetrable in places, providing shelter for many species of wildlife.

The animal species, indeed, are this tract's most significant feature. An average of 31 species of breeding birds have been censused on a 20-hectare study site within this tract, a higher number than any other site in Orange County, including the Big Oak Woods (although only two years worth of data had been collected as of 1988; R. H. Wiley, pers. comm.). The average density of nesting territories was 559/km². Although this is much lower than for the Big Oak Woods (M11), but comparable to the Mason Farm Oak-Hickory Forest (M10), it is remarkable that 16 per cent of this density (92/km²) was made up of the territories of American redstarts (*Setophaga ruticilla*). This species is virtually unknown as a breeding species in the county outside the Mason Farm area. Prothonotary warblers (*Protonotaria citrea*) also occur here in higher density than elsewhere (10/km²), but perhaps the most noteworthy breeding bird is the Swainson's warbler (*Limnothlypis swainsonii*). Its density here is very slight (only a maximum of 6 territories have been observed within the entire swamp) but significant since this bird so rarely breeds within the Piedmont at all. Other bottomland birds regularly nesting in this forest include the northern parula (*Parula americana*), hooded (*Wilsonia citrina*) and Kentucky warblers (*Oporornis formosus*), as well as the hairy (*Picoides villosus*) and pileated woodpeckers (*Dryocopus pileatus*), barred owl (*Strix varia*), and red-shouldered hawk (*Buteo lineatus*), four territories of the last and least common species having been observed within the swamp.

In addition to the avifauna, 52 other animals have been documented [as of 1988] for the swamp, including the regionally-rare bobcat (*Lynx rufus*), river otter (*Lutra canadensis*), American mink (*Mustela vison*), and marsh rabbit (*Sylvilagus palustris*), which occurs nowhere else in the county apart from the adjacent Big Oak Woods (and nowhere else in the Piedmont of North Carolina except for the nearby New Hope Swamp). Seven species of typical coastal plain fish have been collected here, several of which have not previously been documented above the fall line. Finally, one state-listed species, the four-toed salamander (*Hemidactylium scutatum*), was discovered in 1988 nesting in a pool located at the northern end of the swamp within the Mason Farm Biological Reserve.

Mason Farm Hackberry Bottom

Although this is a fairly small tract of bottomland, constrained on one side by a steep bluff and on the other by the Finley Golf Course, it has been left largely undisturbed by the University since it was acquired as part of the Mason Bequest in 1894. Its age appears to be roughly comparable to the Big Oak Woods (M11). A large southern red oak (*Quercus falcata*) that was blown down by the wind was determined to be over 150 years old by a count of its growth rings. Many individual trees have diameters of over two feet.

The composition of the forest is classically typical of alluvial areas along small streams, although now seldom seen in such a complete state. In addition to the hackberry (*Celtis laevigata*), there are sycamore (*Platanus occidentalis*), tulip poplar (*Liriodendron tulipifera*), sweetgum (*Liquidambar styraciflua*), American elm (*Ulmus americana*), river birch (*Betula nigra*), and boxelder (*Acer negundo*), individuals of all of which reach great size. Also notable are the large vines of wild grape (*Vitis rotundifolia*) reaching all the way from the ground to the canopy of the tallest trees. In the understory occur large stands of pawpaw

(*Asimina triloba*) and thickets of spicebush (*Lindera benzoin*) and bladdernut (*Staphylea trifolia*). Herbs characterizing this site are mayapple (*Podophyllum peltatum*), jack-in-the-pulpit (*Arisaema triphyllum*), and especially green dragon (*A. dracontium*), which thrives here in great numbers.

The large trees, dense thickets, and proximity to the creek make this area quite attractive to many animal species. As mentioned above, this entranceway to the Mason Farm Biological Reserve is one of the best known birding areas in the Triangle, particularly during the migration periods; many of the 101 migrants recorded for Mason Farm were observed in these woods along the creek. Especially worth mentioning are the 23 species of warblers and vireos that have been observed here, as many as for the rest of the county combined. These include the rarely seen Philadelphia vireo (*Vireo philadelphicus*), cerulean warbler (*Dendroica cerulea*), Connecticut warbler (*Oporornis agilis*), and mourning warbler (*O. philadelphia*).

Equally noteworthy are the species that choose this small tract for nesting or permanent residence. Prothonotary warblers (*Protonotaria citrea*) and American redstarts (*Setophaga ruticilla*) regularly nest here, although they are uncommon or absent as breeding species throughout the rest of the county (except at sites downstream within the Mason Farm Preserve). Three species of fish, the bowfin (*Amia calva*), banded sunfish (*Enneacanthus obesus*), and flier (*Centrarchus macropterus*), have all been collected at the Mason Farm ford, and represent species much more typical of the coastal plain. This is their farthest penetration into Orange County, if not the entire Piedmont. The red-bellied watersnake (*Nerodia erythrogaster*) is similar in this regard (although it has also been found upstream in the NC Botanical Garden). Other notable residents of this riparian forest include the great horned owl (*Bubo virginianus*), wood duck (*Aix sponsa*), red-tailed hawk (*Buteo jamaicensis*), pileated woodpecker (*Dryocopus pileatus*), and raccoon (*Procyon lotor*), all of which have been observed over a number of years denning, nesting, or roosting in the large trees of this stand. River otter (*Lutra canadensis*) also make regular visits to this section of Morgan Creek.

MANAGEMENT AND PROTECTION: The Federally-owned lands are managed by NC Wildlife Resource Commission as gamelands within the Jordan Lake 100-year floodplain. That portion should be maintained in its unbroken state with no timbering allowed.

The State-owned Hackberry Bottom is protected as a natural area by NC Botanical Garden; it was proposed but not registered with NC Natural Heritage Program. The State should acquire a buffer strip for the lands next to the private property.

OWNERSHIP: Private, State of NC (Mason Farm Biological Reserve), United States of America (New Hope Gamelands)

REFERENCES: Sather, D. and S. Hall. 1988. Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina, Appendix B: Biological Documentation of Sites. N.C. Natural Heritage Program, DENR, Raleigh, NC.

New Hope Creek Watershed

Orange County Natural Areas Inventory

BALD MOUNTAIN/MEADOW FLATS/CURRIE HILL MACROSITE

New Site 2004

Site Number: Macrosite #5

Size: 2,764 acres

Site Significance: National

USGS Quads: Hillsborough
Chapel Hill

The Bald Mountain/Meadow Flats/Currie Hill Macrosite encompasses some of the most unusual geological features in Orange County. In turn, the soils derived from these rocks support several uncommon or rare kinds of natural communities, plants, and animals. Most of the macrosite occurs within the Blackwood Division of Duke Forest, but extends more than a mile to the north and northwest. The macrosite includes six standard sites.

This macrosite is of national significance. Bald Mountain (N01) and Blackwood Mountain (N04) are monadnocks composed of several igneous rock types and support extensive oak-hickory forest on slopes and mature chestnut oak forest on summit ridges. The intervening area is partly underlain by gabbro bedrock; one large swale—Meadow Flats (N02)—holds rainwater and features a rare community type called Upland Depression Swamp Forest. This depression is critical breeding habitat for the state-rare four-toed salamander (*Hemidactylium scutatum*) and has the county's only population of northern swamp dogwood (*Cornus racemosa*). Elsewhere, the unusual Iredell soils support populations of two state-rare plants: Bush's sedge (*Carex bushii*) and Torrey's mountain-mint (*Pycnanthemum torreyi*). To the north, Currie Hill (N06) features more unusual geology: the hill is a conical plug of diabase, rather than the dike formation normally seen in the piedmont. Also notable at Currie Hill is a stand of southern shagbark hickory (*Carya carolinae-septentrionalis*), a state-rare forest orchid, crested coralroot (*Hexalectris spicata*), and a state-rare butterfly, northern hairstreak (*Fixsenia favonius ontario*). Rounding out the macrosite, Steep Bottom Branch (N05) features a deep ravine with mixed mesic hardwood forest and a rich herbaceous layer.

The macrosite provides breeding habitat for a number of neotropical migrant birds, resident turkey, nesting turkey vultures, and bobcat, all of which underscore the importance of this extensively forested and relatively wild landscape.

Orange County Natural Areas Inventory

BALD MOUNTAIN

Site Number: N01
Site Significance: State

Size: 140 acres
USGS Quad: Chapel Hill

SIGNIFICANT FEATURES: The hardwood slopes within this site feature one of the most mature chestnut oak forests in the county and the only monadnock without any sort of development on its upper slopes and summit. Large hollowed-out stumps of chestnut oak, now extremely rare due to a long history of lumbering, provide traditional nesting sites for turkey vultures (*Cathartes aura*). Scenic features include both the rock formations on the summit and the unbroken ridgeline as seen from the surrounding countryside.

NATURAL COMMUNITIES: Piedmont Monadnock Forest

GENERAL DESCRIPTION: The 2004 update to the inventory changes the site name from “Bald Mountain Hardwood Slopes” to conform to the NC Natural Heritage Program.

Bald Mountain is one of a series of monadnocks that run northeast through the southwestern part of the county. The summit rises more than 200 feet above the surrounding terrain due to the resistant nature of the underlying bedrock. Documented rock types include rhyolite flows, slate, diorite, and tonalite (Gibbon, 1966). The large outcrops of igneous rocks are an interesting scenic feature of this monadnock, particularly a series of boulders shaped like dolphin fins located on the northwest slope.

The forest cover on the crown is composed almost completely of chestnut oak (*Quercus prinus*), with scattered presence of other upland oaks such as scarlet oak (*Q. coccinea*), black oak (*Q. velutina*), and white oak (*Q. alba*). The low heath cover here is sparse but the viburnum thickets are well developed, especially on the slopes below the crown of the hill. Due to the relatively dry nature of the ridgetop, several species of open-forest birds nest there, including the northern flicker (*Colaptes auratus*), great crested flycatcher (*Myiarchus crinitus*), white-breasted nuthatch (*Sitta carolinensis*), and summer tanager (*Piranga rubra*). Other noteworthy breeding species include the pileated woodpecker (*Dryocopus pileatus*) and hairy woodpecker (*Picoides villosus*), both of which are characteristic of large tracts of mature hardwoods, and the hooded warbler (*Wilsonia citrina*), which in upland situations is strongly associated with viburnum thickets.

MANAGEMENT AND PROTECTION: This site is part of Duke Forest multiple use lands located within the Rural Buffer zoning district. A small portion on private land on west end of the mountain is unprotected, but the new landowners (2003) were informed by Orange County ERCD of the importance of protecting the natural area. Forestry management practices should take into consideration the value this site has as a natural area. The site should be registered with the NC Natural Heritage Program or dedicated as a state nature preserve.

OWNERSHIP: Duke University; Private

REFERENCES:

Gibbon, E. L. 1966. The vegetation of three monadnocks in the eastern Piedmont of North Carolina. MS thesis, North Carolina State University, Raleigh, NC.

Baldwin, V. 1974. Pages 188-199 In A. E. Radford, ed. 1976. Vegetation, Habitats, Floras: Natural Areas in the Southeastern United States -- Field Data and Information. Department of Biology, UNC Chapel Hill, NC.

Sather, D. and S. Hall. 1988. Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina, Appendix B: Biological Documentation of Sites. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Orange County Natural Areas Inventory

MEADOW FLATS

Updated 2004

Site Number: N02

Size: 233 acres

Site Significance: National

USGS Quad: Chapel Hill

SIGNIFICANT FEATURES: This 2004 update to the Orange County inventory combines two contiguous sites (Meadow Flats and Bald Mountain Gabbro Depression), which had been listed separately in the original 1988 inventory.

This is the best example of upland depression swamp forest in Orange County. This forest is growing on the most extensive area of Iredell soil in the county, and the underlying gabbro sill is, likewise, the largest within the county. This type of geological formation is circumneutral in pH and is extremely poorly drained, covered with standing water in the spring but bone-dry in the summer. Characteristically hydric tree species include willow oak (*Quercus phellos*) and shagbark hickory (*Carya ovata*). Unusual species in the herb layer include Joe-Pye weed (*Eupatorium fistulosum*), partridgeberry (*Mitchella repens*), and rock spikemoss (*Selaginella apoda*). On the western margin near Old NC 86 occurs an unusual species of dogwood (northern swamp dogwood: *Cornus racemosa*); this is the only record for North Carolina.

Associated with the forest are two noteworthy species of animals, the red-shouldered hawk (*Buteo lineatus*), a declining species characteristic of large tracts of bottomland forest, and the four-toed salamander (*Hemidactylium scutatum*), a state-listed *species of special concern* that breeds in mossy areas around isolated shallow pools.

Small-whorled pogonia (*Isotria medeoloides*), a federally endangered species, has been reported for the eastern margin of the natural area (Whigham, 1971). This report has not been confirmed (no specimen or photo); several local botanists have searched for this species, but it may have been destroyed by the 1979 clear-cut of the woodlands adjacent to the natural area. However, this species often remains dormant for several years before it re-emerges. A check in 2001 once again failed to confirm its presence here. If verified, it would be the sole North Carolina population away from the mountains.

NATURAL COMMUNITIES: Upland Depression Swamp Forest

GENERAL DESCRIPTION: The geological features of this site are highly unusual for this region. The underlying rock here is a large intrusion of gabbro, a mafic igneous rock (dark-colored and rich in iron, magnesium, and manganese). The broad, level expanse of Iredell clay weathered from the gabbro makes this one of the most poorly drained sites in the county. In the spring, large areas of the flat are covered with several inches of standing water, with deeper pools forming wherever one of the shallowly rooted trees has been blown over. In the summer, the area is dry except for a few restricted brooks. During the 2001-02 drought, the whole area was without any surficial water.

The poor drainage plus the relatively basic pH of the Iredell soil produced from the gabbro result in an unusual plant community. Willow oak, sweetgum (*Liquidambar styraciflua*), slippery elm, and red maple (*Acer rubrum*) are mixed with white oak (*Quercus alba*), post oak (*Q. stellata*), mockernut hickory (*Carya tomentosa*), sweet pignut hickory (*C. ovalis*), shagbark hickory (*C. ovata*) and tulip poplar (*Liriodendron tulipifera*). Subcanopy and shrub species include red cedar (*Juniperus virginiana*), dogwood (*Cornus florida*), ironwood (*Carpinus caroliniana*), hop hornbeam (*Ostrya virginiana*), redbud (*Cercis canadensis*), winged elm (*Ulmus alata*), possum haw (*Ilex decidua*), and spicebush (*Lindera benzoin*).

As with the plant community, many of the animals found here are more typical of bottomland situations than of upland habitats. The American woodcock (*Scolopax minor*), red-shouldered hawk (*Buteo lineatus*), acadian flycatcher (*Empidonax vireescens*), yellow-throated warbler (*Dendroica dominica*), Kentucky warbler (*Oporornis formosus*), and muskrat (*Ondatra zibethicus*) are all species that would be expected to occur in alluvial or swamp forests but not in a site located at the very head of a watershed. Most noteworthy of these species is the four-toed salamander (*Hemidactylium scutatum*), which nests in the early spring under the saturated sphagnum clumps occurring next to windthrow pools; normally this animal is restricted to the vicinity of seepage areas at the junction of a slope and bottomland.

Mixed in with this group of lowland animals are species more characteristic of open forests in the uplands. These include bobwhite (*Colinus virginianus*), yellow-throated vireo (*Vireo flavifrons*), ovenbird (*Seiurus aurocapillus*), summer tanager (*Piranga rubra*), eastern chipmunk (*Tamias striatus*), gray fox (*Urocyon cinereoargenteus*), and fence lizard (*Sceloporus undulatus*). The presence of these species, along with the frequency of the hooded warbler (*Wilsonia citrina*), scarlet tanager (*Piranga olivacea*), white-breasted nuthatch (*Sitta carolinensis*), and box turtle (*Terrapene carolina*), additionally attests to the maturity and extensiveness of this tract of forest.

MANAGEMENT AND PROTECTION: The majority of the site is within Duke Forest multiple use lands; within the Rural Buffer zoning district. The portion of the gabbro depression located next to Bald Mountain is more disturbed by forestry practices (including ditching) than is the area traditionally known as "Meadow Flats." This site—especially the Duke Forest portion—deserves complete protection as a natural area; it should be registered with the NC Natural Heritage Program or dedicated as a state nature preserve.

OWNERSHIP: Duke University, Private

REFERENCES:

Whigham, D. F. 1971. An ecological study of *Uvularia perfoliata* in the Blackwood Division of the Duke Forest, North Carolina. PhD. dissertation, UNC Chapel Hill, NC.

Sather, D. and S. Hall. 1988. Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina, Appendix B: Biological Documentation of Sites. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Orange County Natural Areas Inventory

EUBANKS ROAD XERIC HARDPAN FOREST

Updated 2004

Site Number: N03

Size: 4 acres

Site Significance: County

USGS Quad: Chapel Hill

SIGNIFICANT FEATURES: The community type is upland Xeric Hardpan Forest (formerly “Montmorillonite Forest”), an unusual habitat characterized by xeric tree species growing on impervious montmorillonite clay.

NATURAL COMMUNITIES: Xeric Hardpan Forest

GENERAL DESCRIPTION: The forest at this site is an unusual combination of hardwoods, dominated by post oak (*Quercus stellata*) and blackjack oak (*Q. marilandica*). The underlying Enon soil has a high shrink-swell capacity and forms an impervious clay layer. The canopy is stunted and rather open, and contains not only the post and blackjack oak but also white oak (*Quercus alba*), willow oak (*Q. phellos*), mockernut hickory (*Carya tomentosa*), pignut hickory (*C. glabra*), and scattered loblolly pine (*Pinus taeda*). Red cedar (*Juniperus virginiana*) is particularly abundant in the subcanopy, along with sourwood (*Oxydendrum arboreum*), red maple (*Acer rubrum*), and black gum (*Nyssa sylvatica*). The herb layer is extremely sparse, consisting of such trailing vines as cow-itch vine (*Campsis radicans*), Virginia creeper (*Parthenocissus quinquefolius*), and Japanese honeysuckle (*Lonicera japonica*), along with broomstraw (*Andropogon scoparius*). Sphagnum moss is common in small depressions that retain surface water after rain, but the overall dry nature of the site is demonstrated by the presence of reindeer lichen (*Cladonia* sp.).

These types of forests with the stunted, open canopy of post oak and blackjack oak are very uncommon in North Carolina, where they are restricted to the Piedmont, on soils of Enon, Iredell, or similar series. This site in the Blackwood Division of Duke Forest is an excellent example of this type of Xeric Hardpan Forest.

A re-survey of this site by Bruce Sorrie in 2002 failed to find any evidence of this forest type at the mapped location, nor did he find cow-itch vine (*Campsis radicans*), blackjack oak (*Quercus marilandica*), and lichens. The forest of the mapped site consists of third growth oak-hickory forest with abundant red maple, scattered red cedar, scattered loblolly pine, and sourwood. The canopy is about 75 feet tall. A few post oaks and willow oaks were noted. The ground is sloping (no water collects there), with many rocks at the surface. Lowbush blueberry (*Vaccinium pallidum*) and muscadine grape (*Vitis rotundifolia*) were noted as common woody plants.

MANAGEMENT AND PROTECTION: This site is part of Duke Forest multiple use lands within the Rural Buffer zoning district. It should be maintained as a natural area and protected against timbering.

OWNERSHIP: Duke University

REFERENCES:

Sather, D. and S. Hall. 1988. Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina, Appendix B: Biological Documentation of Sites. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Orange County Natural Areas Inventory

BLACKWOOD MOUNTAIN

Updated 2004

Site Number: N04

Size: 135 acres

Site Significance: County

USGS Quad: Chapel Hill

SIGNIFICANT FEATURES: The top of the monadnock and associated ridge is occupied by extensive tracts of mature oak—hickory and chestnut oak forests. The presence of wild turkey (*Meleagris gallopavo*) indicates the potential this area has as a wildlife reservoir, both for game as well as for non-game species of animals. Furthermore, this is one of the most scenic ridgelines in the county and is visible from several major roads, including NC 86, Old NC 86, and I-40.

NATURAL COMMUNITIES: Dry-Mesic Oak—Hickory Forest, Dry Oak—Hickory Forest, Mesic Mixed Hardwood Forest, Piedmont Monadnock Forest

GENERAL DESCRIPTION: The main part of the natural area is centered around a steep monadnock connected to the north and south to ridges somewhat lower in elevation. Collectively these hills provide a continuum of upland forest types, ranging from mixed mesic forest on the slopes above Mountain Creek through dry oak--hickory forest on the lower ridges to mature piedmont monadnock forest on the very summit of Blackwood Mountain. Sourwood (*Oxydendrum arboreum*) is dominant in the understory; red maple (*Acer rubrum*) and dogwood (*Cornus florida*) are frequent. One relatively uncommon species found on the Mountain Creek slopes is chinquapin (*Castanea pumila*). This species along with the chestnut oak (*Quercus prinus*), white oak (*Q. alba*), beech (*Fagus grandifolia*), walnut (*Juglans nigra*), hickories (*Carya alba* and *C. glabra*), and hazel-nut (*Corylus americana*) that abound on the mountain and along Mountain Creek are particularly important producers of wildlife forage (mast).

An important example of the wildlife utilizing this area for its abundance of food is the wild turkey (*Meleagris gallopavo*), a formerly rare species in Orange County that has dramatically increased in numbers recently. Turkeys also serve as an indicator of the extensive nature of the forest. Red-tailed hawk (*Buteo jamaicensis*), red-shouldered hawk (*B. lineatus*), and barred owl (*Strix varia*) are other indicators of the large amount of woodlands still present on Blackwood Mountain and its lower slopes.

By 2001, two residences had been built on the summit ridge, however both were built without much disruption to the forest community. Therefore, the integrity rating of the site remains as it was in 1988.

Also in 2001, a population of Torrey's mountain-mint (*Pycnanthemum torreyi*) was found beside the trail leading to Blackwood Mountain, on Duke Forest land. It is listed as Significantly Rare by the NC Natural Heritage Program.

MANAGEMENT AND PROTECTION: The site is within the Rural Buffer zoning district of Orange County. The large portion owned by Duke University is managed as part of the multiple-use Duke Forest lands; the privately-owned portion is unprotected.

Continued protection of the Duke Forest quadrant of the mountain would preserve the most mature forest habitat. However, protecting this section by itself would not be sufficient to ensure the long-term integrity of the overall natural area. Protecting the parcels splitting the Duke Forest lands would secure the northwest slopes of Blackwood Mountain and ensure a continuous forest cover throughout the site.

OWNERSHIP: Duke University; Private

REFERENCES: Sather, D. and S. Hall. 1988. Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina, Appendix B: Biological Documentation of Sites. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Orange County Natural Areas Inventory

STEEP BOTTOM BRANCH

Site Number: N05
Site Significance: County

Size: 107 acres
USGS Quad: Hillsborough

SIGNIFICANT FEATURES: The deep ravine present on this site contains a relatively undisturbed mixed mesic hardwood forest. Apart from its biological value, it is part of one of the county's oldest farms still occupied by descendants of the original settlers. This farm is the most scenic along Old NC 86, itself one of our most aesthetically pleasing secondary roads.

NATURAL COMMUNITIES: Dry Oak-Hickory Forest, Mesic Mixed Hardwood Forest

GENERAL DESCRIPTION: The branch for which this site is named is one of the headwaters of New Hope Creek and its ravine is one of the deepest in this part of the county. Running east to west, the ravine consequently has an extensive north-facing slope on one side and contains a good example of mixed mesic hardwood forest, dominated by beech (*Fagus grandifolia*), red oak (*Quercus rubra*), white oak (*Q. alba*), and tulip poplar (*Liriodendron tulipifera*). The narrow bottomland along the branch is rich with more than 60 plant species, including walnut (*Juglans nigra*), bitternut hickory (*Carya cordiformis*), and southern sugar maple (*Acer floridanum*). On the opposite side of the ravine, along the southern exposures, the forest changes to a dry oak hickory forest, also in good condition.

Although nearly surrounded by agricultural lands, and despite the long history of cultivation in this area, the forest along Steep Bottom Branch is surprisingly mature, and species diversity is very high for such a small area. The presence of several pairs of breeding Kentucky warblers (*Oporornis formosus*) is another indicator of the relatively good quality and length of the narrow bottomlands. Wild turkey (*Meleagris gallopavo*) and bobcat (*Lynx rufus*) have also been observed by the landowners in the recent past; these species are further indicators of the general wildness of this tract and adjoining forested areas to both the west and the east (see Currie Hill, N06).

MANAGEMENT AND PROTECTION: Triangle Land Conservancy owns a northwest portion of the natural area with conservation easements held by Orange County and the State of NC. Conservation easements on the remaining unprotected portions of the natural area are recommended. This area, with its historic farms along Old NC 86 and its wooded hillsides and ravines, is one of the most scenic in the county and deserves special protection within the Rural Buffer zoning district.

OWNERSHIP: Triangle Land Conservancy; Private

REFERENCES:

Moore, J. H. 1985. Steep Bottom Branch. Field Report to NC Natural Heritage Program.

Sather, D. and S. Hall. 1988. Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina, Appendix B: Biological Documentation of Sites. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Orange County Natural Areas Inventory

CURRIE HILL

Site Number: N06

Size: 95 acres

Site Significance: State

USGS Quad: Hillsborough

SIGNIFICANT FEATURES: The rock formation underlying this site is one of the most unusual in the county, a conical plug of diabase rather than the more usual dike formation in which this rock occurs. Growing on the basic soil weathered from the diabase is the best and largest example within the county of a dry basic oak--hickory forest growing in a hilltop situation. In addition to the unusual vegetation, noteworthy wildlife includes wild turkey (*Meleagris gallopavo*) and perhaps the rare northern hairstreak butterfly (*Fixsenia ontario*). Located within the New Hope Creek corridor, this site has demonstrable significance as an upland wildlife reservoir. Scenically, the site is important as one of the few undeveloped hilltops left in the county that is visible from a major thoroughfare.

NATURAL COMMUNITIES: Basic Oak—Hickory Forest

GENERAL DESCRIPTION: The diabase plug forming this knoll is one of the more geologically interesting sites within the county. While diabase dikes are fairly common structures within and near the Triassic Basin, formed as they were along fault lines that mark the boundary of the basin, and flat sills also are known, especially in Durham County, upwardly protruding knobs of diabase are comparatively rare, at least in our area (Big and Little Roundtops, of Gettysburg fame, are the best-known examples). Mason Farm Oak-Hickory Forest (M10) is the only other large area of diabase rock included in this survey.

The soil weathered from diabase is basic in pH, and together with the topography accounts for the unusual vegetation on this knob. On the lower south-facing slopes is a good stand of southern shagbark hickory (*Carya carolinae-septentrionalis*), a base-loving tree that is highly restricted in occurrence within the county. Even more striking, however, is the thick shrub cover of redbud (*Cercis canadensis*), another basophile, which forms dense thickets on the slopes along with downy arrow-wood (*Viburnum rafinesquianum*). The most interesting of the herbs that grow sparsely beneath the thick shrub layer is the state significantly rare orchid, crested coralroot (*Hexalectris spicata*), another strongly basophilic plant.

In contrast to the dense cover on the slopes, the summit has an open forest cover dominated by xeric oaks and hickories, reflecting the generally poor drainage characteristic of diabase formations. These include post oak (*Quercus stellata*), blackjack oak (*Q. marilandica*), mockernut hickory (*Carya tomentosa*), and pignut hickory (*Carya glabra*). The shrub layer here is almost non-existent, but present are herbaceous species characteristic of dry open forests such as goat's rue (*Tephrosia virginiana*).

Two bird species that deserve special mention are wild turkey (*Meleagris gallopavo*), a regionally rare animal requiring large tracts of undisturbed hardwoods, and the hooded warbler (*Wilsonia citrina*), a characteristic species of dense shrub thickets. Possibly present (one individual was seen but not collected or photographed to confirm its presence) is the northern hairstreak butterfly (*Fixsenia ontario*), a species of dry open oak forests that is

considered rare throughout its range. Additional wildlife are common in the area due to the connection between the hill and the New Hope Creek corridor.

MANAGEMENT AND PROTECTION: Portions of the natural area are protected by conservation easements acquired by the Triangle Land Conservancy, Orange County and the Conservation Trust for NC. Conservation easements or registry with the NC Natural Heritage Program should be negotiated with all owners. This area deserves high protection status as a natural area. It is zoned by Orange County as Rural Buffer zoning district.

OWNERSHIP: Private

REFERENCES: Sather, D. and S. Hall. 1988. Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina, Appendix B: Biological Documentation of Sites. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Orange County Natural Areas Inventory

CAMP PIPSISSEWA

Site Number: N07
Site Significance: County

Size: 13 acres
USGS Quad: Hillsborough

SIGNIFICANT FEATURES: Camp Pipsissewa possesses a stand of relatively undisturbed hardwood forest along New Hope Creek and the documented occurrence of wild turkey (*Meleagris gallopavo*) and other wildlife on the adjacent slopes of Currie Hill (N06) demonstrate the significance this area has as part of the New Hope Creek wildlife corridor system. One noteworthy plant species documented as having occurred in this area is the three-leafed violet (*Viola tripartita*), considered regionally rare.

NATURAL COMMUNITIES: Mesic Mixed Hardwood Forest

GENERAL DESCRIPTION: The former camp's frontage along New Hope Creek and non-developed portions within it preserve good examples of mixed mesic hardwood forest. Dominant tree species include beech (*Fagus grandifolia*), northern red oak (*Quercus rubra*), and tulip poplar (*Liriodendron tulipifera*). Contrasting strikingly with this moist forest are the dry, open woodlands of the adjoining slopes of Currie Hill (N06); the developed trail system running through the camp towards Currie Hill thus provides a good chance to see representatives of two extremes of the vegetation found within the county.

New Hope Creek itself provides another important element to the natural history values of the camp. The water quality of the creek is relatively good, despite some evidence of siltation from nearby agricultural lands; it supports a surprisingly abundant mussel and fish fauna for such a small stream. Fox, raccoon, and deer tracks provide evidence that the creek bottom receives heavy use as a wildlife corridor. Characteristic bottomland birds inhabiting this area include barred owls (*Strix varia*), acadian flycatchers (*Empidonax virescens*), and northern parula (*Parula americana*).

MANAGEMENT AND PROTECTION: The site located within the Rural Buffer zoning district, and it was previously operated as camp; its present status is unknown.

OWNERSHIP: Private

REFERENCES: Sather, D. and S. Hall. 1988. Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina, Appendix B: Biological Documentation of Sites. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Orange County Natural Areas Inventory

NEW HOPE CHURCH ROAD BASIC FOREST

Updated 2004

Site Number: N08

Size: 18 acres

Site Significance: County

USGS Quad: Hillsborough

SIGNIFICANT FEATURES: Several outcrops of basic rock and the surrounding terrain afford habitat for basophilic plant species. A large population of a state rare plant, Bush's sedge (*Carex bushii*), occurs in the powerline just south of New Hope Church Road.

NATURAL COMMUNITIES: Dry Oak-Hickory Forest

GENERAL DESCRIPTION: At the top of the northwest-facing slope along this section of New Hope Church Road, several outcrops of greenstone (a basic rock) were exposed in 1988. Ranging in size up to three meters square, they allowed for sunny openings, which are inhabited by several basophilic and open woodland herb species, including clematis (*Clematis ochroleuca*) and wild indigo (*Baptisia tinctoria*). The forest canopy growing on the Enon soil of this gentle knob is dominated by white oak (*Quercus alba*) and northern red oak (*Q. rubra*), and numerous red cedars (*Juniperus virginiana*) reflect the dry and basic conditions of this site. Red cedar also occurs in the subcanopy along with redbud (*Cercis canadensis*), another basophilic species. As the slope descends towards the northwest and follows the I-40 right-of-way, the forest canopy grades into a mature dry oak--hickory forest, though red cedar is still an important component of the subcanopy.

The 2002 survey revealed that this forest is maturing and the canopy has closed, such that sunny openings are now non-existent. No openings or rocky glades were found. This may result in the loss of some herbs or shrubs that require high levels of sunlight. The only place where such species were found was in the narrow powerline.

MANAGEMENT AND PROTECTION: This site is located within the Rural Buffer zoning district. A northern portion of the site is protected by Orange County as part of the historic Blackwood Farm (future park and preserve). A small southern section was fragmented by the relocation of New Hope Church Road in the early 1990s and, therefore, carved out of the site boundaries. The majority remains undeveloped and in private ownership.

The forested slopes on the east side of the interstate, along with the area of outcrops should be managed as a natural area. Any "green strip" along the interstate should incorporate not only the forests adjacent to the road but also this knob to the east.

OWNERSHIP: Orange County; private

REFERENCES:

Watkins, J. 1974. Pages 96-97 In A. E. Radford, ed. 1976. Vegetation, Habitats, Floras: Natural Areas in the Southeastern United States -- Field Data and Information. Department of Biology, UNC Chapel Hill, NC.

Sather, D. and S. Hall. 1988. Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina, Appendix B: Biological Documentation of Sites. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Orange County Natural Areas Inventory

NEW HOPE CHESTNUT OAK FOREST

Site Number: N09
Site Significance: County

Size: 19 acres
USGS Quad: Hillsborough

SIGNIFICANT FEATURES: This site represents one extreme of the chestnut oak forest found in the county, located on a low, gently sloping knob rather than on more typical steep ridgetops and monadnocks, as found for example on Occoneechee Mountain (E07) and Bald Mountain (N01). This site shares with Occoneechee Mountain and Pickards Mountain (M01) a prominent shrub layer composed of several species of heaths.

NATURAL COMMUNITIES: Piedmont Monadnock Forest

GENERAL DESCRIPTION: This is a fairly low-diversity site dominated by chestnut oak (*Quercus prinus*). Other dry oaks that also appear here include white oak (*Q. alba*), black oak (*Q. velutina*), northern red oak (*Q. rubra*), and blackjack oak (*Q. marilandica*). Virginia pine (*Pinus virginiana*), often associated with dry and acidic soils, is also present, along with other dry site indicator species such as persimmon (*Diospyros virginiana*), red cedar (*Juniperus virginiana*), and the herb goat's rue (*Tephrosia virginiana*). The heath cover in the shrub layer is well developed and composed of huckleberry (*Gaylussacia baccata*) and four blueberry species (*Vaccinium* spp.).

MANAGEMENT AND PROTECTION: This site has no formal protection, but is located within the Rural Buffer zoning district, which provides some additional limitations on future development (e.g., density and lot size).

This site should be preserved as an example of chestnut oak forests with low heath cover occurring on less exposed knobs than is typical for the Piedmont. The landowner should be alerted to the natural values of this property.

OWNERSHIP: Private

REFERENCES:

Anonymous, 1972. Page 88 In A. E. Radford, ed. 1976.

Sather, D. and S. Hall. 1988. Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina, Appendix B: Biological Documentation of Sites. N.C. Natural Heritage Program, DENR, Raleigh, NC.

Orange County Natural Areas Inventory

NEW HOPE CREEK FLOODPLAIN MACROSITE

New Site 2004

Site Number: Macrosite #6

Size: 2,038 acres in Orange County
[3,987 ac. in Durham Co.]

Site Significance: State

USGS Quads: Chapel Hill, SW Durham

The New Hope Creek Floodplain Macrosite is the largest contiguous forestland in the Triangle region and contains some of the oldest timber in the North Carolina piedmont. Within these forests there is a wide diversity of upland and bottomland habitats, with correspondingly high numbers of plant and animal species, including many breeding neotropical migrant birds. It provides an important link between the Mud Creek/Couch Mountain and Jordan Lake macrosites. The area is widely used for recreation, while also supporting extensive scientific research on wildlife and forestry. The Orange County portion of the macrosite includes two standard sites: Henry J. Oosting Natural Area (N10) and New Hope Creek Slopes (N11), nearly all of which occurs within the Korstian Division of Duke Forest. Seven additional standard sites are included within the Durham County portion.

The New Hope Creek Floodplain Macrosite is of state significance. Most natural communities here not only cover large areas and feature mature forests, but also have high ecological integrity and are fine examples of their kind. Within Orange County, the macrosite includes cool north-facing rhododendron bluffs, mesic hardwood forests, dry south-facing rocky bluffs, alluvial forests, springs, dry oak-hickory forests, and five miles of uninterrupted stream. Downstream in Durham County the aspect changes as New Hope Creek enters the Triassic Basin; here the creek spreads out laterally to form a broad floodplain which supports extensive bottomland forests, levee forests, floodplain pools, marshes, and beaver ponds.

While habitat diversity contributes most to the ecological significance of this macrosite, several state-rare plants and animals have been recorded. They include the four-toed salamander (*Hemidactylium scutatum*), Lewis's heartleaf (*Hexastylis lewisii*), Bush's sedge (*Carex bushii*), and sweet pinesap (*Monotropsis odorata*). A fourth plant species, creamy tick-trefoil (*Desmodium ochroleucum*, a Federal Species of Concern), was collected here in 1960 but not found since. A fifth, Indian physic (*Porteranthus [Gillenia] stipulatus*), has not been found here since 1957.

Of further interest is the juxtaposition of piedmont/montane species with those of the coastal plain. For instance, the Catawba rhododendrons (*Rhododendron catawbiense*) and galax (*Galax urceolata*) grow on rocky bluffs above a section of creek where dwarf waterdogs (*Necturus punctatus*) occur.

Orange County Natural Areas Inventory

HENRY J. OOSTING NATURAL AREA

Updated 2004

Site Number: N10

Size: 206 acres

Site Significance: Regional

USGS Quad: Chapel Hill

SIGNIFICANT FEATURES: This site preserves an excellent forest of mature mixed mesic hardwoods with outstanding spring floral displays. One state-listed herbaceous species of significantly rare status has been reported to occur along the rich bottom, the Lewis' heartleaf (*Hexastylis lewisii*). A second rare plant species, Bush's sedge (*Carex bushii*), occurs in the powerline. A third species, creamy tick-trefoil (*Desmodium ochroleucum*), a federal species of concern, was collected here in 1960 but not found since.

Several springs exist at the base of a north-facing slope, providing habitat for the state-listed four-toed salamander (*Hemidactylium scutatum*) and for the gray petaltail (*Tachopteryx thoreyi*), a regionally rare dragonfly. Past breeding records also exist for the worm-eating warbler (*Helmitheros vermivorus*) and broad-winged hawk (*Buteo platypterus*), two birds that rarely nest within this part of the Piedmont.

Aesthetically, this is one of the most pleasing forest areas of its size in the county. The large beeches (*Fagus grandifolia*) and other mesic hardwoods lend it a cathedral-like atmosphere.

NATURAL COMMUNITIES: Mesic Mixed Hardwood Forest, Low Elevation Seep, Floodplain Pool

GENERAL DESCRIPTION: The natural area as defined by this inventory encompasses the bottomland and adjacent slopes along Old Field Creek, from where it crosses NC 86 down to its confluence with New Hope Creek; it thus includes both a portion of the traditionally designated Oosting Natural Area as well as private lands downstream. In addition to these bottomlands, the authors include the southward running ravines located in the center of the Duke portion and along its eastern edge. Also included is the powerline just to the north of Old Field Creek.

The forest within the Duke property is particularly mature, having been protected as a natural preserve for the past 65 years and held exempt even from forestry manipulations. While the private lands downstream have not had such protection and are currently in various states of recovery, the bottomlands they contain are the site of one of the largest populations in the county of four-toed salamanders (*Hemidactylium scutatum*), a state-listed species primarily of the piedmont and low mountains, as well as a breeding location for the gray petaltail (*Tachopteryx thoreyi*).

By 2001, however, the site had experienced at least two hurricanes. As a result, abundant tree-falls, tip-ups, dense saplings, and brambles make navigating through some of the upland (southern) portion of the site difficult. The bottomland forest was much less affected by windthrow. Otherwise, the ecological integrity of the site remains high.

The flat bottomland and adjoining slopes at the upstream end of the natural area are forested with excellent specimens of mesic hardwood trees, most notably beech (*Fagus grandifolia*), sycamore (*Platanus occidentalis*), tulip poplar (*Liriodendron tulipifera*), northern red oak (*Quercus rubra*), and white ash (*Fraxinus americana*). The presence of bitternut hickory (*Carya cordiformis*) is an additional indicator of the richness of these lower slopes and bottoms, as is the subcanopy and shrub layer composed of mulberry (*Morus rubra*), spicebush (*Lindera benzoin*), and painted buckeye (*Aesculus sylvatica*). The diversity of spring-blooming herbs is also extremely high and of great aesthetic value. Solid carpets of trout lily (*Erythronium americanum*), wind flower (*Thalictrum thalictroides*), spring beauty (*Claytonia virginica*), toothwort (*Cardamine angustata*), and hepatica (*Hepatica americana*) are but a few of the wildflowers on display in March and April.

The powerline north of Old Field Creek traverses undulating land and its dry to saturated soils support a relatively wide variety of native and alien grasses, sedges, herbs, shrubs, and tree saplings. In 2001 a large population of the state rare Bush's sedge was rediscovered, last seen in NC in 1960.

Equally as rich is the birdlife of this site; during the course of a nine-year breeding bird census (1980s), 21 to 23 species were regularly included in the count. Twenty-one species were recorded while botanizing the property on 2 July 2001. The most significant species recorded in the 1980s survey were the worm-eating warbler (*Helmitheros vermivorus*) and the broad-winged hawk (*Buteo platypterus*), both mountain species that only rarely nest in this part of the Piedmont. Other species indicative of the quality of this site include the red-shouldered hawk (*Buteo lineatus*), hooded warbler (*Wilsonia citrina*), Kentucky warbler (*Oporornis formosus*), ovenbird (*Seiurus aurocapillus*), scarlet tanager (*Piranga olivacea*), and hairy woodpecker (*Picoides villosus*), all typical of mature and extensive hardwood forests.

Several large springs [Low Elevation Seep natural community] occur along the base of the slope bordering the south side of the bottomlands; others are located up the ravine in the center of the Duke Forest tract. These sites are of particular importance since they provide habitat for two state-listed animals. One spring located on the private lands downstream from Duke Forest had at least a dozen nests of the four-toed salamander (*Hemidactylium scutatum*) during the 1988 breeding season. Other nests were found in seepage areas along the ravine on the eastern margin of the preserve where the gray petaltail (*Tachopteryx thoreyi*) had been seen during the previous summer. An extensive oxbow pool [Floodplain Pool natural community], also located on the private portion of the natural area, provides breeding habitat for other amphibians such as the spotted salamander (*Ambystoma maculatum*), marbled salamander (*A. opacum*), and several species of frogs.

MANAGEMENT AND PROTECTION: This site is located within the Rural Buffer zoning district, which provides some additional limitations on future development (density and lot size). The Duke Forest portion is not registered with NC Natural Heritage Program so the future protection status is uncertain. A portion of the riparian corridor downstream of the Duke portion is protected by the Triangle Land Conservancy as part of its Johnston Mill Preserve. Continued protection of the Duke Forest tract as an unmanipulated preserve is recommended, and it should be registered as a state natural area with the NC Natural Heritage Program.

OWNERSHIP: Duke University, Triangle Land Conservancy, Private

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Orange County Natural Areas Inventory

NEW HOPE CREEK SLOPES

Site Number: N11
Site Significance: State

Size: 475 acres
USGS Quads: Chapel Hill
Hillsborough

SIGNIFICANT FEATURES: This large site hosts many significant areas described below. This 2004 update to the Orange County inventory combines six contiguous sites that had been listed separately in the original 1988 inventory. This area is one of the most important study sites for both forestry and biology within the southeastern United States.

Gate 24 Purse Web Spider Ravine – A large spring containing the gray petaltail (*Tachopteryx thoreyi*), a regionally rare dragonfly (removed from state list in 2002), is located within this upland portion of the Korstian Division of Duke Forest. Also noteworthy is a population of the purse-web spider (*Sphodros* sp.), an ancient animal that inhabits undisturbed hardwoods along upland bottoms but which is rare within Orange County.

Wooden Bridge Bluff – This is the richest forest slope along New Hope Creek. Recorded among the abundant herbaceous species is Indian physic (*Porteranthus [Gillenia] stipulatus*), a state-listed species considered significantly rare due to its presence in only a few dozen places in North Carolina.

Duke Forest Rhododendron Bluffs – This is one of only two rhododendron slopes located along New Hope Creek (one of only nine in Orange County), and the only one given some protection as part of Duke Forest. Catawba rhododendron (*Rhododendron catawbiense*) is disjunct from the mountains and occurs in the Piedmont only along the coolest slopes and steepest bluffs (all north facing). This species offers a striking floral display in late spring, due to its large, purplish blossoms. The two rhododendron slopes along New Hope Creek are the most accessible within Orange County and receive heavy visitation, especially during the blooming period.

Hollow Rock Rhododendron Bluffs – This site is unusual both geologically and botanically. The outcrop of sandstone forming the bluff along the south side of New Hope Creek along this stretch is the largest in the county. The rhododendron community is highly restricted within the area (one of only nine within the county), and this one is particularly unusual due to its occurrence on sandstone rather than on the metamorphic rocks more typical for this community. The regionally rare galax (*Galax aphylla*) also occurs here.

The scenic value of this site is also quite important. The catawba rhododendron (*Rhododendron catawbiense*) offers a striking floral display in late spring, due to its large, purplish blossoms and this site, along with the rhododendron slope upstream, is the most accessible within Orange County due to the Duke Forest trail located just across the creek.

Alluvial Forest – The river bottoms along the entire length of the Korstian Division of Duke Forest are in superb condition and receive heavy recreational use by the citizens of both Orange and Durham counties. Along with the riparian corridor within the Eno River State

Park, this is the best unbroken strip of riparian woodland in the county. Two rare species are present: gray petaltail (*Tachopteryx thoreyi*), a regionally rare dragonfly, and sweet pinesap (*Monotropsis odorata*), which is listed as significantly rare within the state.

Piney Mountain – This steep, south-facing bluff has a unique forest canopy, dominated by a variety of dry oaks and hickories. Two regionally rare species of lipfern (*Cheilanthes lanosa* and *C. tomentosa*) occur here.

NATURAL COMMUNITIES: Mesic Mixed Hardwood Forest, Piedmont Acidic Cliff, Piedmont Heath Bluff, Dry Oak—Hickory Forest, Dry-Mesic Oak—Hickory Forest, Piedmont Alluvial Forest, Piedmont Bottomland Forest, Low Elevation Seep

GENERAL DESCRIPTION: Six distinct portions of the site are described below.

Gate 24 Purse Web Spider Ravine

This site is located within a large upland section of the Korstian Division of Duke Forest, along the first permanent stream that crosses under the Wooden Bridge Foot-trail. Although the bottomlands along New Hope Creek receive the most attention by the public and conservationists, upland hardwood tracts such as this also deserve some degree of protection, as is indicated here by the presence of the gray petaltail [dragonfly] and rare purse-web spiders. Also indicative of the quality of this forest is its bird fauna, characterized by such species as ovenbird (*Seiurus aurocapillus*), hooded warbler (*Wilsonia citrina*), and scarlet tanager (*Piranga olivacea*), all typical of mature and extensive tracts of hardwoods.

Wooden Bridge Bluff (Updated 2004)

An intrusion of basic rock at this slope along New Hope Creek provides a nutrient-rich substrate. The resulting forest is quite diverse, dominated by northern red oak (*Quercus rubra*), black oak (*Q. velutina*), beech (*Fagus grandifolia*), tulip poplar (*Liriodendron tulipifera*), and shagbark hickory (*Carya ovata*). Redbud (*Cercis canadensis*), hop hornbeam (*Ostrya virginiana*), slippery elm (*Ulmus rubra*), dogwood (*Cornus florida*), blackgum (*Nyssa sylvatica*), painted buckeye (*Aesculus sylvatica*), and ironwood (*Carpinus caroliniana*) are common in the understory. Other woody species that indicate the site's richness include spicebush (*Lindera benzoin*) and bladdernut (*Staphylea trifolia*). On the drier slopes above the bluff, southern shagbark hickory (*Carya carolinae-sententrionalis*), another base-loving species, is common.

The herb layer on the lower slopes is particularly rich. Catesby's trillium (*Trillium catesbaei*), hepatica (*Hepatica americana*), foamflower (*Tiarella cordifolia*), trout lily (*Erythronium americanum*), crested dwarf iris (*Iris cristata*), devil's bit (*Chamaelirium luteum*), alumroot (*Heuchera americana*), and loosestrife (*Lysimachia tonsa*) are all found here. Indian physic (*Porteranthus [Gillenia] stipulatus*), a plant species state listed as significantly rare, was recorded from here in 1957 but not seen in 1988 nor 2002. Other species uncommon or rare in the county include toothed skullcap (*Scutellaria serrata*) and lily-leaved twayblade orchid (*Liparis lilifolia*), both documented in 2002.

Aesthetically, this is one of the premier areas along this portion of New Hope Creek that is very popular as a recreation site with the public. The area is visible from Wooden Bridge, and rises steeply more than 100 feet above the well-traveled floodplain trail.

The animal species here are mainly the ones associated with the riparian forest along the creek. For a description of this community, see the Alluvial Forest description below.

Duke Forest Rhododendron Bluffs

Because of the ease of access from the Duke Forest trail system, this is the most heavily visited of all the rhododendron bluffs in Orange County. As such, portions of it are disturbed by heavily eroded trails. This gentle bluff overlooking New Hope Creek is covered thickly with rhododendrons (*Rhododendron catawbiense*). The forest emergent above these shrubs is dominated by beech (*Fagus grandifolia*), white oak (*Quercus alba*), and black oak (*Quercus velutina*), with occasional northern red oak (*Q. rubra*), shortleaf pine (*Pinus echinata*), pignut hickory (*Carya glabra*), and red maple (*Acer rubrum*). Subcanopy species include sourwood (*Oxydendrum arboreum*), witch hazel (*Hamamelis virginiana*), serviceberry (*Amelanchier arborea*), hop hornbeam (*Ostrya virginiana*), mountain laurel (*Kalmia latifolia*), styrax (*Styrax grandifolia*), and blackgum (*Nyssa sylvatica*). Herbs are rather sparse, and include pipsissewa (*Chimaphila umbellata*), beech drops (*Epifagus virginiana*), wild ginger (*Hexastylis arifolia*), trailing arbutus (*Epigaea repens*), and bluets (*Houstonia caerulea*).

One animal that occurs at this site, the sumo mite (*Allothrombium* sp.), is nearly as characteristic of this community as are the rhododendrons themselves. While its distribution statewide remains to be ascertained, in the eastern Piedmont at least, its populations are all widely separated and confined to cool, north-facing bluffs (in addition to rhododendron slopes, it also occurs in similar mountain laurel communities). The huge numbers of these large, bright red mites that appear every other year provide one of the more spectacular sights along this section of the creek.

Also recorded for this site is the regionally rare southeastern five-lined skink (*Eumeces inexpectatus*), but this species was not confirmed during this inventory and its status must be viewed as uncertain, especially as this would not be considered prime habitat for this animal. Two noteworthy species that were seen during the inventory are the red salamander (*Pseudotriton ruber*), a rarely observed species that breeds in springs but forages in cool, moist forests such as the one present here, and cedar waxwings (*Bombycilla cedrorum*), a species that rarely breeds in the Piedmont but which was seen nesting along the creek just below the rhododendron bluff. Additional species seen along the creek are listed in the Alluvial Forest description below.

Hollow Rock Rhododendron Bluffs

This is one of several sites in the Triangle where large creeks have carved out steep bluffs as they drop down from the hilly, crystalline formations of the Piedmont into the flatter, softer sediments of the Triassic Basin. Other well-known examples include the King's Mill Rhododendron Slope (within M08) and the White Pines Bluff in Chatham County. These areas often retain communities of montane and northern species along their steep, north-facing slopes, relicts of the cooler conditions that predominated in this area during the Ice Age. This site is no exception but differs somewhat from the rest in that the creek has carved more deeply than usual, all the way down into the sandstone of the Triassic Basin itself. The low sandstone outcrop, 20 to 30 feet high, runs several hundred yards in length and is deeply undercut in places, forming deep recesses (thus the name Hollow Rock). Even without the

unusual biological community, this site would be one of the most interesting and scenic within the county.

The rhododendron community, of course, further enhances the value of this site. Running along the north facing side of the creek, the rhododendron slope has a forest canopy composed mostly of beech (*Fagus grandifolia*), white oak (*Quercus alba*), and northern red oak (*Q. rubra*). Other woody species include mountain holly (*Ilex montana*), sourwood (*Oxydendrum arboreum*), witch hazel (*Hamamelis virginiana*), red maple (*Acer rubrum*), blackgum (*Nyssa sylvatica*), and maple-leaved viburnum (*Viburnum acerifolium*). Many individuals of galax (*Galax aphylla*) are found in the herb layer, along with partridge berry (*Mitchella repens*), beech drops (*Epifagus virginiana*), ebony spleenwort (*Asplenium asplenioides*), and false solomon seal (*Smilacina racemosa*).

Although we recorded no animal species associated with the rhododendrons themselves, this section of New Hope Creek is noteworthy for its possession of dwarf waterdogs (*Necturus punctatus*). This species is characteristically found in the streams of the coastal plain and reaches the upper limit of its range in the broad lowlands of the Triassic Basin; this site, in fact, may be the very westernmost occurrence of this species in North Carolina. Other species found along the riparian strip are included in the site report for the New Hope Alluvial Forest portion of this site.

Although outside the boundaries of Duke Forest, this bluff is located directly opposite a heavily used trail within the Forest and offers one of the best viewing points for the rhododendron blooms during the spring. This view is somewhat compromised, however, by the presence of several private homes located on top of the bluff and by English ivy and other non-native plants trailing into the natural community at one point. One last, if dubious, value this site offers is that it provides one of the best examples of habitat degradation that can occur due-to the invasion of exotic species when a sufficient buffer area is not provided.

Alluvial Forest

The riparian area within the Korstian Division extends approximately five miles, comparable in length to the strip included within the Cate's Ford area of the Eno River State Park. The natural community types within this corridor range from Piedmont Alluvial Forest along the narrowest sections upstream to Piedmont Bottomland Forest within the broad lowland area in the vicinity of the former Hollow Rock Store. The forest at Hollow Rock is particularly significant in that it is growing on the last wide expanse of Congaree soil still uncultivated within the county. Here and elsewhere within the riparian zone are numerous large tree specimens, reflecting the presence of rich alluvial soils and a fairly long history of protection. Along the lower slopes, the forest grades into mixed mesic hardwood and oak-hickory forests, providing a great diversity of community types within the Korstian Division overall.

Following from the diversity of plant communities and the great extent of this protected forest, wildlife abounds here, as recorded over a period of 40 years of Duke University zoological studies. The authors' discovery of the gray petaltail (*Tachopteryx thoreyi*) in 1988 added a regionally rare species to this long list of animals, as well as a breeding bird count of 30 species. Characteristic animals of the extensive tracts of bottomland forest are the red-shouldered hawk (*Buteo lineatus*), green heron (*Butorides striatus*), Kentucky warbler

(*Oporornis formosus*), hooded warbler (*Wilsonia citrina*), northern parula (*Parula americana*), yellow-throated warbler (*Dendroica dominica*), Louisiana waterthrush (*Seiurus motacilla*), beaver (*Castor canadensis*), queen snake (*Regina septemvittata*), and pickerel frog (*Rana palustris*). Several species that are more typical of the Coastal Plain than the Piedmont and reach their western limits at this edge of the Triassic Basin include the yellow-bellied turtle (*Chrysemys scripta scripta*), dwarf waterdog (*Necturus punctatus*), and snail bullhead (*Ictalurus brunneus*). Still other species, such as the eastern chipmunk (*Tamias striatus*), hairy woodpecker (*Picoides villosus*), ovenbird (*Seiurus aurocapillus*), and the regionally rare cedar waxwing (*Bombycilla cedrorum*) add an important upland element to the fauna.

The great charm this valley has for the public lies not only in the diversity of plant and animal communities present here so close to major population centers but also in its impressive mountain-like atmosphere. Wooded cliffs and bluffs rise up over 100 feet from the river bottom, and at various points rock outcrops jut out over riffles or deep, still pools. The extensive trail system along the creek and within the adjoining sections of the Korstian Division forests are visited by thousands of outdoor recreationists annually.

Piney Mountain

This steep, south-facing bluff is the driest site along New Hope Creek. The bluff rises at more than a 45-degree angle for approximately 150 feet. The vegetation is sparsely scattered due to the extremely dry conditions, and rock is exposed over the majority of the bluff face. The stunted canopy is dominated by a large variety of dry oaks and hickories, including post oak (*Quercus stellata*), blackjack oak (*Q. marilandica*), southern red oak (*Q. falcata*), white oak (*Q. alba*), and black oak (*Q. velutina*). Other xeric canopy species include mockernut hickory (*Carya tomentosa*), pignut hickory (*C. glabra*), red cedar (*Juniperus virginiana*), shortleaf pine (*Pinus echinata*), and loblolly pine (*P. taeda*). Hop hornbeam (*Ostrya virginiana*), redbud (*Cercis canadensis*), blackgum (*Nyssa sylvatica*), sourwood (*Oxydendrum arboreum*), and sassafras (*Sassafras albidum*) comprise the thin subcanopy. The herb layer is sparse and is composed of extremely dry species such as resurrection fern (*Polypodium polypodioides*), hairy lipfern (*Cheilanthes lanosa*), woolly lipfern (*Cheilanthes tomentosa*), wild oregano (*Cunila organoides*), hawkweed (*Hieraceum venosum*), goat's rue (*Tephrosia virginiana*), beggar's tick (*Coreopsis* sp.) and stonecrop (*Sedum ternatum*).

MANAGEMENT AND PROTECTION: The site is located within the Rural Buffer zoning district. The portions of the site within Duke Forest are managed as multiple use lands; the other privately owned lands are unprotected.

Continued management of the Duke Forest sections as hardwoods is recommended, and the university should avoid cutting especially in the vicinity of the spring located just downhill from the Wooden Bridge Trail. The forested slope near the wooden bridge (Duke Forest) appears to have been less affected by the hurricanes of the 1990s than other natural areas in Orange County; there are relatively fewer downed trees. Trails should be carefully monitored, and maintained and re-routed, in order to control erosion and trampling. This area should be given a continued high level of protection for its natural values, and should be registered as a natural area with the NC Natural Heritage Program or dedicated as a state nature preserve.

Private landowners should be alerted to the significance of the natural values of their property and the opportunities for protection through conservation easements. Further plantings of exotics should be avoided adjacent to the natural community, and the existing ivy intrusions should be removed.

OWNERSHIP: Duke University; Private

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Orange County Natural Areas Inventory

MUD CREEK/COUCH MOUNTAIN MACROSITE

New Site 2004

Site Number: Macrosite #7

Size: 528 acres in Orange County
[1,301 ac. in Durham Co.]

Site Significance: Regional

USGS Quads: Chapel Hill, Hillsborough
NW Durham, SW Durham

The Mud Creek/Couch Mountain Macrosite protects critical land in the watershed divide between the Cape Fear and Neuse River Basins. It provides an important, although tenuous, link between the Durham Division of Duke Forest and the New Hope Creek Floodplain Macrosite. The Orange County portion of the macrosite includes one standard site: Couch Mountain (N12); additional standard sites are included within the Durham County portion.

The Mud Creek/Couch Mountain Macrosite is of Regional level significance. Its importance would be greater if stream connections to New Hope Creek, on both sides of the county line, were protected as wildlife corridors. Couch Mountain supports an extensive forest of mature hardwoods, primarily oaks and hickories. Many white oaks (*Quercus alba*) exceed two feet in diameter and some are over 300 years old. Notable is the presence of southern shagbark hickory (*Carya carolinae-septentrionalis*), normally only found in basic soil derived from diabase rock. A state-rare forest orchid, crested coralroot (*Hexaletris spicata*), was documented in 1935 and is still likely to occur here.

The Orange County portion of the macrosite features a high, forested hill that gives rise to several creeks. The Durham County portion features Upland Depression Swamp Forest, mature hardwoods, Basic Oak-Hickory Forest on diabase, mesic ravines, and a cypress swamp (originally created by damming and planting, but now augmented by beaver marshes). Overall, the macrosite provides breeding habitat for a number of neotropical migrant birds, the state-rare four-toed salamander (*Hemidactylium scutatum*), many other herps, and the state-rare Lewis's heartleaf (*Hexastylis lewisii*).

Orange County Natural Areas Inventory

COUCH MOUNTAIN

Site Number: N12
Site Significance: Regional

Size: 132 acres
USGS Quads: Hillsborough,
NW Durham

SIGNIFICANT FEATURES: This large hill located on the edge of the Triassic Basin has one of the oldest stands of upland hardwoods in the county; the canopy contains many individual white oaks (*Quercus alba*) that are over two feet in diameter and some of which exceed 300 years in age. This forest is also unusual in composition: sweet pignut hickory (*Carya ovalis*) is the dominant hickory on the summit, while southern shagbark hickory (*C. carolinae-septentrionalis*), a species indicating a basic soil type (perhaps due to an unmapped diabase dike) is frequent along the slopes.

NATURAL COMMUNITIES: Dry-Mesic Oak—Hickory Forest

GENERAL DESCRIPTION: This wooded hilltop has one of the least disturbed examples of the upland white oak forest remaining in the county and is typical of what existed throughout our area prior to the arrival of European colonists. Species in the canopy include white oak (*Quercus alba*), northern red oak (*Q. rubra*), black oak (*Q. velutina*), and mockernut hickory (*Carya tomentosa*). Sweet pignut hickory (*C. ovalis*), scattered through the forest but especially abundant on the summit, replaces the more usual pignut hickory (*C. glabra*). The subcanopy and shrub layer are also typical of upland hardwood forests, and include black gum (*Nyssa sylvatica*), sourwood (*Oxydendrum arboreum*), dogwood (*Cornus florida*), downy arrowwood (*Viburnum rafinesquianum*), and muscadine grape (*Vitis rotundifolia*).

One unusual feature of this forest is the frequent occurrence of southern shagbark hickory (*C. carolinae-septentrionalis*), particularly on the southern slope and on a saddle just below the peak. The density of the viburnum thickets, along with the presence of the shagbarks, is often a good indication that the soil is fairly basic in pH. Since this ridge is located right next to the Triassic Basin, the presence of an unmapped diabase intrusion is fairly likely.

Like most of the plant species, the animals are fairly typical of upland hardwoods. The presence of the pileated woodpecker (*Dryocopus pileatus*) and white-breasted nuthatch (*Sitta carolinensis*), both species which prefer large tracts of mature hardwood forests, is a further indication of the quality of the forest, while the sighting of several hooded warblers (*Wilsonia citrina*) reflects the density of the shrub thickets.

MANAGEMENT AND PROTECTION: Most of the site is managed as Duke Forest multiple use lands within the Rural Buffer zoning district. This site should be registered as a natural area with the NC Natural Heritage Program, and maintained in its natural condition.

OWNERSHIP: Duke University; Private

REFERENCES:

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APPENDICES

*Inventory of Significant Natural Areas and Wildlife Habitats
Orange County, NC*

Animal Species Indicative of Special Habitats in Orange County

I. Species restricted to the Triassic Basin:

Setophaga ruticilla	American Redstart
Protonotaria citrea	Prothonotary Warbler
Limnothlypis swainsonii	Swainson's Warbler
Sylvilagus palustris	Marsh Rabbit
Trachemys scripta	Yellowbelly Slider
Anolis carolinensis	Green Anole
Elaphe guttata	Corn Snake
Nerodia erythrogaster	Redbelly Water Snake
Necturus punctatus	Dwarf Waterdog
Amia calva	Bowfin
Ameiurus brunneus	Snail Bullhead
Acantharchus pomotis	Mud Sunfish
Centrarchus macropterus	Flier
Enneacanthus gloriosus	Bluespotted Sunfish
Enneacanthus obesus	Banded Sunfish
Etheostoma fusiforme	Swamp Darter
Etheostoma serrifer	Sawcheek Darter

II. Species typical of montane habitats:

Bombycilla cedrorum	Cedar Waxwing
Helmitheros vermivorus	Worm-eating Warbler
Plethodon cinereus	Northern Redback Salamander
Callophrys augustinus	Brown Elfin
Erynnis brizo	Sleepy Duskywing
Amblyscirtes hegon	Pepper and Salt Skipper
Allothrombium sp.	Sumo Mite
Mesomphix sp.	land snail

III. Species dwelling in the interior of hardwood forests:

Coccyzus americanus	Yellow-billed Cuckoo
Caprimulgus vociferus	Whip-poor-will
Mniotilta varia	Black-and-white Warbler
Seiurus aurocapillus	Ovenbird
Oporornis formosus	Kentucky Warbler
Wilsonia citrina	Hooded Warbler
Piranga olivacea	Scarlet Tanager
Terrapene carolina	Eastern Box Turtle
Sphodros spp.	Purse-web Spiders

Animal Species Indicative of Special Habitats in Orange County

IV. Species characteristic of bottomlands and riparian forests:

Aix sponsa	Wood Duck
Buteo lineatus	Red-shouldered Hawk
Strix varia	Barred Owl
Scolopax minor	American Woodcock
Ceryle alcyon	Belted Kingfisher
Empidonax virescens	Acadian Flycatcher
Parula americans	Northern Parula
Dendroica dominica	Yellow-throated Warbler
Seiurus motacilla	Louisiana Waterthrush
Sorex longirostris	Southeastern Shrew
Mustela vison	American Mink
Lutra canadensis	Northern River Otter
Ambystoma maculatum	Spotted Salamander
Eurytides marcellus	Zebra Swallowtail
Asterocampa celtis	Hackberry Emperor [butterfly]
Asterocampa clyton	Tawny Emperor [butterfly]
Ummidia audouini	Trap-door Spider
Ummidia carabivorous	Trap-door Spider
Myrmekiaphila fluviatilis	Trap-door Spider

V. Species inhabiting springs and seeps:

Pseudotriton montanus	Eastern Mud Salamander
Pseudotriton ruber	Red Salamander
Hemidactylium scutatum	Four-toed Salamander
Tachopteryx thoreyi	Gray Petaltail [dragonfly]

VI. Species requiring large tracts of undeveloped lands:

Buteo platypterus	Broad-winged hawk
Buteo jamaicensis	Red-tailed Hawk
Accipiter cooperii	Coopers Hawk
Accipiter striatus	Sharp-shinned Hawk
Meleagris gallopavo	Wild Turkey
Strix varia	Barred Owl
Picoides villosus	Hairy Woodpecker
Dryocopus pileatus	Pileated Woodpecker
Sitta carolinensis	White-breasted Nuthatch
Urocyon cinereoargenteus	Common Gray Fox
Mustela frenata	Long-tailed Weasel
Mustela vison	American Mink
Lutra canadensis	Northern River Otter
Lynx rufus	Bobcat
Crotalus horridus	Timber Rattlesnake

Status of Rare Plants in Orange County¹

Common Name	Scientific Name	Federal Status	State Status	Last Observed ²
Vascular Plants				
Southern Anemone	<i>Anemone berlandieri</i>		Significantly Rare	Current
Bradley's Spleenwort	<i>Asplenium bradleyi</i>		Significantly Rare	Current
Prairie Blue Wild Indigo	<i>Baptisia minor</i>		Threatened	Obscure
American Barberry	<i>Berberis canadensis</i>		Significantly Rare	Historic
American Bluehearts	<i>Buchnera americana</i>		Significantly Rare	Historic
Douglass's Bittercress	<i>Cardamine douglassii</i>		Significantly Rare	Obscure
Bush's Sedge	<i>Carex bushii</i>		Significantly Rare	Current
Wood's Sedge	<i>Carex woodii</i>		Significantly Rare	Historic
Piedmont Horsebalm	<i>Collinsonia tuberosa</i>		Significantly Rare	Historic
Creamy Tick-trefoil	<i>Desmodium ochroleucum</i>	Species of Concern	Significantly Rare	Historic
a witch grass	<i>Dichanthium annulum</i>		Significantly Rare	Historic
Eastern Shooting Star	<i>Dodecatheon meadia var meadia</i>		Significantly Rare	Historic
Smooth Coneflower	<i>Echinacea laevigata</i>	Endangered	Endangered	Historic
Eastern Isopyrum	<i>Enemion biternatum</i>		Significantly Rare	Historic
Godfrey's Thoroughwort	<i>Eupatorium godfreyanum</i>		Significantly Rare	Historic
Large Witch-alder	<i>Fothergilla major</i>		Significantly Rare	Current
Heller's Rabbit Tobacco	<i>Gnaphalium helleri var helleri</i>		Significantly Rare	Historic
Crested Coralroot	<i>Hexalectris spicata</i>		Significantly Rare	Current
Lewis's Heartleaf	<i>Hexastylis lewisii</i>		Significantly Rare	Current
Small Whorled Pogonia	<i>Isotria medeoloides</i>	Threatened	Endangered	Historic
Earle's Blazing Star	<i>Liatris squarrulosa</i>		Significantly Rare	Historic
Glade Milkvine	<i>Matelea decipiens</i>		Significantly Rare	Historic
Sweet Pinesap	<i>Monotropsis odorata</i>	Species of Concern	Significantly Rare	Current
Wiry Panic Grass	<i>Panicum flexile</i>		Significantly Rare	Historic
Glade Wilde Quinine	<i>Parthenium auriculatum</i>		Significantly Rare	Historic
Purple Fringeless Orchid	<i>Platanthera peramoena</i>		Significantly Rare	Current
Indian Physic	<i>Porteranthus stipulatus</i>		Significantly Rare	Historic
Torrey's Mountain-mint	<i>Pycnanthemum torrei</i>	Species of Concern	Significantly Rare	Current
Water-plantain Spearwort	<i>Ranunculus ambigens</i>		Significantly Rare	Historic
Michaux's Sumac	<i>Rhus michauxii</i>	Endangered	Endangered	Historic
Pursh's Wild-petunia	<i>Reullia purshiana</i>		Significantly Rare	Historic
Southern Skullcap	<i>Scutellaria australis</i>		Significantly Rare	Historic
Shale-barren Skullcap	<i>Scutellaria leonardii</i>		Significantly Rare	Current
Appalachian Golden-banner	<i>Thermopsis mollis sensu stricto</i>		Significantly Rare	Historic
Glade Bluecurls	<i>Trichostema brachiatum</i>		Significantly Rare	Historic
Nonvascular Plants				
Closter's Brook-hyponum	<i>Hygrohypnum closteri</i>		Significantly Rare	Historic

¹ List compiled from NC Natural Heritage Program database in November 2004. For current listings, consult the "Heritage Data" on the NC Natural Heritage Program web site at <http://www.ncnhp.org/>

² "Historic" species were last observed more than 20 years ago; "Current" species have been spotted within the past 20 years; and "obscure" indicates the date the species was last observed is uncertain.

Status of Rare Animals in Orange County¹

Common Name	Scientific Name	Federal Status	State Status	Last Observed ²
Vertebrates				
Fishes				
Roanoke Bass	<i>Ambloplites cavifrons</i>		Significantly Rare	Current
Carolina Darter	<i>Etheostoma collis pop</i>	Species of Concern	Special Concern	Historic
Pinewoods Shiner	<i>Lythrurus matutinus</i>	Species of Concern	Significantly Rare	Current
Amphibians				
Four-toed Salamander	<i>Hemidactylium scutatum</i>		Special Concern	Current
Neuse River Waterdog	<i>Necturus lewisi</i>		Special Concern	Current
Birds				
Sharp-shinned Hawk	<i>Accipiter striatus</i>		Significantly Rare	Historic
Bald Eagle	<i>Haliaeetus leucocephalus</i>	Threatened	Threatened	Current
Red-cockaded Woodpecker	<i>Picoides borealis</i>	Endangered	Endangered	Historic
Warbling Vireo	<i>Vireo gilvus</i>		Significantly Rare	Current
Invertebrates				
Crustaceans				
Carolina Well Diacyclops	<i>Diacyclops jeanneli putei</i>		Significantly Rare	Historic
Carolina Ladle Crayfish	<i>Cambarus davidi</i>		Significantly Rare	Current
Insects				
Golden Banded-skipper	<i>Autochton cellus</i>		Significantly Rare	Historic
Northern Oak Hairstreak	<i>Fixsenia favonius ontario</i>		Significantly Rare	Current
Giant Swallowtail	<i>Papilio cressphontes</i>		Significantly Rare	Historic
Mollusks				
Dwarf Wedgemussel	<i>Alasmidonta heterodon</i>	Endangered	Endangered	Current
Triangle Floater	<i>Alasmidonta undulata</i>		Threatened	Current
Brook Floater	<i>Alasmidonta varicosa</i>	Species of Concern	Endangered	Current
Atlantic Pigtoe	<i>Fusconaia masoni</i>	Species of Concern	Endangered	Current
Yellow Lampmussel	<i>Lampsilis cariosa</i>	Species of Concern	Endangered	Current
Carolina Fatmucket	<i>Lampsilis radiata conspicua</i>		Threatened	Current
Green Floater	<i>Lasmigona subviridis</i>	Species of Concern	Endangered	Current
Creeper	<i>Strophitus undulatus</i>		Threatened	Current
Savannah Lilliput	<i>Toxolasma pullus</i>	Species of Concern	Endangered	Current
Notched Rainbow	<i>Villosa constricta</i>		Special Concern	Current

¹ List compiled from NC Natural Heritage Program database in November 2004. For current listings, consult the "Heritage Data" on the NC Natural Heritage Program web site at <http://www.ncnhp.org/>

² "Historic" species were last observed more than 20 years ago (before 1984); "Current" species have been spotted within the past 20 years (since 1984).

Checklist of the Butterflies of Orange County

Revised March 2002 by Jeffrey S. Phippen, Duke University Biology Department

Superfamily Papilionoidea (True Butterflies)

Papilionidae

Pipevine Swallowtail	<i>Battus philenor</i>	
Zebra Swallowtail	<i>Eurytides marcellus</i>	i
Black Swallowtail	<i>Papilio polyxenes</i>	
Giant Swallowtail	<i>Papilio cresphontes</i>	n, i
Tiger Swallowtail	<i>Papilio glaucus</i>	
Spicebush Swallowtail	<i>Papilio troilus</i>	

Pieridae

Checkered White	<i>Pontia protodice</i>	r
Cabbage White	<i>Pieris rapae</i>	
Falcate Orangetip	<i>Anthocharis midea</i>	
Clouded Sulphur	<i>Colias philodice</i>	
Orange Sulphur	<i>Colias eurytheme</i>	
Southern Dogface	<i>Zerene cesonia</i>	n, r
Cloudless Sulphur	<i>Phoebis sennae eubule</i>	
Little Sulphur	<i>Eurema lisa</i>	
Sleepy Orange	<i>Eurema nicippe</i>	

Lycaenidae

Harvester	<i>Feniseca tarquinius</i>	r, i
Great Purple Hairstreak	<i>Atlides halesus</i>	
Coral Hairstreak	<i>Satyrium titus</i>	
Banded Hairstreak	<i>Satyrium calanus</i>	
Striped Hairstreak	<i>Satyrium liparops</i>	r
Oak Hairstreak	<i>Fixsenia favonius</i>	r
Brown Elfin	<i>Callophrys augustus</i>	r, i
Henry's Elfin	<i>Callophrys henrici</i>	
Pine Elfin	<i>Callophrys niphon</i>	
Juniper Hairstreak	<i>Callophrys gryneus</i>	
White-M Hairstreak	<i>Parrhasius malbum</i>	r
Gray Hairstreak	<i>Strymon melinus</i>	
Red-banded Hairstreak	<i>Calycopis cecrops</i>	
Eastern Tailed-Blue	<i>Everes comyntas</i>	
Spring Azure	<i>Celastrina ladon</i>	
Summer Azure	<i>Celastrina neglecta</i>	

Symbols: n = nonbreeding in county (occurrence accidental, vagrant, or migrant)
 r = regionally rare i = indicator of special habitat

Nymphalidae

American Snout	<i>Libytheana carinenta</i>	
Gulf Fritillary	<i>Agraulis vanillae</i>	n, r
Variegated Fritillary	<i>Euptoieta claudia</i>	
Great Spangled Fritillary	<i>Speyeria cybele</i>	
Silvery Checkerspot	<i>Closyne nycteis</i>	r
Pearl Crescent	<i>Phyciodes tharos</i>	
Question Mark	<i>Polygonia interrogationis</i>	
Eastern Comma	<i>Polygonia comma</i>	
Mourning Cloak	<i>Nymphalis antiopa</i>	
American Lady	<i>Vanessa virginiensis</i>	
Painted Lady	<i>Vanessa cardui</i>	
Red Admiral	<i>Vanessa atalanta</i>	
Common Buckeye	<i>Junonia coenia</i>	
Red-spotted Purple	<i>Limenitis arthemis astyanax</i>	
Viceroy	<i>Limenitis archippus</i>	
Hackberry Emperor	<i>Asterocampa celtis</i>	i
Tawny Emperor	<i>Asterocampa clyton</i>	i
Southern Pearly-eye	<i>Enodia portlandia</i>	i
Northern Pearly-eye	<i>Enodia anthedon</i>	i
Appalachian Brown	<i>Satyroides appalachia</i>	i
Gemmed Satyr	<i>Cyllopsis gemma</i>	
Carolina Satyr	<i>Hermeuptychia sosybius</i>	
Little Wood-Satyr	<i>Megisto cymela</i>	
Common Wood-Nymph	<i>Cercyonis pegala</i>	
Monarch	<i>Danaus plexippus</i>	

Superfamily Hesperioidea (Skippers)

Hesperiidae

Silver-spotted Skipper	<i>Epargyreus clarus</i>	
Long-tailed Skipper	<i>Urbanus proteus</i>	n, r
Hoary Edge	<i>Achalarus lyciades</i>	
Southern Cloudywing	<i>Thorybes bathyllus</i>	
Northern Cloudywing	<i>Thorybes pylades</i>	
Confused Cloudywing	<i>Thorybes confusis</i>	r
Hayhurst's Scallopwing	<i>Staphylus hayhurstii</i>	r
Sleepy Duskywing	<i>Erynnis brizo</i>	r
Juvenal's Duskywing	<i>Erynnis juvenalis</i>	
Horace's Duskywing	<i>Erynnis horatius</i>	
Zarruco Duskywing	<i>Erynnis zarucco</i>	
Wild Indigo Duskywing	<i>Erynnis baptisiae</i>	r

Symbols: n = nonbreeding in county (occurrence accidental, vagrant, or migrant)
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Hesperiidae (*continued*)

Common Checkered-Skipper	<i>Pyrgus communis</i>	
Common Sootywing	<i>Pholisora catullus</i>	r
Swarthy Skipper	<i>Nastra lherminier</i>	
Clouded Skipper	<i>Lerema accius</i>	
Least Skipper	<i>Ancyloxypha numitor</i>	
Fiery Skipper	<i>Hylephila phyleus</i>	
Cobweb Skipper	<i>Hesperia metea</i>	r
Tawny-edged Skipper	<i>Polites themistocles</i>	
Crossline Skipper	<i>Polites origenes</i>	
Southern Broken-Dash	<i>Wallengrenia otho</i>	
Northern Broken-Dash	<i>Wallengrenia egeremet</i>	
Little Glassywing	<i>Pompeius verna</i>	
Sachem	<i>Atalopedes campestris</i>	
Delaware Skipper	<i>Anatrytone logan</i>	r
Zabulon Skipper	<i>Poanes zabulon</i>	i
Dion Skipper	<i>Euphyes dion</i>	r, i
Dun Skipper	<i>Euphyes vestris</i>	
Dusted Skipper	<i>Atrytonopsis hianna</i>	
Pepper and Salt Skipper	<i>Amblyscirtes hegon</i>	r, i
Common Roadside-Skipper	<i>Amblyscirtes vialis</i>	r, i
Eufala Skipper	<i>Lerodea eufala</i>	n, r
Ocola Skipper	<i>Panoquina ocola</i>	

References:

The taxonomy used here follows North American Butterfly Association *Checklist & English Names of North American Butterflies, Second Edition* (2001. Morristown, NJ), except for recognition of Summer Azure as a full species as is promoted by several authors. Another important reference is *Notes on the Butterflies of North Carolina - Ninth Approximation* by H. LeGrand, Jr. and T. Howard (2002. <<http://www.ncsparks.net/butterfly/9th.html>>).

All species listed were seen in the field by the original authors (Steve Hall and Dawson Sather, 1988) and/or by the current author (Jeff Pippen) who has been keeping records of Orange Co. butterfly sightings since 1995 (with over 4,400 records).

Special credit must be given to Jeff Nekola for his discovery of the Brown Elfin, one of the most exciting finds within the county, and for the first collections of the Sleepy and Wild Indigo Duskywings and the Dusted and Common Roadside-Skippers, all from the important butterfly area he identified on the summit of Occoneechee Mountain.

Symbols: **n = nonbreeding in county (occurrence accidental, vagrant, or migrant)**
 r = regionally rare **i = indicator of special habitat**

Explanation of Status and Rank Codes for Plants

N.C. Status: E = Endangered, T = Threatened, SC = Special Concern, SR = Significantly Rare. Plant statuses are determined by the Plant Conservation Program, N.C. Department of Agriculture, and the N.C. Natural Heritage Program (NHP). Collection from the wild of Endangered, Threatened, and Special Concern species is regulated by state law. The Significantly Rare status is a NHP designation indicating the need for population monitoring and possible conservation action for species not currently listed as Endangered, Threatened or Special Concern.

U.S. Status:

E = Endangered. A plant that is in danger of extinction throughout all or a significant portion of its range.
T = Threatened. A plant that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

FSC = Federal Species of Concern. This status replaces the former "Category 2" Candidate status used by the U.S. Fish and Wildlife Service. Category 2 plants were those for which there was some evidence of vulnerability, but for which there were not enough data to support listing as Endangered or Threatened. The FSC code has no official status.

N.C. Rank:

S1 = Critically imperiled in North Carolina because of extreme rarity or because of some factor making it especially vulnerable to extirpation from the state. Typically 1-5 populations.
S2 = Imperiled in North Carolina because of rarity or because of some factor making it very vulnerable to extirpation from the state. Typically 6-20 populations.
S3 = Rare or uncommon in North Carolina. Typically 21-100 populations.
SH = Of historical occurrence in North Carolina, not having been verified in more than 20 years, and suspected to be still extant.

Global Rank:

G1 = Critically imperiled globally because of extreme rarity or because of some factor making it especially vulnerable to extinction throughout its range. Typically 5 or fewer occurrences globally.
G2 = Imperiled globally because of rarity or because of some factor making it very vulnerable to extinction throughout its range. Typically 6-20 occurrences globally.
G3 = Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range or because of other factors making it vulnerable to extinction throughout its range. Typically 21-100 occurrences.
G4 = Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.
G5 = Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.
Q = Questionable taxonomic assignment.
T = The rank of a subspecies or variety. As an example, G4T1 would apply to a subspecies or variety of a species with an overall rank of G4, with the subspecies or variety warranting a rank of G1.
? = Unranked, or rank uncertain.

An S or G rank involving two numbers indicates uncertainty of rank. For instance, a G2G3 rank indicates that the species appears to warrant either a G2 or a G3 ranking, but that existing data do not allow that determination to be made.

Explanation of Status and Rank Codes for Animals

N.C. Status: E = Endangered, T = Threatened, SC = Special Concern, SR = Significantly Rare, D = Delisted, P = Proposed (e.g., PE = Proposed Endangered). Animal statuses are determined by the N.C. Wildlife Resources Commission and the N.C. Natural Heritage Program. Endangered, Threatened, and Special Concern species are afforded some protection by state law (the Endangered and Threatened Wildlife and Wildlife Species of Special Concern act, 1987). The Significantly Rare status is a NHP designation and indicates rarity and the need for population monitoring and conservation action for species not currently listed as Endangered, Threatened or Special Concern.

U.S. Status:

E = Endangered. An animal that is in danger of extinction throughout all or a significant portion of its range.

T = Threatened. An animal that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

FSC = Federal Species of Concern. This status replaces the former "Category 2" Candidate status used by the U.S. Fish and Wildlife Service. Category 2 animals were those for which there was some evidence of vulnerability, but for which there were not enough data to support listing as Endangered or Threatened. The FSC code has no official status.

N.C. Rank:

S1 = Critically imperiled in North Carolina because of extreme rarity or because of some factor making it especially vulnerable to extirpation from the state. Typically 1-5 populations.

S2 = Imperiled in North Carolina because of rarity or because of some factor making it very vulnerable to extirpation from the state. Typically 6-20 populations.

S3 = Rare or uncommon in North Carolina. Typically 21-100 populations.

SA = Accidental or casual; one to several records for North Carolina, but the state is outside the normal range of the species.

SH = Of historical occurrence in North Carolina, not having been verified in more than 20 years, and suspected to be still extant.

S-B (e.g., S2B) = Rank of the breeding population in the state (for migratory species only). In the example provided, "S2B," the breeding population has a state rank of S2, regardless of the rank of the non-breeding population.

S-N = Rank of the non-breeding population in the state (for migratory species only).

-Z- (e.g., SZN) = Population is not of significant conservation concern. In the example provided, "SZN," the non-breeding population is not of significant conservation concern.

Global Rank:

G1 = Critically imperiled globally because of extreme rarity or because of some factor making it especially vulnerable to extinction throughout its range. Typically 5 or fewer occurrences globally.

G2 = Imperiled globally because of rarity or because of some factor making it very vulnerable to extinction throughout its range. Typically 6-20 occurrences globally.

G3 = Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range or because of other factors making it vulnerable to extinction throughout its range. Typically 21-100 occurrences.

G4 = Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.

G5 = Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.

Q = questionable taxonomic assignment.

T = The rank of a subspecies or variety. As an example, G4T1 would apply to a subspecies or variety of a species with an overall rank of G4, with the subspecies or variety warranting a rank of G1.

GH or TH = Historical occurrences only throughout its range, with the expectation that it may be rediscovered (GH for a species, TH for a subspecies or variety).

GU = Possibly in peril range-wide, but status uncertain; more information is needed.

? = Unranked, or rank uncertain.