Chapter 6. Natural and Cultural Systems Element

6.1. PURPOSE

The Natural and Cultural Systems Element is several elements combined into one. This chapter addresses the following components of natural and cultural resources (or systems):

- Agriculture;
- Air and Energy Resources;
- Cultural and Historic Resources;
- Natural Areas, Wildlife Habitat and Prime Forests; and
- Water Resources.

In many comprehensive plans, topical areas such as these are individual elements. The rationale for combining them here into one document is explained in part by the very name of the Element – Natural and Cultural Systems. The word "systems" is selected to reflect the fact that natural resources and cultural resources are inextricably interwoven components of Orange County's corner of the world. There are direct and important relationships between air quality and natural areas – between water resources and agriculture – between cultural resources and all of the others. Issues that threaten Orange County's biodiversity (such as the effect of non-native species on our aquatic habitat) also pose concerns for agriculture and water.

Our natural and cultural resources function as systems – systems that interact with each other on a frequent basis. By addressing them together in one document, we may create opportunities for better coordination and synergy among policies that address the different resources.

The background data, trends, needs, and goals and objectives within this element serve as the basis for future policies, programs and action strategies that may be undertaken by Orange County elected officials, its advisory boards, and staff. The manner in which these implementation mechanisms are created and established is addressed in *Section 1.4: Administration and Implementation Guidelines*.

6.2. OVERVIEW

The Orange County that we see and experience today is based in large part on its natural setting and the cultural development patterns that have evolved in response to that setting. The following is an overview of the County's natural and cultural landscape.

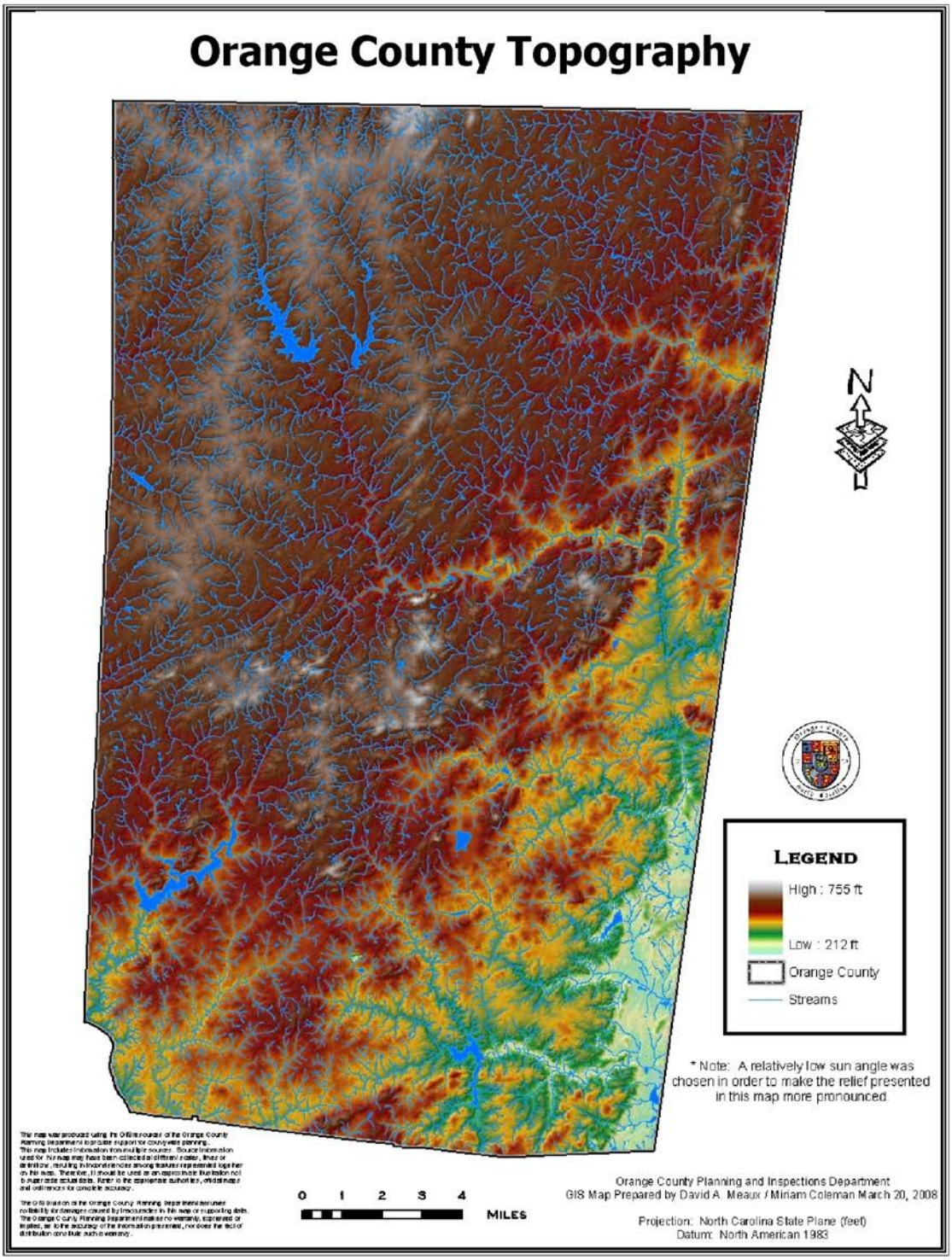
NATURAL SETTING

Orange County is located near the eastern edge of the Piedmont physiographic province in North Carolina. Geologically, much of the County's 399 square miles (254,720 acres) is within the Carolina Terrane, which is land composed of diverse, generally metamorphosed volcanic rocks. The southeastern corner of the County is in the Triassic Basin, which is an area of sedimentary, easily eroded rock.

Most of the County's landscape features broad, upland ridges with small streams and narrow floodplains. No large streams that originate in other counties flow into Orange; rather, the County serves as the upper watershed (headwaters) 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 that forms the County's southwestern boundary. In the north, Eno River and Little River (north and south forks) flow into the Neuse River system. And near the County's northwestern boundary, South Hyco Creek and Lynch Creek, flow north into the Roanoke River system.

Elevations in Orange County range from a high of 867 feet at the summit of Occoneechee Mountain near Hillsborough down to 240 feet in the southeastern corner of the County. (See Map 6-1.) There are no natural lakes in Orange County—only small marshy wetlands that have been created with the help of beaver dams, and human impoundments such as University Lake and other reservoirs.

Occoneechee Mountain is one in a linear series of inselbergs (hills of highly resistant rock) that are prominent in southwestern Orange County. Other inselbergs include Bald, Blackwood, and Crawford mountains. Apart from those inselbergs, there are a very few areas of high relief in the County. Along 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 distinctive natural areas of the County, such as the rhododendron communities, pine-oak bluffs, and dry, rocky slopes are restricted to those steep, stream-cut slopes.



MAP 6-1: ORANGE COUNTY TOPOGRAPHY

SOILS, AGRICULTURAL POTENTIAL AND IMPACT ON SETTLEMENT PATTERNS

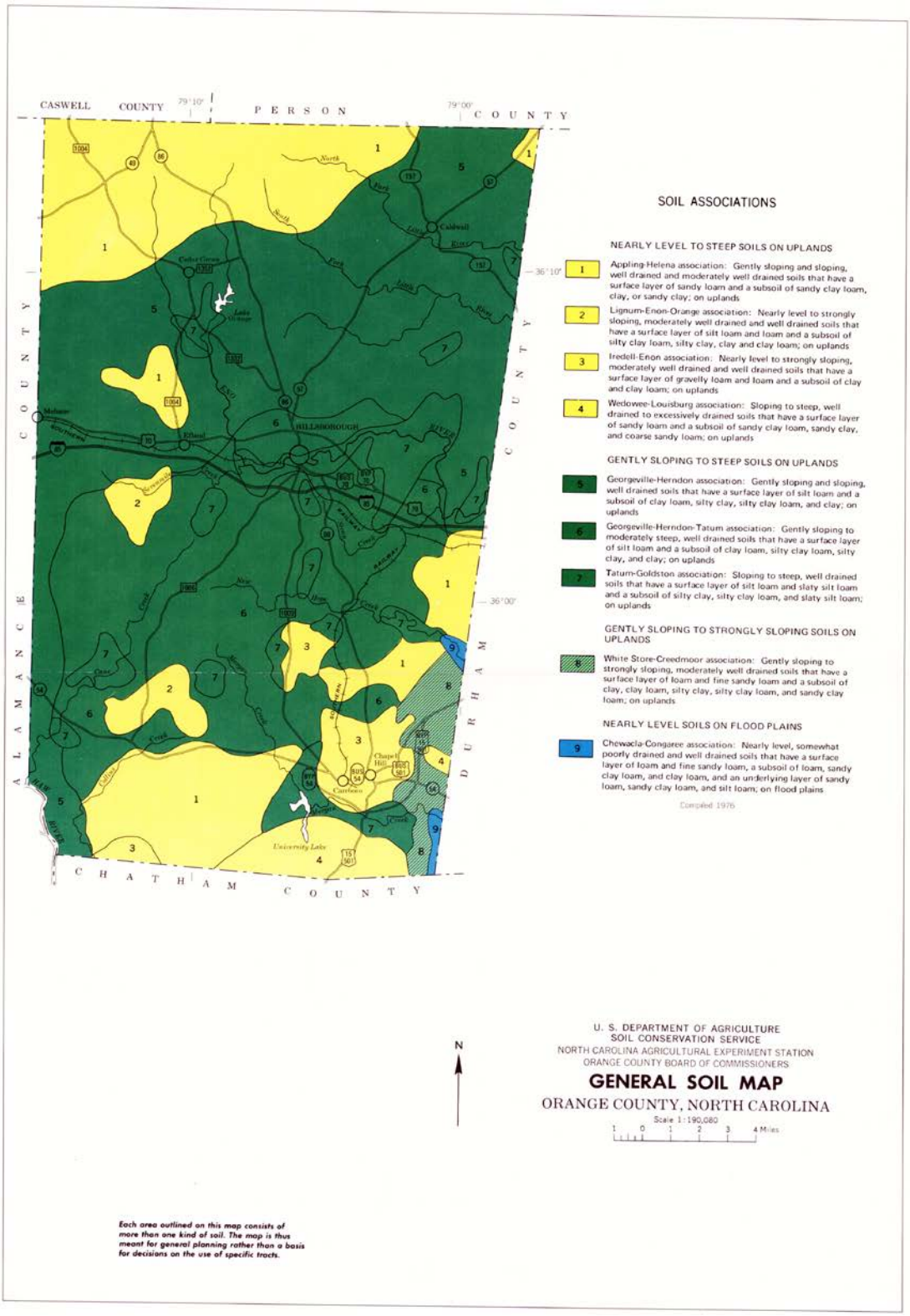
Almost three quarters of the County's land area consists of soils productive for agricultural and forestry uses, including 140,630 acres of prime farmland and 58,650 acres of state and locally important farmland.[1] The majority of these quality soils extend across the County in a diagonal pattern southwest to northeast as shown in the dark green areas on the General Soils Map (6-2) Soils from three main associations – Georgeville-Herndon, Georgeville-Herndon-Tatum and Tatum-Goldston – are prevalent in this area. These gently sloping and well-drained soils contain layers of silt loam and clay that make them suitable for most agricultural uses. Other soil types are located throughout the County in small areas, along drainageways or ridges.[2]

The County's natural setting, both physical and physiographic, determine its mild (warm and humid) climate, its long growing season, and its soil composition.[3] These elements--the climate, length of the growing season and the types of local soils--significantly affect the agricultural potential of the land as well as historic and prehistoric settlement patterns (i.e., the placement of historic and prehistoric settlements and transportation networks).

[1] *Important Farmlands Orange County, North Carolina.* Supplement to Soil Survey Report of Orange County, 1972.

[2] Orange County also contains significant areas of Appling-Helena soils, in the northwest corner of Cedar Grove Township, the southern section of Bingham Township and in scattered pockets throughout the county. The Appling-Helena soil type contains layers of sandy loam and sandy clay. It has good potential for woodland, hay and pasture cover, less for tobacco, row crops, and truck crops (vegetables.)

[3] The growing season (i.e., the typical frost-free period in Orange County) lasts for about 200 days from the last frost in mid April to the first front in late October.



MAP 6-2: ORANGE COUNTY GENERAL SOIL MAP

CULTURAL SETTING

Though not formed until 1752, Orange County has a long settlement history. Early Spanish and European explorers in the sixteenth and seventeenth centuries traveling through the area likely encountered large populations of Native Americans that settled along the area's rivers and streams. These populations were most likely an amalgamation of several Siouan speaking tribes, which would include the Occaneechi, Eno, Saponi, Shakori and the Sissipahaw. Although no written record of these cultures exists prior to European contact, archaeological evidence suggests that the area has been occupied to some degree since at least 10,000 BC.

The combination of European-introduced diseases, conflict with settlers, and increased European desire for land and deerskin marked the beginning of the depopulation of most native groups in Orange County. Settlements became less centralized, and tribes either dissolved or merged as settlers moved further into the Piedmont. By the early 1700s, much of the area had been abandoned by the native tribes.

Orange County was formally created from parts of Granville, Johnston and Bladen counties in 1752, and by 1767 it was the most populous County in North Carolina. Its immense original boundaries encompassed present Orange, Person, Caswell, Alamance, Chatham and Durham counties, and portions of Guilford, Randolph, Rockingham, and Wake – approximately 3,500 square miles in all. Opportunities for inexpensive and well-advertised l and attracted a variety of ethnic and religious groups, particularly Scotch-Irish Presbyterians, German Lutherans and English Anglicans (from Eastern North Carolina and Virginia) and English Quakers. Members of these groups often migrated from Europe together, settling first in the middle colonies such as Pennsylvania and Virginia and traveling down the Great (Philadelphia) Wagon road to North Carolina. They established communities such as Hawfields, New Hope and Cane Creek.

These early settlers were mainly subsistence farmers who built modest farmsteads, grew crops, and raised livestock for family consumption. Gradually a small planter class emerged, one that depended on a large labor force to prepare land for agricultural use and to tend crops.[4] As successful landowners began to import Africans for this purpose the once distinct ethnic communities began to blend into a more homogenous white population.

Orange County escaped the physical destruction of the Civil War but, like so much of the south, experienced substantial financial loss as well as social upheaval. The total value of farms fell by half between 1860 and 1870, and the average size of farms dropped from 285 acres to 198 acres. Agricultural production suffered from the absence of much of the male workforce during the war, and from emancipation afterward. Many emancipated blacks left rural Orange for opportunities elsewhere but others stayed and acquired property and prospered.[5]

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[4] Although large plantations were rare in what is now Orange County, a few residents such as John Cabe, William Cabe, James Pratt, and William Kirkland (Ayr Mount) achieved planter status. Each had substantial holdings along the Eno River, comprising fertile bottomlands for cultivation and adjacent tracts cleared for pastures.

[5] Several African-American families, such as the Corbetts, purchased large tracts of land in the Carr community in Cedar Grove Township and prospered. In addition, some African

Plantations and large farms were subdivided and sharecropping and tenant farming became more widespread.[6] The nineteenth century also saw a rise in small industry and manufactured goods. The mill industry grew throughout the late nineteenth century, with several flour and gristmills located along the Eno River and smaller creeks throughout the County.

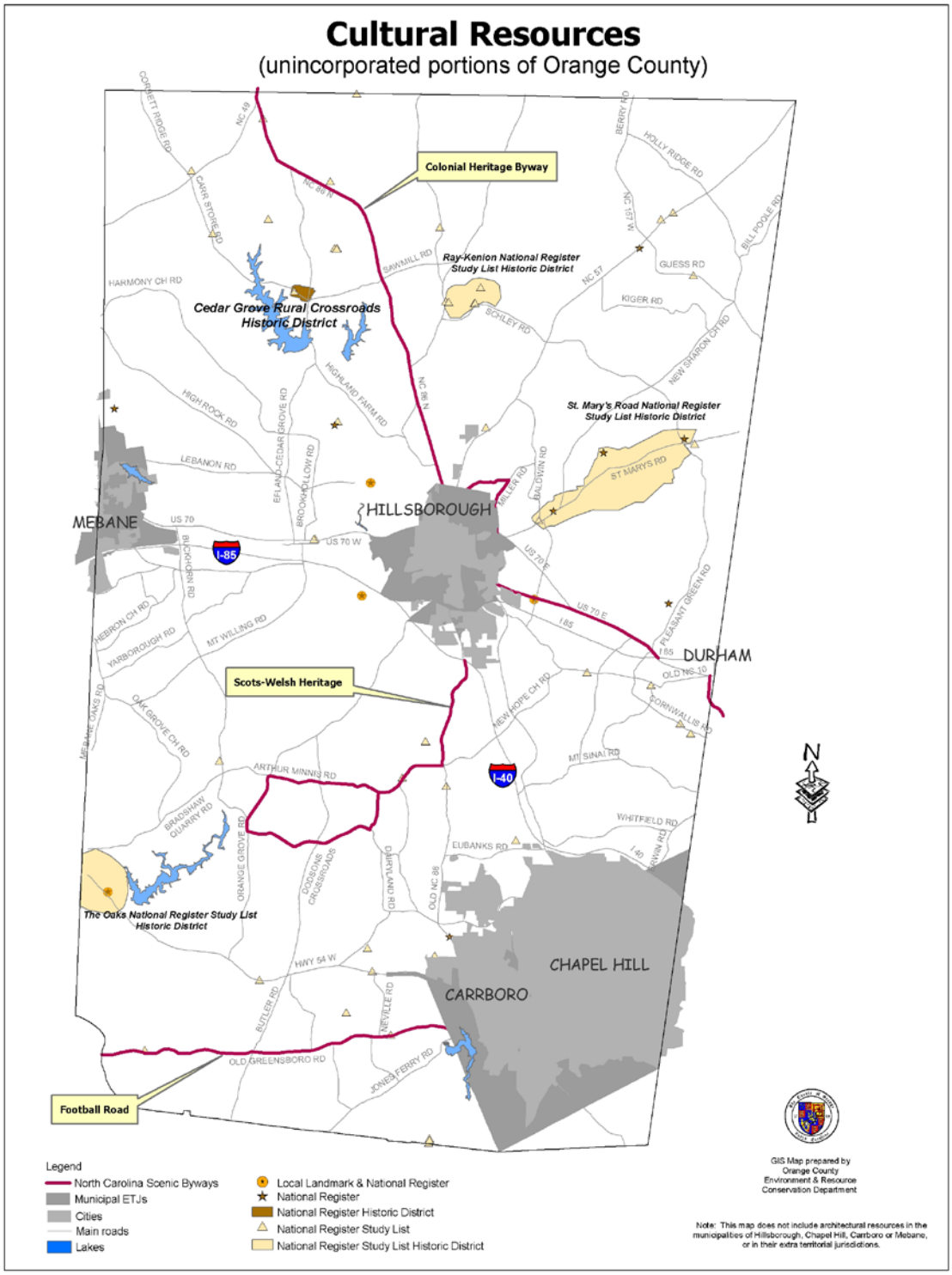
Post-Civil War economic expansion was fueled, in part, by the extension of railroad lines through the County. This increased access to outside markets for Orange County farmers, who continued to increase tobacco production. As nearby tobacco factories and other industry in surrounding areas expanded, the population grew accordingly. During the 1920s, North Carolina's "Good Roads" program lead to the hard surfacing of many roads in the County, thus increasing access to rural areas and facilitating modernization.

Economic development continues to increase throughout Orange County and in Chapel Hill, in particular. The expansion of the University of North Carolina at Chapel Hill, founded in 1789, and Research Triangle Park, developed in 1959, has contributed greatly to population growth in the area, although many areas throughout Orange County have remained relatively rural.

Map 6.3 identifies the current inventory of cultural resources in the County, such as local and national historic landmarks and districts that preserve historically important cultural sites and areas in the County.

Americans, such as Robert Fitzgerald, migrated to the south, as part of efforts of the Freedmen's Bureau and Quaker missionary groups, to teach in schools.

[6] In 1890, 58 percent of the county's farmers were either renters, croppers, or laborers. By the turn of the century, nearly 40 percent of all farmers in Orange County were sharecroppers and worked on average 20 to 60 acres.



MAP 6-3: CULTURAL RESOURCES

6.3. GOALS

The following natural and cultural systems goals will guide future policy and implementation strategies for the county.

Natural and Cultural Systems Overarching Goal: A sustainable balance and appreciation of natural, cultural and agricultural resources.

Natural and Cultural Systems Goal 1:
Energy conservation, sustainable use of non-polluting renewable energy resources, efficient use of non-renewable energy resources, and clean air.

Natural and Cultural Systems Goal 2:
Economic viability of agriculture, forestry, and horticulture and their respective lands.

Natural and Cultural Systems Goal 3:
Infrastructure and support systems for local and regional agriculture.

Natural and Cultural Systems Goal 4:
Preservation of historic, cultural, architectural and archaeological resources, and their associated landscapes.

Natural and Cultural Systems Goal 5:
Awareness and appreciation of the diverse cultural history and heritage of Orange County and its residents.

Natural and Cultural Systems Goal 6:
Sustainable quality and quantity of ground and surface water resources.

Natural and Cultural Systems Goal 7:
A balanced and healthy diversity of native plant and animal populations.

Natural and Cultural Systems Goal 8:
Networks of protected natural, cultural, and agricultural lands.

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6.4. COMPONENT ELEMENTS

6.4.1. AGRICULTURE

All county residents enjoy some gain from local farms. Farmland is an irreplaceable physical, cultural, and economic asset in Orange County. Everyone who eats can benefit from the quality, health benefits, environmental benefits, and convenience associated with locally grown products. Everyone who travels along county roads can enjoy the scenic vistas retained through tilled fields, pastures, and forestlands.

The perception that farmers will always farm and maintain the rural parts of Orange County may be tested vigorously in the coming years as the cost of this stewardship continues to rise. Once farmland is converted to other uses it is probably lost to agriculture forever.[7] Recognizing the finite nature of productive soils, Orange County residents and elected officials have sought to preserve agricultural lands dating back to initial countywide planning efforts of the late 1960s. The changing nature of federal, state, and local regulations have presented new challenges, and traditional commodity programs are being phased out. The global market is impacting prices, both for selling products and for buying products (seeds, feed, fuel, etc). Land costs continue to escalate due to the attractiveness of the County and the greater Triangle Region as a place to live and work. With careful planning this growing population can contribute to the future of local agriculture as new consumers for locally grown and value-added[8] farm products and as visitors for agri-tourism.[9]

The Agricultural section of the Natural and Cultural Systems Element is designed to provide an overview of the state of agriculture in Orange County. It is not intended to be the single unabridged source of information for farmers; rather, as part of the 2030 Comprehensive Plan it is a policy guide for future County decisions. It includes brief descriptions of popular County programs to conserve and protect farming resources. This section also includes a discussion of current trends in the farming community, an assessment of needs related to local agriculture, and a series of goals and objectives to advance agricultural (including forestry) efforts countywide. The long-term survival of agriculture in Orange County requires a three-tiered approach:

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[7] Since 2002, the State of North Carolina has lost more than 300,000 acres of farmland. The State is one of the top states in the nation for incurring farmland loss.

[8] "Value-added" refers to the process of adding financial value to a product. For example a new production process or a new marketing strategy can add more financial value to a product. Minor processing or packaging can "add value" to a raw product; farmers may make a greater profit selling apple cider or apple pies than selling apples.

[9] Agri-Tourism describes a new tourist business opportunity for farmers, and the like. Tourists are more and more interested in touring local farms and attending events. Tours and events, like the annual Piedmont Farm Tour organized by the Carolina Farm Stewardship Association, are becoming more popular every year.

1. The County must continue efforts to protect productive farmland soils so that they remain available for agricultural and forestry use;

2. Farming must become a more profitable venture; and

3. New and younger residents must cultivate interest and knowledge in farming to take over as the next generation.

6.4.1.1. HISTORIC DATA, CURRENT DATA, EVALUATION OF TRENDS

HISTORIC DATA

During the first half of the nineteenth century, Orange County developed into a landscape of small- and medium-sized farms. By 1850, three-quarters of the County's farms contained less than 100 acres, while just a handful comprised more than 500.[10] Some planters were successful growing cash crops, such as burley tobacco (air dried) and cotton for profit, but for the most part, these early settlers were primarily subsistence farmers who raised livestock and grew grains and vegetables for their own use.

During the first half of the twentieth century, technological improvements – the mechanization of farm equipment and the introduction of modern conveniences such as rural electrification – had a substantial impact on local residents. Farmers could cultivate larger areas of land and work longer hours. The introduction of bright leaf tobacco (flue-cured) provided new profits for many family farms, particularly in Cedar Grove Township in the northwest part of the county.[11] The North Carolina Cooperative Extension Service encouraged Orange County farmers to develop dairy operations and provided construction plans for a new type of farm building, the grambrel-roof dairy barn, which has become an icon for farming throughout the nation. Many prospered from this new commodity. Farmers also continued to grow traditional row crops such as corn and grains, to raise livestock, and to grow vegetables for family consumption. Those who were able to grow more than they needed often drove to neighboring markets to "peddle" their wares, particularly value-added products such as butter and baked goods. As transportation networks improved, commercial agriculture began to replace the small subsistence-based farms.

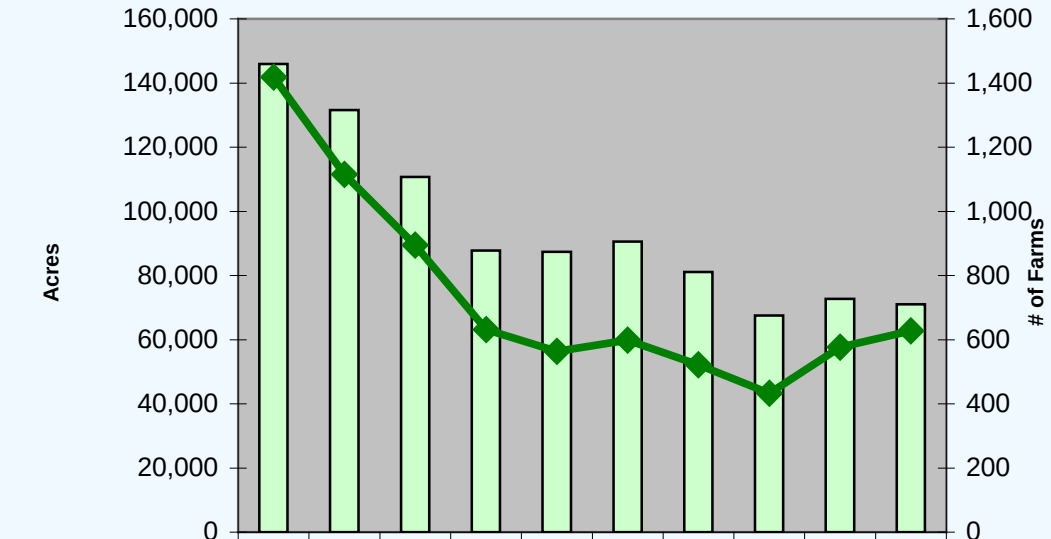
By the late 1960s and 1970s rural Orange began to change as a result of accelerating population growth. As new residents moved into the

[10] U.S. Bureau of the Census, *Population of the United States in 1860; Agriculture in the United States in 1860.*

[11] Since the late 19th century, bright leaf tobacco has been the primary crop in northern Orange County and remains the third largest component of the County's agricultural economy, after nursery-greenhouse and dairy (grade A milk). Approximately 15 farmers still grow tobacco; all are located in the northern part of the County. Sorghum was also raised and processed in the Carr community, in the extreme northwest part of Cedar Grove Township during the turn of the twentieth century.

rural parts of the County, farmland was converted to other uses. The amount of land devoted to agriculture decreased from 70 percent in 1950 to 28 percent in 2002, and the number of farms decreased from a post-World War II high of more than 2000 in 1950 to 631 in 1974.[12] Since the 1970s, however, the number of farms has remained relatively constant. See Figure 6-1.

FIGURE 6-1: ORANGE COUNTY AGRICULTURE (1959-2002)



	1959	1964	1969	1974	1978	1982	1987	1992	1997	2002
Land In Farms	145,9	131,5	110,7	87,81	87,34	90,57	81,10	67,49	72,67	71,01
# of Farms	1,418	1,115	895	631	564	599	522	433	577	627

Source: 1959-2002 Census of Agriculture, US Department of Agriculture

CURRENT DATA

Agriculture remains a significant component of Orange County's economy. The County had $32.7 million gross sales in agriculture in 1996, and the number of local farms grew by 8 percent from 1997 to 2002. The average farm size dropped from 156 to 113 acres, but this pattern is consistent with the emergence of organic farming, which often requires less land and can be a more compatible neighbor to residential uses.

TRENDS

[12] The amount of land in production dropped from 145,968 acres in 1959, to 81,100 acres in 1987, to 67,500 acres in 1992 before leveling off at 71,000 acres in 2002. This fifty year decline in farming activity is an almost 75,000 acre (74,968) decrease of land in some form of farm use. Source: North Carolina Department of Agriculture and Consumer Services – *2002 Census of Agriculture.*

Revenues from commodities that traditionally formed the basis of the agricultural economy such as tobacco, grains, dairy and beef cattle are on the decline. But revenues from specialized sectors such as commercial horticulture, fruits and vegetables (including organics), and equestrian activities are increasing.[13] Other sources of future farm income will likely come from timber harvesting, forestry, and from the conversion of former dairy and tobacco operations to feed-based hay production.[14] See Figure 6-2.

FIGURE 6.2: INCOME CHANGE FOR MAJOR AGRICULTURAL PRODUCTS (1996-2005)

	2005 vs 1996	2005 vs 2004
Milk	- 32%	- 5%
Tobacco & Field Crops	- 83%	- 65%
Eggs	- 5%	- 20%
Nursery & Greenhouse	+ 122%	+ 7%
Livestock	+ 93%	+ 24%
Fruits & Vegetables	na	+ 46%
Forestry	+ 62%	- 4%

Source: 2007 State of the Economy Report, Economic Development

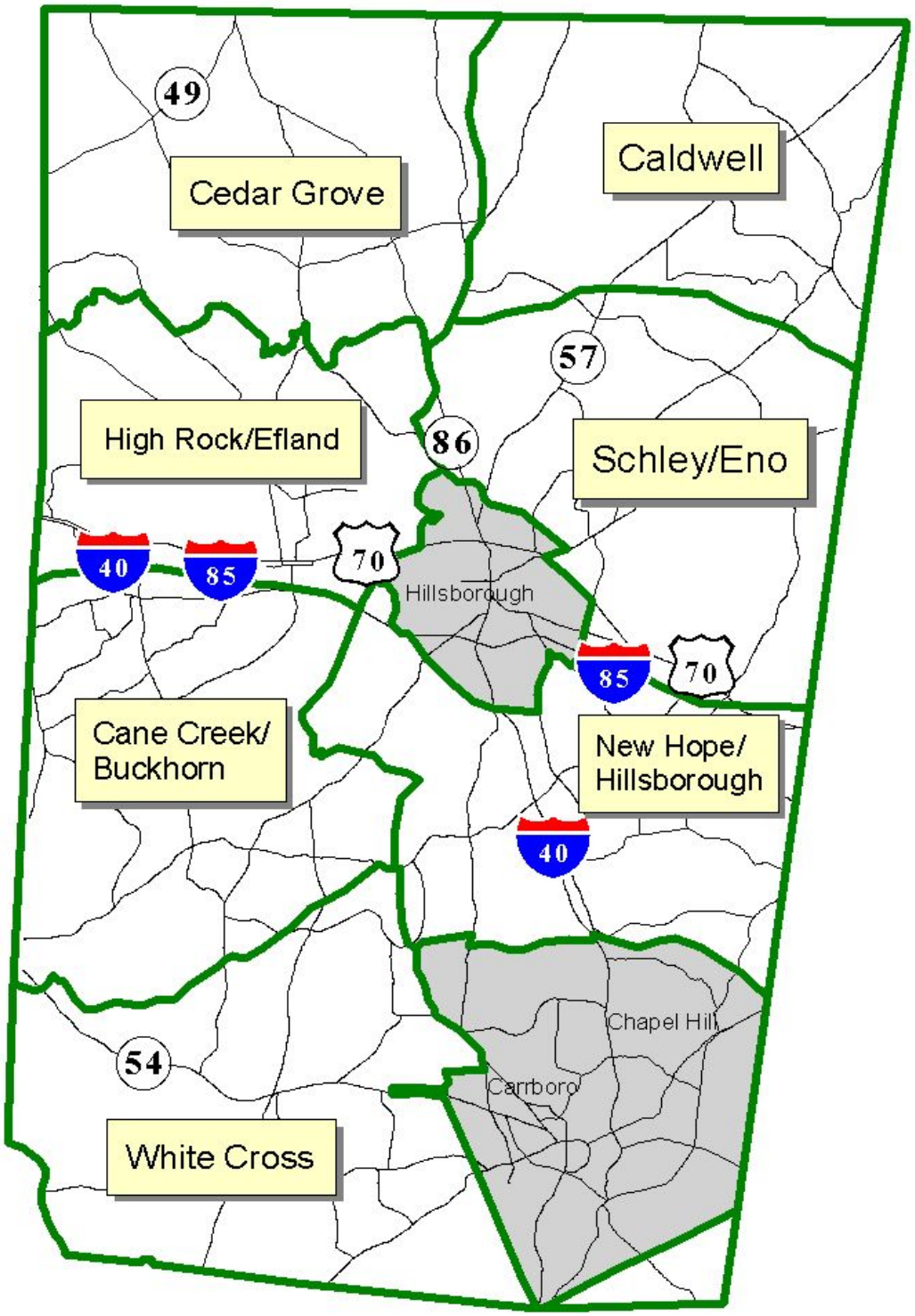
This transition from traditional commodity operations to more diverse organic and small-scale sustainable farming is occurring nationwide, and in many ways Orange County is ahead of the curve. In 1992 Orange was one of the first counties in North Carolina to adopt a Voluntary Farmland Preservation Plan that established a voluntary agricultural district (VAD) program and created the Agricultural District Advisory Board (later renamed the Agricultural Preservation Board). By January of 2009, almost 2,270 acres on eleven farms will be enrolled in the VAD program. In 2000, Orange County established the first comprehensive county land acquisition program in North Carolina, the Lands Legacy Program. By 2007 the Lands Legacy program had acquired more than 1,200 acres of farm conservation easements--

[13] This also includes new efforts to market products directly to consumers, such as community supported agriculture, roadside farm stands, pick your own operations, and farmers markets.

[14] Drought conditions over the last few years have brought new challenges to the farming community, particularly finding sources for hay for beef cattle farmers, who traditionally grow their own. Many farmers have had to sell cattle ahead of schedule in order to limit their losses.

limiting the development potential on those lands in perpetuity.[15] Both of these successful programs preserve farmland voluntarily. See Map 6-4.

[15] With a conservation easement, the County or other conservation agency purchases the development rights, while the farmer retains ownership of the land and is compensated for agreeing to convey rights in the property, including some or all of the development rights.



MAP 6-4: ORANGE COUNTY VOLUNTARY AGRICULTURAL DISTRICTS

The County has promoted local agriculture in other ways too. In 2002, through a collaborative effort with the Economic Development Commission and Cooperative Extension Service, Orange County created a new position – Agricultural Economic Development Coordinator – to assist farmers with business planning, marketing, and brokering agricultural goods and services. Information on local farmers is now published in a directory, *LOCAL HARVEST*, and available online at www.orangecountyfarms.org. The agricultural economic development coordinator has been involved with the creation of a farm incubator program, the development of a value-added processing center, the enhancement of local farmers markets and related infrastructure, and continues to collaborate with other farm agencies for special programs.

February 2008 marked the tenth anniversary of the annual Orange County Agricultural Summit. For the last few years, summits have included presentations from grocery stores and restaurant managers seeking locally grown products for their businesses. Orange County is uniquely positioned to pursue opportunities for agriculture created by an affluent, highly educated populace, interested in high-quality farm produce and services. Residents desire locally grown goods for a variety of reasons. Some prefer the nutritional benefits of fresh food.[16] Others feel a personal commitment toward broader issues of reducing dependency on foreign markets and contributing to the local economy often summarized in the slogan "think globally, act locally." Still others are looking for a farm connection, a way to teach children where food comes from and an opportunity to experience the sense of community often associated with farming.

The long-term viability of this service-oriented agriculture is by no means assured, but it may present the best new market for traditional farmers looking for ways to diversify and supplement their income. Many farmers are already taking advantage of these new consumers, pursuing new and innovative ways to market their goods through community supported agriculture (CSA) programs, farmers markets, individual farm stands, and pick-your-own operations. Local institutions remain another, relatively untapped, market for local products. The County is continuing its efforts to encourage the public school system, the University of North Carolina at Chapel Hill, and the UNC-hospital to purchase local food products whenever possible and is working to develop the infrastructure needed to help facilitate this exchange.

Existing programs such as Future Farmers of America (FFA) and 4-H are teaching young people about different aspects of agriculture. North Carolina State University in Raleigh offers several programs for

[16] Studies have shown that practical experience with fresh food (growing and harvesting, eating seasonally, preserving and cooking) has a positive impact on dietary habits. The 5-10 day transportation and storage lag between production and consumption leads to losses of 30-50% in some nutritional constituents. Source: *Health Benefits of Urban Agriculture,* a paper from the Community Food Security Coalition's North American Initiative on Urban Agriculture, authored by Anne C. Bellows, PhD Rutgers, The State University of New Jersey, Katherine Brown, PhD Southside Community Land Trust, Jac Smit, MCP The Urban Agriculture Network.

students interested in farming and soil conservation. In late 2007, the southeast regional office of the American Farmland Trust relocated to Orange County, where it shares a new office with the North Carolina Farm Transition Network (NCFTN). NCFTN provides services to farmers wishing to plan for the future such as estate planning and developing a "land link."[17] As farmers continue to age, land links may become an invaluable way to keep active farms in operation.[18]

Farming is an economic activity, driven by individual investment decisions based on the productive and viable use of land. The changing character of agriculture in Orange County is inevitable. Whether the changes are positive – enhancing the role of agriculture in the local economy, or negative – resulting in the loss of rural character and a traditional way of life, remains a question. But, with a growing population to feed in the coming years, productive farmland should be viewed as an important resource worthy of protection.

Many of the challenges that local farmers face are not unique to Orange County. The American Farmland Trust and other conservation organizations have spent more than twenty years researching different strategies to preserve productive farmland nationwide. Some of these tools require special legislation not available in North Carolina, but many are available and are already in use in Orange County. The following provides a sample of some key county programs in place or in progress.

EXISTING PROGRAMS & STUDIES

VOLUNTARY AGRICULTURAL DISTRICTS

In 1985, the North Carolina General Assembly passed the Farmland Preservation Enabling Act authorizing counties to establish farmland preservation programs including voluntary agricultural districts (VAD). Farmers who qualify for the program enjoy recognition and protection against nuisance suits in exchange for agreeing to sustain agriculture in their district for a period of ten years.[19] The Act also created the North Carolina Farmland Preservation Fund and enabled counties to

[17] A land link partners a young prospective farmer with an experienced farmer. The experienced farmer provides hands-on training and may eventually sell the farm to the apprentice once he or she is ready to retire.

[18] The average age of an Orange County farmer in 1997 was 56. Source: N.C. Department of Agriculture and Consumer Services, *1997 Census of Agriculture.*

[19] Participants sign an agreement with the County, filed with the Orange County Tax office and the local office of Natural Resources Conservation Service of the USDA. A landowner may withdraw from the program, however, by submitting written notice to the Board of County Commissioners. In 2005, the County reduced the minimum farm size for participation in the VAD program from 80 acres to 20 acres and divided the County into seven districts: Cedar Grove, High Rock/Efland, Cane Creek/Buckhorn, White Cross, New Hope, Schley/Eno and Caldwell. (See Map 6-4.) Instead of designating each farm as its own individual district, participating farms are now assigned to a district based on location.

develop purchase of agricultural conservation easements programs.[20] Orange County adopted its Voluntary Farmland Preservation Program Ordinance (VFPPO) in 1992, creating the framework for the local VAD program.

LANDS LEGACY PROGRAM

The Lands Legacy Program provides the mechanism for the County to acquire or otherwise protect prime or threatened farmland or forestland before it is damaged or lost to incompatible development activities. Using the program, the County can purchase or acquire through donation agricultural conservation easements to keep farmland in production.[21] In 2002, the County acquired its first farmland conservation easement for the Walters property in Cedar Grove Township, using funds from the (then) North Carolina Farmland Preservation Fund. Many of these projects have been in partnership with Orange Soil and Water Conservation District and other conservation entities.

The Voluntary Agricultural District and the Purchase of Development Rights (PDR) components of the Lands Legacy Program are two successful programs for preserving agricultural lands. The County is also considering a Transfer of Development Rights (TDR) program. In a transfer of development rights program the development rights are reduced or extinguished for one parcel and transferred to another parcel, which can serve to direct development away from important agricultural areas to areas more suitable for growth.

FLEXIBLE DEVELOPMENT

Sometimes farmers strategically sell a section or sections of land in order to retain their larger complex. Flexible development standards were adopted in 1996 to preserve important natural and cultural features, including scenic views and active farmland, while still providing an opportunity for farmers to sell or develop sections of their property. Prime farmland and prime forestland must be identified as part of concept plan submittal, and at least 33 percent of such resources must be set aside as conservation areas. County staff and some local developers are exploring the possibility of leasing some or all of the 33 percent of open space for farm use. In 2006 the County adopted amendments to reduce density and increase lot sizes in the rural sections of the County to ease development pressures and nuisance related issues between existing farmers and new residents.

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[20] In a later amendment, the General Assembly created a matching mechanism for distribution of Farmland Preservation Trust Fund monies, with preference to counties with a countywide farmland action plan.

[21] A conservation easement is a voluntary legal agreement between a landowner and a land management agency that limits some of the owner's uses of the property in order to achieve conservation purposes. It is an individually tailored legal agreement by which a property owner typically conveys development rights in return for tax credits or compensation, while still holding ownership of the land.

PRESENT USE VALUE TAXATION

The present use value taxation program is a State program designed to tax land based on its use rather than its market value. Agricultural designation is based on the North Carolina State Use Value Law, which requires ten acres of cropland and average gross sales of $1,000 per year for the preceding three years. (Some smaller tracts of five acres may get use value with certain horticultural crops; forestry use requires twenty acres and a plan on file with the Natural Resources Conservation Service or North Carolina Forest Service.) The County Tax Assessors Office defines "qualifying" farmland based on certain criteria such as acreage, soil type and use. For many farmers enrollment in the present use program is the difference between staying in farming and selling out.

COST OF COMMUNITY SERVICES

To understand the fiscal impact of programs such as present use-value taxation, the American Farmland Trust (AFT) has studied the cost of public service needs (water/sewer, schools, fire and police) for residential development compared to farmland. In 2006, the AFT conducted a Cost of Community Services Study for Orange County, and determined that on average, for every $1 in revenue raised by residential development, the County must spend $1.24 on services. For each dollar of revenue raised by farm, forest, or open space, Orange County only spends $0.72 cents on services. Based on this study, which is consistent with nationwide trends, most residential development does not pay for itself; the exception is typically very high-end housing or housing served by public water and sewer systems.

POTENTIAL PROGRAMS AND INITIATIVES

ENHANCED VOLUNTARY AGRICULTURAL DISTRICTS

In 2005 the General Assembly amended the Farmland Enabling Act to include an economic development component. Renamed the Agricultural Development and Farmland Preservation Enabling Act and the Agricultural Development and Farmland Trust Fund, this new legislation established a new category of districts called Enhanced Voluntary Agricultural Districts (EVAD). The new districts offer additional benefits for farmers, who sign an irrevocable conservation agreement for at least ten years.[22] The revised trust fund supports agricultural development projects as well as traditional farmland preservation programs such as agricultural easements.

TRANSFER OF DEVELOPMENT RIGHTS (STRATEGIC GROWTH & RESOURCE CONSERVATION)

While TDR programs have been successful components to farmland preservation efforts in some states, legislative limits have prevented

[22] Orange County is reviewing the additional benefits linked to the EVAD program and will likely pursue another amendment to its ordinance in the future, to provide for this new type of district.

them from becoming fully realized in North Carolina. Local farm boards first considered the program as an option for Orange County in, "To Preserve Our Farms Final Report of the Orange County Agricultural Task Force," prepared in the 1980s. In 2007, the County began to consider voluntary TDRs again and hired a consultant to evaluate the feasibility of such a program as part of a potential farmland protection and growth management strategy.[23]

AGRICULTURAL SUPPORT ENTERPRISES

The Planning Department, Economic Development Commission, Cooperative Extension Service, Soil and Water Conservation District, and the Environment and Resource Conservation Department staffs have been working together to examine County regulations regarding farm related uses that are outdated or unnecessarily onerous. Proposed is a series of amendments to the Zoning Ordinance that better accommodates the needs of farmers looking for ways to diversify and generate more income. The amendments target uses that provide farmers with supplemental revenue from agricultural products, businesses that are logical extensions of the farm use, and services related to agriculture. A new agricultural support enterprises manual (users guide) is also being proposed to make the application process more user-friendly.

FARM AGENCIES & ADVISORY BOARDS

There are too many agencies at the local, state, and federal level that offer services and programs for farmers to list in this chapter. The Agricultural Preservation Board (APB) is a County-staffed board that provides recommendations to the Board of County Commissioners, which appoints its members.[24] The other boards are made up of elected and appointed members, who serve their particular constituency. The commodity organizations, such as the Orange-Durham Cattlemen's Association (ODCA), the North Carolina State Beekeepers Association, Inc., and the Orange County Landscapers Association also hold regular meetings and support local farmers. The four main agricultural boards for Orange County are listed in the table below. While the farm agencies and their boards have worked somewhat independently from one another in the past they will need to work together in the future, to engage the farming community to develop a long-term vision for farming and to see it come to fruition.

[23] TDRs may offer an alternative less expensive option to PDRs but determining the most suitable sending and receiving areas can be challenging.

[24] The Economic Development Commission, Planning Board, Historic Preservation Board and the Commission for the Environment, may also collaborate with the APB for specific projects.

TABLE 6-1: FARM AGENCIES AND ADVISORY BOARDS

NAME/AFFILIATION	MISSION STATEMENT
Agricultural Preservation Board (APB) / Orange County Environment & Resource Conservation Department	A twelve-member commission that advises the Orange County Board of Commissioners on matters pertaining to local agriculture. Offers recommendations for Voluntary Agricultural District applications and changes to Voluntary Agricultural Protection Ordinance.
Orange Soil & Water Board of Supervisors / Orange County Soil & Water Conservation District/NRCS	A five-member board that establishes and implements programs to protect and conserve soil, water, prime and unique farmland, rangeland, woodland, wildlife, energy and other renewable natural resources on local, non-federal lands. The Board of Supervisors administers the district; raises and budgets districts funds, and reports to the public; and coordinates assistance and funding from federal, state and local government district associations.
Farm Service Agency County Committee (for Durham & Orange Counties / Orange-Durham Counties FSA	The five-member committee that provides oversight to staff regarding federal programs for local farmers. Committee members offer their experience and judgment and are involved with FSA decisions on producer appeals, commodity price support loans and payments, yields, conservation programs, and farm disaster assistance.
Cooperative Extension Advisory Council / Orange County Cooperative Extension Service	The twelve-member board that provides oversight to the local Extension Service office and offers ideas on new objectives and programs. The membership represents a cross-section of the extension service programs, including the farming community, landscapers/horticultural farmers, 4-H programs, extension and community association programs, and local school systems.

6.4.1.2. ORANGE COUNTY'S AGRICULTURAL NEEDS

The introductory section of this chapter identified three components vital to the long-term survival of agriculture in Orange County: 1) keeping productive soils in operation; 2) making farming more profitable; and 3) producing new farmers. The preceding section provided a sample of some of the more popular programs and initiatives already available, or in progress. Since farmers typically prefer voluntary and incentive-based options to regulatory mandates, the role for Orange County government in the future of local agriculture is still being determined. Future efforts to support agriculture and forestry should consider the following needs.

1. Productive soils need to be conserved and protected from development.

- Agricultural priority areas should be identified, and areas of contiguous prime and active agricultural and forestlands should be protected as "communities." The conservation of "critical mass" bolsters the likelihood of success for farm-oriented communities and enhances the opportunities for inter-farm collaborative marketing.

- The County needs to continue, and improve existing programs to preserve farmland through voluntary means such as conservation easements and voluntary agricultural districts.

- The County should explore ways to make farmland available and affordable for new farmers (young and new to farming.)

2. Additional tax benefits at the County and State level may be needed to help keep farming viable. Some of these benefits may require pursuing special legislation, or statewide legislation.

   - The County should pursue a farmer-to-farmer transfer program that would exempt the buyer from the rollback if the property stays in farm use.

   - The County should explore property tax deductions on farm buildings and machinery.

   - The County should pursue property tax deductions on land in donated easements and on land enrolled in voluntary agricultural districts.

   - Farmers should also be encouraged to seek out special programs that provide innovative financial and technical assistance for farm buildings such as the Orange County Local Landmark Program[25] or the National Trust's Barn Again! Program. The County may also wish to follow New York's example and pursue a state rehabilitation tax benefit for barns.

3. Mechanisms and local government program offerings that address profitability and augment agricultural infrastructure should be pursued adopted, and promoted. Local farmers need access to business planning. This type of assistance can also help verify if the crops they are spending the most money on are really bringing in the highest return.

   - Orange County Government should continue to examine and modify regulations that may be unnecessarily onerous. The County may wish to review state regulations as part of this effort and consider requesting special legislation, as appropriate.

[25] This program provides a potential property tax deferral for historic structures, including houses and farm structures.

- Orange County should continue to identify suitable locations for agricultural facilities--processing centers, community kitchens, demonstration tracts, community gardens and the like.
- The county needs a better link between producers and consumers, particularly for potentially large-scale buyers such as restaurants, institutions, and grocery store chains. This is an area where government can help through brokering programs, the dissemination of information, and the creation and management of websites and directories.
- The County should also encourage small-scale farmers to pursue more cooperative ventures and seek more regional programs to compete with corporate operations.

4. There is a need for more inter- and intra-governmental cooperation with regard to agricultural and forestry programs.
   - The County needs to include the municipalities in a countywide vision for agriculture to better accommodate farms located in the towns' extra territorial jurisdictions.
   - County departments should develop more cooperation among each other and among the various agricultural agencies that serve local farmers. Farm programs often remain isolated from county regulatory programs administered through the Planning Department and Environmental Heath.
5. The County needs to teach the next generation about farming and encourage some to pursue farming as an occupation.
   - All local residents should have an appreciation of the farming community, an understanding of where their food and other agricultural products come from, and the nutritional benefits of eating local foodstuffs.
   - Farm-related education should go beyond the classroom and provide hands-on training.
   - One current example of inter-governmental cooperation is the prohibition of open burning on ozone alert days. Other opportunities may exist for the County and Division of Forest Resources to coordinate, such as in the promotion of forest management plans and best management practices, and notification to adjoining property owners on controlled burns.
6. County residents should develop a more holistic view of agriculture and a better understanding of the global implications of their lifestyle decisions, particularly as consumers.
   - In 1929, Governor O. Max Gardner launched the Live-At-Home Program "for its main purpose the encouraging of all of us engaged in farming to grow for ourselves and to supply ourselves with all the food and feed-stuffs and livestock products necessary for family and farm consumption the year

round. It would also encourage us to grow enough surplus to supply the small towns and the cities which are our logical markets; and it would encourage the city folks of this state to give a preference to the North Carolina farmer in their purchase of the supplies which he grows."[26] Today the Goodness Grows in North Carolina program promotes this same concept of buying locally grown products.

- In an effort to address increasing petroleum demands and increasing oil prices, farmers and non-farmers should reconsider their energy usage—building and vehicle needs (cars and farm machinery). Local farmers should also explore the potential for growing crops suitable for the production of alternative fuels.

6.4.1.3. OBJECTIVES

Objectives are intermediate steps toward reaching a goal. The following objectives are intended to help achieve Orange County goals pertaining to agricultural resources—specifically Goals 2, 3 and 8, which are restated below. The timeframes for the objectives conform to the guidelines discussed in *Section 1.4: Administration and Implementation Guidelines.*

Natural & Cultural Systems Goal 2: Economic viability of agriculture, forestry, and horticulture and their respective lands.

Objective AG-1:
Recognize and support the right to farm. Protect farm operations from incompatible adjacent land uses or activities that will adversely affect the long-term agricultural investment in land and improvements. (See also Land Use Objective LU-3.4.)

Objective AG-2:
Pursue new measures (some of which may require special legislation) to make farming more profitable, such as additional programs for tax assistance. (See also Economic Development Objective ED-4.4.)

Objective AG-3:
Develop programs and associated infrastructure facilities to make local farms more economically viable, including local farm product processing, development of a distribution center, and marketing initiatives. (See also Land Use Element Objective LU-3.4 and Economic Development Objective ED-4.4.)

Objective AG-4:
Minimize the negative impacts of future public projects (such as roads, utility lines, etc) on farming operations and productive farmland. Conduct public review of projects proposed by entities

[26] *Emergency Relief in North Carolina. A Record of the Development and the Activities of the North Carolina Emergency Relief Administration, 1932-1935.* North Carolina Emergency Relief Commission, State Administrator, Mrs. Thomas O'Berry. Edited by J.S. Kirk, Walter A. Cutter and Thomas W. Morse. Raleigh: Edwards and Broughton.

that have the power of eminent domain, and consider the impact of such actions on agricultural activity.

Natural & Cultural Systems Goal 3: Infrastructure and support systems for local and regional agriculture.

Objective AG-5:
Teach the next generation about farming, support apprentice options, and promote the pursuit of farming as an occupation. Develop community awareness of farming.

Objective AG-6:
Develop a single clearing-house information source for current agricultural topics, agricultural programs, and events sponsored by Orange County and/or for local farmers in conjunction with the Orange County Farms website. (See also Economic Development Element Objective ED-1.1.)

Objective AG-7:
Complete an examination of the local food system, and create a regional sustainable food network, whereby local residents consume 10% locally grown and produced products in five years.

Objective AG –8:
Encourage the use and production of natural fuel alternatives to petroleum-based products and pursue new types energy sources.

Natural & Cultural Systems Goal 8: Networks of protected natural, cultural, and agricultural lands.

Objective AG-9:
Encourage farmers to continue to be model environmental stewards and promote good forest stewardship management practices using state and federal programs that provide financial assistance. (See also Natural Areas, Wildlife Habitat, and Prime Forests Objective NA-8.)

CONCLUSION

Ultimately, the success of economically viable agriculture in Orange County is dependent upon education and understanding between farmers, citizens, and government. The rights and interests of each should be respected and nurtured. Particularly, it requires the realization that prime farmland is a finite resource, and that farmers must be able to make a living off the land. Without economically viable agriculture, much of our rural character and its associated benefits to the community will be lost.

6.4.2. AIR AND ENERGY RESOURCES

In Orange County, air quality and energy consumption stand out as pressing environmental issues, as County and regional populations continue to expand.

Awareness and concern about air quality and climate change in Orange County is a fairly recent environmental issue when compared to water resources and natural areas. The rapid population growth of the Research Triangle area in the last three decades and the transportation increases associated with this growth are the primary factors that have raised consciousness about air and climate issues. Over the last decade, this has manifested itself in exceedances in local ground-level ozone. This has led to an increase in knowledge and awareness about the local implications of global climate change. With this new knowledge, ground-level ozone and the local contribution to greenhouse gas emissions and global climate change have become significant local issues. Localities like Orange County have begun to assess and evaluate their own role in creating more local and regional ozone pollution and attributing to global climate change.

By far the most significant component of air quality concern in Orange County is the pollution generated from transportation sources. The number of vehicle miles traveled has increased significantly in the last decade, and a countywide greenhouse gas emissions inventory has found that half of the County's greenhouse gas emissions are from the transportation sector. Orange County has the potential for use of alternative energy sources including solar, biodiesel, grain-based fuels and waste-derived fuels.

6.4.2.1. HISTORIC DATA, CURRENT DATA, EVALUATION OF TRENDS

ATMOSPHERE, CLIMATE AND AIR QUALITY

Declining air quality can contribute to respiratory illnesses such as asthma, aggravate existing heart and lung diseases, impair visibility, contribute to global warming, and pollute aquatic systems.

The North Carolina Division of Air Quality (NCDAQ) currently produces the only local inventory of air emissions, dividing sources into five major categories based on how they are released into the atmosphere:

- **Area** sources are small stationary sources such as gas stations, dry cleaners, and repair shops that alone are not very large, but combined can be significant sources. NCDAQ typically estimates these emissions from per capita or per employee emissions information.
- **Biogenic emission** sources are living organisms such as trees, plants, and cattle. In air quality modeling, emissions from biogenic sources are viewed as relatively constant from year to year.
- **Mobile** sources include automobiles and trucks. The NCDAQ's estimates are based on estimated vehicle miles traveled within Orange County.

- **Nonroad mobile** sources come from equipment such as lawn mowers, outboard engines, airplane emissions, agricultural equipment and construction machines.
- **Point** sources are largely stationary sources like factories and electric power plants. Currently, there are only a few point sources of emissions in Orange County.

The NCDAQ collects information on the kinds of pollutants released into the air. These pollutants can be assigned to the following six categories:

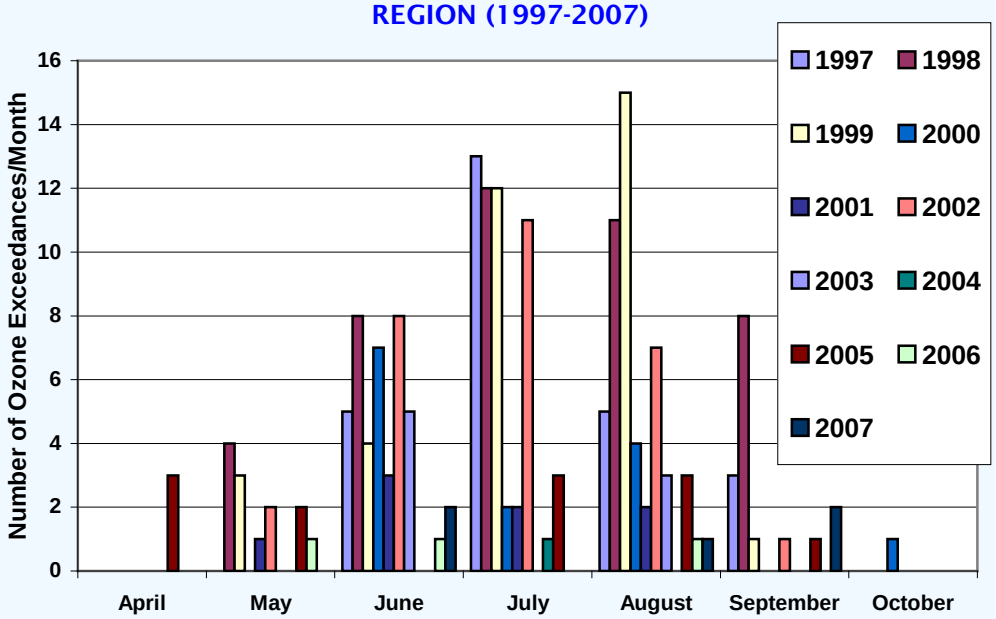
- **Carbon Monoxide** (CO): A colorless, odorless gas that forms when carbon in fuel does not burn completely.
- **Hazardous Pollutants**: A wide range of hazardous compounds like arsenic, chlorine, and mercury.
- **Nitrogen Oxides** (NOx): A gas formed when fuel is burned at high temperatures in vehicles and industry. NOx is the primary contribution to ground-level ozone production in North Carolina.
- **Particulate Matter** (PM): A term for particles such as dust, dirt, soot, smoke and liquid droplets. PM is defined by the size of its diameter: PM10 is less than or equal to 10 micrometers, PM2.5 is less than or equal to 2.5 micrometers, and all sizes are included in the total amount of suspended particulate matter (TSP). There has been greater concern about PM2.5 recently, because these fine particles penetrate deeper into the lungs.
- **Sulfur Dioxide** (SO2): A gas that is released when fuels such as coal and oil are burned.
- **Volatile Organic Compounds** (VOC) and Reactive Organic Gases (ROG): Hydrocarbon compounds such as volatile fuels and solvents that contribute to ground-level ozone production. VOCs include many of the same compounds as ROGs, but ROGs are only those compounds active in atmospheric photochemical reactions.

HOW CLEAN IS THE AIR IN ORANGE COUNTY?

In 2004, the U.S. Environmental Protection Agency (EPA) designated Orange County and several other neighboring counties as "nonattainment areas" under the EPA's revised ambient air quality standard for ozone, meaning that the region's air quality did not attain the federal standard for ozone. In late 2007, however, the EPA approved a request from the State to redesignate the Raleigh-Durham-Chapel Hill area to "attainment" and it is now in a maintenance program to follow a State plan for maintaining the ozone standard through 2017.

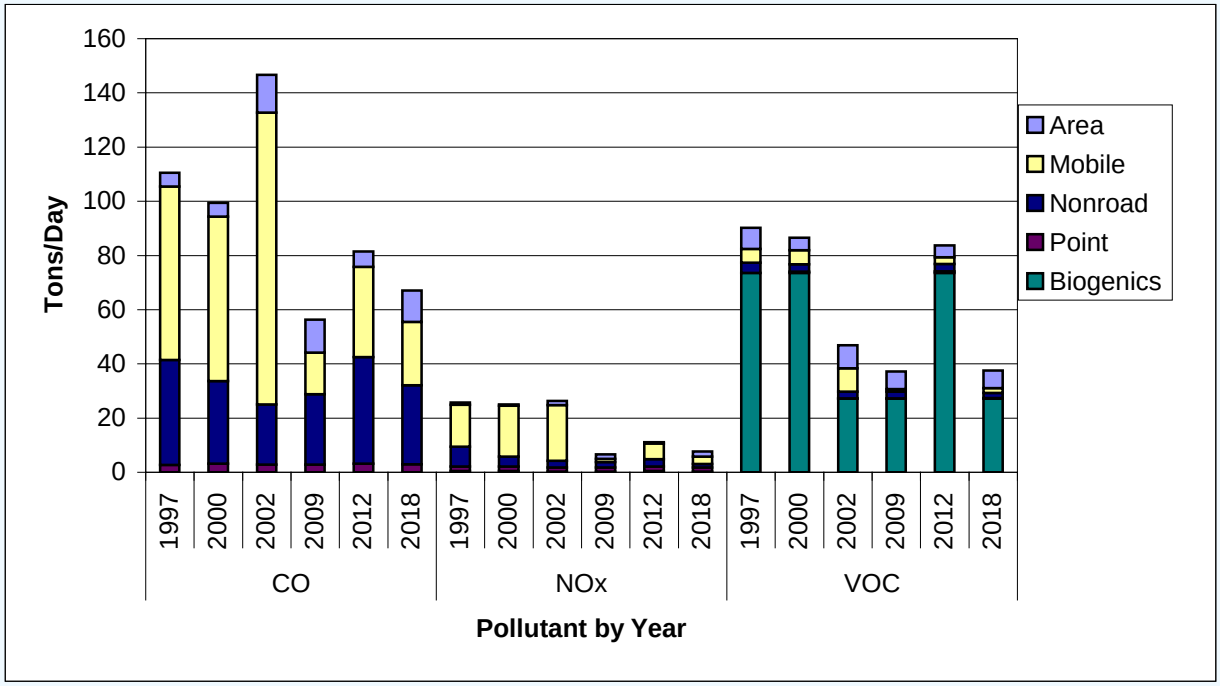
The environmental indicators listed below and shown in the following graphics characterize air quality in Orange County.

FIGURE 6-3: MONTHLY TRENDS IN OZONE EXCEEDANCE DAYS IN THE TRIANGLE REGION (1997-2007)



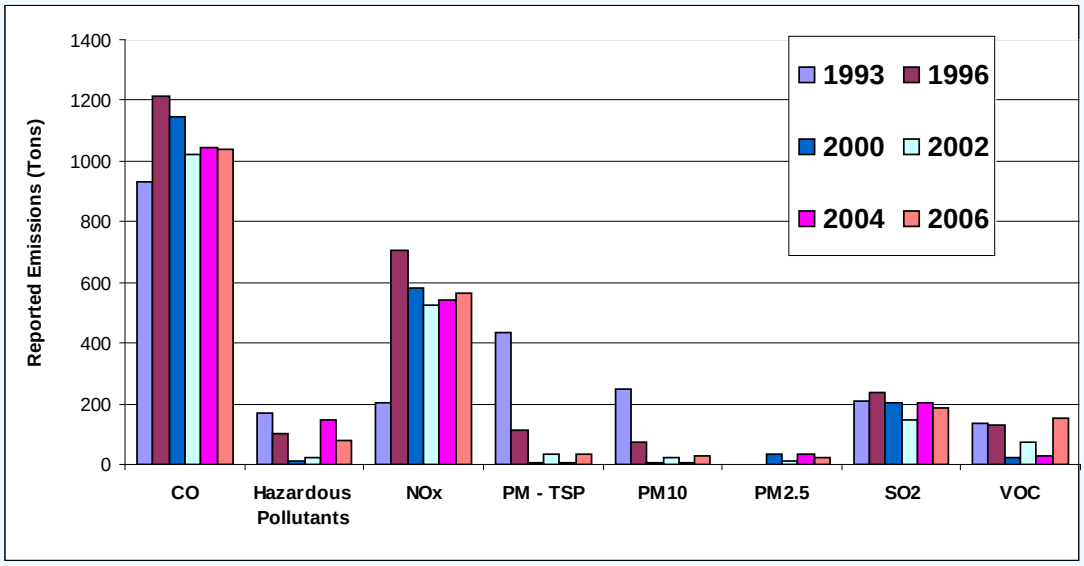
Source: North Carolina Department of Air Quality (NC DAQ)

FIGURE 6-4: ESTIMATED AND PROJECTED EMISSIONS BY SOURCE (1997-2018)



Source: North Carolina Department of Air Quality (NC DAQ)

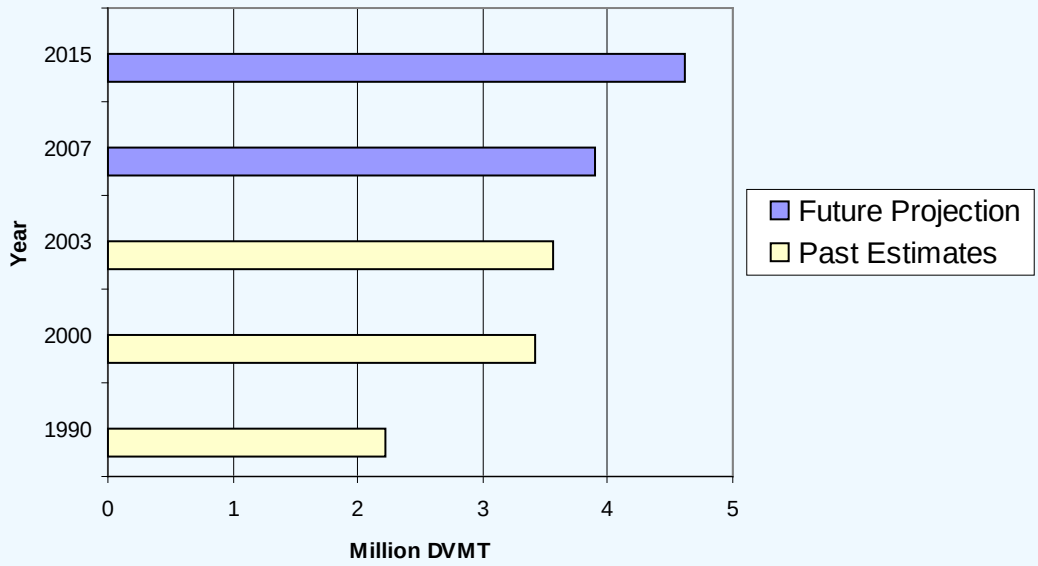
FIGURE 6-5: TRENDS IN POINT SOURCE AIR POLLUTANTS (1993-2006)



Source: North Carolina Department of Air Quality (NC DAQ)

Additionally, the following transportation-related indicator impacts air quality in Orange County:

FIGURE 6-6: CHANGE IN DAILY VEHICLE MILES TRAVELED (1990-2015)



Source: North Carolina Department of Transportation (NC DOT)

CLIMATE CHANGE AND ENERGY RESOURCES

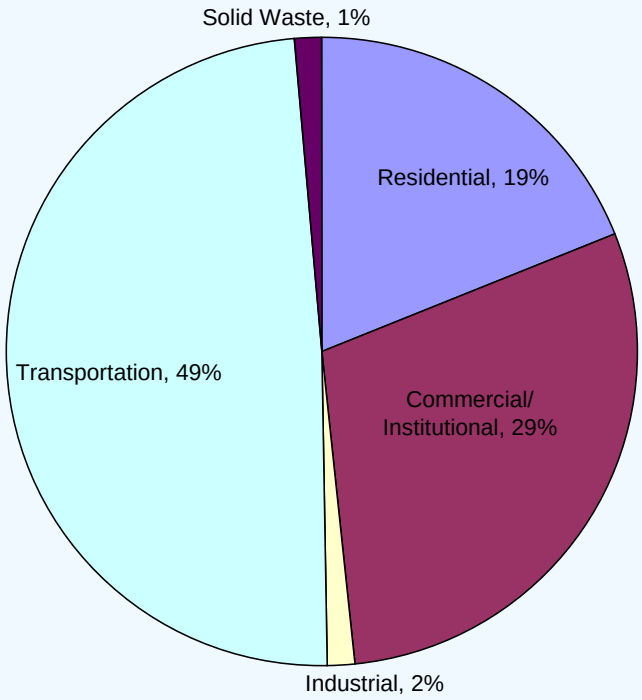
Orange County recognizes that greenhouse gases contribute to global warming. Fortunately, local governments can play a meaningful role in addressing climate change by adopting measures and programs that work to ameliorate impacts on the County's ecosystem. These programs and measures will also serve to address many of the air quality issues listed in the previous section – and advance toward the goal of becoming a sustainable community.

There are good local examples of air quality and emissions planning and implementation efforts. The City of Durham is a participant in the International Council for Local Environmental Initiatives (ICLEI)[27] Cities for Climate Protection (CCP) campaign. The CCP campaign enlists cities to adopt policies and adopt measures to reduce greenhouse gas emissions. Durham County developed a greenhouse gas plan that will help the City and County fulfill their commitments to climate change mitigation. The International Council for Local Environmental Initiatives used a special assessment tool to quantify the link between green house gas emissions in the area and Durham's air emissions planning. The assessment identified additional strategies for improving local air quality to be added to the plan.

Orange County, Chapel Hill and Carrboro initiated a Greenhouse Gas Emissions Inventory and Reduction Action Plan project in 2006. As a part of this project, which is currently underway, a 2005 baseline inventory of greenhouse gas emissions in Orange County was conducted. The inventory found that 49%, or nearly half of the community emissions, come from the transportation sector. The commercial/institutional and residential sectors contribute 29% and 19% respectively. The following figure summarizes the community emissions inventory for the county as of 2005:

[27] ICLEI is an organization of local governments committed to sustainability. For more information on this organization, refer to their website www.iclei.org .

FIGURE 6-7: 2005 COMMUNITY GREENHOUSE GAS EMISSIONS BY SECTOR



This project will eventually evaluate potential green house gas reduction measures, set a reduction target for the communities, and offer actions steps that can be taken to achieve the desired reduction.

TRENDS

- Orange County (as part of the Triangle region) was **designated "non-attainment" for ground-level ozone** in 2004. In late 2007 the area was redesignated "attainment" and it is now in an attainment maintenance program to follow a State plan for maintaining the ozone standard through 2017. However, it should be noted that ozone trends are greatly affected by summer weather and climate. There has been an improvement in ground-level ozone, due to multi-state agreements to reduce NOx emissions from power plants. On the other hand, if the U.S. Environmental Protection Agency pushes for more stringent ozone levels in coming years, ozone levels may again become a pressing issue.

- **Greenhouse gas emissions and air quality** are being impacted by local and global actions, and especially the impacts of increasing transportation on air quality.

- There is a growing interest in **locally-generated alternative energy resources**, whether at an individual or community level. Through local initiatives and new state programs, alternative electricity generation from air, solar, and water sources are being used and/or explored by County citizens, local advocates, and some builders.

- Orange County, its municipalities, and some employers (such as UNC) have taken actions in the last decade to improve fuel efficiency and reduce emissions by acquiring **alternative fuel or low-emission vehicles** for their fleets. County citizens have also shown interest in alternative fuels, as witnessed by the growing trend of electric hybrid and other vehicles now registered.

- Awareness of the rising cost of energy has led many local governments, institutions and businesses to begin taking actions to **improve energy and water efficiency and reduce waste**, especially in new structures.

- Orange County has aggressively worked to **reduce landfill waste**, with a current reduction of approximately 42% of waste diverted from the waste stream through recycling and other measures. The County is also planning for the possible use of methane from the County landfill for energy production.

6.4.2.2. ORANGE COUNTY'S AIR AND ENERGY NEEDS

1. There is increased need and interest at the state and local level to **promote alternative and sustainable fuels and power generation options**. Programs to better link citizens, businesses and possible alternative energy providers are needed.

2. The county will **need to comply with stricter air requirements** that will likely be coming in future years, and maintain necessary reductions while still encouraging economic growth. (See also Economic Development Element.)

3. The county should continue taking local actions, and be part of appropriate regional initiatives to meet or perform better than **Federal ozone standards.**

4. With no local measure of ozone levels, **installation of an ozone monitor in Orange County is needed**.

5. A plan is needed to first **assess and then implement the ongoing countywide greenhouse gas emissions inventory and action plan target reductions** (working individually and collectively toward the target reductions).

6. With transportation the single major air quality and climate issue, **identification of new bus lines** and implementation of additional public transportation is needed.

7. An **accounting of Orange County agricultural resources** is needed, to help assess 1) the potential for heat and power generation, 2) the potential for distribution, and 3) potential customers for power generated and ancillary products.

8. An **accounting and assessment of air (and water) pollution impacts** in Orange County (both increases and decreases) is needed. (Please see also Water Resources chapter).

9. The **management and reuse of landfill gas** from the Orange County landfill is needed.

10. The County needs to determine how to **foster participation in green energy programs**, such as installation incentives for solar generation/solar tempering in residential construction, use of demand side management, and energy efficiency upgrades to schools and older buildings.

11. Finally, the County needs an **inventory of funding opportunities, programs, credits**, etc., that can be used to improve energy efficiency and generate sustainable power. The County needs to identify ways to facilitate the use of these options by County businesses, institutions, and residents.

6.4.2.3. OBJECTIVES

Objectives are intermediate steps toward reaching a goal. The following objectives are intended to help achieve Orange County goals pertaining to air and energy resources—specifically Goal 1, which is restated below. The timeframes for the objectives conform to the guidelines discussed in *Section 1.4: Administration and Implementation Guidelines.*

Natural and Cultural Systems Goal 1: Energy conservation, sustainable use of non-polluting renewable energy resources, efficient use of non-renewable energy resources and clean air.

GREENHOUSE GASES

Objective AE-1:
Assess and implement the current countywide greenhouse gas emissions inventory and action plan target reductions.

Objective AE-2:
Adopt a carbon reduction plan to reduce County green house gas emissions by a target to be determined by the ongoing Greenhouse Gas Emissions Study by the year 2020.

OZONE

Objective AE-3:
In addition to local actions, the County should continue to join appropriate regional initiatives meet or perform better then Federal ozone standards.

Objective AE-4:
Work towards the installation of an ozone monitor in Orange County.

Objective AE-5:
Develop an accounting and assessment of air and water pollution impacts in Orange County (both increases and decreases). (See also Water Resources Objective WR-15.)

Objective AE-6 :
Minimize ozone exceedances by a percentage to be determined from future data by the year 2015.

AIR POLLUTION SOURCES - TRANSPORTATION

Objective AE-7:
Expand and enhance Orange County's public transportation system (See also Transportation Objective T-1.6.)

Objective AE-8:
Improve transportation efficiency: promote more public transportation, ride sharing, and alternative transportation such as bicycling and walking. (See also Transportation Objective T-1.1 and Land Use Objective LU-3.2.)

Objective AE-9:
Promote the use of more fuel-efficient vehicles, and vehicles that use sustainable alternative fuels such as biofuel and electricity.

Objective AE-10:
Convert the County's vehicle fleet to fuel efficient and low-emissions vehicles.

AIR POLLUTION SOURCES – BUILDING ENERGY USE

Objective AE-11:
Improve the energy efficiency of buildings through several action steps: 1) upgrade existing buildings, including County and school buildings; 2) educate planning and building inspection officials about the technologies and techniques of energy efficient construction; and 3) encourage the use of LEED "Gold" (or equivalent) as a standard in new construction. (See also Land Use Objective LU-2.7.)

Objective AE-12:
Provide a system for builders, owners, lenders, appraisers, and buyers of buildings to assess the energy efficiency of structures.

ALTERNATIVE ENERGY

Objective AE-13:
Develop an inventory of funding opportunities, programs, credits, etc., that can be used to improve energy efficiency and to generate sustainable power. Identify ways for the County to facilitate the use of these options by County businesses, institutions, and residents.

Objective AE-14:
Develop an accounting of Orange County agricultural and animal-related resources in order to assess: 1) the potential for heat and power generation; 2) the potential for distribution; and 3) the potential customers that could purchase the power generated and ancillary products.

Objective AE-15:
Foster participation in green energy programs such as installation incentives for solar hot water/solar generation/solar tempering in residential or commercial construction. The County should develop programs that will link citizens and businesses with options for alternative and sustainable energy sources.

Objective AE-16:
Develop the use of alternative fuels and waste-derived fuels that will convert landfill, water treatment, agricultural, and wood wastes into heat and electricity.

CONCLUSION

Orange County is on its way to becoming a 21st century sustainable community. This element sets out a strategy for the county to expand on recent successes and identifies goals and objectives to increase energy efficiency, increase the use of non-polluting renewable resources, and improving air quality for Orange County and the larger region. It incorporates a broad approach to attacking the problems of green house gas emissions and global climate change from a local standpoint. Achieving these goals will require coordination and action from the County, the local governments, businesses, and private citizens.

6.4.3. CULTURAL AND HISTORIC RESOURCES

The purpose of the Cultural Resources component of the Natural and Cultural Systems Element is to cultivate a better understanding of local resources, what they are, what makes them significant or valuable, and how to protect them from losing that significance or value. A *Cultural Resource* is a site, building, landscape, or object significant in history or prehistory, architecture, archaeology or culture. *Historic Preservation* is the process of recognizing, recording, or protecting cultural resources ranging from prehistoric archaeological sites to historic structures.[28]

Orange County officials demonstrated their support for preserving cultural resources in 1991 by adopting *An Ordinance Creating the Historic Preservation Commission of Orange County*.[29] This important document established the historic preservation commission and the local landmark program—the mechanism to designate important historic sites and districts with local honorary status. In 1996 the County adopted the *Historic Preservation Element* of the Comprehensive Plan, which outlined a vision for the long-term protection and management of local resources. The 1996 Element also included a lengthy section devoted toward conservation subdivision designs that has been relocated to the *Land Use Element* as part of the 2030 Comprehensive Plan update.

The current Cultural Resources component chapter supersedes the 1996 Element. It provides updated information on different types of cultural resources and available programs to conserve and protect these resources; it also includes a discussion of current trends in the preservation community, an assessment of needs related to local preservation, and a series of goals and objectives to advance preservation efforts countywide.

The formal historic preservation movement in the United States has come a long way since its inception in the mid nineteenth century with the efforts of Ann Pamela Cunningham and the Mount Vernon Ladies' Association to save Mount Vernon. Historians have gradually become more inclusive, recognizing the importance of telling the whole "story." What started as a movement designed to save the best of the best--the oldest house, the most architecturally significant building, the estate associated with a particularly important historical figure--has gradually widened its scope to include the buildings, landscapes, and archaeological sites associated with more diverse communities.

Preservationists and curators have likewise debated (and continue to debate) the best way use cultural resources to interpret the past. What happens to the value of a historic building if it loses its context? Is a farmhouse still significant if the fields are subdivided and developed? Can the field patterns, farm roads, vistas, the shade trees that once surrounded the house, provide information in and of themselves? Should an addition look

[28] The threshold for "historic" is fifty (50) years or older, unless the resource is of exceptional importance.

[29] The provisions of the preservation ordinance are authorized by North Carolina General Statute 160A-400.1-400.14.

new or should it look like part of the original (old) building? These questions reflect the broader vision that is historic preservation today.

Much of this Cultural Resources section is devoted to descriptions of existing programs for historic structures: honorary designations, rehabilitation tax credits, and survey and documentation programs have served as the "bread and butter" of local preservation efforts for roughly forty years. The underlying theme, however, speaks to the protection and management of all types of cultural resources in Orange County--historic structures and their associated landscapes, archaeological resources and other forms of material culture, cemeteries, historic roadbeds and trading paths, and scenic vistas. It also speaks to the County's heritage and history: both in written and unwritten forms. The key to any successful preservation program, however, is and will always be stewardship, and in the case of private property this duty falls into the hands of the owners. This section is intended to provide the tools and inspiration to handle this challenge today and into the future.

6.4.3.1. HISTORIC DATA, CURRENT DATA, EVALUATION OF TRENDS

TOOLS FOR IDENTIFYING, DOCUMENTING, AND PROTECTING CULTURAL RESOURCES

NATIONAL REGISTER OF HISTORIC PLACES

The National Register of Historic Places was created through the National Historic Preservation Act of 1966 as part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect historic and archeological resources. The program offers honorary status to historic properties through a formal designation process.

For a cultural resource (historic building, archaeological site, cultural landscape, etc.) to be listed in the National Register, it must meet at least one of four criteria based on its historic context. The criteria describe how properties are significant for their association with:

A. important events;

B. persons;

C. for their importance in design or construction; or

D. for their information potential.

The criteria provide a systematic approach to evaluate the significance of cultural resources of all populations nationwide. The National Register program and its associated criteria system have served, and continue to serve, as the model for almost all preservation programs.[30]

[30] See complete list of National Register criteria in *Appendix H.*

The other key component to significance is integrity. Common building types and designs gain significance as they get older if they retain their original features, particularly as fewer examples survive.[31]

Cultural resources may be listed in the National Register as individual sites or as part of historic districts. A historic district is a cluster of properties within a defined geographic area associated with a specific theme or period of construction. Rural historic districts may focus on a mill, a certain landscape feature such as a river, or a neighborhood store and crossroads. In order for district boundaries to follow practical landmarks some properties may be included that do not add to the overall theme; these properties are referred to as "non-contributing." Individual properties must meet a higher threshold of significance than contributing properties in a district. A district may contain properties that have less significance than an individually listed site but still contribute to the overall theme of the district.

The two main benefits of National Register listing are 1) consideration in the planning process for federal, federally licensed, and federally assisted projects (such as the location of highways and widening projects and the location of cellular communication towers as well as state projects) and 2) eligibility for tax credits for certified rehabilitation projects. Properties which have been deemed eligible for the National Register through an initial review by the State Historic Preservation Office (SHPO) are placed on the "Study List." Study list properties enjoy the same consideration during the federal and state planning process as sites placed in the National Register. The listing of a cultural resource in the National Register does not obligate or restrict a private owner in any way unless the owner seeks a federal benefit such as a grant or tax credit. National Register property owners do not have to participate in a review process or obtain a Certificate of Appropriateness. Properties may be removed from National Register listing, however, if their historic character is compromised.

There are currently twelve properties listed in the National Register of Historic Places within Orange County's planning jurisdiction. These include: Ayr Mount, Moorefields, the Bingham School Inn, Saint Mary's Chapel, the Paisley-Rice Log House, Faucette Mill and House (Chatwood), Rigsbee's Rock House, Maple Hill (Jacob Jackson Farm), the Dr. Arch C. Jordan House, the Cabe-Pratt-Harris House, the Maude Faucette House (The Elms), and the Holden-Roberts House. One additional property is listed as an archaeological site.[32] The Cedar Grove Rural Crossroads Historic District is listed as a rural historic district. Thirty-six properties are listed on the North Carolina study list

[31] For example, a turn of the twentieth century rural farmhouse may become more significant over time if it retains its original features—windows, siding, porch posts, chimneys on the exterior, and mantels, stair trim, beadboard on the interior. A high-style 1850s house constructed with a two-story porch, may lose significance if it is updated—covered with synthetic siding, new windows, modified porch, stuccoed chimney, etc.

[32] The locations of specific archeological sites are not shown on county maps due to the sensitive nature of these resources.

as appearing eligible for the National Register.[33] Three historic districts have been placed on the study list; these include the Ray-Kenion Historic District, the Oaks Rural Historic District and St. Mary's Road Historic District. (See Map 6-3 in the *Summary* section of this Element.)

CULTURAL LANDSCAPES AND HISTORIC FARMS

In the early 1980s, the preservation community began to develop a better understanding of the relationship between important structures and their surrounding landscapes, or context, and a new category was added to the National Register program called, Cultural Landscapes.[34] Nominations to the National Register are reviewed under different categories based on the type of resource; for example, a property may be nominated as an example of a house, a farm or an archaeological site. In the case of a farm, the significance is linked to the whole complex rather than just the house. A property which retains its main house and a number of outbuildings may be eligible for the National Register as a farm or cultural landscape even if the house has been updated with synthetic siding or other character-altering treatments.

REHABILITATION TAX CREDITS & NC REHABILITATION CODE

One financial benefit to National Register listing, as an individual property or as a contributing property in a historic district, is the potential for rehabilitation tax credits.[35] Since 1976, the Internal Revenue Code has included a 20 percent investment tax credit for "income-producing" properties--commercial, industrial, and rental residential buildings--listed in the National Register. In North Carolina, new historic preservation tax credits took effect on January 1, 1998. The new law increased the state credit for certified rehabilitations of income-producing historic property from 5 percent to 20 percent, and for the first time provided a 30 percent credit for certified rehabilitations of non income-producing historic structures, including private (owner-occupied) residences. There is no equivalent federal credit for non income-producing properties.

Owners who choose to participate in the preservation tax incentive program must follow the Secretary of the Interior's Standards for Rehabilitation and receive approval prior to beginning the actual work. The credit is claimed against the cost of a certified rehabilitation.[36]

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[33] A few of these properties have been modified since they were identified in the early 1990s and may no longer be eligible for the National Register.

[34] The NPS defines cultural landscapes in *Cultural Resource Management Guideline* as "a geographic area, including both cultural and natural resources and the wildlife or domestic animals therein, associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values."

[35] An income tax deduction lowers the amount of income subject to taxation. A tax credit lowers the amount of tax owed.

[36] Property owners interesting in pursuing state or federal rehabilitation tax credits should contact the Restoration Branch of the State Historic Preservation Office (SHPO) prior to

Historic property owners pursuing building permits may also wish to request to have their project reviewed under the Rehabilitation Code or under the Existing Buildings Section of the standard State Building Code.[37]

EASEMENT DONATION TAX DEDUCTIONS

The Federal Internal Revenue Code provides for federal income, estate, and gift tax deductions for charitable contributions of partial interests in real property (land and buildings). Taxpayers' gifts of qualified interests must be "exclusively for conservation purposes." One of these purposes is defined as "the preservation of an historically important land area or certified historic structure."

CERTIFIED LOCAL GOVERNMENT PROGRAM

The Orange County Historic Preservation Commission is a member of the Certified Local Government (CLG) Program, a federal program, which provides a framework for historic preservation activities at the local level, including requirements for annual training. The program also includes additional funding opportunities for state and federal grant monies.

HISTORIC RESOURCES SURVEYS

One of the key requirements for Certified Local Governments is to complete and maintain an inventory of historic properties. In the early 1990s, the Historic Preservation Commission hired two consulting firms to survey historic properties in the unincorporated portions of the county.[38] These efforts produced an inventory of more than 600 architectural resources, and a substantial report outlining the County's overall history and development. In 2007 the County hired a third consultant in an internship capacity to update the survey. This update focused on three main components:

1. Adding properties to the inventory that were inadvertently omitted or less than fifty years old in 1991-1992;

2. Identifying properties that have since been destroyed or relocated; and

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beginning any work. Information on tax credits can be found online at www2.cr.nps.gov/tps/tax/ or http://www.hpo.dcr.state.nc.us/tchome.htm.

[37] In January 2007, the 2006 North Carolina Rehabilitation Code was adopted as part of the North Carolina State Building Code. Work is classified into six categories (repair, renovation, alteration, reconstruction, change of use and additions), each with its own specific criteria and requirements for that category of work. See also http://www.ncrehabcode.com/look/lookhm.html or contact the Restoration Branch of the SHPO or the Orange County Inspections Division of the Planning and Inspections Department.

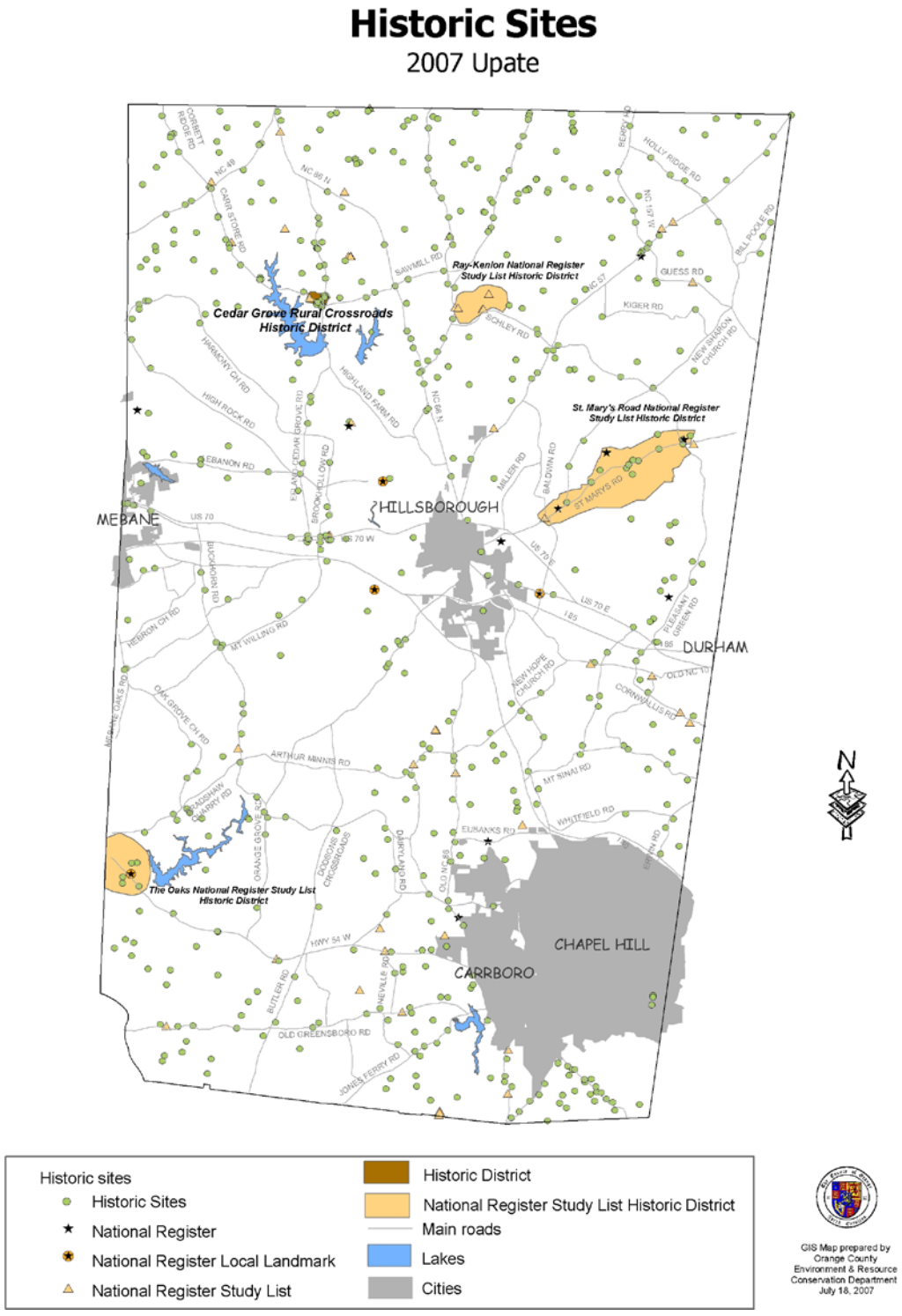
[38] Countywide surveys area conducted in partnership with the SHPO. Consultants use USGS maps to locate resources and may survey a few properties outside of the project area when jurisdictional lines are not clear in the field.

3. Verifying each structure's location on USGS maps and on GIS layers.

The County maintains a file on each property recorded in the inventory that consists of a written data sheet, a brief architectural and social description and a series of photos. As of the 2007 update, the countywide survey includes 634 properties according to the following breakdown. (See Table 6-2 and Map 6-5.)

TABLE 6-2: COUNTYWIDE SURVEY OF HISTORIC SITES

Township	Survey Sites	National Register Properties	Study List Properties	Local Landmarks
Bingham	78	1	4; HD	1
Cedar Grove	199	HD	10; HD	0
Chapel Hill	160	0	13	0
Cheeks	63	3	2	2
Eno	43	5	3; HD	1
Hillsborough	19	1	1	0
Little River	72	1	3	0



MAP 6-5: HISTORIC SITES MAP

LOCAL LANDMARK PROGRAM

Another important component of the Historic Preservation Commission's duties is to recommend properties with special historic or architectural significance for designation in the County's Local Landmark Program.[39] Properties may be designated as individual landmarks or as part of districts. The owners of individually designated Local Landmarks are eligible for an annual 50 percent property tax deferral as long as the property's important historic features are maintained.[40] As of 2007, four individual Orange County properties have been designated into the Local Landmark Program: Chatwood, Moorefields, the Bingham School Inn, and Rigsbee's Rock House. There are currently no local historic districts in the County's jurisdiction.

The Local Landmark program is a form of overlay zoning. Significant properties must be located in the County's planning jurisdiction to be eligible for the program.[41] Local landmark and local district property owners (for contributing and non-contributing buildings) wishing to make changes to building exteriors and site features must apply for a Certificate of Appropriateness (COA). Following a quasi-judicial process, the Historic Preservation Commission reviews applications for proposed changes and determines the appropriateness based on design standards.[42] Minor changes can be approved administratively--without going through the formal COA process.

The context for Orange County's historic resources is very different than for its urban counterparts. County resources are typically located in rural settings with the main house set away from the public road. Many are historic farmsteads and some are still part of active farms. This situation provides a different set of opportunities and challenges than that of urban preservation programs. Design standards must take into account the distance between the house and the road when considering appropriate changes such as additions. Farmers may

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[39] In 1997, per the recommendation of the HPC, the BOCC adopted a new program called *Preserving the Orange Tradition: A Landmark Designation Program for Orange County*.

[40] The property tax deferral program does not extend to properties in local historic districts. Recapture penalties, three years back taxes, may apply if the owner destroys the property or damages its historic value.

[41] All three of the towns in Orange County: Carrboro, Chapel Hill and Hillsborough have downtown historic districts listed in the National Register of Historic Places. The City of Mebane also has a number of historic properties in its jurisdiction that are listed in the National Register including a handful of rural historic districts. Chapel Hill and Hillsborough have locally designated historic districts. As of January 2008, however, none of the municipalities have adopted provisions to designate individual landmarks.

[42] The Local Landmark Program was adopted, in 1997, before the HPC finished developing design standards. The Secretary of the Interior's Standards for Rehabilitation were adopted for use evaluating COA applications until the new standards based on Orange County's rural architectural legacy are finished and adopted. See *Appendix I* for the Secretary of the Interior's Standards for Rehabilitation.

remove farm buildings that have outlived their original purpose. Metal replacement buildings may be considered visibly incongruous but may serve the practical use needed to keep the farm profitable. Older homes and associated outbuildings are most likely to survive when in use. The Historic Preservation Commission remains cognizant of the need to balance historic integrity with modern-day functionality.

The Local Landmark Program and the National Register of Historic Places are *two entirely distinct and separate programs*. Both offer honorary status to historic properties through a formal designation process. The specific benefits of each program, however, are quite different. The Local Landmark Program is a local program administered by local government; properties are designated by the adoption of an ordinance by the Board of County Commissioners. The National Register of Historic Places is a federal program administered by the National Park Service in partnership with state historic preservation offices (SHPO).[43]

THE CENTURY FARM PROGRAM

The Century Farm program provides yet another honorary program for North Carolina farmers. This special program was initiated in 1970 when the North Carolina State Fair chose to highlight its theme "Salute to Agriculture" by searching for North Carolina families who had maintained active farms for more than 100 years. Today almost 1,600 farms are listed in the program including fifteen from Orange County. [44]

Agriculture and preservation work hand-in-hand to preserve and conserve cultural landscapes. Honorary programs such as the Local Landmark Program, the National Register of Historic Places, and the Century Farm Program provide opportunities for recognition, awareness, and preservation of Orange County's rich agricultural history. Participation can offer financial incentives in the form of rehabilitation tax credits and/or property tax deferments. Preservation programs can dovetail with agricultural programs such as Voluntary Agricultural Districts and agricultural conservation easements to increase

[43] Local governments do not participate in the administration of the National Register program except to offer recommendations for new listings.

[44] The Orange County farmers include: Elbert H. Allison; N. K. Andrews; Elizabeth N. Blalock, Thomas N. Blalock, James M. Blalock; J. Fred Bowman, Betty Bowman; Jane M. Branscome, L. M. Merritt, E. Mangum; Flora Dick Dellinger, Edna Dellinger, Cothran Dellinger, Gene Dellinger; Estelle Haley, Frances H. Griffin, Wade E. Griffin; Katherine L. Kirkpatrick; Floyd Fox Miller; A. Gordon Neville; Ralph Neville (Heirs): Anne Neville Williams, Jane Neville Hatley, Bryant Neville, Claude Neville; Shelton L. Ray; Richard Roberts, Ollie Roberts; Bryant J. Walker; and L. Phillip Walker.

awareness for agri-tourism and direct marketing purposes, and to minimize nuisance-related concerns.[45]

ARCHAEOLOGICAL RESOURCES

Orange County has sponsored numerous archaeological surveys, particularly in the last five years. Information from these projects is shared with the Office of State Archaeology but is not made public due to salvage concerns. Since the design of Little River Park and Natural Area in 1999, the County has conducted cultural resources surveys as part of the master plan design process for new parks. In October of 2006, the Board of County Commissioners adopted a new policy requiring cultural and archaeological surveys for all County development projects. Surveys are conducted by archaeological consultants, who meet federal standards and typically include: background research, systematic surface and subsurface investigation (digging based on a grid system), field reconnaissance, and a reporting of the results. Information from these surveys can be used to assist in the siting of future facilities and/or for identifying areas of historic and cultural interest for possible interpretation.

In addition to archaeological surveys conducted in advance of new County development projects, local residents can also ensure the documentation and preservation of valuable historic and prehistoric archaeological resources. The value of an artifact is in its context (original location), its relationship with other artifacts, its structural elements, or its relationship to natural features. Once removed from their context many artifacts lose their value.[46] Residents are encouraged to use the Office of State Archaeology (OSA) to determine the appropriate course of action regarding archaeological finds, particularly those that may involve old cemetery sites. The OSA can help residents record, map, and catalog sites, thus preserving valuable locations information on the future.

HISTORIC CEMETERIES

Historic cemeteries offer an invaluable link to the past. Often, smaller family cemeteries are subject to abandonment and neglect over time, resulting in the loss of valuable genealogical and historical information. Increasing development in the region further jeopardizes these cultural resources. The OSA can provide information on the State Cemetery

[45] See also information on *Barn Again*! in the Trends Section of this chapter and in the Agricultural Chapter of this Element.

[46] Archaeological research in the late 1970s and early 1980s led to the creation of an "Archaeological Potential Map," which reflected the likelihood of finding resources based on topographic features such as ridges and drainageways. The map lacks the precision to replace site specific-fieldwork for predicting the location of archaeological resources and should only be used as a general guide.

Survey and the state statutes (N.C.G.S. Chapter 70, Article 3), regarding the handling of human skeletal remains.[47]

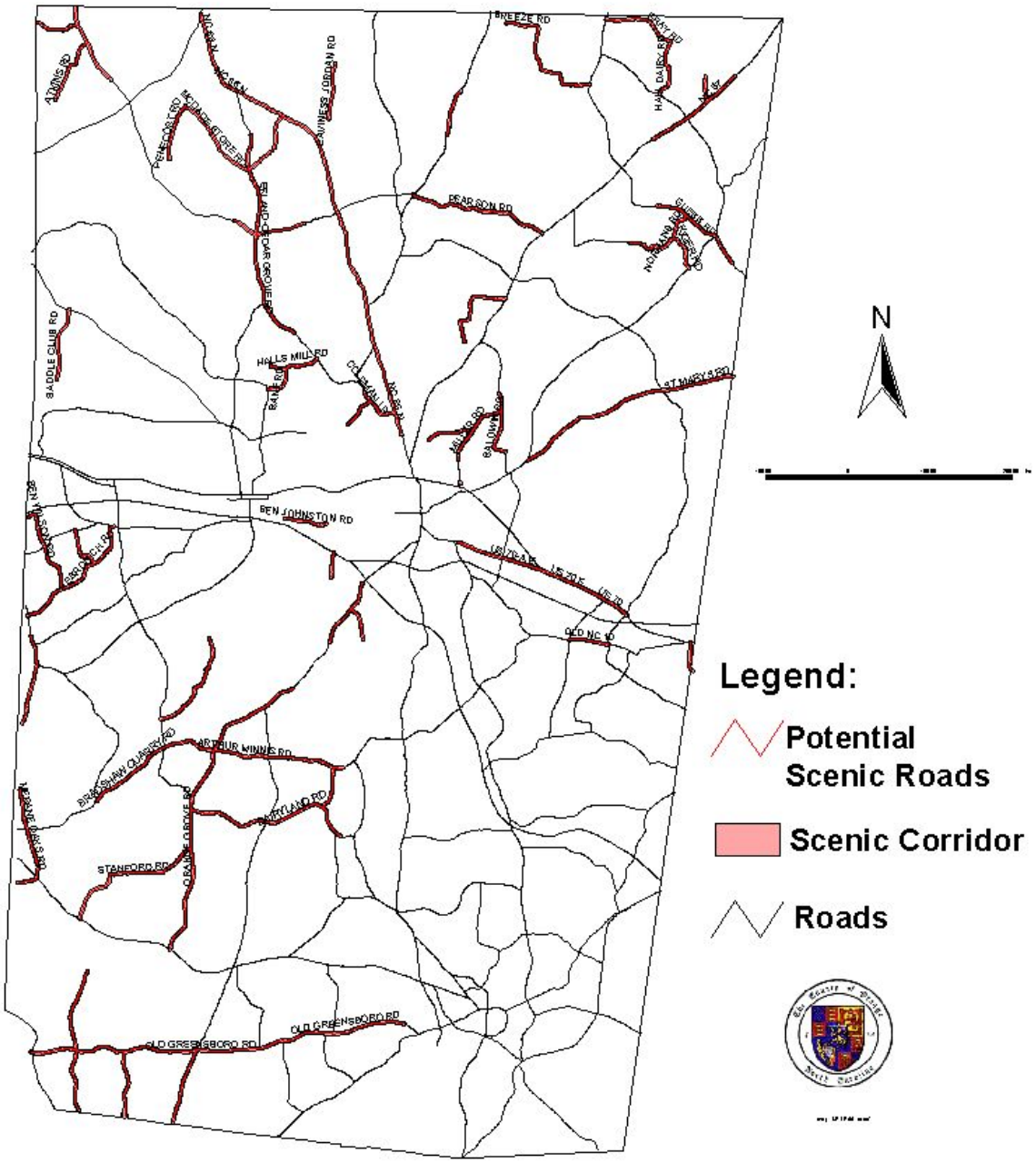
SCENIC RESOURCES

During the late 1980s to mid 1990s, Orange County Planning staff, working in conjunction with the Planning Board's Transportation Advisory Subcommittee (TAS), researched scenic road programs in other states and localities, and developed a proposal for Orange County. The Scenic, Rustic, and Rural Roads Program separated potential corridors into three categories based on the focus of their designation – natural natural features, historic or cultural resources, or rural or agricultural context. The group systematically ranked roads based on criteria and produced a Scenic Corridors Map, which included segments from fifty (50) local roads. (See Map 6-6: Orange County Scenic Corridors Map.) While, the initial proposal was voluntary, the map was included in the Land Use Element of the Comprehensive Plan and referenced in the Flexible Development option of the Subdivision Regulations. Views from the identified corridors are considered conservation areas in the Flexible Development standards.

The HPC is currently evaluating the corridors shown on the 1981 map to determine which road segments still merit scenic designation. The HPC has also been working to develop a new heritage/scenic corridor program. As development continues to occur, rural roads and their associated agricultural vistas may become compromised unless additional measures are adopted.

The North Carolina Scenic Byways Program offers another form of recognition to special road corridors that contribute to the visual character of a community. Honorary in nature; there is no regulatory component to the program, nor any preemptive development restrictions. Three North Carolina Scenic Byways pass through Orange County – the Colonial Heritage Byway, the Football Road, and the Scots-Welsh Byway. (See Map 6-3 in the Summary section of this Element.)

[47] ERCD works with the Durham-Orange Genealogical Society of North Carolina (D-OGS) to inventory cemeteries in Orange County; information on their cemetery census is available online.



MAP 6-6: ORANGE COUNTY SCENIC CORRIDORS MAP

HIGHWAY MARKER PROGRAM

The North Carolina Highway Historical Marker Program was established in 1935, based on the marker program in Virginia established in 1926. The Department of Cultural Resources' Research Branch and the Department of Transportation's Traffic Engineering Branch, Division of Highways administer the program jointly. Eligibility is subject to specific criteria based on state significance. Unlike the recognition of historic structures or archaeological sites, the markers typically commemorate important individuals who have been dead for twenty-five or more years. Today there are more than 1,400 state markers throughout North Carolina, at least one in every county. Orange County currently has twenty-five markers, including those within the towns of Chapel Hill and Hillsborough.[48]

HERITAGE DOCUMENTATION PROGRAMS

Since it is inevitable that some resources will be lost over time documentation is important. The Historic American Buildings Survey (HABS) was established in 1936 to record a sampling of different types of buildings throughout the United States. Each property is documented with measured drawings, photographs and written descriptions in accordance with very specific standards. Original materials are permanently housed in the Library of Congress; however, copies are made available to the public and can be viewed online or purchased.

Over the years, three companion programs have been created that greatly expand the scope of the original survey: the Historic American Engineering Record (HAER; 1969); the Cultural Resources Geographical Information Systems Facility (CRGIS;1989); and the Historic American Landscapes Survey (HALS;2000). Today all four programs fall under the umbrella of the Heritage Documentation Programs, administered by the National Park Service. The documentation materials can provide invaluable information when researching a particular property to prepare a National Register nomination, or when trying to restore a property.

DEMOLITION BY NEGLECT AND THE QUICK RESPONSE TEAM

Another area where rural preservation efforts must differ from their urban counterparts is addressing the problem of demolition by neglect. Demolition by neglect is when a property owner neglects to maintain a building, for whatever reason, to the point the building is deemed

[48] The twenty-five North Carolina State Highway Historical Markers located in Orange County include: G-3 Thomas Burke; G-4 William Hooper 1742-1790; G-9 Archibald Debow Murphey; G-10 Francis Nash; G-11 Thomas Ruffin; G-16 Thomas Burke; G-19 Edmund Fanning; F-23 Regulators Hanged; G-26 Thomas H. Benton; G-33 Occaneechi; G-37, G-38, G-39 Bingham School; G-40 William A. Graham; G-48 Paper Mill; G-64 Moses A. Curtis; G-66 Hughes Academy; G-84 Old Eno Church and Cemetery; G-88 North Carolina Society of the Cincinnati; G-90 St. Mary's Chapel; G-92 University of N.C. at Chapel Hill; G-100 Harriet M. Berry 1877-1940; G-103 J. G. de Roulhac Hamilton; G-108 James Hogg 1972-1804; G-115 Elizabeth Keckly ca. 1820-1907; G-122 Hart's Mill; G-125 Billy Strayhorn 1915-1967.

unsalvageable.[49] Enforcing a demolition by neglect ordinance in a county jurisdiction can be challenging. Rural buildings are typically less publicly visible and likely do not present the same types of safety concerns as urban structures (except perhaps for children and trespassers.) Older farm structures, no longer in use, may suffer neglect or intentional destruction – leading to the substantial loss of valuable historical information.

To address this situation, the Historic Preservation Commission established a new program in partnership with the Inspections Division, in 2006, called the Quick Response Team (QRT). The purpose of the QRT is to provide information regarding preservation or salvage options to the applicant as well as to document the structure prior to its demolition. When the County receives an application for a demolition permit for a building fifty (50) years or older within Orange County's planning jurisdiction the QRT is notified. The QRT visits the site within three business days of the application date to evaluate the significance of the building. In most cases, demolition proceeds without further delay. In those cases where the building is particularly significant the QRT is granted two additional business days to provide the applicant with information on salvage companies and/or preservation firms to pursue options other than demolition. The QRT records and documents the structure; releasing the demolition permit within the five-day (maximum) period, if not sooner. The QRT has photographed approximately ten buildings using this program. Documentation has been particularly useful in those cases where the property was not recorded in the countywide inventory.

TRENDS IN THE PRESERVATION COMMUNITY

Preservation philosophies are continually evolving. As conservationists uncover new information about historic structures, historians and curators are faced with new decisions on how to convey this new information. At the private level, individual homeowners make choices regarding their lifestyles—do they wish to live in a house that is "authentic" or one that has all of the latest conveniences. Most choose something in between.

During the next several years, the preservation community will likely see the greatest potential for change in five key areas: 1) accepting the next phase of buildings (fifty years and older) as historic; 2) developing a greater appreciation for cultural landscapes as part of local heritage; 3) establishing the role for government in local preservation efforts; 4) understanding the decline of the house museum movement and the need to seek new or different uses for these types of facilities; and 5) conveying accurate information regarding the compatibility of historic preservation to the green building and affordable housing movements.

[49] In urban settings historic buildings that are in jeopardy of collapse are often condemned for public safety reasons; condemnation often leads to demolition. Many municipal preservation programs are pursuing demolition by neglect ordinances to minimize this problem. (The Town of Hillsborough recently adopted such an ordinance.)

- The National Register criteria apply to **properties fifty years and older**. Houses constructed in the 1950s are now eligible for this special designation. For some residents, recognizing post World War II houses, particularly modest brick ranch homes and innovative modernist houses, as "historic" may take some getting used to. These buildings represent the next phase of resources that will be nominated to the National Register.

- Residents will likewise have to develop a better appreciation for the **relationship between historic properties and their surrounding context**. Long-term efforts to protect Orange County's rural character will have to take into account the role of historic farmsteads--houses, outbuildings, fields and farm roads. Tearing down an older farmhouse to construct a new house clearly changes the visual character of the property; the loss of the outbuildings, even modest outbuildings destroys character as well. The 1987 National Trust for Historic Preservation program Barn Again! awards successful barn restoration projects and provides information, including costs, for common repairs and retrofit options. While the QRT program is a success story for local preservation efforts, the fact that property owners continue to demolish buildings through neglect or intention reveals a lack of understanding of the value of historic buildings individually and as part of a farm building complex.

- As **governmental entities** (the County and the State) continue to purchase easements and property for parkland and other uses, attention is needed to decide the future of existing buildings. Decisions will require accurate assessments of building conditions and costs for stabilization, reuse and long-term maintenance. Identifying new uses for buildings that have out-lived their original purpose may have to be discussed. Decision makers should also consider their role as a model of the type of preservation stewardship that they advocate for the private sector.

- **House museums** are losing attendance, nationwide. Some future park sites retain farm complexes, which may lend themselves to potential museum use. Local residents and elected officials should consider the special issues associated with museums before pursuing new facilities—the need for a higher threshold of authenticity in buildings and furnishings, the level of wear-and-tear that public access has on historic structures, circulation needs for the general public and for the handicapped, insurance, and perhaps most important the story. What is the museum's mission or purpose? What is it designed to convey? What is the best way to communicate that message to the public to make history engaging?

- Preservation works hand-in-hand with the ideals of the **green building** movement. Many older buildings were oriented to take advantage of topography--natural light and wind, and

vegetation such as shade trees – and incorporated design features such as high ceilings, wide, hallways, and front and back porches to make them more comfortable and energy efficient. Local preservationists must partner with green building enthusiasts to determine the best ways to accommodate green principles without compromising historic character.[50]

- Some of the same principles apply to **affordable housing**. Efforts to make existing buildings "maintenance free" can create new problems in the long run. The application of synthetic siding over existing wood siding can trap moisture inside the wall and lead to rot. Underpinning houses without providing sufficient ventilation can lead to excessive moisture under the house. It can be more difficult to repair a new window than an older unit; instead of replacing an individual pane of glass the whole unit may need to be replaced. In addition, once these character-defining elements are removed the house may lose eligibility for grants or tax credit programs based on historic integrity. It is important to convey the value of original materials—historic value and economic value. Stripping a historic building to a shell and rebuilding it with lower quality components simply produces a lower quality product, which is not necessarily affordable housing.

6.4.3.2. ORANGE COUNTY'S CULTURAL AND HISTORICAL RESOURCES NEEDS

EDUCATION AND OUTREACH

A large portion of the needs associated with successful countywide cultural resource protection is linked to education and outreach.[51] There are a lot of misconceptions about historic preservation programs. In a nutshell:

- Inclusion in the countywide survey is for information purposes only; there are no regulatory implications.
- Likewise there are no restrictions associated with listing a property in the National Register, unless the owners wish to pursue rehabilitation tax credits.
- Local landmark and local historic district property owners need to apply for a certificate of appropriateness before

[50] Window replacements, for example, have significant and character-altering impact with limited improvements to energy efficiency. Good quality storm windows, a less expensive option, may provide the same energy benefits and have a longer life cycle than replacement windows (typically 10 to 20 years).

[51] Historic property owners should take advantage of the information and technical support available from the HPC, county preservation staff and the SHPO staff.

applying for a building permit. The Historic Preservation Commission will evaluate the application based on specific design standards. The owner can appeal the Historic Preservation Commission's decision.

GAPS IN COVERAGE

Orange County's Historic Preservation Commission serves the County's planning jurisdiction. Hillsborough and Chapel Hill have historic district commissions that review changes to properties inside their local historic districts. Neither the town of Carrboro nor the City of Mebane have locally designated historic districts.[52] The remaining sections of the towns' jurisdictions – the areas in the town limits that are not part of local historic districts and the areas in the towns' extra-territorial jurisdictions – do not have appointed preservation advocates. In addition, only the county's preservation ordinance includes provisions for designating individual local landmarks. The potential for a 50-percent property tax deferral could become an effective incentive for rehabilitating and redeveloping significant resources within town jurisdictions, particularly those which require substantial work and which will have higher assessment value once the work is completed.

INTERNAL POLICY CONFLICTS

Some Orange County policies may inadvertently conflict with preservation missions. For example, zoning regulations place a limit of one primary dwelling per lot. Historic buildings are traditionally located on the best building site on the tract, the best view, the best drainage, and the most suitable soils. In order to construct a new house on an existing historic property, older buildings must lose their "residential status" by being disconnected from septic services, demolished or abandoned, thus leading to their eventual demise.

When the County adopted zoning countywide, commercial operations in the rural areas were zoned Existing Commercial (EC-5). Many of these small operations were housed in older store buildings or former gas stations. Once scattered throughout the county at various crossroads, many of these turn of the century buildings are gone or at risk unless a new use for them can be identified.

Clustering additional growth around existing crossroads communities may compromise their character, and in some cases compromise National Register or Local Landmark eligibility. New residential buildings tend to be much larger than their historic counterparts and may negatively impact the visual landscape. As part of the growing New Urbanism movement, village-type community designs attempt to emulate the proportions of historic communities and structural elements, which can create a false sense of history along with disproportional and oddly detailed houses. Zoning ordinances can prescribe building setback dimensions, footprint size, and heights, but cannot (without design guidelines) prohibit incongruous new buildings.

[52] The Appearance Commission serves as the Town of Carrboro's Historic District Commission. The City of Mebane does not have an appointed Historic District/Preservation Commission.

Affordable housing programs may save the physical structure but can also lead to the inadvertent destruction of historic character-defining elements. Efforts to make buildings "maintenance-free" with the application of synthetic siding, new windows, and "upgraded" interiors can lead to "cookie cutter" units that are devoid of original character. These improvements may appear to make the building look new in the short-term, but in the long-term they can be more difficult to maintain and may lead to a more disposable property.

FUNDING FOR MAINTENANCE, RESTORATION AND PURCHASE

Historic resources are often lost or compromised for lack of funding. Interested buyers may face special challenges with lending agencies or have difficulty obtaining insurance. Delayed maintenance such as roof upkeep or exterior paint can lead to more expensive repairs in the long run. A maintenance fund for small projects could balance the rehabilitation tax credit programs that require a threshold of expenditure.

DOCUMENTATION

Even with the most successful preservation program, some historic buildings will eventually be lost over time. This is why documentation is so important. In addition to systematic survey updates, the County must remain vigilant with its documentation efforts through the QRT and regular drive-by schedules. Buildings that move into or out of the County should be documented. Important buildings and building complexes that appear threatened should be documented, in addition to efforts for renovation and reuse.

6.4.3.3. OBJECTIVES

Objectives are intermediate steps toward reaching a goal. The following objectives are intended to help achieve Orange County goals pertaining to cultural resources—specifically Goals 4, 5 and 8, which are restated below. The timeframes for the objectives conform to the guidelines discussed in *Section 1.4: Administration and Implementation Guidelines.*

Natural & Cultural Systems Goal 4: Preservation of historic, cultural, architectural and archaeological resources, and their associated landscapes.

Objective CR-1:
Provide for the systematic identification of historic buildings, objects, districts, sites, structures and archaeological sites. Update and improve these inventories at regular intervals.

Objective CR-2:
Establish stronger partnerships with preservation organizations for the dissemination of information on current topics and to provide hands-on training, such as "how to" publications, examples of design guidelines, technical briefs, etc. (See also Economic Development Objective ED-4.1.)

Objective CR-3:
Work within the Orange County government system to identify and resolve existing policies which may be in conflict with the County's historic preservation mission. (See also Economic Development Objective ED-4.1, Housing Objective H-3.6 and Land Use Objective LU-4.5.)

Objective CR-4:
Strive to make the community more aware of the activities of the Historic Preservation Commission and its place in County government. (See also Economic Development Objective ED-4.1.)

Objective CR-5:
Promote existing programs that offer financial incentives for preservation purposes and pursue new programs to encourage the purchase, preservation, maintenance or adaptive reuse of historic landscapes, and historic and soon to be historic structures. (See also Economic Development Objective ED-4.1.)

Natural & Cultural Systems Goal 5: Awareness and appreciation of the diverse cultural history and heritage of Orange County and its residents.

Objective CR-6:
Develop and strengthen educational programs to make history engaging to the public.

Objective CR-7:
Encourage publication of material relating to the County's heritage.

Objective CR-8:
Determine the appropriate level of heritage tourism promotion in Orange County based on interests and concerns of residents and coordinate heritage tourism efforts with existing programs in the county. (See also Economic Development Objective ED-1.7.)

Objective CR-9:
Explore ways to inform the public about archaeology, how archaeologists conduct investigations and what they do with the findings. Consider "virtual" archaeological display options to share information from County-sponsored cultural resources surveys without risking salvage concerns.

Natural & Cultural Systems Goal 8: Networks of protected natural, cultural and agricultural lands.

Objective CR-10:
Establish a dialogue with the other jurisdictions in and adjacent to Orange County to address cultural resources in areas with or without designated Historic Preservation/District Commissions.

Objective CR-11:
Increase public information/awareness endeavors to promote land and cultural resource stewardship – for individual homes, historic

farmsteads and their associated landscapes – as well as alternative means of private property dedication and preservation.

Objective CR-12:
Provide for a user-friendly public input process for systematic acquisition of and contribution to information about cultural resources.

CONCLUSION

Efforts to protect and preserve cultural resources in Orange County will require a multifaceted approach. The loss of these resources permanently removes part of our heritage and changes the visual character of rural areas. It can also reduce affordable housing options and diminish tourism opportunities such as driving tours and other special events. It is critical that the County use the 2030 Comprehensive Plan process and the greater green building movement to upgrade the dialogue among residents on the importance of cultural resources and to develop a win-win attitude toward their protection.

6.4.4. NATURAL AREAS, WILDLIFE HABITAT, AND PRIME FORESTS

The purpose of the Natural Areas, Wildlife Habitat, and Prime Forests component chapter of the Natural and Cultural Systems Element is to provide direction and guidance for future land protection efforts in the County through a set of goals and objectives. Development activities and other forms of habitat destruction in the County put the habitats of plant and animal species at risk of being removed or destroyed. Further habitat fragmentation and habitat destruction will likely result in a loss of biodiversity in the County and change the County's character and naturally functioning systems. In response to this threat, this component sets an objective to protect 10% of county by 2010. It also provides an inventory of natural sites located within Orange County, a listing of programs and organizations that are working to protect the County's important natural lands, and an assessment of information, programmatic, and policy needs required to meet goals to protect important natural areas.

BIOGEOGRAPHIC SETTING

Orange County is located within the Piedmont Ecoregion. The landscape consists typically of gently rolling hills, draining generally towards the southeast. The major plant and animal community of the region is the Eastern Deciduous Forest, which is typically dominated by oak and hickory trees. The characteristic successional stages of this vegetation range from old fields, to pine woods, to hardwood forests.

The many types of natural communities that exist in Orange County are strongly associated with the variety of topographic, geologic, soil, and hydrologic conditions found throughout our landscape. The two most common natural communities in the County are the Mesic Mixed Hardwood Forest (located on slopes above streams) and the Dry-Mesic Oak – Hickory Forest (common on upland areas). There are also several types of wetland communities, especially in stream valleys.

There are no natural lakes in Orange County. There are many hundreds of farm ponds, however, which have both positive and negative affects on stream ecology. Natural springs create wetlands in both uplands and floodplains. Other, marshier, wetlands are created by the impoundment of streams by beavers and for reservoirs, such as University Lake.

Two features of the County's landscape play a significant role in determining the location and composition of its plant and animal communities. The first are inselbergs (also known as monadnocks), which are isolated hills capped with rock that is more resistant to erosion than the surrounding countryside. Orange County has a series of inselbergs running generally southwest from Hillsborough toward the Haw River. The most notable example is Occoneechee Mountain, which has the highest elevation (867 feet) and is host to plants and animals characteristic of mountain communities. Other examples are Blackwood Mountain, and Bald, Pickards, and Crawford mountains. The nearest area of inselbergs to Orange County is the Uwharrie Mountains, which have a similar biota. The great distance separating our "mountains" from the Uwharries has resulted in a reduced diversity of

species and a lower likelihood of their replacement if they were removed or destroyed.

The second important feature is the Durham Triassic Basin. Located on the southeastern edge of the County, it is a unique part of the landscape with elevations that range down to 240 feet – the lowest in the County. This is the only part of the county with true swamp forests. Many of the animals living there are normally found in the Coastal Plain.

Other local factors that affect the distribution of Orange County's flora and fauna are the restricted soil formations, north-facing slopes, vernal pools, and springs. Each of these provides restricted habitat to plant and animal communities that are often widely separated from related communities by miles of inhospitable terrain.

ENVIRONMENTAL HERITAGE

The environment and natural resources of Orange County have played an important role in its development. Three centuries ago, the County's hills and river bottoms were covered with extensive forests, largely comprised of mature hardwood (deciduous) trees. Those forests provided habitats for most of the County's native species of wildlife. The native people hunted game in those forests and in open prairie-like areas, which were often burned to drive game animals across the land.

Early European settlers eliminated the region's large mammals both for food and for the safety of their community. Some were predators, like the gray wolf, black bear and mountain lion. Settlers also hunted wild turkey, white-tailed deer and smaller mammals. Beaver were eliminated from NC before the 1900s, but were later reintroduced. North America's only native parrot – the Carolina parakeet – was considered an orchard pest and was hunted to extinction.

The vast majority of the land in Orange County (and throughout the entire Piedmont) has at some time been cleared and farmed. Throughout the 1700 and 1800s settlers cut trees and farmed the land until the reduced soil fertility and emergence of new urban industries resulted in widespread abandonment of farmland. Much of that farmland has since regenerated back into woodlands.

Today more of Orange County is forested than it has been over the past 200 years. Forests have grown up on abandoned farm fields, steep slopes, rocky outcrops and bottomlands. Most of those areas, however, are early succession woodlands dominated by pine and mixed pine-hardwood communities. It generally takes from 75 to 100 years for hardwood trees to begin replacing the pines that become established on abandoned fields. It takes much longer for woodlands to transform into an oak-hickory forest, or in moist lowland areas, a forest community often dominated by sweet gum and yellow poplar.

PLANTS AND ANIMALS

Despite the widespread changes to the landscape over the past 300 years, Orange County still has some relatively intact areas that are home to significant plant and animal communities. Most native

animals still depend on large areas of continuous undisturbed hardwood forests to survive.

Orange County hosts a variety of animals, but few species are endemic (found here and nowhere else) to the Piedmont and none is confined only to this county. Most animals range widely over the Eastern Deciduous Forest Biome, from the Mississippi Valley to the Coastal Plain. A list of significant animal species in the County is provided as *Appendix J*.

Typical woodland animals in Orange County include mammals such as the white-tailed deer, raccoon, gray fox, eastern gray squirrel, white-footed mouse, short-tailed shrew, and red bat. Common woodland birds include 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.

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. Several species of mollusks and fish live in the rivers and streams, although many are considered as rare, threatened or endangered.

Some animal species in the County require large tracts of undisturbed land for their existence. Those same animals are often the most sensitive to forest fragmentation and urbanization. Finding healthy populations of bobcat, wild turkeys, or pileated woodpeckers is one of the best indicators of a relatively undisturbed "natural" area. The absence of species such as ovenbirds, hooded warblers, or eastern hognose snakes indicates that a site has lost most of its wild qualities, even if large trees or unusual plant species are present.

Orange County is home to more than one thousand different plant species. Plants show more regional differentiation than animals due to their restricted ability to disperse and their narrower habitat requirements, but few are considered endemic to the Piedmont. Two exceptions are Lewis' heartleaf and southern shagbark hickory—both present in Orange County. A list of significant plant species in the County is provided as *Appendix J*.

Many of the County's forests and open lands have been invaded by exotic plants that can spread over large areas and harm native plants. Invasive plants are a problem throughout the Piedmont. They spread rapidly and cause a significant loss of biodiversity. Prime culprits are Japanese stilt grass, Japanese honeysuckle, multiflora rose, and Chinese privet. Efforts to eradicate these plants are difficult and costly.

6.4.4.1. HISTORIC DATA, CURRENT DATA, EVALUATION OF TRENDS

PREVIOUS INVENTORIES OF THE COUNTY'S NATURAL RESOURCES

Orange County has made concerted efforts to identify all of the significant natural resource lands located within its jurisdiction. In 1986 the Planning Department produced an initial inventory of sites having biological and geological significance in the unincorporated areas of the County. That effort was followed up in 1988 by the *Inventory of Natural Areas and Wildlife Habitat for Orange County, NC* (Sather and Hall) with assistance from the Triangle Land Conservancy.

Orange County's inventory of natural areas (updated 2004) identifies 53 natural areas (or "natural heritage sites") that are either unique to Orange County or are exemplary of the natural ecosystems found in the County and the surrounding region. The areas total more than 10,000 acres and individual sites range in size from four acres to 892 acres. Many sites provide habitats for rare or unusual plant and animal species. Collectively, they represent the natural diversity of the County, from dry upland ridges to river bluffs and bottomland forests.

Three of Orange County's natural heritage sites are considered to be of national significance because of the presence of federally listed threatened or endangered species. They are the Eno River aquatic habitat, University Lake aquatic habitat, and an area known as Meadow Flats. Ten other sites are considered to be of state significance. The other sites are significant at a regional or county level. In addition to the 53 individual sites, the inventory identifies seven larger areas of significance referred to as macrosites. A map of the natural heritage sites and macrosites in the county is provided in *Appendix K*.

A plan for protecting key segments of the New Hope Creek corridor was developed in 1991 for the governing boards of Durham, Chapel Hill, Durham County and Orange County. The *New Hope Corridor Open Space Master Plan* recommended the permanent protection of the river corridor for wildlife habitat and low-impact recreation. The Orange County part of the plan extends from Erwin Road northwest to Mt. Sinai Road near Blackwood Station, and is comprised largely of Duke Forest lands. The plan also recognized the importance of protecting New Hope Creek headwaters upstream of the plan limits.

The *Landscape with Wildlife* reports (1997 & 1999) identified the remaining prime forests in Orange County. Prime forests were defined as large areas (>40 acres) comprised of hardwood and mixed hardwood-pine forests. The project used a GIS-based rating system to identify those areas of a size and character most suitable for habitat used by native wildlife, and showed changes in forest cover over time.

In 2002 the *Triangle GreenPrint* identified important resource lands across the six-county Triangle region. The GreenPrint presents the "essential green infrastructure" (e.g., natural areas, prime farm and forestland, and important watershed lands), suggests ways to protect those lands by various means, and tracks ongoing land protection efforts throughout the region. Orange County was a participant in the

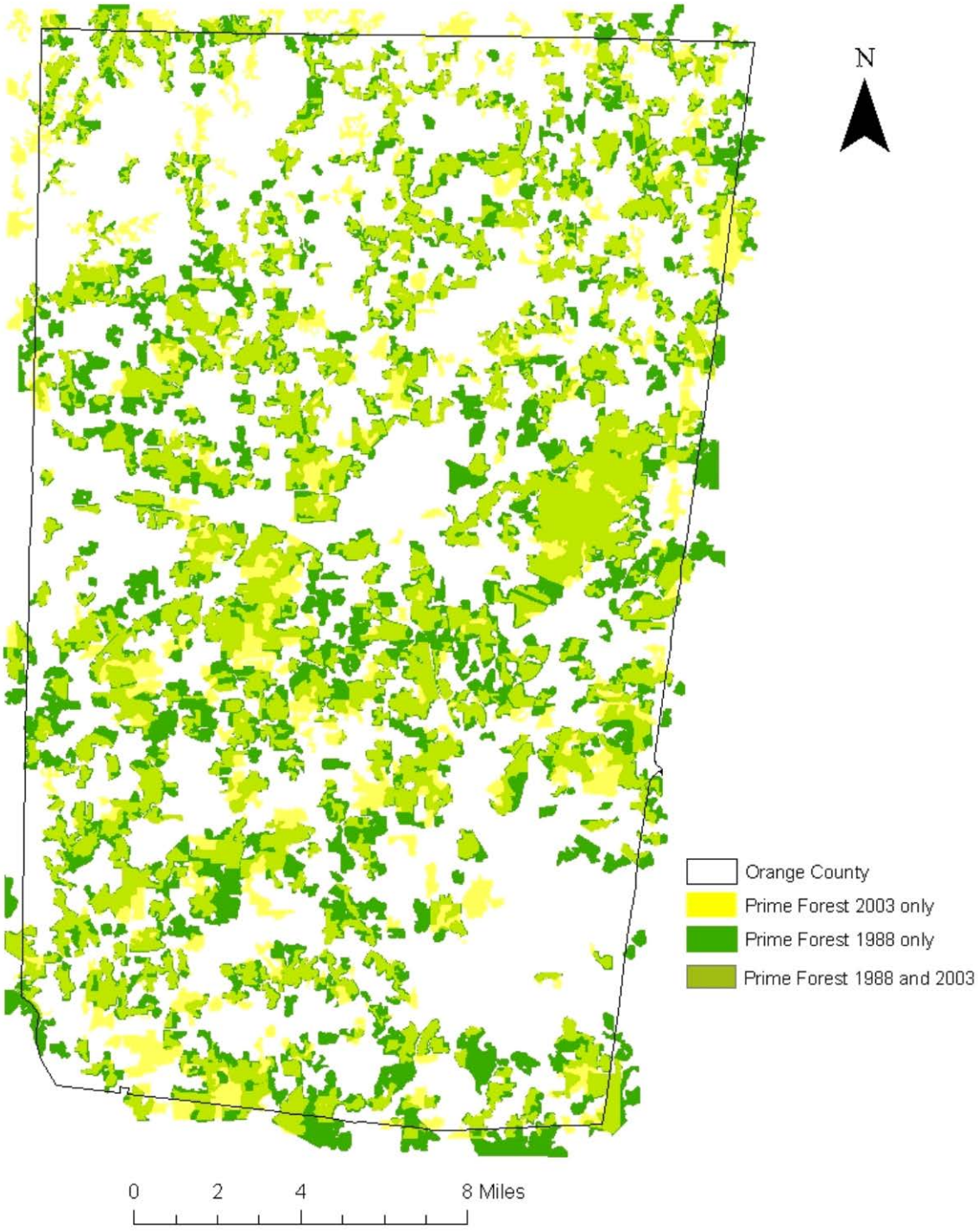
development of that regional plan, and has incorporated it into the Lands Legacy program.

CHANGE IN PRIME FOREST COVER

Prime forests (i.e., hardwood and mixed hardwood pine forests) were prominent in the pre-European settlement landscape of Orange County. They provide habitat for many indigenous plant and animal species that are restricted to hardwood forest habitats. Those forests also help the people of Orange County by improving air quality and water quality, and by helping to control flooding.

The *Landscape with Wildlife* report (1997) found that the county may have lost as much as 25% of its prime forestland since the 1970s. Over that same period many other prime forests were fragmented to the point where they can no longer accommodate diverse species.

In 1988 Orange County had about 71,000 acres of prime forest (28% of Orange County). An update was completed in 2004 that illustrated the change in area of prime forest between 1988 and 2003, but the information was not sufficiently accurate to compare differences in actual acreage over that time period (*State of the Environment*, 2004). (See Map 6-7.)



MAP 6-7: CHANGES IN FOREST COVER (1998-2003)

STATUS OF RARE PLANTS AND ANIMALS

The conversion of natural lands to urban or suburban uses results in habitat loss for native plants and animals, and can result in loss of native species. The North Carolina Natural Heritage Program maintains a list of rare plant and animal species and classifies them as endangered, threatened or species of concern. The status of Orange County's rare plant and animal species is provided in *Appendix L*.

Since 2002 three species (Carolina darter, sharp-shinned hawk, small whorled pogonia) were changed from the "Current" to the "Historic" category, meaning that they have not been observed in Orange County during the past 20 years. The 2004 update of the *Inventory of Natural Areas and Wildlife Habitat for Orange County, North Carolina* confirmed the previous documentation of several rare species within the county's natural areas and added one new species, the Carolina Ladle Crayfish.

LAND PROTECTION EFFORTS

Early efforts to conserve land in Orange County include Duke University's purchase of large tracts of land (including abandoned farmland) in the 1920s and 30s. The land was managed for forestry research and education, and later for timber production. Duke Forest continued to grow and many sections were recognized for their conservation value. In 2004, Duke University registered 1,220 acres for voluntary protection with the North Carolina Natural Heritage Program. Today, Duke is the largest landowner in the County, owning more than 5,000 acres of land. Duke Forest provides an excellent model of sustainable land management.

The State of North Carolina began purchasing lands for the new Eno River State Park beginning in the 1970s. The linear park was established around large natural areas associated with the river. Acquisition of land along the Eno from Durham to Hillsborough continues today pursuant to the state park master plan. Now more than two-thirds of the state park (3,160 acres) is in Orange County. The State has also acquired 160 acres along the Eno near Hillsborough for Occoneechee Mountain State Natural Area.

In the 1980s the Orange Water and Sewer Authority (OWASA) started acquiring lands in Bingham Township for the Cane Creek Reservoir and later acquired more land in the watershed to protect drinking water supplies. In 1984 the University of North Carolina dedicated 367 acres as the Mason Farm Biological Reserve.

During the 1980s and 1990s the Triangle Land Conservancy, the Eno River Association, and others used the aforementioned inventories and plans to protect critical resource lands along important river corridors.

Significant natural resource lands are also protected as part of the development approval process administered by the Orange County Planning Department. The Unified Development Ordinance requires that important natural resources be identified and avoided. Some of those areas are set aside as private open space or are dedicated to the County for open space and low-impact recreation purposes. The

County encourages private preservation of open space areas through education and outreach.

LANDS LEGACY PROGRAM

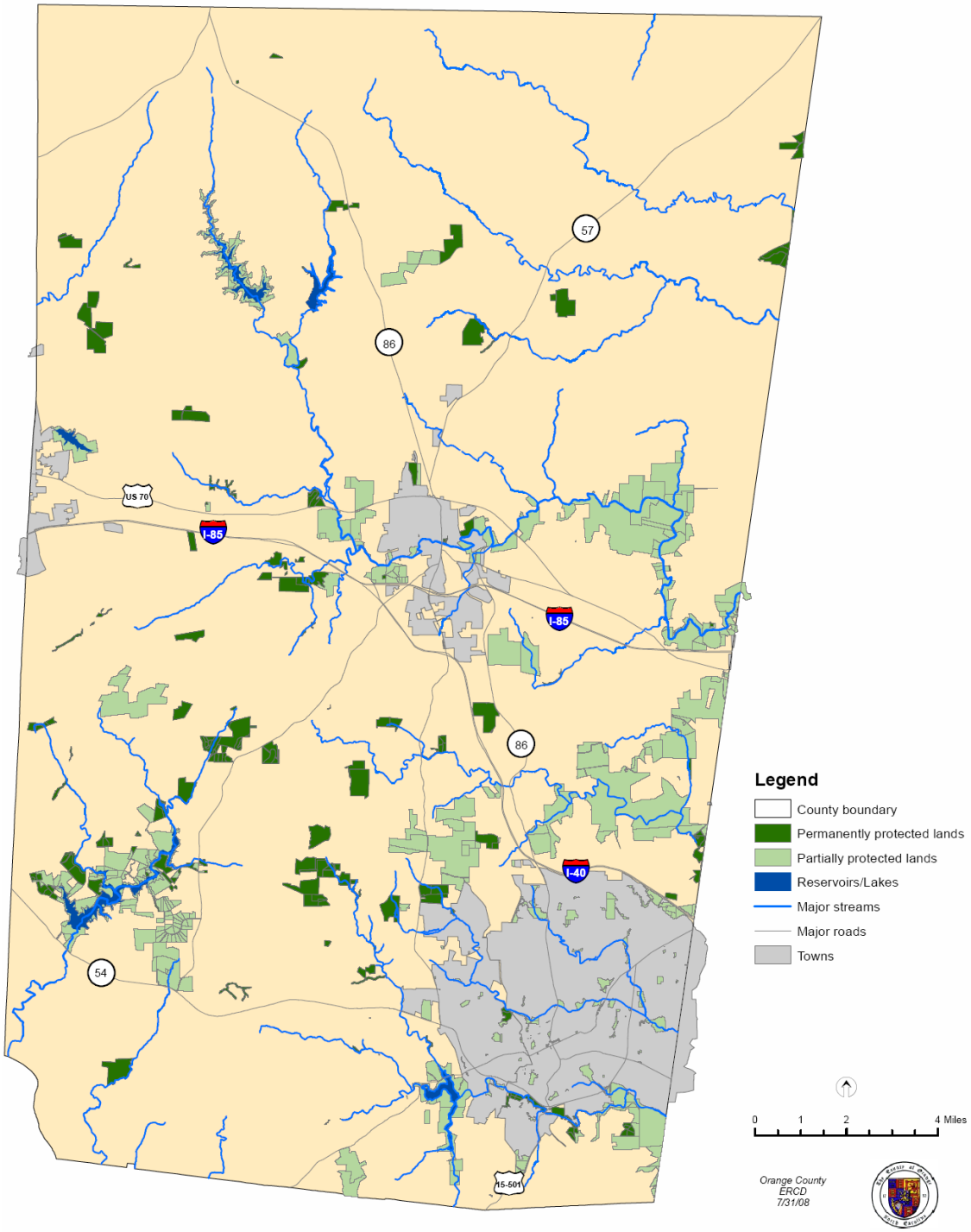
In 2000 Orange County accelerated the pace of conservation by establishing the Lands Legacy program -- the first comprehensive county land conservation program in North Carolina. Lands Legacy was the first focus of the new Environment and Resource Conservation Department, a department established in 1998 to make environmental protection a separate function of county government. Through Lands Legacy the County collaborates with local land trusts, OWASA, area universities, and other partners to protect some of the County's most important natural and cultural resources before they are lost or irreparably damaged. The types of land protected include natural areas and wildlife habitat, parkland, prime farmland, historic and cultural sites, and stream buffers. The County also works with its advisory boards to help guide its acquisition priorities and sets those priorities every two years through the adoption of the Lands Legacy Action Plan. To date, Lands Legacy has protected nearly 2,300 acres, as described in Table 6-3.

TABLE 6-3: LAND PROTECTED THROUGH LANDS LEGACY PROGRAM (2007)

Fee Simple Acquisitions	Acres
-Parkland	670
-Natural lands/Other	307
	977 acres
Conservation Easements (privately-owned lands)	
-Prime farmland	1,088
-Natural areas	210
	1,298 acres
Total Protected Land	**2,275 acres**

CURRENT ESTIMATES OF PROTECTED LAND

The County's Environment and Resource Conservation Department (ERCD) maintains a comprehensive database of protected lands throughout the County, including public parkland, nature preserves, and other public and private open space dedicated for conservation. The data includes conservation easements held by local land trusts, OWASA, Orange County and several other entities.



MAP 6-8: PROTECTED LANDS IN ORANGE COUNTY(2008)

The protected land data and trends are reported in the County's *State of the Environment* report, which is published by the Commission for the Environment (CfE). The report describes the condition of many important natural resources in the County, including its biological resources. The CfE plays an important role in the protection of those resources by advising the Board of Commissioners on which lands should be protected through the Lands Legacy program and designing future parks in ways that protect sensitive resource areas.

In 2004 the *State of the Environment* reported there were 19,265 acres of protected land in Orange County, and that just over half of that land was considered "permanently" protected.[53]

Land protection has accelerated over the past few decades. Prior to 1981 there was an estimated 4,400 acres of protected land in Orange County. Another 4,900 acres were protected during the 1980s, and then 7,150 acres in the 1990s). Since 2000 an estimated 5,000 acres have been protected thus far and it appears that figure may reach 8,000 by 2010.

By the end of 2007 a total of 22,650 acres (8.8% of the County) were protected through various means, including parks, nature preserves, historic sites, and dedicated private open space. More work is needed to meet the Commission for the Environment's goal of 10% of the County's land area being conserved by the year 2010. Many important natural resource lands remain completely unprotected. Map 6-8 illustrates the locations of protected lands in Orange County.

The amount of protected land continues to increase in Orange County thanks to the efforts by the local land trusts, OWASA, and other land conservation entities active in this region. Eno River State Park continues to expand, but is still several hundred acres short of completing the park master plan.

Although considerable progress has been made to conserve land in Orange County, many highly significant natural heritage areas remain vulnerable to being damaged or destroyed by future development. The *State of the Environment* (2004) found that about 4,000 acres (40%) of the County's 10,000 acres of documented natural areas remained unprotected.

By the end of 2007 the County, through its Lands Legacy program, had protected 2,275 acres, including land for seven new county parks and conservation easements on 1,300 acres of privately owned farms and forestlands. Many of the earlier acquisitions were to satisfy a deficit of parkland in the County. Later efforts focused on an initiative to protect farmland using conservation easements.

Over the remainder of this decade the Lands Legacy program is expected to focus more effort on the protection of significant natural areas. One objective is to establish larger areas of natural lands (including prime forests) as nature preserves. This effort was envisioned in the ERCD report that led to the adoption of Lands Legacy

[53] Permanently protected is defined here as meaning that a long-term binding agreement to preserve land was executed.

(2000). The concept was also discussed in the *Joint Master Recreation & Parks Work Group* report (1999).

Envisioned is a system of nature preserves jointly owned and managed by different entities, including Orange County. The purpose is to protect critical masses of undeveloped land (including significant natural areas) surrounded by low-density development and working farms and managed forests. Less sensitive areas might include facilities for public access. Other portions would remain wilderness areas that support native wildlife. This concept complements the desired protection of ecologically significant macrosites described earlier and recommended in the *Inventory of Natural Areas and Wildlife Habitats for Orange County, North Carolina* (2004).

6.4.4.2. ORANGE COUNTY'S NATURAL AREAS, WILDLIFE HABITAT, AND PRIME FORESTS NEEDS

The following section outlines some of the information, program enhancements, and process changes that are needed in order to:

- Support the County's goal of sustaining a balanced and healthy diversity of native plant and animal populations;
- Support the County's goal of providing a network of protected natural, cultural and agricultural lands; and
- Achieve an adequate level of protection for Orange County's most important natural areas, prime forests and wildlife habitat.

A COMPREHENSIVE NATURAL AREAS AND OPEN SPACE CONSERVATION PLAN

The *Inventory of Natural Areas and Wildlife Habitat for Orange County* proposed a specific network of protected wildlife corridors, which has been incorporated into County plans. In 2000 the Shaping Orange County Task Force recommended that the County develop a much more comprehensive conservation plan that would help to ensure long-term protection of its important biological resources.

The plan should address:

- threats to important natural areas and rare species;
- connectivity between protected areas;
- coordination with neighboring counties and conservation partners; and
- the sustainable management of critical natural resources.

EXPAND THE SCOPE OF ORANGE COUNTY'S INVENTORY OF NATURAL AREAS TO INCLUDE PREVIOUSLY UNEXPLORED SECTIONS OF THE COUNTY

The natural areas that were documented in the County's initial inventory (1988) were concentrated in areas of the County that were more easily accessible or that were already protected in some fashion.

Many sites were located in Duke Forest, Eno River State Park, and on University of North Carolina property. New areas of the County should be explored, including northern Orange County. This action is recommended by the Commission for the Environment and endorsed by the NC Natural Heritage Program.

A MONITORING PROGRAM FOR ORANGE COUNTY'S NATURAL AREAS

More fieldwork is needed to document the continued presence of rare plant and animal species in the County. The 2004 update to the County's inventory of natural areas provided a rare opportunity to re-visit sites that had been identified in 1988. Many sites have not been re-visited for 20 years. More frequent visits are necessary to ensure that those sites are intact.

A BETTER METHODOLOGY FOR MONITORING CHANGES IN FOREST COVER

A more detailed and consistent approach is needed for determining changes in forest cover. Efforts were made in 1988 and 2004 to calculate forest cover in Orange County using GIS-based methods, but there were differences in the methods used that make it difficult to compare the results. The information would be useful to get a better understanding of where the County is losing critical habitat for native plants and animals. Better data would help Orange County work with private landowners and other conservation partners on the protection of large areas of prime forest and connections between core forest areas (i.e., wildlife corridors).

A METHODOLOGY FOR MONITORING BIODIVERSITY IN ORANGE COUNTY

One of the critical issues identified in the *2004 State of the Environment* report was the loss of biodiversity in Orange County. Although the County still has large areas of open space and a diversity of wildlife, timber harvesting and development have reduced wildlife habitat and degraded aquatic habitat, which hastens the loss of certain plant and animal populations. The Commission for the Environment recommends developing a way of monitoring common non-rare indicator species as a way to measure the "state of biodiversity" in Orange County.

6.4.4.3. OBJECTIVES

Objectives are intermediate steps toward reaching a goal. The following objectives are intended to help achieve Orange County goals pertaining to natural areas, wildlife habitat and prime forests (Goals 7 and 8), which are restated below. The timeframes for the objectives conform to the guidelines discussed in *Section 1.4: Administration and Implementation Guidelines.*

Natural & Cultural Systems Goal 7: A balanced and healthy diversity of native plant and animal populations.

Objective NA-1:
Conserve high-priority natural areas and wildlife habitats, including wetlands, rivers and streams, floodplains, steep slopes, prime forests, wildlife corridors, and other critical habitats. (See also Water Resources Objective WR-1.)

Objective NA-2:
Conduct more frequent updates to the County's inventory of natural areas, and include previously unsurveyed areas of the County.

Objective NA-3:
Develop a more detailed and consistent methodology for monitoring changes in forest cover throughout the County, and specifically the extent of mature hardwood forest.

Objective NA-4:
Encourage adequate stormwater runoff controls in existing developed areas and require these controls for new subdivisions to protect sensitive downstream aquatic habitat. (See also Land Use Element Objective LU-2.3 and Erosion Control Objective EC-1.)

Objective NA-5:
Prohibit development that would cause adverse impacts on highly significant natural areas and wildlife habitat. (See also Land Use Objective LU-2.2 and Water and Wastewater Objective WW-14.)

Objective NA-6:
Develop a way of monitoring common indicator species as a way to measure the "state of biodiversity" in Orange County.

Objective NA-7:
Ensure that significant natural areas and wildlife habitat located on County-owned lands are protected with adequate ecosystem management practices and stewardship.

Objective NA-8:
Encourage forest management practices on both public and private land that minimize disruption and fragmentation of intact hardwood forests. (See also Agriculture Objective AG-9.)

Objective NA-9:
Encourage long-term productivity of farms and timber lands through best land-use management practices and conservation agreements. (See also Parks and Recreation Objective PR-1.1.)

Natural & Cultural Systems Goal 8: Networks of protected natural, cultural and agricultural lands.

Objective NA-10:
Require that all major subdivisions (defined as having more than 5 lots according to the Orange County Unified Development Ordinance) include within their boundaries open space suitable for low-impact

recreation and wildlife habitat. (See also Land Use Objective LU-4.3 and Parks and Recreation Objectives PR-1.3 and PR-4.1.)

Objective NA-11:
Develop a comprehensive conservation plan for achieving a network of protected open space throughout Orange County, which addresses 1) threats to important natural areas; 2) connectivity between protected areas; 3) coordination with neighboring counties; and 4) sustainable management of critical natural resources. (See also Parks and Recreation Objective PR-5.4.)

Objective NA-12:
Establish a system of nature preserves that protect large areas of undeveloped land (including significant natural areas) surrounded by low-density development and working farms and managed forests. (See also Parks and Recreation Objective PR-5.4.)

Objective NA-13:
Promote clustering of residential development and dedication of large areas of undisturbed land for low-impact recreational use by residents and for wildlife habitat. Where feasible, these areas should be contiguous to neighboring tracts of undisturbed land. (See also Parks and Recreation Objective PR-5.1.)

Objective NA-14:
Encourage developers and neighborhood associations to protect undeveloped community open space through formal conservation agreements.

Objective NA-15:
Protect land in and around biologically significant areas, and connections between these areas, to allow for the maintenance of native wildlife and plant populations and their functional relationships.

Objective NA-16:
Create a system of public and private open space and conservation areas, including parks, nature preserves, and scenic vistas representative of the Orange County landscape. (See also Land Use Objective LU-3.10, Parks and Recreation Objective PR-5.4, and Transportation Objective T-1.5.)

Objective NA-17:
Maintain and protect land that contains valuable productive resources, such as prime farmland and prime forestland, by directing incompatible development away from these areas. (See also Water and Wastewater Objective WW-14, Land Use Objective LU-2.2, and Natural Areas Objective NA-5.)

CONCLUSIONS

The County has been a leader in land protection efforts in the State of North Carolina, and more work can be done. With this chapter, the County is setting a vision of preserving an interconnected system of natural preserves, parklands, and other natural areas jointly owned and managed by different entities as one cohesive system for land protection. The goals and objectives are the framework for the County

to work with local land trusts, institutions, and private landowners to preserve a natural network of lands in the County and to ensure long-term environmental sustainability of its natural systems.

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6.4.5. WATER RESOURCES

The water resources of Orange County are part of an ecosystem with two inter-related components that rely on precipitation for recharge and replenishment: surface water, contained within rivers and lakes; and ground water, stored in rock fractures and deep soils below the land surface. The inter-relationship between surface and ground water, and their resultant interactions and impacts, is the ultimate mechanism necessary for planning and assessment of the overall resource. For example, ground water provides "baseflow" to streams, which is the primary source of water in the many creeks and streams of the County during much of the year. Conversely, surface water helps replenish the ground water supplies. Both are part of the hydrologic cycle.

It is important to view surface and ground water as a complex, interactive natural system that reacts to human activity manifested in reduced stream flow, reduced reservoir volume, degraded water quality and lowered water tables.

SURFACE WATER

Orange County is located at the headwaters of three major river basins in North Carolina and southern Virginia: the Neuse River Basin, Cape Fear River Basin and to a much lesser degree, the Roanoke River Basin. These river basins contain a number of smaller watersheds, which can be seen in Map 6-9: Orange County Watersheds. As a headwaters county, streams flow in all directions into neighboring jurisdictions, but few streams flow into Orange County. As such, the County has very limited water resources of its own. This is, and has been, a major consideration of water resources planning. Additionally, surface waters carry nutrients and sediment downstream, which create impacts to aquatic habitat and water quality and quantity.

RIVER BASINS

Much of northern Orange County is within the Neuse River Basin. The Neuse River begins east of Orange County, emerging from Falls Lake in Durham and Orange counties and flowing east-southeast to the Pamlico Sound near New Bern. The primary sub-basin of the Neuse within Orange County is the Eno River watershed, which begins in northwestern Orange County as an East Fork and West Fork, before joining to flow south toward Occoneechee Mountain and Hillsborough, and thence sharply east to Durham County and eventually Falls Lake. Within Orange County, the Eno is often described as three sections – the Upper Eno (upstream of Lake Ben Johnson in Hillsborough), the Middle Eno[54] (a three-mile stretch of the river through Hillsborough), and the Lower Eno (from this point to the Durham County line).

Another watershed within the Neuse basin in northeastern Orange County is the Little River Watershed. The Little River features a North Fork and South Fork in Orange County, before the two merge downstream in Durham

[54]The Middle Eno is not considered a water supply watershed, as it is downstream from the Hillsborough drinking water intake, and upstream of the protective "arc" of the Lower Eno water intake in Durham.

County. Finally in the Neuse, the headwaters of the Flat River are located in far northeastern Orange County. Both the Little River and Flat River continue east into Durham County into reservoirs before joining the Eno in Falls Lake. These are also water supply watersheds for Durham County.

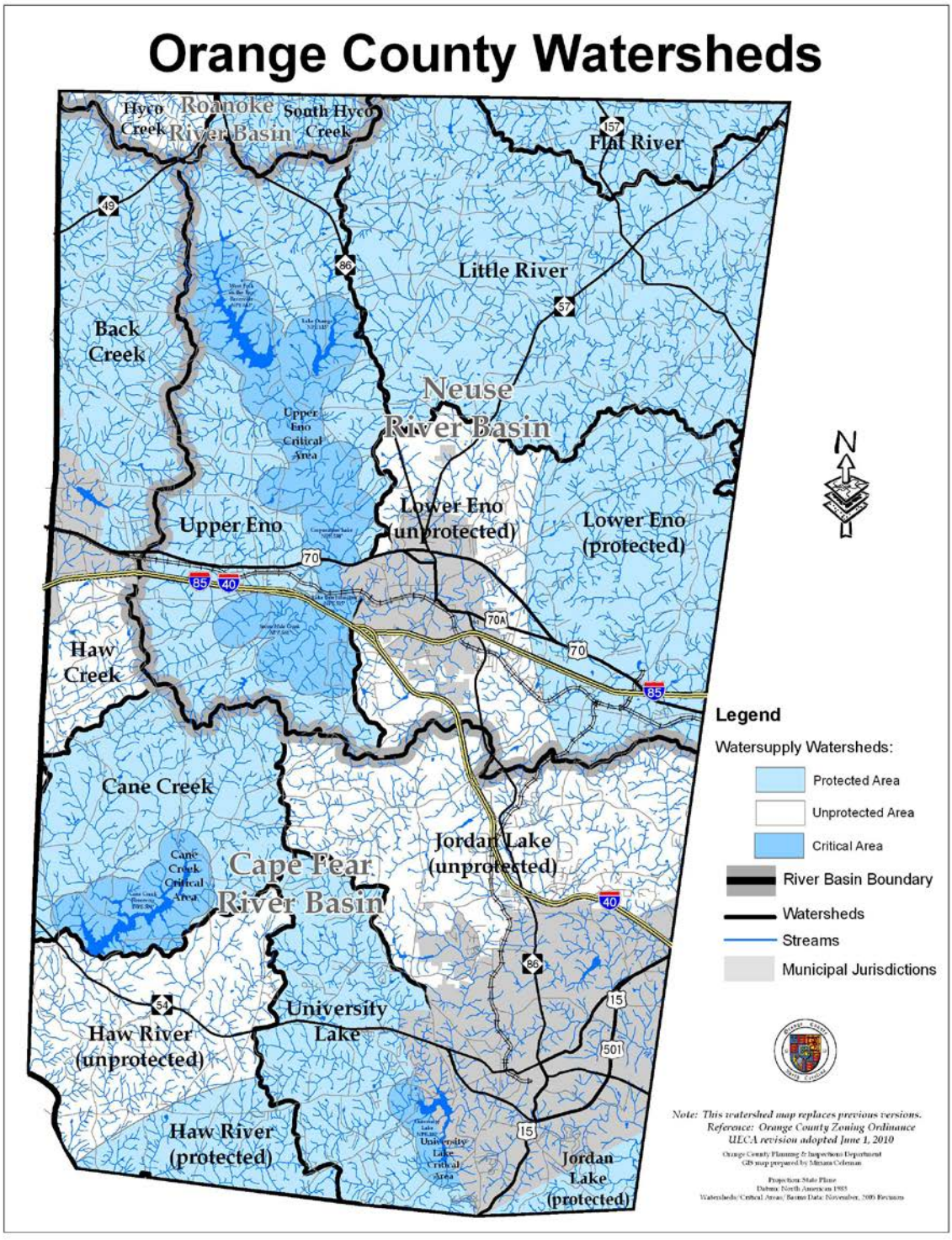
Southern and western Orange County lies within the Cape Fear River Basin. The Cape Fear River begins a few miles south of Jordan Lake, southeast of Orange County, and flows to the Atlantic Ocean south of Wilmington, but its headwaters lie far to the west, north of Greensboro. In this region, the Haw River and other streams feed Jordan Lake, a large reservoir located southeast of the County line, and thence the Cape Fear.

Many of these streams flow west/southwest into the Haw River or south and east into New Hope Creek River – the collector stream for the portion of the Cape Fear basin in Orange County. The Haw itself is the southwestern boundary of Orange County, and also has the distinction of being the only river or stream that touches Orange County from an upstream source. Within the Cape Fear Basin in Orange County are several watersheds that drain to the Haw: Back Creek and Haw Creek to the northwest and west, and Cane Creek and Collins Creek to the southwest. In the southeastern part of the County, Morgan Creek flows into Jordan Lack and New Hope Creek and its tributaries flow east and south to briefly become the New Hope River just before entering Jordan Lake. Water supply impoundments within the Cape Fear in Orange County include Cane Creek Reservoir and University Lake. Portions of western Orange County in the Cape Fear basin drain west into Quaker Creek Reservoir northeast of Mebane.

Finally, a small portion of northwestern Orange County is part of the Roanoke River Basin, and the two streams in this area – North Hyco Creek and South Hyco Creek, drain north into Caswell County and the Dan River. The Dan straddles the North Carolina–Virginia border and eventually becomes the Roanoke River, flowing east to Albemarle Sound.

In all, there are 15 different watersheds in Orange County within these three river basins. (See Map 6-9.)

MAP 6-9: ORANGE COUNTY WATERSHEDS.



WATERSHEDS

Most of these watersheds provide drinking water to citizens both within and outside of the County's boundaries. In fact, ten watersheds are classified as water supply watersheds by the State of North Carolina, meaning that the water in these areas is eventually withdrawn from downstream lakes or river intakes, and used by area water utilities to provide drinking water. Table 6-3 shows the watersheds and the different towns or water utilities that receive drinking water from the watershed.

Natural systems, including hydrologic systems, lend themselves to evaluation at the watershed bioregion level. A bioregion may be a watershed or a group of watersheds within the same basin that functions together as a system. For the purposes of natural resources planning, these bioregions are a useful way of evaluating and planning for our natural resources, and this Comprehensive Plan recognizes this fact - by using watersheds as a planning unit.

The following table lists the 15 watersheds within Orange County. Those which are also water supply watersheds are distinguished by bold font, with the water supply that it serves in parentheses.

TABLE 6-4: ORANGE COUNTY WATERSHEDS

Watershed[55]	Water Supply (lake)	Water Serves
Roanoke River Basin		
North Hyco Creek	NA	NA
South Hyco Creek	Roxboro Lake	Roxboro, Person County
Neuse River Basin		
Upper Eno River	West Fork Reservoir Corporation Lake Lake Ben Johnson	Hillsborough Orange-Alamance Hillsborough
Middle Eno River	NA	NA
Lower Eno River	West Point on Eno intake	Durham (city)
Little River	Little River Reservoir	Durham (city)
Flat River	Lake Michie	Durham (city)
Cape Fear River Basin		
Back Creek	Quaker Lake	Mebane, Graham
Haw Creek	NA	NA
Cane Creek	Cane Creek Reservoir	OWASA (Chapel Hill, Carrboro)
Collins Creek / Haw River[56]	Haw River/US 15/501 intake	Pittsboro

[55] It should be noted that State water supply watershed classifications aggregate some of these watersheds together based on the location of water supply impoundments, like University Lake. State watershed classifications do not necessarily match the hydrologic watersheds listed here.

Watershed[55]	Water Supply (lake)	Water Serves
University Lake	University Lake	OWASA (Chapel Hill, Carrboro)
Lower Morgan Creek	Jordan Lake[57]	Cary/Apex, Chatham County, others
Little Creek[58]	Jordan Lake (part)	Cary/Apex, Chatham County, others
New Hope Creek	Jordan Lake (part)	Cary/Apex, Chatham County, others

Watershed protection for these areas has long been a top priority. In 1981, Orange County became the first county in North Carolina to adopt watershed protection zoning. Watershed protection measures have been refined and increased since 1981, using technical watershed studies and new State minimum standards. Orange County watershed protection standards meet, and in most cases exceed, the State minimum measures.

Orange County also was the first county in North Carolina to adopt a Sedimentation and Erosion Control Ordinance (now known as the Erosion Control and Stormwater Ordinances) in 1987. This ordinance works to protect water quality by regulating construction erosion control and stormwater practices. Special provisions exist in certain watersheds, such as the Neuse basin.

GROUND WATER

The geological characteristics of Orange County, in which the ground water resources reside, are typical of the eastern Piedmont of North Carolina. The Piedmont as a physiographic province stretches from New Jersey to Alabama, and in North Carolina lies between the coastal plain and Blue Ridge Mountains.

The vast majority of Orange County lies within a geologic region of North Carolina known as the Carolina Terrane (formerly Carolina Slate Belt). This geologic region trends north to south through the Piedmont, generally between Winston-Salem and Chapel Hill. The Carolina Terrane is a belt of weakly metamorphosed volcanic and sedimentary and igneous rocks about 500 to 600 million years old. The region contains deeply weathered bedrock and complex geology. A small portion of the County along the

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[56] A portion of this watershed in Orange County is within the 10-mile arc for the "Haw River Watershed," marked from the Pittsboro intake at US 15/501. The remainder (upper) portion of the watershed is not considered a water supply watershed, as shown on Map 5.2.

[57] Jordan Lake currently provides water to the towns of Cary and Apex. Chatham County also acquires water from Cary. Other jurisdictions hold future allocation rights for drinking water from Jordan Lake, including OWASA and Orange County.

[58] Little Creek includes several creeks that drain Chapel Hill and Carrboro, including Bolin Creek and Booker Creek. A portion of this watershed falls into the 5-mile Jordan Lake "arc' for watershed protection; the remainder (upper portions) is not considered a water supply watershed.

southeastern edge with Durham County is within the Triassic Basin. Additional detail on the geology of the County may be found in the Natural Areas, Wildlife Habitat, and Prime Forests section of this Element and Map D10 in Appendix A. Figure 6-8: Cross-Section of Ground Water System in Orange County, shown below, illustrates the how ground water supplies are accessed.

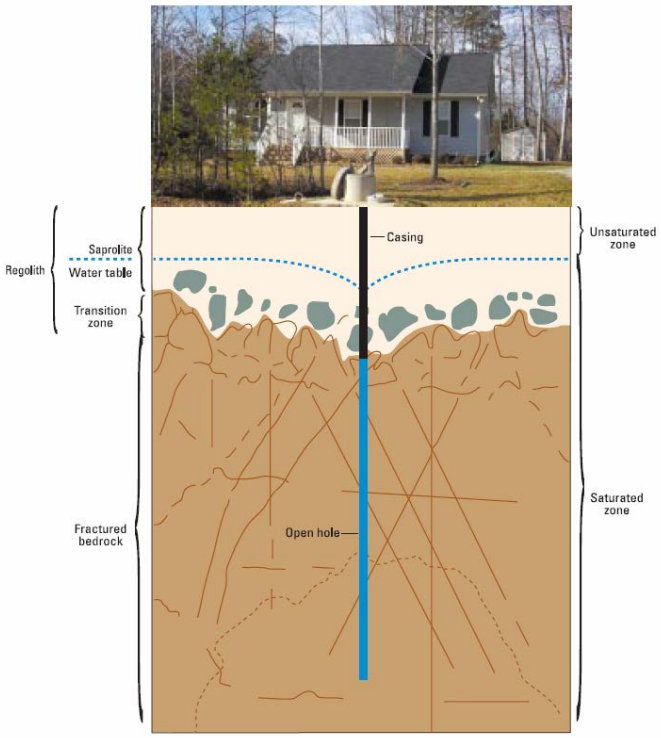

Figure 3. Principal components of the ground-water system in the Piedmont physiographic province of North Carolina.

FIGURE 6-8: CROSS SECTION OF GROUND WATER SYSTEM IN ORANGE COUNTY.

In the Piedmont region of the Carolinas and Virginia, there is no "aquifer" in the conventional sense of a regionally-extensive sandstone or limestone of high porosity and permeability. Instead, water in this region is found in the fractures of the crystalline rock located below the surface, or in a "saturated zone" of deeply weathered bedrock sometimes called "regolith."

Wells that are drilled into the Orange County geologic formations seek to intersect as many of these fractures as possible, although it is nearly impossible to know where the fractures are located. This is the reason for the wide variability of well depth and water yield in the County. The average well depth in Orange County is 300 feet, and average yield is 18 gallons per minute, however, both of these figures can vary dramatically from case to case. Ground water in Orange County is used primarily for drinking water and for agricultural and landscaping irrigation.

6.4.5.1. HISTORIC DATA, CURRENT DATA, EVALUATION OF TRENDS

Orange County has a long history of data collection and interpretation through reports and studies in the area of water resources. This history is due in large part to the limited availability of surface water and the somewhat-unknown availability of ground water.

As far back as the 1960's, droughts and water shortages have been key issues of concern for County residents. The water shortages continued into the 1970's and were only abated after new reservoirs were constructed in southwestern and northwestern Orange County in the 1980's and 1990's. However, droughts of historic record in 2002 and 2007-08 have renewed these concerns.

The County has invested in many surface and ground water studies in the last 30 years to learn more about the nature of its water resources. A listing of these studies and the multitude of data collection on the topic of water resources, resource limitation and supply planning dates to the late 1970's. This documentation is extensive and provides much information about the County's approach to water resources planning and its special challenges and opportunities. The full listing of studies and reports on water resources may be found in Section *6.4.7 Other Key Documents*.

Water use in areas of the County that rely on private groundwater wells is much more difficult to assess – whether for agriculture, landscaping or residential drinking supply.

HISTORIC AND CURRENT DATA - SURFACE WATER

Of the many water resource studies conducted in Orange County there are five reports that relate to surface water and deserve special mention here. These documents are the basis for the way water resources are managed in Orange County, and serve as linchpins for much of the County's water resources standards:

TABLE 6-5: OVERVIEW OF KEY WATER RESOURCE STUDIES

Name of Study	Year	Findings/Results
Orange County Water Supply Study	1987	Determine best sites for new reservoir for central Orange. Demand expected to outpace supply by 2003 (this predated West Fork of Eno Reservoir). Limited future reservoir sites exist in the County.
University Lake Watershed Technical Study	1989	Stringent land use controls needed to protect against further degradation/sedimentation. Led to land use controls (lot size, impervious limits).
Little River/Lake Michie Watershed Technical Study	1990	Protection measures needed for these two watersheds primarily in northern Orange. County adopted land use protection standards (lot size,

Name of Study	Year	Findings/Results
		impervious limits) in 1992.
State Watershed Protection Rules and Implications for Orange County	1991	Examined proposed state minimum rules. After rules changed, County opted to keep original more protective standards in place.
Cane Creek Watershed Technical Study	1999	Stringent land use controls needed to protect against future degradation/sedimentation. Led to land use controls (lot size, impervious limits), with some open space provisions.
Jordan Lake Watershed Technical Study and Proposed Nutrient Management Rules	2004 and ongoing	Technical study for large regional lake focused on areas of concern – including Upper New Hope Arm (southeast Orange). Proposed reductions in nitrogen (25%) and phosphorus (5%) currently being considered.

The ultimate result of the many technical studies and state watershed rules is that much of the County's land area is comprised of small to medium sized water supply watersheds, which by their nature require special protection measures. The limited potential for future water supply sources makes increased protection of the existing sources and better characterization of the fractured crystalline rocks all the more critical. All of the County's major water supply watersheds have been the subject of technical studies, except for the Upper Eno watershed. This watershed has been the subject of conservation studies, but a full technical study has not been undertaken.

The County's overall approach to watershed protection, as noted in the introduction, is to pursue a non-structural approach. This involves protection of water quality at the source, by using land use measures to control impervious surface, the number of housing units (and hence wastewater systems), the infiltration of stormwater on-site, and the protection of stream buffers to further filter water as it moves from the watershed to the stream corridors.

Minimum lot size limits help achieve the goal of limiting human impacts and is a broad tool that is widely in use. Accompanying limits on the amount of land that can be impervious to water infiltration helps reduce sheet flow runoff into streams and encourage infiltration into the soil.

Orange County's stream buffer provisions are a key component of the County's watershed protection approach. Implemented through the Unified Development Ordinance, the overall size and width of protected stream buffers are based on a calculation that takes into consideration the slope of the land and the existing vegetative cover along an identified water body. At a minimum, stream buffers are required to be fifty (50) feet in width along both sides of a stream, with an additional fifteen (15) or thirty (30) feet of protected buffer required based on

severity of slope. Protected stream buffers are measured from the edge of the stream bank of defined special flood hazard areas.

Floodplains are mapped areas of the County adjoining streams in which a frequency of flooding may be expected to occur in a given timeframe. The most frequently used floodplain measure is the special flood hazard area. This denotes the floodplain area subject to a chance flood occurrence of one percent (1%) in any given year. Map D-11 of the *County Profile Element*, located in Appendix A, illustrates the location of special flood hazard areas in the County, along with other development constraints.

One of the impacts of land development over time is an increase in surface water runoff during storm events.

Another type of land that is of significance in terms of both natural areas and water quality is wetlands. Wetlands in Orange County and other upland areas are primarily associated with streams and water bodies. Wetlands are important to overall health and environmental diversity, providing habitat for aquatic and riparian species, and also serving as in important natural water filtering device. More information about the wildlife habitat associated with wetlands may be found in section 6.4.4

SURFACE WATER QUANTITY

Surface water quantity and availability is, as previously noted, considerably limited due to the "headwaters" nature of the County. A standard measurement of the amount of water in reservoirs and water systems is the calculation of "safe yield." While definitions of this term vary, and the term for safe yield is changeable, safe yield is generally defined as the demand for water that can be met under drought conditions. For example, a 30-year safe yield is the demand that a water system can support under drought conditions that would occur on an average of once every 30 years (or have a one in 30 chance of occurring in any one given year).

The following table, Table 6-6 illustrates existing and planned expansions of water supply sources in Orange County, their owner, and safe yield of supply.

TABLE 6-6: EXISTING AND PLANNED EXPANSIONS OF WATER RESOURCES

Provider	Reservoirs	Safe Yield	Storage	Owner / Serves
EXISTING				
Hillsborough	West Fork Eno, Lake Ben Johnson	2.58 mgd	810 million gallons	Hillsborough
OWASA	Cane Creek Reservoir, University Lake, NC 54 Stone Quarry Reservoir	13.0 mgd (estimated 30-year)	3,550 million gallons	(OWASA)[59] Chapel Hill, Carrboro
Orange-Alamance Water System	Corporation Lake and community wells	Uncalculated	20 million gallons	OAWS (western Orange, SE Alamance)
Orange County	Lake Orange[60]	N/A – see footnote	N/A – see footnote	Orange County (Hillsborough, OAWS)
FUTURE				
OWASA	Existing System – plus expanded Stone Quarry Reservoir	19.5 mgd (estimated 30-year)	5,950 – 6,550 million gallons	OWASA
Hillsborough	West Fork of the Eno Reservoir, Phase II	5.58 mgd	1,014 million gallons	Hillsborough

SURFACE WATER QUALITY

Water quality is affected by a number of factors. Sediment that is washed downstream affects water quality, storage capacity of reservoirs and aquatic habitat. This sediment typically comes from natural erosion, road or land construction, or agriculture.

One example of the long-term impact of sedimentation is the change that has occurred to Corporation Lake, an impoundment on the Eno River. Over the past 30 years, the available yield of water from this lake has steadily dwindled to the point where sediments have taken up much of the lake's capacity to store water.

Sediments in transit often transport soil nutrients downstream. Increased loading of nitrogen and phosphorus are the primary water quality issues that result from sedimentation. Considerable time and effort has been expended to date to address the loading of these nutrients into streams and lakes. In particular, the Neuse and Cape Fear basins have been designated Nutrient Sensitive Waters by the State. Special reduction measures have been instituted in the Neuse basin to

[59] OWASA = Orange Water and Sewer Authority

[60] Lake Orange is part of the synchronized reservoir system of the Upper Eno watershed, in conjunction with Hillsborough's West Fork of the Eno reservoir and Lake Ben Johnson. Its safe yield is part of the Hillsborough system yield listed above.

address nitrogen and phosphorus, and are currently being considered for the Cape Fear.

Each year, as required under the federal Clean Water Act, the North Carolina Division of Water Resources releases a listing of streams or stream segments that are not meeting water quality standards for the their classified use (generally, to be "fishable and swimmable)." This list of "303(d) impaired streams" for 2006 in Orange County includes:

- The southernmost segment of Collins Creek, in southwest Orange;
- All of Booker Creek, including Eastwood Lake in Chapel Hill and a branch of the stream that runs parallel to Homestead Road in Chapel Hill;
- Bolin Creek in Chapel Hill and Carrboro, up to the general vicinity of the Adams Preserve in Carrboro;
- Little Creek (the confluence of Bolin Creek and Booker Creek) near the Durham County line; and
- Meeting of the Waters Creek, near the UNC campus and NC Botanical Garden.

This listing is updated every two years.

HISTORIC AND CURRENT DATA - GROUND WATER QUANTITY AND QUALITY

Approximately 37% of the County's population, or 45,000 persons, rely on ground water for their water supply. This water is provided primarily by individual wells, although a smaller percentage of subdivisions and developments are served by larger "community" wells.

Ground water quality is also affected by contaminants, both naturally-occurring and introduced by human activity. Iron and manganese are naturally-occurring contaminants present in surface and ground waters, and are typical "nuisance" issues rather than potable water concerns. Radon is another naturally-occurring contaminant in ground water, formed by the radioactive decay of uranium. Higher than normal levels of radon have been detected in portions of southern and south-central Orange County as part of the ground water studies conducted to date. The radon findings are associated primarily with underlying granitic plutons in these areas, which stretch southward across the County line into Chatham County. Radon implies uranium-bearing rocks. Arsenic is yet another naturally occurring element of concern in the Orange County ground water.

In the early 1990's, questions about the potential limitations of ground water resources and future rural development patterns led the County to create a Water Resources Committee in 1992, to examine the questions related to groundwater quantity and quality. Based on the Committee's interim findings, the County embarked on a series of cost-share studies with the U.S. Geological Survey (USGS) to investigate ground water resources quantity and quality in Orange County. This

resulted in three studies specifically on ground water in Orange County:

- Ground-Water Recharge to the Regolith-Fractured Crystalline Rock Aquifer System, Orange County NC (1996);
- Susceptibility of Ground Water to Surface and Shallow Sources of Contamination, Orange County NC (1999); and
- Investigation of Ground-Water Availability and Quality in Orange County, NC (2001).

Data from the 1996 study produced an assessment of the amount of ground water recharge in inches (or gallons/day/acre). This information, combined with ground water recharge duration characteristics and mean recharge rates allows for the use of ground water data for land use planning purposes. (See Figure 6-9: Ground Water Recharge Duration Characteristics and Mean Recharge.)[61]

[61] As described in the 1996 USGS Water Resource Investigation Report 96-4220. While these subbasins are similar to water supply watersheds, they are aggregated differently.

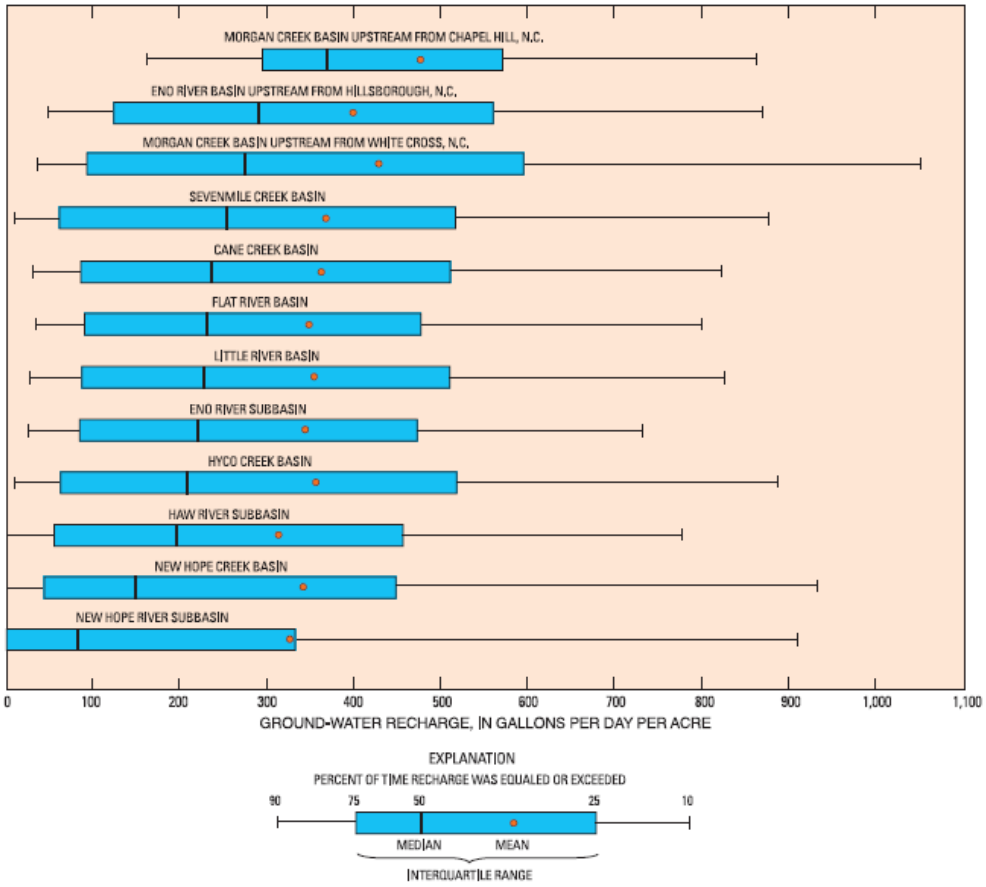

Figure 8. Selected ground-water recharge duration characteristics and mean recharge in 12 basins and subbasins in Orange County, N.C. (from Daniel, 1996, fig. 19).

FIGURE 6-9: GROUND WATER RECHARGE DURATION CHARACTERISTICS AND MEAN RECHARGE.

Based on these studies and their subsequent deliberations, the Orange County Water Resources Committee issued its final report in March 2001. The Committee made a number of findings, and issued the following recommendations:

- Conduct **further research into radon in ground water** in south-central Orange to explore health risks.
- **Create an ongoing ground water monitoring system**, using wells to evaluate changes in well yield and water quality and serve as an "early-warning system" for impending problems.
- **Consider a "water budget" approach for planning for the County's water resources** and assessing the impacts of land use patterns.

- Incorporate **sustainable ground water yield** into zoning decisions and development approvals.
- Consider **requiring new subdivisions to locate well sites prior to approval**, and create a well reserve (or wellhead protection area) on all new lots.
- **Promote water conservation for ground water users**, as well as surface water users.

In May 2001, the Water Resources Committee transitioned into the Commission for the Environment, which created a Water Resources Committee of its own to pursue a task assigned by the Orange County Board of Commissioners – analyze the findings of the USGS ground water reports and Water Resources Committee final report, and develop implementation proposals.

WATER RESOURCES TRENDS - THE SYNTHESIS OF SURFACE AND GROUND WATER

In 2004, the Commission for the Environment began drafting a plan called the "Water Resources Initiative." This plan, adopted in principle by the Board of Commissioners, proposed action in several key areas:

- Assess impact of droughts and floods by creating the observation well network proposed in the Water Resources Committee (2001) report. A recommended program design exists that could allow the County to monitor ground water in storage and issue alerts as needed.
- Further explore the impact of ground water baseflow on stream flow and aquatic life habitat.
- Review and evaluate floodplain maps and explore the inter-relationship of land use patterns and flooding to see what effect this has on intensity of flooding and floodprone areas.
- Conduct the additional research on radon in ground water in certain portions of the County (as per the Water Resources Committee report).
- Conduct increased sampling for organic contamination of ground water supplies to supplement the small sample size of the 2001 USGS study.
- Create a local inventory of ground water contamination incidents, including site checks and evaluation of possible contaminant plume migration. This would require working with State and local health officials and would provide useful information the area residents and the County.
- Identify a resource person to inform and assist citizens in well construction and siting techniques, based on information learned to date.

- Identify a resource person to provide technical and policy assistance to citizens, boards and County departments on water resources matters.

- Conduct information management of, and technical evaluations from, the database of well information gathered since the mid-1990's. This information would be useful to both the County for policy analysis and citizens for basic information about well statistics.

In 2007, the County funded a new Water Resources Coordinator position to begin addressing some of these (and other) recommendations.

The USGS studies of 1996-2001 also introduced the concept of a "water budget" approach to planning for water resources. This approach looks to tie together surface water and ground water quantity in a systematic approach. A water budget seeks to identify the amount of water within a certain area (county), and assess the means and possible mechanisms of allocating the resources in a sustainable fashion.

Trends that have become evident over the past two decades of water resource investigations include the following:

- **The County has little to no potential for new surface water supplies**. This is placing additional pressure on water conservation as a means of meeting increasing demand. Per capita usage of water increased 15% from 1985 to 2000. The importance of conservation has been further highlighted by a series of droughts in recent years.

- **Nitrogen and phosphorus concentrations in surface water have become important considerations to water quality,** especially in the Neuse and Cape Fear River basins (and the water supply sources within).

- The **amount and types of withdrawals from the Eno River are changing with growth** and changed land uses in the Eno basin.

- While the percentage of the County's population using ground water for drinking water has decreased slightly, the **overall number of people using ground water continues to increase**.

- **Ground water quality is relatively good**, except for high levels of radon in southern and south-central Orange County.

- The **number of impaired streams in the County has increased slightly in the last decade**. There are nine streams in Orange County that have volunteer groups monitoring water quality. All but one of these streams are within the Town of Carrboro or the Town of Chapel Hill's extra-territorial jurisdiction.

- The culmination of surface water and ground water studies have pointed to a **need for a comprehensive "water budget"**

approach to managing all water resources, including additional study and research. The Water Resources Initiative from 2005, and recent augmentations of this program, is representative of this trend.

- Watershed technical studies have indicated, and subsequent watershed protection standards (and evaluations of the impacts of same) have validated, that the **non-structural (land use) approach of watershed protection is an effective and low-cost method of protecting water quality**.
- **Efforts at the regional level to plan for watershed protection have been started**, which may provide for a new paradigm of watershed protection and use of large regional water supplies, like Jordan Lake.
- The **potential for water reclamation and reuse has been explored**, and was recently instituted by OWASA and UNC on a limited basis, to further conserve potable water supplies.
- **Public awareness of water issues and water conservation has been heightened** by the droughts of 2002 and 2007-08.
- **All public water suppliers in Orange County have increased their water capacity in the last 20 years**, but recent droughts are causing further exploration of additional supplies by providers.
- **Ground water contamination incidents reported to the State have increased dramatically since 1990**, but many of the incidents are still being investigated or mitigated and are not "closed out."
- **Biotic tests performed on streams in the County are showing improvement**, but only 38% of streams had test results rated "good" or "excellent."
- **Questions about the water quality impacts from the land application of wastewater treatment plant biosolids have arisen**, leading to several studies that are underway.
- A **Commission for the Environment, comprised of environmental scientists and interested citizens, was formed** in 1998 to advise the Board of County Commissioners on environmental issues, including water resources studies and policy.
- The North Carolina Division of Water Quality has begun a **multi-year study of the Neuse River basin**, including the Eno River. This study may have important implications for the existing water allocation agreements, and release of water from the Eno reservoirs.

6.4.5.2. ORANGE COUNTY WATER RESOURCE NEEDS

Orange County's water resources are clearly a foremost consideration in all aspects of planning, and help provide the policy framework and underpinnings for much of the County's land activities.

Based on the many studies and assessments conducted to date, along with recent perspective on the finite nature of the resource, the following key community needs for water have been identified:

- **Calculation of Water Demand and Supply.** In 1987, the County's future population growth and water demand was calculated against the available and expected water supply. A full reassessment of this measure has not occurred since, and may be timely given the droughts and changes in water consumption and water supplies.

- **Consideration of the Water Resources Budget Planning Approach.** Orange County has conducted or participated in many technical studies of the County's surface and ground water supplies, and has developed a proposed program for addressing comprehensive water resources planning and monitoring. A new position was established in 2008 to coordinate efforts in water resources among the many departments that have a role in water, but full consideration of the recommended "water resources budget" approach has not yet occurred.

- **Technical Watershed Study for Upper Eno.** One major watershed in Orange County has not had a technical watershed study conducted, the Upper Eno watershed. What is the future of the Eno, and what will optimize the protection of the resource and still provide for needed services? Given the complexity of this watershed, the number of different users and the low flow of the stream, a technical study of the watershed may inform changes needed to the existing Capacity Use Agreement and long-term planning for the resource.

- **Additional Technical Studies to Support Planning for Ground Water Demands.** The issue of available ground water for rural residential development has become a topic of keen interest for planners and resource managers. Ways to expand on the technical studies performed to date are needed, in a way that helps provide useful and meaningful information that can help evaluate new development proposals. This may include wellhead protection investigation and characterization of fracture systems.

- **Validating the Success of the County's Non-Structural Approach to Watershed Planning.** The County's non-structural approach to watershed protection of the last 25 years (i.e., focusing on protection at the source, stream buffers and land use protection) appears to have been effective in protecting water quality, but a quantitative study

to assess these protection measures could be performed to validate this assumption.

- **Exploration of Radon Levels in Ground Water.** Further exploration (perhaps in conjunction with Chatham County) of high radon levels in ground water.
- **Permanent Water Conservation Program.** New permanent water conservation programs may be needed to extend the life of existing water supplies and reinforce the finite nature of the resource.
- **Assessment of Drought Planning.** An assessment of contingency planning for water supplies and water provisions during drought conditions is needed to ensure they are adequate.

6.4.5.3. OBJECTIVES

Objectives are intermediate steps toward reaching a goal. The following objectives are intended to help achieve Orange County goals pertaining to water resources—specifically Goal 6, which is restated below. The timeframes for the objectives conform to the guidelines discussed in *Section 1.4: Administration and Implementation Guidelines.*

Natural & Cultural Systems Goal 6: Sustainable quality and quantity of ground and surface water resources.

Objective WR-1:
Preserve natural resources such as grasslands, woodlands and wetlands to allow for water recharge of ground water and water quality protection. (See also Natural Areas Objective NA-1.)

Objective WR-2:
Create long-term conservation programs for ground water and surface water that will help extend the life of our finite existing water supplies. (See also Water and Wastewater Objectives WW-1 and WW-11.)

Objective WR-3:
Coordinate acquisition of open space for watershed protection purposes with neighboring counties, for watersheds providing drinking water to Orange County or neighboring citizens.

Objective WR-4:
Coordinate possible nutrient trading and stormwater credits between the towns and County, including possible stream buffer acquisition or other land conservation approaches.

Objective WR-5:
Promote and participate in regional efforts to plan for use of water supplies in the region in an equitable manner, including contingency planning for water supplies during droughts. (See also Water and Wastewater Objective WW-5.)

Objective WR-6:
Ensure greater coordination among County agencies on water resources, including cooperative efforts to prevent surface and ground water pollution by addressing failing septic systems and wells. (See also Water and Wastewater Objective WW-19.)

Objective WR-7:
Promote land use patterns that preserve the natural hydrologic system and maintain a sustainable "carrying capacity" balance for the future between ground water and surface water resources (See also Land Use Objective LU-2.9.)

Objective WR-8:
Ensure that sufficient water resources are available for farms.

Objective WR-9:
Encourage and participate in efforts by the state and other regional jurisdictions to address the future use of Jordan Lake as a water supply, in a manner that links sustainable growth to future water allocation.

Objective WR-10:
Establish a county network of ground and surface monitoring wells to assist in water resources planning and drought monitoring.

Objective WR-11:
Provide incentives and educational information to landowners to increase protection of watersheds and ground water supplies and their inter-relationships.

Objective WR-12:
Prepare a new Orange County Water Supply Study, and make updated supply and demand projections that can be used to inform future decision-making.

Objective WR-13:
Create a mechanism for intergovernmental coordination of water resources, calculating a comprehensive County "water budget" approach.

Objective WR-14:
Use the new Water Supply Study (WR-11) and the State's Neuse River Basin model (2009-10) to evaluate the Upper Eno Watershed and its optimal protection measures.

Objective WR-15:
Conduct cooperative research on ground and surface water quality, working with other partners in the County and adjoining jurisdictions to address water quality problems such as radon. (See also Air and Energy Objective AE-5.)

Objective WR-16:
Conduct additional research on well yields and wellhead protection to determine if more reliable information on well yields and wellhead protection areas can be discerned with available technology.

Objective WR-17:
Reduce the number of 303(d) impaired streams by minimizing impacts of non-point and point source pollution.

Objective WR-18:
Continue hydrogeologic characterization of the ground water system (including quantifying recharge areas), with emphasis on fractures in the crystalline rocks.

Objective WR-19:
Develop water efficiency standards for new development in order to decrease per capita water use.

Objective WR-20:
Promote Best Management Practices for new developments which minimize stormwater runoff. (See also Land Use Objective LU-2.3 and Erosion Control Objective EC-1.)

Objective WR-21:
Develop land use policies that promote a 'no net loss' principle for groundwater recharge, for each recharge area.

TABLE 6-7: GOALS AND OBJECTIVES LINKS TO PLANNING PRINCIPLES

GOAL/ OBJECTIVE	BOARD OF COUNTY COMMISSIONERS' PLANNING PRINCIPLES								
	1. Efficient and Fiscally Responsible Provision of Public Facilities and Services 2. Sustainable Growth and Development 3. A. Encouragement of Energy Efficiency, Lower Energy Consumption, and the Use of Non-Polluting Renewable Energy Resources B. Promotion of Both Air Quality Protection and the Development of an Effective Transportation System 4. Natural Area Resource Preservation 5. Preservation of Rural Land Use Pattern 6. Water Resources Preservation 7. Promotion of Economic Prosperity and Diversity 8. Preservation of Community Character								
	1	2	3A	3B	4	5	6	7	8
Overarching Goal		√	√	√	√	√	√	√	√
Goal 1 and Objectives AE-1 – AE-16		√	√	√	√			√	√
Goal 2 and Objectives AG-1 – AG-8	√	√	√	√	√	√	√	√	√
Goal 3		√			√	√		√	
Goal 4 and Objectives CR-1 – CR-5	√	√	√	√	√	√			√
Goal 5 and Objectives CR-6 – CR-9									√
Goal 6 and Objectives WR-1 – WR-21		√	√	√	√	√	√	√	√
Goal 7 and Objectives NA-1 – NA-9	√	√	√	√	√	√			√
Goal 8 and Objectives CR-10 – CR-12, NA-10 – NA-17 and AG-9							√		√

CONCLUSIONS

As exemplified by the Board of County Commissioner's Guiding Principles for developing the 2030 Comprehensive Plan, the protection and sustainable use of the county's water resources is of paramount importance. Long-term planning and management of the County's water supplies is necessary to insure future demand can be met. The County needs to continue the momentum gained over the last two

decades to gather data, explore solutions, and implement actions to protect precious surface and ground water resources. The County can serve as the coordinator of water resource planning efforts; creating a comprehensive approach that addresses watershed planning at the regional, local, and site levels.

6.5. LINKS TO OTHER ELEMENTS

Natural and Cultural Systems are interconnected to economic development, housing, transportation, park and recreation facilities, and community services planning. Linkages between specific natural and cultural systems goals and objectives have been identified in this element. The following summarizes the objectives from other Elements that are linked with natural and cultural systems objectives.

ECONOMIC DEVELOPMENT

Objective ED-1.1:
Focus public education efforts on sustainability issues, looking at the social, economic and environmental contributions of local businesses.

Objective ED-1.7:
Enhance Orange County's tourist industry.

Objective ED-4.1:
Enhance historic character by supporting organizations' efforts to preserve, promote, and maintain historic structures, and identify Orange County policies that may be in conflict with these efforts.

Objective ED-4.4:
Enhance rural and agricultural community character by supporting local agriculture markets, supporting complementary conservation and management tools, and considering tools to make farming more profitable.

HOUSING

Objective H-3.6:
Work within the Orange County government system to identify and resolve existing policies which may be at odds with historic preservation goals, green building approaches, and workforce and affordable housing efforts.

LAND USE

Objective LU-2.2:
Continue to protect valuable resource land such as productive agricultural acreage, managed forest areas, natural areas, historic sites and properties, and potential reservoir sites through the County's Lands Legacy Program, and by directing incompatible development away from these areas through land use and zoning policies and regulations.

Objective LU-2.3:
Require non-residential and higher-density residential developments within Transition Areas to use Best Management Practices (BMP's) for

stormwater control, as outlined within the Orange County Unified Development Ordinance, to ensure that potential adverse impacts on the water quality of existing and proposed reservoir sites.

Objective LU-2.7:
Refine green building standards to guide the design, siting, construction, and management of publicly owned and managed buildings in a manner that conserves energy and/or uses non-polluting renewable energy sources. Explore the development of green building standards for private development.

Objective LU-2.9:
Evaluate the carrying capacity of groundwater and surface water resources of the 15 watersheds in Orange County.

Objective LU-3.2:
Coordinate land use patterns to facilitate the expanded use of non-auto modes of travel, the increased occupancy of automobiles, and the development and use of an energy-efficient transportation system.

Objective LU-3.4:
Recognize the right to farm and discourage the location of new non-farm development, particularly more intensive residential development, within farming areas to minimize the incidence of complaints and nuisance suits against farm operations.

Objective LU-3.10:
Identify prime viewsheds along major transportation corridors and other areas, and amend County land use ordinances to ensure long-term protection of viewsheds.

Objective LU-4.3:
Determine how private developments can best accommodate or provide public and private commercial recreational facilities to serve Orange County's residents.

Objective LU-4.5:
Work within the Orange County government system to identify and resolve existing land development policies that may be in conflict with the historic preservation goals.

PARKS AND RECREATION

Objective PR-1.1:
Acquire and /or retain public ownership of parks, recreation facilities, open space, and conservation areas that will serve Orange County.

Objective PR-1.3:
Develop a land use planning mechanism for securing new parks through the development approval process.

Objective PR-4.1:
Developers shall provide for adequate and appropriate open space suitable for active/low-impact recreation in residential developments.

Objective PR-5.1:
Locate parks and recreational facilities close to residential areas to encourage informal interaction with nature, encourage walkability, and create areas of wildlife habitat with appropriate recreational facilities within the more populated areas.

Objective PR-5.4:
Encourage development of a system of private open space and conservation areas, including nature preserves, parks, linear parks, and scenic vistas compatible with the character of Orange County.

SERVICES AND FACILITIES

Objective WW-1:
Maintain a sustainable and high quality supply of ground and surface water so that available resources meet existing and projected needs.

Objective WW-5:
Maintain a cooperative joint planning process among the County, the municipalities, and water and wastewater providers and guide the extension of service in accordance with the Comprehensive Plan, the Orange county-Chapel Hill-Carrboro Joint Planning Agreement and Land Use Plan, and the policies of the municipalities.

Objective WW-11:
Increase educational efforts that increase citizen understanding of water quality problems and the need for water conservation.

Objective WW-14:
Designate prime reservoir sites in the County, and protect those sites from adverse development.

Objective WW-19:
Establish a continuing wastewater treatment inspection program within identified Protected and Critical Water Resource Areas.

Objective EC-1:
Continue to use Best Management Practices (BMP's) for stormwater control, as outlined within the Orange County Unified Development Ordinance, to minimize potential adverse impacts on the water quality.

TRANSPORTATION

Objective T-1.1:
Increase the occupancy of automobiles through ridesharing and other means; and expand the use of public transit (including bus and rail), walking, and biking as primary modes of travel.

Objective T-1.5:
Identify prime viewsheds along major transportation corridors and protect these areas for their scenic and natural resource values.

Objective T-1.6:
Expand the availability and use of public transportation (including bus and rail) throughout the County to provide better connections between employment centers, shopping and service locations, and other key

points of interest in both urban and rural areas, particularly for the County's senior and disabled populations and others without access to automobiles.

6.6. OTHER KEY DOCUMENTS

The following are lists of key documents that were useful in preparing the Natural and Cultural Systems Element. The documents are grouped according to the component chapter of the Element. (See *Section 1.2.5: Where to Look for Related Information* if you would like to obtain one of these documents.)

AGRICULTURAL RESOURCES

- Policy Documents, Creation of APB—VFPO, Rules of Procedure (1992-2002)
- *Planning for an Agricultural Future: A Guide for North Carolina Farmers and Local Governments.* American Farmland Trust, 2007.
- *To Preserve Our Farms, Final Report of the Orange County Agricultural Task Force* (1979)
- *Preserving Our Farms: A Purchase of Development Rights Program of Orange County North Carolina* (Orange County Planning & Inspections Dept., 1994)
- *Farmland for the Future: A Program for Acquiring Agricultural Conservation Easements in Orange County, North Carolina* (1991)
- *Orange County Soil Survey & Supplement, "Important Farmlands in Orange County North Carolina"* (1978)
- *Report of the Ad Hoc Committee on Farmland Preservation to the Board of Directors of the North Carolina Associations of County Commissioners* (1984)
- *Public Policymaking: A Rural Land-Use Case Study of the Public Policy Process* (1984)
- *The Revised Universal Soil Loss Equation with Factor Values for North Carolina*? (1995)
- Kimberly Siran masters thesis, N.C. State University (1997)
- Text and Map in *1981 Land Use Element*
- *Zoning Limitations and Opportunities for Farm Enterprise Diversification: Searching for New Meanings in Old Definitions.* Robert Andrew Branan, 2006.

AIR AND ENERGY RESOURCES

- Carrboro, Hillsborough, Chapel Hill and Orange County: *Greenhouse Gas Emissions Inventory and Forecast* (draft) (ICLEI Energy Services, Toronto, ON, CA, 2007)

- *Orange County State of the Environment* (Commission for the Environment, 2000; 2002; 2004)
- *Clean Air for the Triangle Area – An Action Agenda* (Southern Environmental Law Center, 2005)
- *Environmental Responsibility in County Government Goal* (Orange County, 2005)
- *Alternative Fuel and Low Emissions Vehicle Work Group Report*, (Orange County, 2000)
- *Marin Countywide Plan, Natural Systems and Agriculture Chapter* (Marin County CA, 2007)
- *A Report on Sustainability Indicators for Orange County* (Pamela McIntosh, 2000)

CULTURAL RESOURCES

- Preservation Ordinance, Historic Preservation Commission Rules of Procedure
- *1996 Historic Preservation Element*
- *Preserving the Orange Tradition* (local landmark program)
- Report on financial impact of local landmark program
- Draft Design Standards (two sets) prepared by Historic Preservation Commission and by grad student
- Staff prepared Historic Preservation Commission notebooks
- Draft Discussion Paper, Heritage/Scenic Corridor Program
- *The Scenic, Rustic, and Rural Roads Program*, by the Planning Board's Transportation Advisory Subcommittee (TAS),
- Multiple Properties Documentation Form (MPDF) & Publication Narrative
- Countywide inventory of historic sites (files) and Loose-leaf notebooks Architectural Resources Report of St. Mary's Road (GAI Consultants)
- National Register Historic District Nominations for Cedar Grove, The Oaks
- Text and Map in *1981 Land Use Element*
- County Policy for Cultural and Archaeological Surveys (2005)

NATURAL AREAS, WILDLIFE HABITAT AND PRIME FORESTS

- *Inventory of Sites of Cultural, Historic, Recreational, Biological, and Geological Significance in the Unincorporated Portions of Orange County* (Planning Dept., 1986; revised 1988)

- *Inventory of Natural Areas and Wildlife Habitats for Orange County* (Sather and Hall, 1988; updated 2004)
- *Vascular Flora of the Duke Forest, NC* (Palmer, 1990)
- *Eno River State Park Aquatic Inventory* (NC Wildlife Resources Commission, 1996)
- *Environment and Resources Protection Committee Report*, Shaping Orange County's Future (1998)
- *B. Everett Jordan Lake Project: Inventory for Rare, Threatened, and Endangered Species and Natural Area Inventory* (Harry LeGrand for US Army Corps of Engineers, 1999)
- *A Lands Legacy Program for Orange County* (ERCD, 2000)
- *Orange County State of the Environment* (Commission for the Environment, 2000; 2002; 2004)
- *State of Open Space* (Triangle Land Conservancy, 2000 & 2002)
- *Triangle GreenPrint Regional Open Space Assessment* (Triangle J Council of Governments et al., 2002)
- *New Hope Corridor Open Space Master Plan* (Coulter Associates and New Hope Corridor Advisory Committee, 1991)
- *A Landscape with Wildlife for Orange County– Parts I & 2* (Wiley et al. for Triangle Land Conservancy, 1997 & 1999)
- *The Duke Forest at 75, A Resource for All Seasons* (Ida Phillips Lynch for Duke University, 2006)

WATER RESOURCES

- *Orange County State of the Environment* (Commission for the Environment, 2000; 2002; 2004)
- *Ground-Water Recharge to the Regolith-Fractured Crystalline Rock Aquifer System, Orange County NC* (US Geological Survey in conjunction with Orange County, NC, Water Resources Investigations Report 96-4220, Charles C. Daniel III, 1996)
- *Susceptibility of Ground Water to Surface and Shallow Sources of Contamination, Orange County, NC* (US Geological Survey in conjunction with Orange County, NC, Open File-Report 99-179, Silvia Terziotti and Jo Leslie Eimers, 1999)
- *Investigation of Ground-Water Availability and Quality in Orange County, NC* (US Geological Survey Water Resources Investigations Report 00-4286, in conjunction with Orange County, NC, William L. Cunningham and Charles C. Daniel III, 2001)
- *Public Forum: State of Our Local Water Supply* (Orange Water and Sewer Authority, 2008)

- *Orange County Water Supply Study, Phase I* (Hazen and Sawyer, P.C., 1987)
- *Report of the Water Resources Committee* (Orange County Water Resources Committee, 2001)
- *Shaping Orange County's Future* (Shaping Orange County's Future Task Force, 2001)
- *Jordan Lake Watershed Technical Study and Proposed Nutrient Management Rules* (draft) (NC Division of Water Quality, 2007)
- *Cane Creek Watershed Technical Study* (TetraTech, 1999)

6.7. INTERGOVERNMENTAL COORDINATION

Natural and cultural resources know no political boundaries. As such, coordination both within Orange County government and with other area jurisdictions is of paramount importance.

INTRA-GOVERNMENTAL

On an intra-governmental level, natural and cultural resources issues are addressed by several advisory boards and staff. The Agricultural Preservation Board (APB) is charged to encourage the preservation and protection of farmland in Orange County, and to advise the Board of Commissioners on matters related to agriculture. The Economic Development Commission also has responsibilities related to agricultural economic development, and there are other local farm-related advisory boards that are partially or wholly outside of County government, such as the Soil and Water Board of Supervisors (State/federal), the Cooperative Extension Board (State), and the Farm Services Agency Board (federal). All of these boards have met together infrequently on agricultural topics of mutual interest, and have expressed a desire to do so more regularly.

The Commission for the Environment (CFE) is charged to advise the Board of Commissioners on matters affecting the environment, particularly the topical areas of air quality, water resources and natural areas/biological resources, as well as environmental education. As there are additional County advisory boards that may provide advise on these topics to the Board of Commissioners, coordination is essential.

A member of the federal Certified Local Government (CLG) program, the Historic Preservation Commission (HPC) is charged to advise the Board on matters of historic and cultural resource significance, including the identification and protection of the County's historic, archaeological and cultural resources. One of the Commission's most important duties is to recommend properties with historic of architectural significance for designation in the County's Local Landmark Program as individual landmarks or as part of local historic districts, and to grant Certificates of Appropriateness for designated properties.

INTERGOVERNMENTAL

Coordination of County policies and decisions affecting natural and cultural resources with other jurisdictions in Orange County includes working with the Towns of Chapel Hill, Carrboro, Hillsborough and Mebane, and the City of Durham, to ensure that the interconnectivity of natural resources is recognized and planned for, and that there is consistency in the way cultural resources are

addressed. Each of the municipalities within the County has mechanisms for protecting open spaces and natural areas, floodplains and watersheds, and historic districts.

In the last decade, the towns and County have worked together on many open space acquisitions that protect natural heritage sites, water quality and other sensitive lands – such as the Adams Preserve, Hollow Rock Preserve, and University Lake watershed. The County's Lands Legacy Program strives for close coordination with the other adjoining local governments. Interconnectivity of natural resource lands, whether for wildlife or human uses, is a key component and likely to be an area of emphasis for many years to come.

Many natural and cultural resource issues are multi-jurisdictional and require a regional response, such as watershed protection and air quality. Orange County participates with many regional partners through the Triangle J Council of Governments and other regional mechanisms. The County also has worked with Durham County on several conservation efforts, such as Little River Park and the New Hope Preserve, and has discussed joint ventures with Chatham County.

There are two particular areas where a need for greater coordination has been highlighted. One is in the area of historic preservation. State enabling statutes do not provide for easy coordination and consistency between town and County jurisdictions – especially in extra-territorial jurisdiction (ETJ) areas. Additionally, historic district commissions in Chapel Hill and Hillsborough have only limited to no legal jurisdiction over properties outside the boundaries of their local designated historic districts.

The second relates to agriculture and Voluntary Agricultural Districts. As urban areas encroach upon traditionally agricultural areas, the State's legislation related to Voluntary Agricultural Districts lacks clarity on how these districts function in areas that are transitioning from rural to urban uses.

In summary, conservation of the natural and cultural resources within Orange County will require heightened levels of cooperation and collaboration with the other local governments in the County and the region in future years.

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