

State of the **ENVIRONMENT** *2004*



ORANGE COUNTY
Commission for the Environment

ACKNOWLEDGEMENTS

The Commission for the Environment

would like to dedicate this report to

Orange County Commissioner Alice Gordon

Commissioner Alice Gordon proposed the creation of the Orange County Commission for the Environment and was the County Commissioner representative on the Commission for the Environment from its formation in 1997 to 2005. In 1998, she proposed the creation of the Environment and Resource Conservation Department and the Comprehensive Resource Conservation Program now known as the Lands Legacy Program. The Board of Commissioners established the Environment and Resource Conservation Department on June 22, 1998 and authorized the Lands Legacy Program on April 4, 2000.

Orange County Commission for the Environment

Laura Cotterman	Hervey McIver
Charles C. Daniel, III	Ken Meardon
Mark Ginsberg	Richard Pratt
Annette Jurgelski	Johnny Randall
Michelle Kempinski	Mark Smith
Marge Anders Limbert	Rebecca Vidra
Heather MacDonald	Chris Wachholz

Orange County Environment and Resource Conservation Department

David Stancil, Director
Kristin Knight, Project Manager
Carol Melton, Administrative Assistant
Rich Shaw, Land Conservation Manager
Margaret Jones, Resource Conservation Technician
Beth Young, GIS Project Coordinator

Special thanks to the many government staff and other experts who contributed their time.



The Seven Mile Creek Preserve

Orange County Environment & Resource Conservation

306-A Revere Road / PO Box 8181

Hillsborough, NC 27278

Phone: (919) 245-2590, Fax: (919) 644-3351

April 2005

This edition of the *State of the Environment* report continues the goals and format that were introduced in the 2002 edition. For that report, the Commission for the Environment (CfE) adopted a set of environmental indicators for each of its three areas of interest: air, water, and biological resources. By continuing these same indicators and building on the data collected in 2002, we are able to evaluate the progress that the county has made in protecting its natural resources.

This report is intended to give a useful overview of the environmental trends in the county and will facilitate efforts for further protection and conservation of our natural environment. The CfE will be glad to respond to any questions raised by the content.

Sincerely,

Mark Smith, Chairperson
Commission for the Environment

PURPOSE

*The Orange County
Commission for the Environment
presents the
State of the Environment to:*

- ▶ Describe Orange County's current environmental status
- ▶ Give the county objective measures to evaluate progress toward a cleaner, healthier environment
- ▶ Highlight the major environmental challenges facing the county
- ▶ Recommend actions to confront these challenges

ORANGE COUNTY

STATE OF THE ENVIRONMENT 2004

OVERVIEW

Critical Issues.....	2
Recommendations.....	3
Demographics	5

AIR RESOURCES

Introduction.....	8
Emissions estimates	9
Emissions from point sources	11
Ozone exceedances	13
Transportation modes.....	15
Fuel efficient or alternative fuel vehicles.....	17
Travel to work.....	19
Daily vehicle miles traveled.....	21
Miles of state maintained road lanes.....	23

BIOLOGICAL RESOURCES

Introduction.....	26
Acres of protected land	27
Acres of protected natural areas.....	29
Prime forest.....	33
Acres within the present use value program	35
Status of rare plants and animals	37

WATER RESOURCES

Introduction.....	40
Water demand	41
Public water system safe yields	43
Groundwater contamination incidents	47
Wastewater permit violations and spill collection	49
Streams not meeting classified uses.....	51
Percent of benthos site tests that are good or excellent	53
Number of stream protection programs	55
Wetland destruction	57

FIGURES

Figure 1: Map of Orange County	1
Figure 2: Population Trends in Orange County, 1980-2003.....	6

AIR RESOURCES

Figure 3: Estimated and Projected Emissions by Source, 1997-2017	10
Figure 4: Trends in Point Source Air Pollutants, 1993-2002.....	12
Figure 5: Monthly Trends in Ozone Exceedance Days in the Triangle Region, 1997-2003	14
Figure 6: Ozone Monitor Locations in the Triangle Region.....	14
Figure 7: Means of Transportation to Work in Orange County and North Carolina in 1990 and 2000...	16
Figure 8: Percentage of Working People In or Out-Commuting in Orange County, 1990-2000	20
Figure 9: Change in Daily Vehicle Miles Traveled, 1990-2015	22
Figure 10: Total State Maintained Road Lane Miles, 1985-2003	24

BIOLOGICAL RESOURCES

Figure 11: Percent of Protected Orange County Acreage, 2004.....	28
Figure 12: Percent of Protected Natural Areas in Orange County, 2004.....	30
Figure 13: Protected Lands in Orange County, 2004	31
Figure 14: Orange County Forest Cover Change from 1988-2003	34
Figure 15: Acres of County Land in the Present Use Value Program, 1993-2004.....	36

WATER RESOURCES

Figure 16: Distribution of Total Water Demand, 2000.....	42
Figure 17: Water Demand (GPD/P), 1985-2000	42
Figure 18: Water and Sewer Management Planning and Boundary Agreement, 2001	45
Figure 19: Protected Watersheds in Orange County.....	46
Figure 20: “Closed out” Groundwater Contamination Incidents, 1986-2004	48
Figure 21: Total Volume of Wastewater Spills, 1998-2003	50
Figure 22: Wastewater Permit Violations, 1998-2003	50
Figure 23: Impaired Water Bodies, 2004.....	52
Figure 24: Biotic Tests Rated “Good or Excellent”, 1987-2003	54
Figure 25: Approved 401 Wetland Impacts, 1996-2003	58

TABLES

Table 1: Municipal and Unincorporated Populations, 1980-2003	5
--	---

AIR RESOURCES

Table 2: Emissions in Tons per Day, 1997-2017	10
Table 3: Point Source Air Pollution, 1993-2002	12
Table 4: Alternative Fuel Vehicles and Fuel Use in Local Municipalities, 2000-2003	18
Table 5: Number of Registered Hybrid Vehicles in Orange County, 2003	18
Table 6: Change in Average Travel Time to Work	19
Table 7: Change in Out-Commuting in Orange County Between 1990 and 2000	20
Table 8: Change in In-Commuting in Orange County Between 1990 and 2000	20
Table 9: Daily Vehicle Miles Traveled, 1990-2015	22
Table 10: Total State Maintained Road Lane Miles, 1985-2003	24

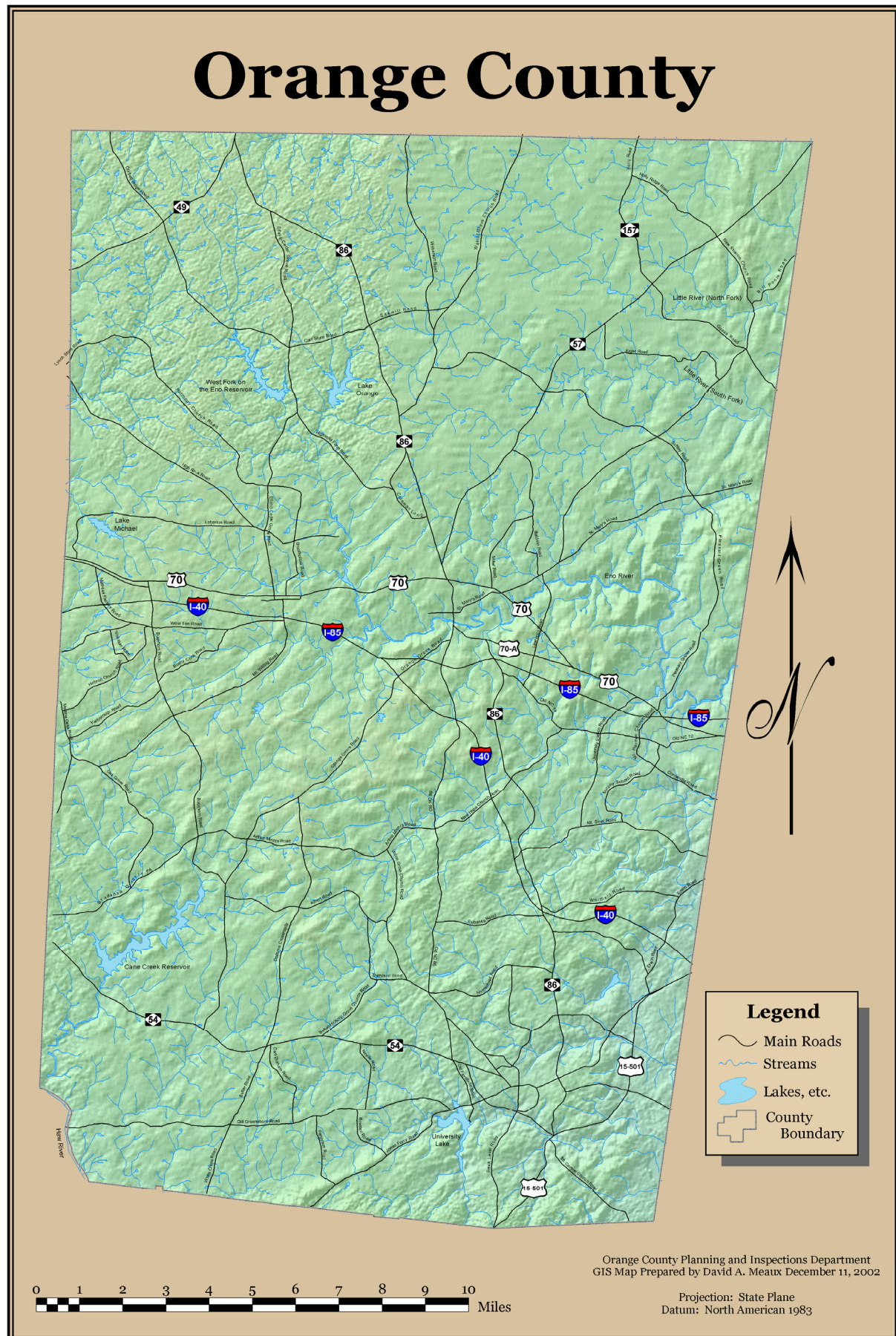
BIOLOGICAL RESOURCES

Table 11: Acres of Protected Land in Orange County, 2004	28
Table 12: Protected Acres in Natural Areas, 2004	30
Table 13: Total Acreage in Present Use Value Program, 1993-2004	36
Table 14: Status of Orange County's Rare Plants and Animals	38

WATER RESOURCES

Table 15: Water Usage (mgd), 1985-2000	42
Table 16: Percent Change in Demand (GPD/P), 1985-2000	42
Table 17: Public Water Supply Safe Yield, 1992-2003	44
Table 18: Average and Maximum Daily Demand Per Year, 1992-2003	44
Table 19: Ground Contamination Incidents, 1986-2004	48
Table 20: Wastewater Spills, 1998-2003	50
Table 21: Wastewater Permit Violations, 1998-2003	50
Table 22: Percent of Biotic Tests Rated "Good or Excellent", 1987-2003	54
Table 23: Registered Stream Watch Programs, 2004	56
Table 24: Impacted Wetlands, 1996-2003	58

Figure 1: Map of Orange County



Overview

The Orange County Commission for the Environment (CfE) and the Orange County Environment and Resource Conservation Department (ERCD) have created this report to provide an updated analysis of the county's natural environment and to make recommendations that will help the county create and implement effective environmental policies.

While Orange County has been foremost among the region's counties in promoting planned growth over indiscriminate sprawl, the county's natural environment remains susceptible to serious degradation from the steady, long-term conversion of natural land to urban and suburban infrastructure. The public needs to understand the strategies available to protect our water, air, and biological resources while also planning for future growth.

In preparing this report, the CfE has used a set of key environmental indicators first adopted for the 2002 report. This 2004 edition contains some minor changes in the structure of the report, but the indicators remain largely the same since their introduction in 2002. These measurable "indicators" uncover trends in the county's environment, alert us to potential impacts on human health and natural resources, and suggest areas where additional information, research, and monitoring are needed.

The indicators selected by the CfE are grouped into three categories: air, biological resources, and water. CfE members with expertise in these areas form separate committees to review any changes in the data. These committees have identified the critical issues listed below. Recommendations for action are presented later in the report.

CRITICAL ISSUES

- **POOR AIR QUALITY**

In 2004, Orange County and seven other counties in the Triangle region were designated as ozone nonattainment areas under the federal Clean Air Act guidelines. The continuing unhealthy ozone levels threaten human health and Orange County's ecosystems. The county is currently working on developing a ground-level ozone strategy to help reach attainment.

- **LOSS OF BIODIVERSITY**

Habitat for Orange County's native flora and fauna, ecosystems, and natural communities continues to be destroyed or significantly degraded as a result of conversion of natural land cover to suburban, urban, and transportation uses. Protection efforts do not appear to be keeping pace with the loss of biological diversity associated with habitat loss and degradation.

- **THREAT OF DIMINISHED WATER QUANTITY**

Water resources in the area are inadequate during periods of drought. According to the most recent U.S. Census data, the average water usage per person increased at least 15% from 1985 to 2000.

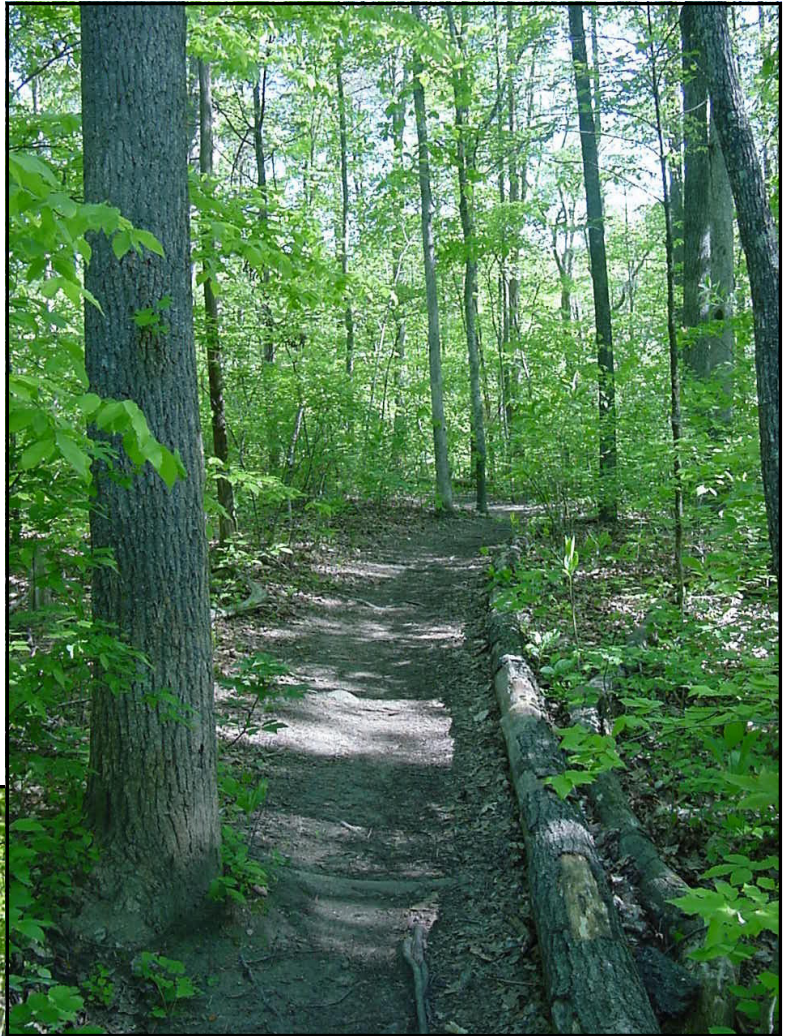
- **LACK OF INFORMATION ABOUT GROUNDWATER QUALITY**

While many residents of Orange County rely on groundwater, little attention is given to incidents of groundwater contamination of wells or to groundwater quality generally.

RECOMMENDATIONS

AIR RESOURCES	Pages
1. Orange County should develop the in-house capability to generate accurate and comprehensive air emission inventories for the county, particularly for area and mobile sources.	9-10
2. The county should investigate how neighboring Triangle counties manage ground-level ozone.	13-14
3. Current work on a county ground-level ozone strategy should continue.	13-14
BIOLOGICAL RESOURCES	Pages
1. Orange County should ensure that at least 10% of Orange County's land area (25,600 acres) is permanently protected by the year 2010.	27-28
2. The county should continue efforts to protect permanently both recognized significant natural areas and large tracts of "prime forest" (mature hardwood and mixed hardwood-pine forests) by using outright purchases, acquisition of conservation easements, and the development approval process.	29-34
3. To ensure long-term protection of existing biological resources, the county should develop a comprehensive conservation plan that addresses threats to natural areas and populations of rare species; connectivity among protected areas; and coordination with neighboring counties and conservation partners.	37-38
WATER RESOURCES	Pages
1. To meet future needs for an adequate supply of high quality water, Orange County should engage interested parties in planning reclamation programs that would provide water for nonpotable purposes and consequently reduce demand on existing limited sources of potable water.	41-44
2. In order to monitor the effect of drought on local groundwater supplies, Orange County should create a network of observation wells.	41-42
3. The county should become responsible for monitoring and acting upon reported incidents of groundwater contamination. Orange County should perform outreach to advise residents of the need to test and protect their groundwater resources.	47-48

The 27-acre property known as the Adams Tract was recently purchased in a joint effort by the Town of Carrboro, Orange County, and the North Carolina Clean Water Management Trust Fund. The Town of Carrboro will manage the area for recreation.



Demographics

Residential growth is the most fundamental factor affecting the pattern of development in Orange County. As has been the case for many years, the county continues to experience dramatic population growth. From 1980 to 2003, the county's population grew from 77,055 to 120,881, a 57% increase (2.5% average annual growth rate). In contrast, during the same time period, North Carolina grew by 43% and the United States expanded at a rate of 28%. Many people are attracted to Orange County for its central location in the Triangle region as well as its high quality of life.

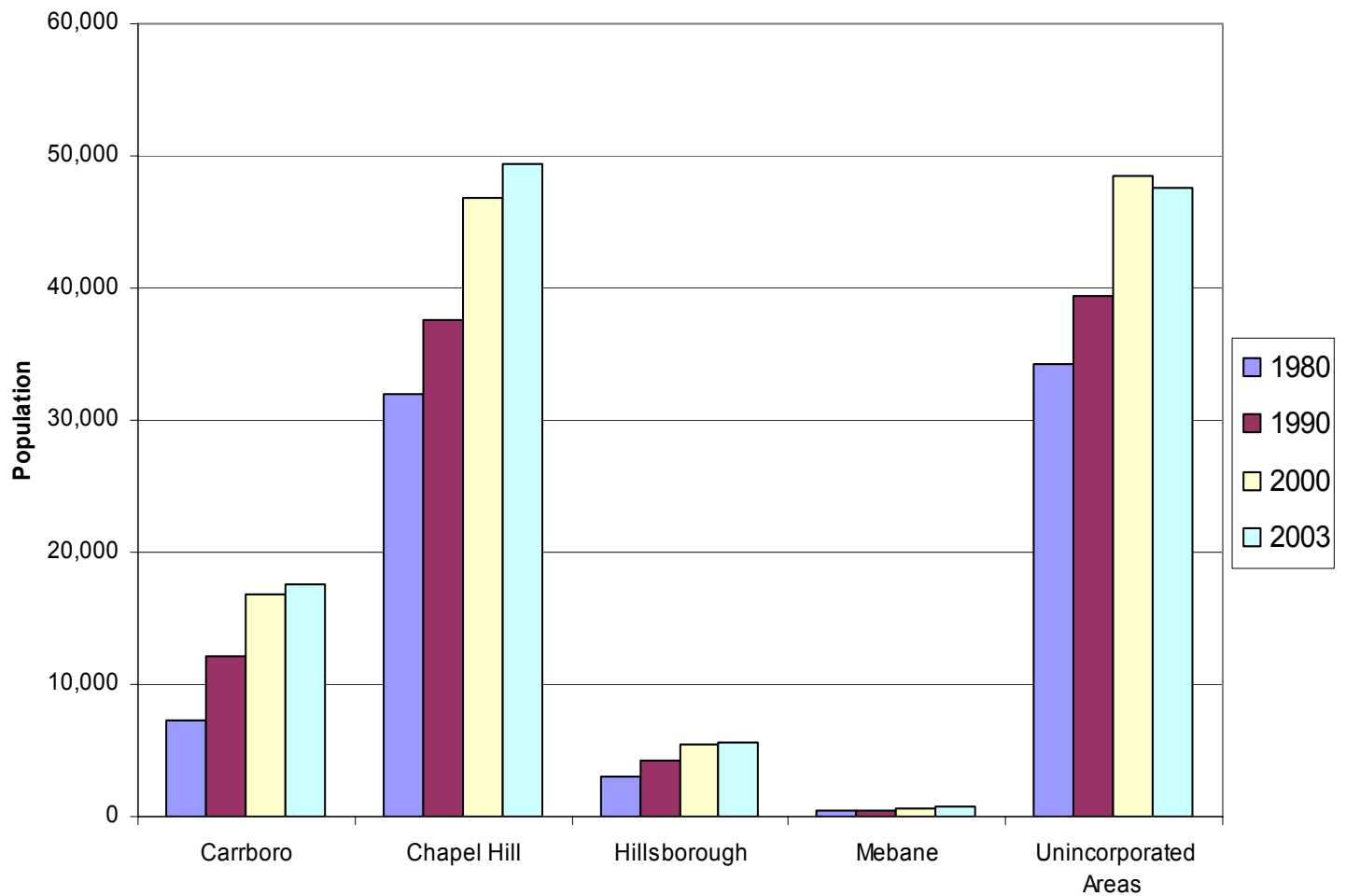
As shown in Figure 2, Orange County is continuing to experience an upward trend in population growth. All of the municipal and unincorporated areas report significant increases in population. The unincorporated population did decrease between 2000-2003, but this is likely due to local annexations. Table 1 compares the populations throughout the county and the growth rates over time. The greatest rate of increase occurred in Carrboro with a 139% increase in population from 1980-2003. Mebane had the second highest rate (95% over 23 years) as well as the fastest rate of growth for 2000-2003 at 9.5%. Although Chapel Hill remains the dominant residential and commercial center in the county, unincorporated areas also contain a large portion of the population (40%). This rural population poses challenges in both the planning and provision of public services.

Table 1: Municipal and Unincorporated Populations, 1980-2003

	1980 Census	1990 Census	2000 Census	2003 Estimate	% Change 1980-1990	% Change 1990-2000	% Change 2000-2003	% Change 1980-2003
Carrboro								
Population	7,336	12,134	16,782	17,585	65.4%	38.3%	4.8%	139.4%
Land area (sq. mi.)	2.47	3.53	4.47	5.48	42.9%	26.6%	22.6%	122.2%
Persons per sq. mi.	2,970	3,437	3,754	3,209	15.7%	9.2%	-14.5%	8.1%
Chapel Hill (within Orange County)								
Population	32,038	37,596	46,798	49,438	17.3%	24.5%	5.6%	54.3%
Land area (sq. mi.)	12.37	15.98	18.37	n/a	29.2%	15.0%	n/a	n/a
Persons per sq. mi.	2,590	2,353	2,548	n/a	-9.2%	8.3%	n/a	n/a
Hillsborough								
Population	3,019	4,263	5,446	5,541	41.2%	27.8%	1.7%	83.5%
Land area (sq. mi.)	2.16	3.55	4.58	4.58	64.4%	29.0%	0%	112.0%
Persons per sq. mi.	1,398	1,201	1,189	1,210	-14.1%	-1.0%	1.7%	-13.5%
Mebane (within Orange County)								
Population	379	485	675	739	28.0%	39.2%	9.5%	95.0%
Land area (sq. mi.)	0.20	0.25	0.57	n/a	25.0%	126.0%	n/a	n/a
Persons per sq. mi.	1,895	1,940	1,195	n/a	2.4%	-38.4%	n/a	n/a
Unincorporated Areas								
Population	34,283	39,373	48,526	47,578	14.8%	23.2%	-2.0%	38.8%
Land area (sq. mi.)	383	377	372	n/a	-1.6%	-1.2%	n/a	n/a
Persons per sq. mi.	90	105	130	n/a	16.7%	24.8%	n/a	n/a
TOTAL COUNTY								
Population	77,055	93,851	118,227	120,881	21.8%	26.0%	2.2%	56.9%
Land area (sq. mi.)	400	400	400	400	0.0%	0.0%	0%	0.0%
Persons per sq. mi.	193	235	296	302	21.7%	26.0%	2.0%	56.9%

Sources: U.S. Census Bureau and North Carolina State Demographics

Figure 2: Population Trends in Orange County, 1980-2003





The new 391-acre Little River Regional Park opened in December 2004 as a joint venture between Durham and Orange Counties.

AIR RESOURCES

In Orange County, air quality stands out as a pressing environmental issue as county and regional populations continue to expand. Declining air quality can affect the health of all county residents and damage local ecosystems. County emissions also contribute to regional air quality issues like ozone and international problems like global warming.

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, agricultural equipment, and construction machines.
- **Point sources** are large 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:** This category includes 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 contributor 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.

These pollutants contribute to respiratory illnesses such as asthma, aggravate existing heart and lung diseases, form acid rain, impair visibility, contribute to global warming, and pollute aquatic systems. Improving air quality remains a pressing issue for Orange County and the entire Triangle region. In particular, reducing the amount of ground-level ozone is one of the greatest challenges for the area. Ground-level ozone is not emitted directly, but rather formed from NOx, ROGs, and other pollutants during a photochemical reaction. In 2004, the U.S. Environmental Protection Agency (EPA) designated Orange County and seven other neighboring counties as nonattainment areas under the EPA's revised ambient air quality standard for ozone.

The indicators in the air resources section track the types of pollutants emitted in Orange County and the human behaviors that affect the amount of pollutants released. "Emissions estimates" and "Emissions from point sources" look at the pollutants emitted from all different sources and then specifically point sources only. "Ozone exceedances" shows the pattern of ozone exceedance days in the region. "Transportation modes" discusses how people reach their place of work. "Fuel efficient or alternative fuel vehicles" summarizes the growing use of these types of vehicles by government and private citizens alike. "Travel to work," "Daily vehicle miles traveled," and "Miles of state maintained road lanes" all track how our transportation patterns in Orange County affect air pollution trends.



AIR RESOURCES

Emissions estimates

Why the indicator was selected

Tracking trends in air pollutant emissions is critical for assessing air quality impacts and for developing strategies to improve air quality. In particular, emissions of nitrogen oxides (NO_x) and reactive organic gases (ROG) are the primary contributors to the ground-level ozone, which is the main concern in Orange County and the Triangle. Carbon monoxide (CO) also contributes to ozone formation, though to a lesser extent than NO_x and ROG.

How the indicator was measured

CO, NO_x, and ROG are projected along within other pollutant estimates for Orange County. The North Carolina Division of Air Quality (NCDAQ) estimates emissions by looking at the make-up of the county and inserting these data in models. For example, NCDAQ takes information about vehicle miles traveled (VMT) on county roads and inserts these data into the U.S. Environmental Protection Agency's (EPA) MOBILE6.2 model to predict road vehicle emissions. The EPA's NONROAD2002a model is used for nonroad emission projections. The county's population and industry figures are used to estimate area sources such as gas stations, dry cleaners, and repair shops. The NCDAQ also tracks point sources from individual producers such as factories. Biogenic source emissions are calculated by estimating pollutants released by trees, cattle, and other living organisms.

The trend in Orange County

Improving

Since the last report in 2002, NCDAQ has adopted newer models for measuring air quality and any changes in the projections reflect the use of these updated models. Figure 3 shows the overall trends in emission estimates, and Table 2 gives the predicted emissions for CO, NO_x, and ROG. Overall, the models predict that Orange County will see continued reductions in NO_x emissions over the next 12 years. This projected reduction depends on the accuracy of EPA and NCDAQ estimates regarding new vehicle emission controls, types of cars in use, future growth, travel patterns, and other variables. Orange County may differ from a typical North Carolina county in several ways, including the overall levels of growth, the number of interstate vehicle miles traveled (VMT), and local transportation patterns. An understanding of how these variations affect pollutant emissions is vital to achieving and maintaining healthy air quality.

Recommendations

Orange County should:

- Develop the in-house capability to assess and generate accurate and comprehensive emission inventories for point, area, and mobile sources.
- Continue its involvement with the Durham-Chapel Hill-Carrboro Metropolitan Planning Organization (MPO), which provides traffic projections for long-range transportation planning.
- Assess the validity of the state's current and future estimates of VMT, transportation modes, and other critical issues to determine whether and how these estimates can be improved.

Figure 3: Estimated and Projected Emissions by Source, 1997-2017

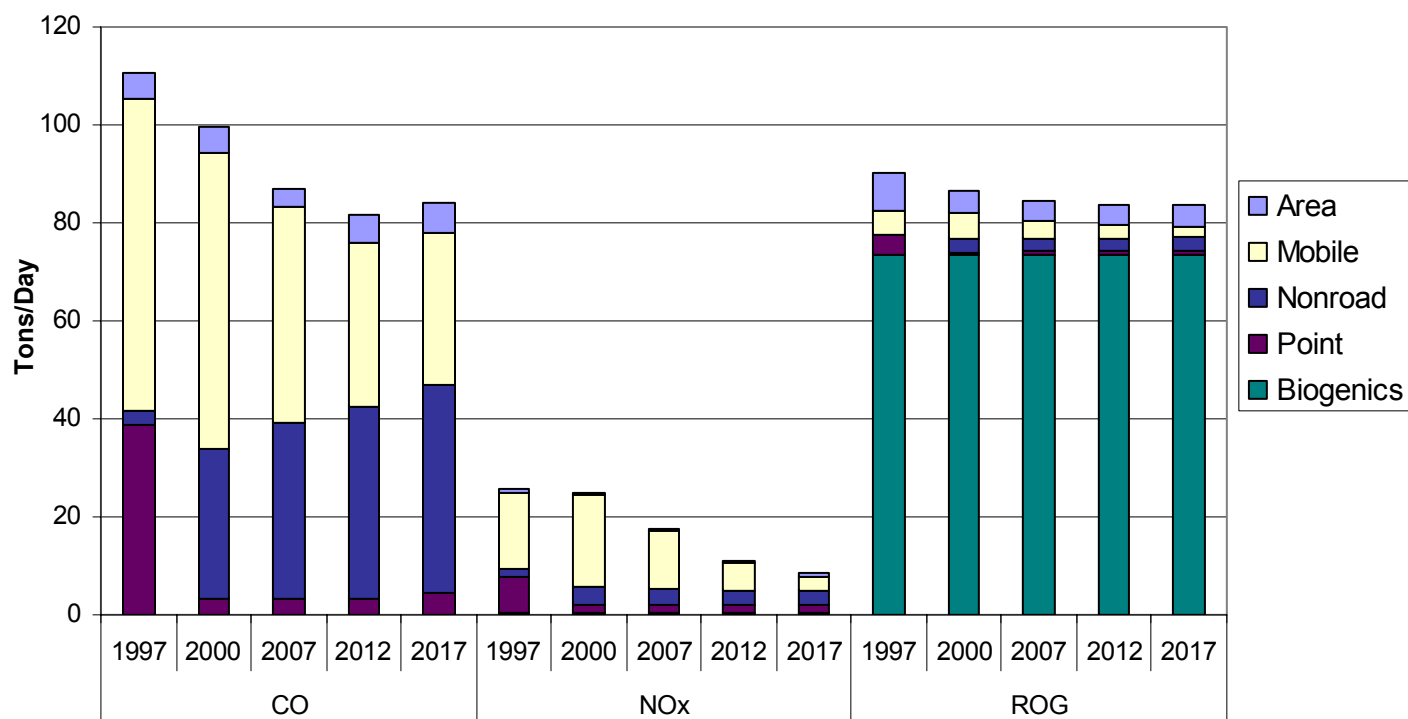


Table 2: Emissions in Tons per Day, 1997-2017

Pollutant		Estimated		Projected		
		1997	2000	2007	2012	2017
CO	Area	5.0	5.0	3.5	5.7	6.1
	Mobile	64.0	60.7	44.2	33.3	31.2
	Nonroad	38.8	30.5	35.9	39.3	42.5
	Point	2.7	3.2	3.2	3.2	4.3
	Biogenics	0.0	0.0	0.0	0.0	0.0
	Total	110.5	99.4	86.8	81.5	84.1
NOx	Area	0.8	0.4	0.3	0.5	0.5
	Mobile	15.5	18.8	11.9	5.7	3.1
	Nonroad	7.3	3.7	3.2	2.8	2.6
	Point	1.6	1.6	1.6	1.6	1.7
	Biogenics	0.5	0.5	0.5	0.5	0.5
	Total	25.7	25	17.5	11.1	8.4
ROG	Area	7.8	4.5	4	4.3	4.5
	Mobile	5.0	5.2	3.5	2.5	2.1
	Nonroad	3.8	2.8	2.7	2.8	2.9
	Point	n/a	0.4	0.5	0.5	0.5
	Biogenics	73.6	73.6	73.6	73.6	73.6
	Total	90.2	86.5	84.3	83.7	83.6



AIR RESOURCES

Emissions from point sources

Why the indicator was selected

Emissions from point sources in Orange County are relatively small compared to emission from other sources. Yet it is important to track point sources over time, because there can be concentrated impacts in one immediate area or cumulative impacts on the surrounding region.

How the indicator was measured

The North Carolina Division of Air Quality (NCDQA) tracks the number of point sources discharging pollutants in Orange County. Carbon monoxide (CO), hazardous pollutants (includes over 180 kinds of dangerous pollutants), nitrogen oxides (NO_x), particulate matter of varying sizes (PM), sulfur dioxide (SO₂), and volatile organic compounds (VOC) are important pollutants to track, because of their potential effects on human health and local ecosystems.

The trend in Orange County
Improving

The number of facilities reporting emissions has decreased from 18 in 1999 to 6 in 2002, the most recent data available. In general, this reduction in facilities is related to decreases in most pollutant emissions. Figure 4 shows the trend in selected point source pollutants while Table 3 gives the actual data from this time period. As Table 3 indicates, SO₂ and VOC were substantially reduced between 1999 and 2002. The figures also reflect a reduction in CO and NO_x, but these levels still remain of concern. Estimates of point source emissions of particulate matter also imply a considerable decline. However, TSP and PM₁₀ have been shown to be poor indicators of the health impact of particulate matter, and concern has shifted to PM_{2.5}. Emission and ambient measurements for PM_{2.5} did not begin until 1999 and since then have shown a marginal increase. Future tracking of PM_{2.5} emissions is important.

Recommendations

The county should:

- Track local point source emissions and assess the assumptions that go into these estimated projections.
- Review potential localized impacts of these sources, including any ambient modeling studies done as part of the relevant state permits.

Figure 4: Trends in Point Source Air Pollutants, 1993-2002

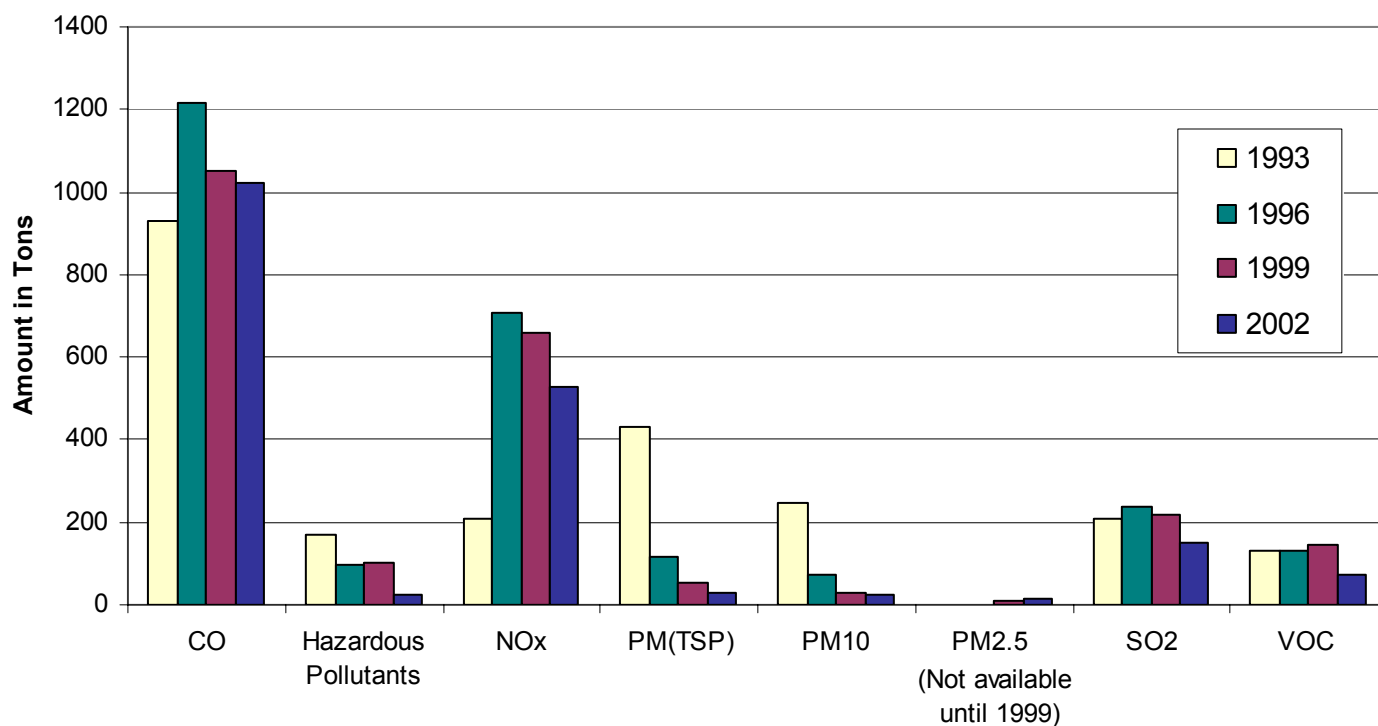


Table 3: Point Source Air Pollution, 1993-2002

Pollutant	1993		1996		1999		2002	
	Facilities Reporting	Annual Output (tons)	Facilities Reporting	Annual Output (tons)	Facilities Reporting	Annual Output (tons)	Facilities Reporting	Annual Output (tons)
CO	10	932	10	1,216	12	1,051	4	1,020
Hazardous Pollutants	5	169	12	99	10	102	4	24
NOx	11	206	11	706	13	661	4	528
PM (TSP)	13	432	17	115	15	51	6	31
PM10	12	247	16	74	15	28	6	23
PM2.5 (not available until 1999)	-	-	-	-	4	8	4	13
SO ₂	7	208	8	238	11	220	4	149
VOC	12	133	12	129	10	143	4	71
# of facilities reporting at least one pollutant	20		21		18		6	



AIR RESOURCES

Ozone exceedances

Why the indicator was selected

Ground-level ozone pollution is a major concern in Orange County. This harmful ozone is created through the action of intense sunlight on nitrogen oxides (NO_x) and reactive organic gases (ROGs) emitted by motor vehicles, industries, and other sources. Ground-level ozone may cause permanent lung damage, trigger health problems, and harm plants and ecosystems. There is also “useful” ozone (i.e. the ozone layer), which is located in the upper atmosphere and protects us from the sun’s harmful radiation.

How the indicator was measured

Based on U.S. Environmental Protection Agency (EPA) monitoring protocols for urban areas, the North Carolina Division of Air Quality (NCDAQ) currently does not operate an ozone monitor in Orange County. Because urban non-attainment status is assessed at the Metropolitan Statistical Area (MSA) level, Orange County’s official ozone status is generated by assessments of the ten ozone monitors spread throughout the Triangle area. Statistics from individual monitoring stations surrounding Orange County provide a general profile of ozone levels in our area. The monitor locations are seen in Figure 6. Without a monitor, the county cannot track actual ozone levels within its borders.

The trend in Orange County

Indeterminate

In April 2004, the EPA designated Orange County, along with seven other counties in the Triangle region, as a non-attainment area under the revised federal standard for ozone. This designation came with the switch to a more protective 8-hour average standard instead of the previous 1-hour average. The EPA changed the standard because recent research has shown that longer periods of exposure to ozone, even at lower levels, have negative health effects. As a result, this standard is now based on levels above 0.08 parts per million (ppm) over an 8-hour period instead of above 0.12 ppm over a 1-hour period. To designate nonattainment areas, the EPA looks at the fourth highest daily measurement within a MSA in each year and averages these values over a three-year period.

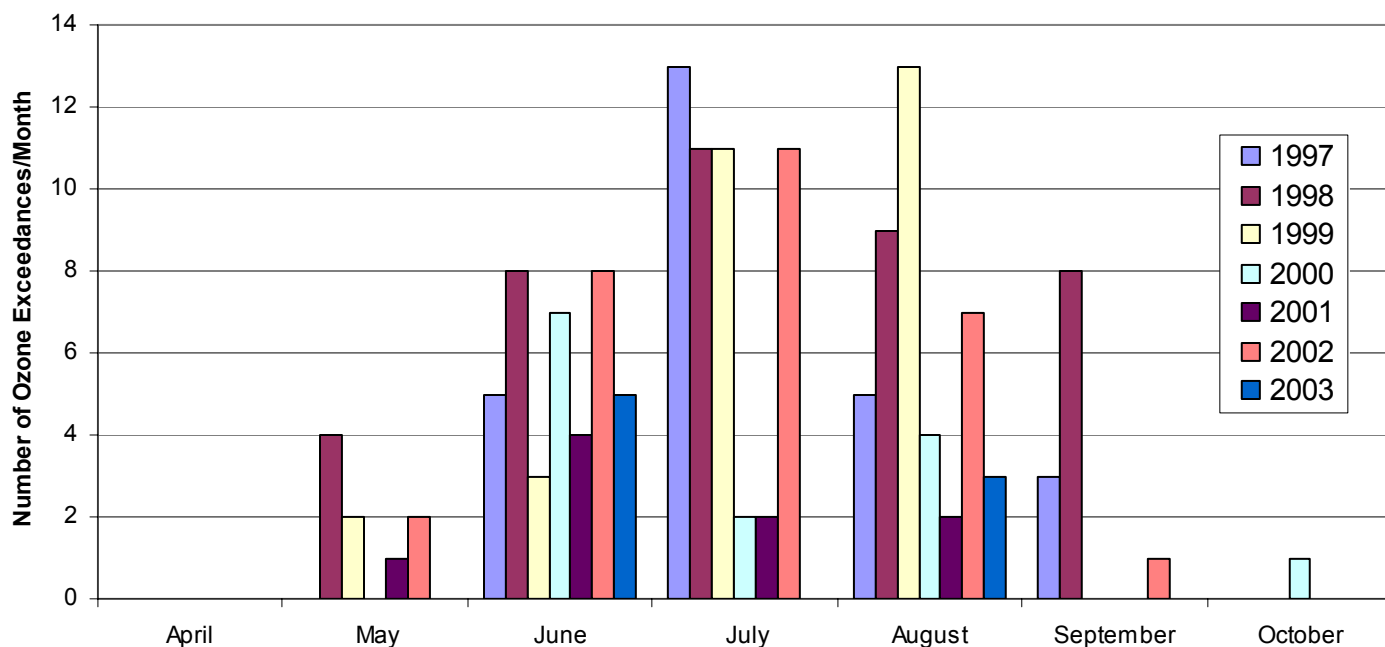
Figure 5 shows the variation experienced in the number of nonattainment days from 1995 to 2003. These variations are most likely related to hot weather extremes favorable for ozone-generating reactions. The majority of exceedance days occur during the summer months.

Recommendations

As a result of its nonattainment status, Orange County should:

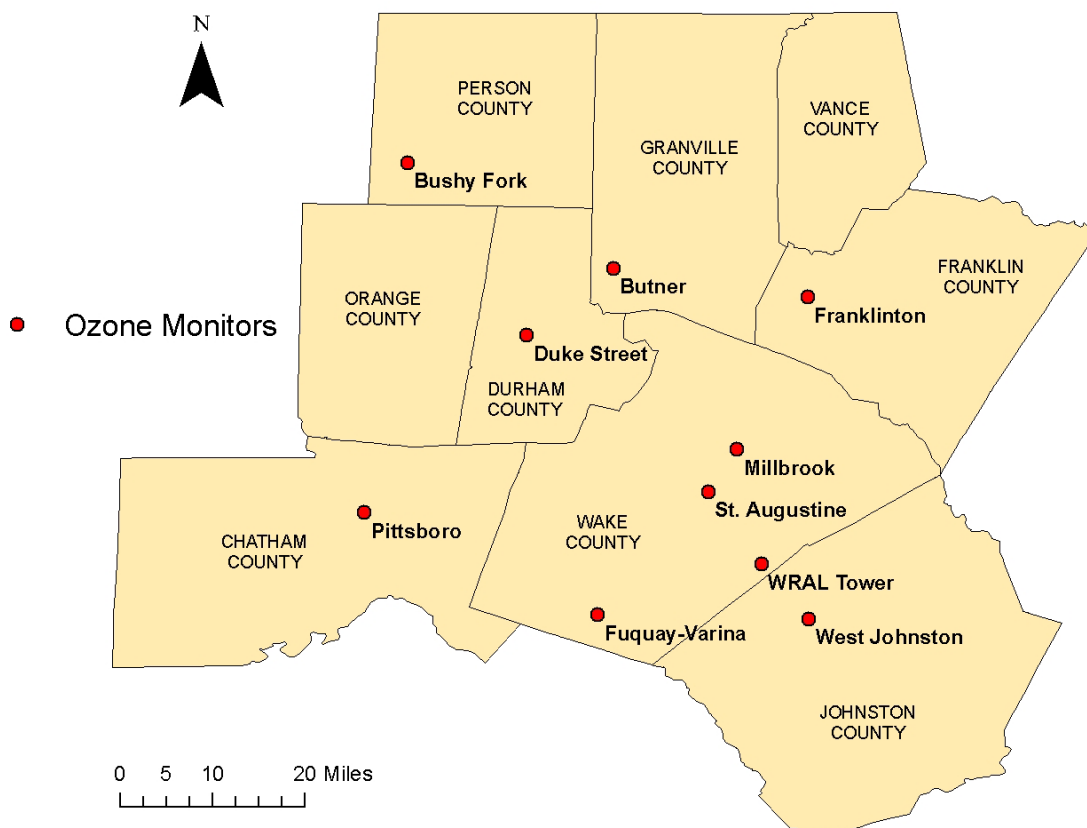
- Complete its ground-level ozone strategy to address its ozone non-attainment status. The Commission for the Environment will review other ground-level ozone prevention plans in the Triangle region and develop a strategy for Orange County.
- Work with Duke University to install an ozone monitor in Duke Forest. This monitor would provide for the first time ozone data from directly within the county.

Figure 5: Monthly Trends in Ozone Exceedance Days in the Triangle Region, 1997-2003



Note: Exceedance values of 0 in Figure 5 indicate that no exceedances occurred during that month. All ozone exceedances occurred in the months May-October during the period of 1997-2003.

Figure 6: Ozone Monitor Locations in the Triangle Region





AIR RESOURCES

Transportation modes

Why the indicator was selected

Automobile use in the county is directly related to air quality, because vehicle exhaust contributes a substantial portion of air pollutants. Therefore, it is important to encourage alternatives to the dominant single-occupancy automobile. In particular, there are a number of unique aspects of Orange County's employment base, population distribution, and commuting/movement patterns that offer more innovative opportunities in alternative transportation. Tracking the types of transportation modes can be used to gauge the success of policies that support alternative modes of transportation.

How the indicator was measured

The statistic presented here represents the journey-to-work in and out of Orange County. The U.S. Census Bureau provides means of transportation to work data from the 1990 and 2000 census results.

The trend in Orange County

Improving

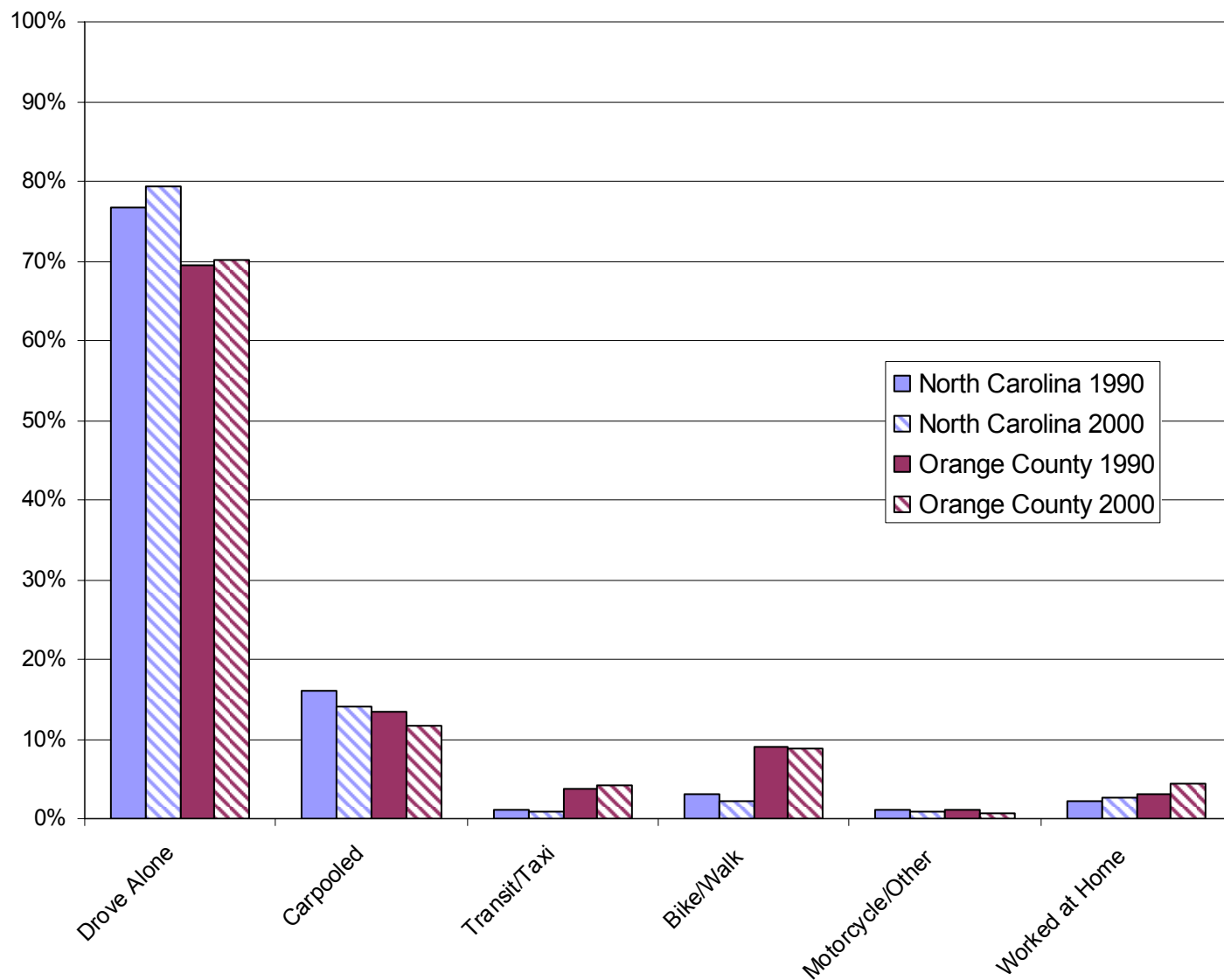
As seen in Figure 7, the single-occupancy automobile is by far the dominant mode of transportation to work for Orange County citizens. However, a comparison of the data for Orange County to North Carolina as a whole reveals unique trends in the county. The percentage of workers driving alone and the number of carpoolers is lower in Orange County than in North Carolina as a whole. The number of people using public transit, walking/biking, and working at home is significantly higher than the state average (while still only a small portion of total commuting trips). Further investigation is necessary to determine the extent to which Chapel Hill's transit system, the dominance of the University of North Carolina at Chapel Hill (UNC-Chapel Hill), and other factors affect these measures.

Recommendations

Orange County should:

- Continue to investigate ways to shift our transportation to cleaner, more efficient modes.
- Work to reduce vehicle trips altogether by increasing telecommuting, co-locating jobs and residences, and developing walkable, bike-friendly, and mass transit-oriented communities.

Figure 7: Means of Transportation to Work in Orange County and North Carolina in 1990 and 2000





AIR RESOURCES

Fuel efficient or alternative fuel vehicles

Why the indicator was selected

Because Orange County now faces ozone non-attainment status and increasing daily vehicle miles traveled per capita, any effort that reduces pollution from mobile sources is encouraging. One action that both government and private citizens can take is to choose vehicles that are more fuel efficient or use an alternative fuel.

How the indicator was measured

Orange County's personal property tax on vehicles provides a system that tracks the make and model of vehicles licensed in the county, which includes hybrid cars. The system does not track alternative fuel vehicles such as those run on ethanol or biodiesel. Data obtained from local municipalities about their government-owned vehicles are more complete and provide information on both hybrid and alternative fuel automobiles.

The trend in Orange County

Improving

As seen in Table 4, several local governments are taking steps to incorporate alternative fuel vehicles. Chapel Hill now has three vehicles in service that run on compressed natural gas. Both Carrboro and Chapel Hill are using biodiesel in many of their fleet vehicles. Orange County recently received a grant from the Clean Cities Coalition to install a compressed natural gas fueling station. At this time, the plan is to install the facility near the current Orange County Public Works site in Hillsborough. Tentatively scheduled to open in October 2005, the station may be open to the public.

Orange County is also beginning to see more hybrid vehicles in use. Table 5 shows the total number of hybrid vehicles registered in the county as reported by the Orange County tax assessor's office.

Recommendations

Orange County should:

- Track the number of alternative fuel vehicles. The county should develop a system to record the number of vehicles using fuels such as biodiesel or ethanol.
- Purchase alternative fuel or low emission vehicles whenever feasible. The use of these cars is another step toward reducing mobile pollution sources in the county.
- Consider tax incentives that encourage local citizens to invest in cleaner vehicles for personal use.

**Table 4: Alternative Fuel Vehicles and Fuel Use
in Local Municipalities, 2000-2003**

		Town of Carrboro		Town of Chapel Hill			
		2002	2003	2000	2001	2002	2003
Compressed Natural Gas	Vehicles¹ Purchased	0	0	7	0	0	3
	Fuel Use	0	0	n/a	n/a	3,600 ccf	5,000 ccf
	Gasoline Gallon Equivalent	0	0	n/a	n/a	2,880 gallons	4,000 gallons
Electric	Vehicles Purchased	0	0	2	0	0	0
	Fuel Use	0	0	n/a	n/a	n/a	12,000 kwh
	Gasoline Gallon Equivalent	0	0	n/a	n/a	n/a	358 gallons
Biodiesel²	Fuel Use	7,945 gallons	14,937 gallons	0	0	0	42,000 gallons

Note: The Towns of Chapel Hill and Carrboro are currently the only two municipalities in Orange County using alternative fuel vehicles.

kWh = kiloWatt-hours; 1 ccf = 100 cubic feet.

¹ Recorded purchased vehicles may have had associated fuel use that was not reported such as in 2000 and 2001 in Chapel Hill.

² Biodiesel can be used in conventional diesel vehicles without modification.

Table 5: Number of Registered Hybrid Vehicles in Orange County, 2003

Total Number of Registered Hybrid Vehicles (as of 2003)	
Honda Civic	35
Honda Insight	14
Toyota Prius	92



AIR RESOURCES

Travel to work

Why the indicator was selected

The amount of time that people spend traveling to work correlates directly to air emissions. Because the dominant mode of transportation is the single occupancy vehicle, statistics on travel time and commuting can indicate how much people contribute to air pollution.

How the indicator was measured

In the 1990 and 2000 censuses, the U.S. Census Bureau obtained data on travel time to work for workers 16 years and older from the 1990 and 2000 censuses and on the number of people commuting out of their county of residence. From these data, statistic calculations were made to assess the number of in and out-commuters in Orange County.

The trend in Orange County

Increasing

As seen in Table 6, commuting time for Orange County workers continues to increase. Figure 8 confirms that both the number of in-commuters (workers from other counties) and out-commuters (Orange County workers going to other counties) continues to rise as well. Table 7 and 8 detail the extent of these changes between 1990 to 2000, the most recent period for which data are available.

Table 6: Change in Average Travel Time to Work

Year	Average Travel Time in Minutes	Percent Change From 1980
1980	18.5	n/a
1990	18.9	2.2%
2000	22.0	18.9%

Recommendations

Orange County should:

- Study commuting patterns in Orange County and develop strategies to improve them.
- Encourage and offer incentives for regional employers to promote telecommuting to take cars off the road.
- Promote carpooling and the use of public transportation for those who must commute.

Figure 8: Percentage of Working People In or Out-Commuting in Orange County in 1990-2000

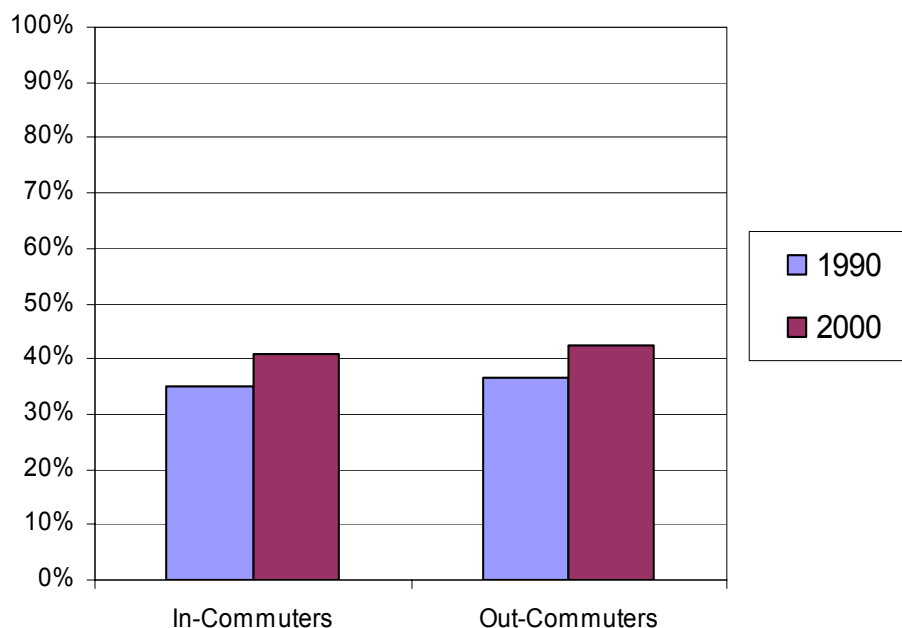


Table 7: Change in Out-Commuting in Orange County Between 1990 to 2000

	1990	2000	% Change 1990 to 2000
Number of Orange County Residents Who Work	49,915	65,009	30.2%
Number of Orange County Residents Working in Other Counties	18,324	27,563	50.4%
Percent of Orange County Residents Working in Other Counties	36.7%	42.4%	15.5%

Table 8: Change in In-Commuting in Orange County Between 1990 to 2000

	1990	2000	% Change 1990 to 2000
Total Number of People Working in Orange County	48,621	59,147	21.6%
Number of Orange County Workers Living in Other Counties	17,030	24,094	41.4%
Percent of Orange County Workers Living in Other Counties	35.0%	40.7%	16.3%



AIR RESOURCES

Daily vehicle miles traveled

Why the indicator was selected

Daily vehicle miles traveled (DVMT) represent vehicle use on public roads in Orange County by both residents and non-Orange County residents. The analysis of these data over time is a critical factor in estimating the contribution of vehicle emissions to the degradation of air quality within the county.

How the indicator was measured

The North Carolina Department of Transportation (NCDOT) collects traffic data and uses them to estimate statistics such as DVMT shown in Figure 9. Vehicle miles are divided into rural and urban. Within these large categories, the mileage is broken down into the type of road. Per capita daily vehicle miles traveled are calculated by dividing the total miles driven that year by the total county population. The North Carolina Division of Air Quality (NCDAQ) modeled the DVMT projections for 2007 and 2015.

The trend in Orange County

Increasing

Table 9 shows that both the rural and urban DVMT continue to rise in Orange County. Urban DVMT corresponds to miles traveled primarily by local residents while rural DVMT are associated more with travelers passing through the county. Figure 9 shows that DVMT projections into the future are predicted to increase at a steady rate. Based on past trends, expected population and job growth, and development patterns, there will likely be ongoing increases in DVMT in the county unless comprehensive measures are enacted to reduce the dominant single-occupant trips. However, we should not experience the dramatic rise in DVMT seen between 1990 and 2000 after the completion of Interstate 40 in 1988 added a large number of interstate miles to Orange County's road network.

Recommendation

Orange County needs to:

- Develop innovative strategies to address these issues involved in rising vehicle miles. An initial step for Orange County is to cooperate with other local authorities, NCDOT, and NCDAQ to develop and refine an integrated transportation-impacts model (transportation demand model/emissions model combination). Such a model can be used to investigate the possible impacts of trip-reduction measures, road construction and development proposals, transit improvements, increases in employment, and other factors that will come into play over the next decades.

Figure 9: Change in Daily Vehicles Miles Traveled, 1990-2015

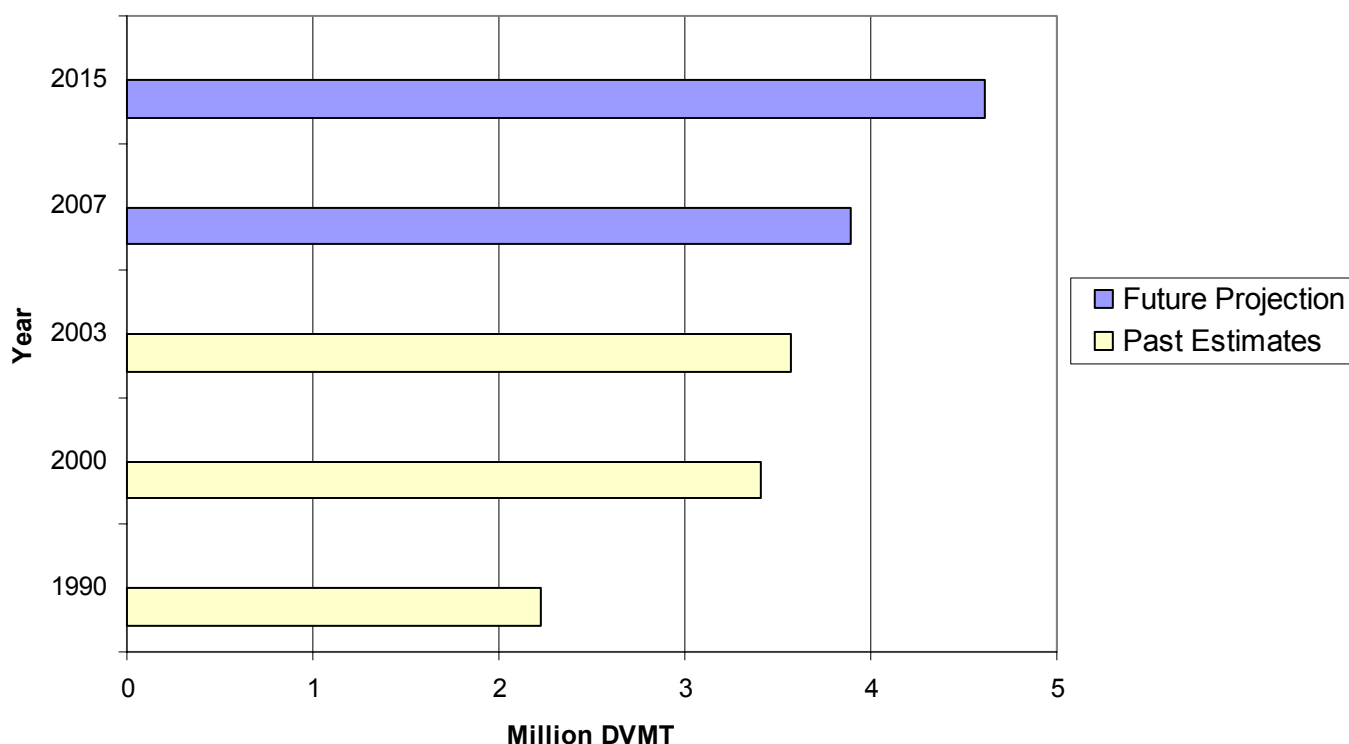


Table 9: Daily Vehicle Miles Traveled, 1990-2015

	Measured			Projected	
	1990	2000	2003	2007	2015
Rural					
Total	1,501,850	2,410,300	2,452,400	2,823,992	3,602,239
Arterial	75,700	196,100	192,150	217,288	261,398
Collector	569,300	647,630	678,090	757,525	947,433
Interstate	745,550	1,417,590	1,414,490	1,673,667	2,155,278
Local	111,300	148,980	167,670	175,512	238,130
Urban and small urban					
Total	726,280	1,001,400	1,112,570	1,147,344	1,541,948
Arterial	558,040	754,080	445,200	867,498	1,083,826
Collector	35,890	41,500	388,590	46,245	57,894
Freeway	53,660	57,420	61,600	63,559	79,569
Interstate	21,070	114,320	109,200	132,904	172,555
Local	57,620	34,080	107,980	37,138	148,104
Grand Total	2,228,130	3,411,700	3,564,970	3,896,162	4,615,809
% of Grand Total as Interstate and Freeway	36.8%	46.6%	44.5%	48.0%	52.2%



AIR RESOURCES

Miles of state maintained road lanes

Why the indicator was selected

The number of road lane miles in Orange County represents the overall capacity of the transportation system. Additional lane miles can result in greater DVMT and thus in increased vehicle emissions. However, new lane miles that allow freer flow of traffic can potentially reduce emissions. Historically, new roads have made it possible for drivers to reach destinations more quickly. But if demand escalates, these roads can become congested and result in higher emissions if drivers are stuck idling in traffic. Some compare adding additional lane miles to “dealing with weight gain by loosening your belt.”

How the indicator was measured

This indicator is compiled by the North Carolina Department of Transportation (NCDOT) based on the total mileage of state maintained roads: that is, all highways, arterial routes, major urban roads, and rural roads, except local streets maintained by municipalities. “Lane miles” count a mile of four-lane road as four miles and consider any widening of existing roads as new lane miles. However, “lane miles” are not distinguished by road type; thus a new state road in a rural area contributes the same number of “lane miles” as a new lane of I-40.

The trend in Orange County

Increasing

Figure 10 shows how the overall lane mileage of our local road system grew steadily over the last 15 years, but always at a rate that averaged less than one percent a year. However, when this information is compared to the “Daily Vehicle Miles Traveled” indicator, a very cautionary combination is revealed. While the amount of actual pavement grew only gradually in that period, the DVMT increased at a much greater rate. Table 10 shows that between 1990 and 2000, lane miles grew by only 4.2%, while the estimated DVMT grew by over 50%. A large percentage of that dramatic increase in DVMT has occurred on a small number of new interstate lane miles, and has allowed high traffic volumes to develop in a short period of time.

Recommendations

The county should:

- Track state maintained road lane miles along with other transportation measure to provide a comprehensive picture of the impact of vehicle use on air quality, land and water resources, and the overall environment in Orange County. Comparing lane miles for different road types could provide more specific measures of system capacity. However, even these measures will be inadequate to assess fully the immediate and longer-term impacts of new roads on DVMT, traffic flow, and other parameters critical to understanding air quality impacts.
- Develop an integrated traffic/air quality modeling program and collect associated data to better understand the impacts of added lane miles.

Figure 10: Total State Maintained Road Lane Miles, 1985-2003

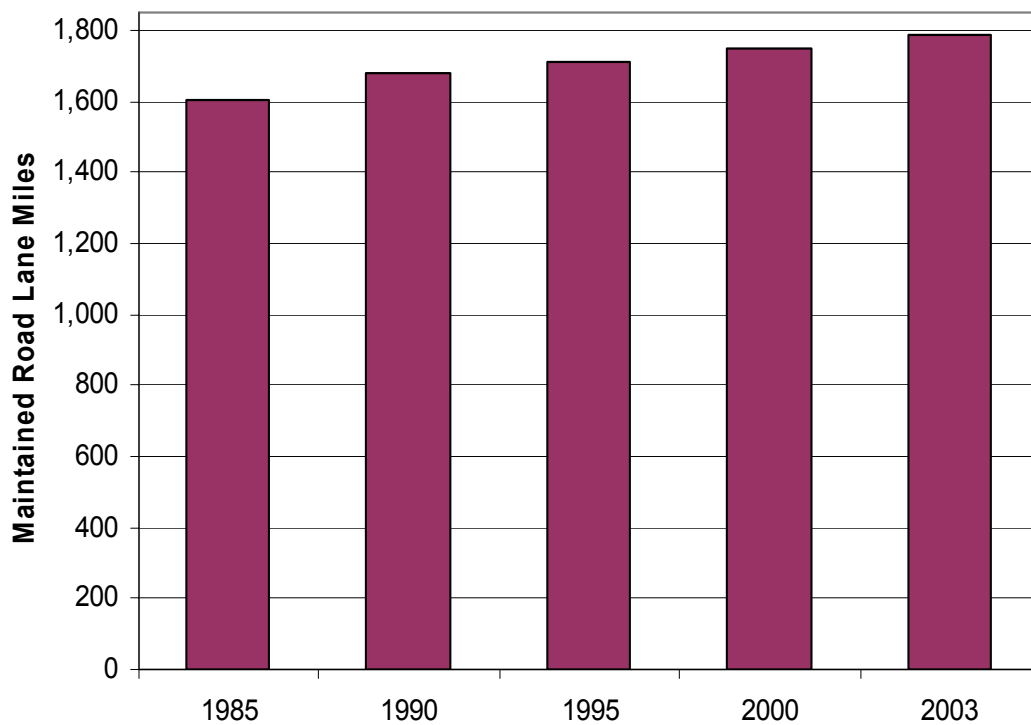


Table 10: Total State Maintained Road Lane Miles, 1985-2003

Year	Lane Miles	Percent Change	
1985	1,602	n/a	
1990	1,678	1985-1990	4.7%
1995	1,710	1990-1995	1.9%
2000	1,750	1995-2000	2.3%
2003	1,788	2000-2003	2.2%
		1985-2003	11.6%

Note: The lane miles shown are defined as the center line mileage times the number of lanes. Example: 1.23 miles multiplied by 3 lanes = 3.69 miles. These mileage totals are for all state maintained roads or essentially all roads in Orange County (Interstate, US, NC, and SR).



In 2003, this 223-acre farm in Cedar Grove was placed under conservation easement by owners Carl and Elizabeth Walters.

BIOLOGICAL RESOURCES

Orange County is home to a wealth of biological resources within a variety of natural communities, from the forested hilltops known as “monadnocks” (such as Oconeechee Mountain) to the bottomland swamp forests of the Triassic Basin (such as the lower Morgan Creek floodplain). Encroaching development, however, can devour valuable natural areas and fragment the landscape, making it more difficult for native plants and animals to survive. Therefore it is important for Orange County to monitor the conditions of existing natural areas and individual species and to protect these biological resources.

Significant developments in protecting Orange County’s biological elements have occurred since the last report in 2002. Among these was a 2004 update of North Carolina’s Natural Heritage Program’s inventory of natural areas for the county. New to this edition of the inventory was the identification of important “macrosites” in less developed areas of the county and the inclusion of special aquatic sites as recognized natural areas.

Another integral element in the protection of local biological resources is Orange County’s Lands Legacy Program. Started in April 2000, Lands Legacy is administered by the Environment and Resource Conservation Department (ERCD). The department works with willing landowners to acquire land or to protect private land through conservation easements. ERCD often collaborates on projects with local land trusts and other conservation partners. Since the program was started, Orange County has acquired 757 acres of new land for parks and preserves and protected another 648 acres of farmland and natural land with conservation easements.

The Biological Resources section of this report highlights data from the 2004 natural areas inventory, and reports on the progress made by Lands Legacy and others to protect important resource lands in Orange County. The “Acres of protected land” indicator shows the many different types of land protection efforts ongoing in the county. The “Acres of protected natural areas” indicator is a subset of the protected land figures. This indicator tracks the protection of those lands recognized as important natural areas by the North Carolina Natural Heritage Program. The “Prime forest” indicator displays some of the notable changes in forest cover from 1988-2003. The “Acres within the present use value program” tracks the amount of land receiving special tax treatment as agricultural, forest, or horticultural land. Finally, the “Status of rare plants and animals” shows the current information maintained by the Natural Heritage Program on individual species.



BIOLOGICAL RESOURCES

Acres of protected land

Why the indicator was selected

Lands that are protected from future development are important community assets that provide innumerable benefits for the people of Orange County. These protected areas improve air and water quality, provide habitats for native plant and animal species, and can serve as recreational and scenic spaces for the county's residents. The most effective method of protecting land for conservation purposes is to acquire it outright (by purchase or donation) or to work with the owners to restrict its future development with conservation easements. Conservation easements¹ are used by many landowners in Orange County to ensure long-term protection of important natural resources on their property.

How the indicator was measured

The Environment and Resource Conservation Department (ERCD) maintains a database of protected lands in Orange County. Table 11 lists the different entities responsible for protecting land over the past few decades, and shows the amount of land considered to be permanently or partially protected² as of December 2004.

The trend in Orange County Improving

Local governments, residents, and non-profit organizations continue to work hard to protect important natural resource lands in Orange County. The county became a full partner in this effort when it adopted the Lands Legacy Program in 2000. Over the past two years (2002-04), another 2,250 acres were protected, including 970 acres to the Eno River State Park, 520 acres by Orange County, and 233 acres by the Town of Chapel Hill. Over 400 acres of prime farmland were protected by conservation easements. In total there are 19,265 acres of protected land, or as Figure 11 shows about 7.5% of all land area in Orange County. At this time, 9,842 acres of those protected lands (or 3.8% of all county land) are considered "permanently" protected. Many important natural and cultural resource lands remain completely unprotected.

Recommendations

Orange County should:

- Continue to support and collaborate with its conservation partners (e.g., land trusts, Duke University/University of North Carolina at Chapel Hill, State of North Carolina, Orange Water and Sewer Authority) and private landowners to protect natural areas, stream/wildlife corridors, prime farm and forestland, and water supply watershed areas.
- Work with its conservation partners to achieve the permanent protection of at least 10% of Orange County land by 2010.

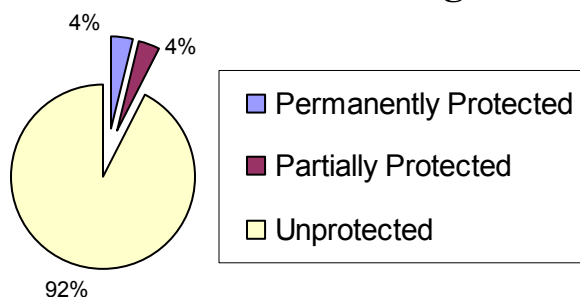
¹ Conservation easements are voluntary, legal agreements between the landowner and a nonprofit conservation organization or a local government. Under the agreement the landowner gives up certain rights to develop the land in the future.

² "Permanently protected" lands are those properties most likely to remain protected from future development. They include all lands protected by conservation agreements (e.g., easements) and lands owned by conservation entities, such as non-profit land trusts, North Carolina State Parks, and Orange Water and Sewer Authority. "Partially protected" lands are intended to remain undeveloped, but lack binding agreements for their permanent protection (e.g., Duke Forest, UNC-Chapel Hill's Mason Farm Biological Reserve, and several local government parks and open space properties).

Table 11: Acres of Protected Land in Orange County, 2004

PERMANENTLY PROTECTED LANDS			Acreage by Acquisition Period				Total
Organization		Protection Type	Pre 1981	1981-1990	1991-2000	2001-2004	
Name	Type						
Botanical Garden Foundation	Nonprofit	Ownership		17	77		94
		Easement			23		23
Town of Carrboro	Local Govt.	Ownership				27	27
Conservation Trust for NC	Nonprofit	Easement			143	35	178
Eno River Association	Nonprofit	Ownership			17	28	45
Moorefields Foundation	Nonprofit	Ownership		85			85
The Nature Conservancy	Nonprofit	Ownership		10			10
		Easement	4				4
Orange County (Lands Legacy Program)	Local Govt.	Ownership			63	135	198
		Easement			8	560	568
Orange Water and Sewer Authority	Utility Provider	Ownership	73	1,983	1,300	275	3,631
		Easement			164	209	373
Eno River State Park	State Govt.	Ownership	800	800	374	1,148	3,122
Occoneetchee Mt State Park	State Govt.	Ownership			74		74
NC Agricultural Foundation	Nonprofit	Ownership				164	164
Triangle Land Conservancy	Nonprofit	Ownership		5	428	35	468
		Easement		9	348	284	641
New Hope Gamelands	Fed. Govt.	Ownership	98				98
U.S. Fish and Wildlife Service	Fed. Govt.	Easement		51			51
Subtotal			975	2,960	3,007	2,900	9,842
PARTIALLY PROTECTED LANDS			Acreage by Acquisition Period				Total
Organization		Protection Type	Pre 1981	1981-1990	1991-2000	2001-2004	
Name	Type						
Town of Carrboro	Local Govt.	Ownership		28	67	1	96
Town of Chapel Hill	Local Govt.	Ownership	131	152	133	255	671
City of Durham	Local Govt.	Ownership			11		11
Town of Hillsborough	Local Govt.	Ownership		28			28
Orange County (Lands Legacy Program)	Local Govt.	Ownership	331	33	38	404	806
Duke University (Duke Forest)	Private University	Ownership	2,419	397	2,175	71	5,062
Private Homeowners Associations	Neighborhood Group	Ownership	70	239	562	265	1,136
Classical American Homes Preservation Trust	Nonprofit	Ownership			263		263
University of North Carolina at Chapel Hill	Public University	Ownership	200	1,093	90		1,383
Subtotal			3,151	1,937	3,339	996	9,423
TOTAL			4,126	4,897	6,346	3,896	19,265

Figure 11 : Percent of Protected Orange County Acreage





BIOLOGICAL RESOURCES

Acres of protected natural areas

Why the indicator was selected

Natural areas provide habitats for native plant and animal species, and can also serve as recreational and scenic places for Orange County's residents. The first *Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina* was published in 1988. That inventory identified significant natural areas (also known as "natural heritage sites") recognized by the North Carolina Natural Heritage Program. Many areas include unique and exemplary habitats that are critical for rare animals, plants, and ecosystems. An update to the 1988 Inventory was completed in 2004, resulting in changes to many site boundaries. With the update, some of the natural areas were reduced in size due to development activities while other sites were enlarged.

Orange County, through its Lands Legacy Program, works with its conservation partners (land trusts, State of North Carolina, Duke University/University of North Carolina at Chapel Hill, private landowners, and others) to monitor natural areas and protect them through its Lands Legacy Program.

How the indicator was measured

Table 12 provides an overview of the amount of natural area lands that have been permanently or partially protected¹ over time in Orange County. Data were collected from organizations active in land conservation throughout the county.

The trend in Orange County

Improving

Since the last *State of the Environment* report (2002), another 700 acres of natural areas were permanently protected, including natural areas located along Bolin Creek, Steep Bottom Branch, and the Eno River. Also noteworthy was Duke University's placement of 1,220 acres of Duke Forest natural areas into the state's Registry of Natural Areas in 2004.

Figure 12 shows that just over half (61% or 6,139 acres) of the county's 10,140 acres of natural areas are either permanently or partially protected. About 4,001 acres of natural areas remain unprotected, however, and could be damaged or destroyed by future development.

Recommendations

Orange County should:

- Continue to protect these areas through its Lands Legacy Program, in consultation with the Commission for the Environment (CfE) and in collaboration with other conservation partners.
- Guide new development away from natural areas through its land use planning and subdivision approval processes.
- Develop a process of monitoring the natural areas and their rare species populations on a more frequent basis.

¹ "Permanently protected" lands are those properties most likely to remain protected from future development. They include all lands protected by conservation agreements (e.g., easements) and lands owned by conservation entities, such as non-profit land trusts, North Carolina State Parks, and the Orange Water and Sewer Authority. "Partially protected" lands are intended to remain undeveloped, but lack binding agreements for their permanent protection (e.g., Duke Forest, UNC-Chapel Hill's Mason Farm Biological Reserve, and several local government parks and open space properties).

Table 12: Protected Acres in Natural Areas, 2004

PERMANENTLY PROTECTED LANDS		Acreage by Acquisition Period				
Organization		Pre 1981	1981-1990	1991-2000	2001-2004	Total
Name	Type					
Botanical Garden Foundation	Nonprofit		16	75		91
Conservation Trust for NC	Nonprofit			141		141
Draper Savage Foundation (Moorefields)	Nonprofit		4			4
Eno River Association	Nonprofit			1		1
The Nature Conservancy	Nonprofit		7			7
Orange County (Lands Legacy)	Local Govt.			63	25	88
Orange Water & Sewer Authority	Utility Provider	29	984	158	3	1,175
Eno River State Park	State Govt.	579	371	267	595	1,812
Occoneechee Mt State Park	State Govt.			53		53
Triangle Land Conservancy	Nonprofit		5	198	89	292
New Hope Gamelands	Fed. Govt.	82				82
Subtotal		690	1,383	956	712	3,746
PARTIALLY PROTECTED LANDS		Acreage by Acquisition Period				
Owner		Pre 1981	1981-1990	1991-2000	2001-2004	Total
Name	Type					
Town of Chapel Hill	Local Govt	3		36	20	59
City of Durham	Local Govt			9		9
Town of Hillsborough	Local Govt		27	2		29
Orange County (Lands Legacy)	Local Govt.	67		63	50	180
Duke University (Duke Forest)	Private	488	92	579	9	1,169
Classical American Homes Preservation Trust	Nonprofit			56		56
University of North Carolina at Chapel Hill	Public University	116	722	52		891
Subtotal		674	841	798	79	2,393
TOTAL ACRES PROTECTED						6,139
TOTAL ACRES UNPROTECTED						4,001

Figure 12: Percent of Protected Natural Areas in Orange County, 2004

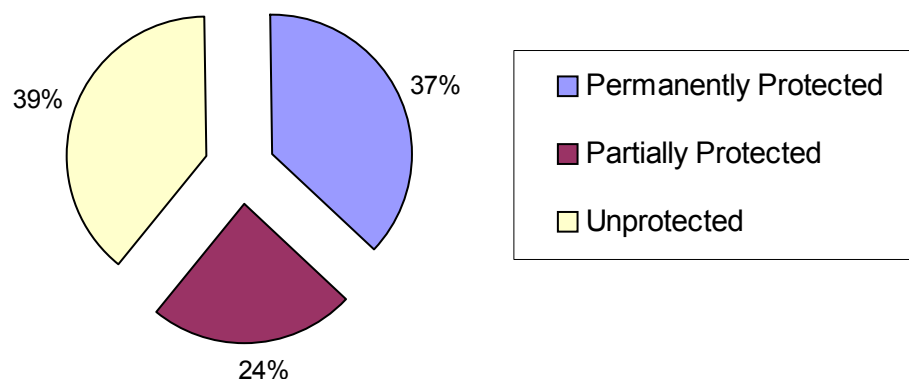
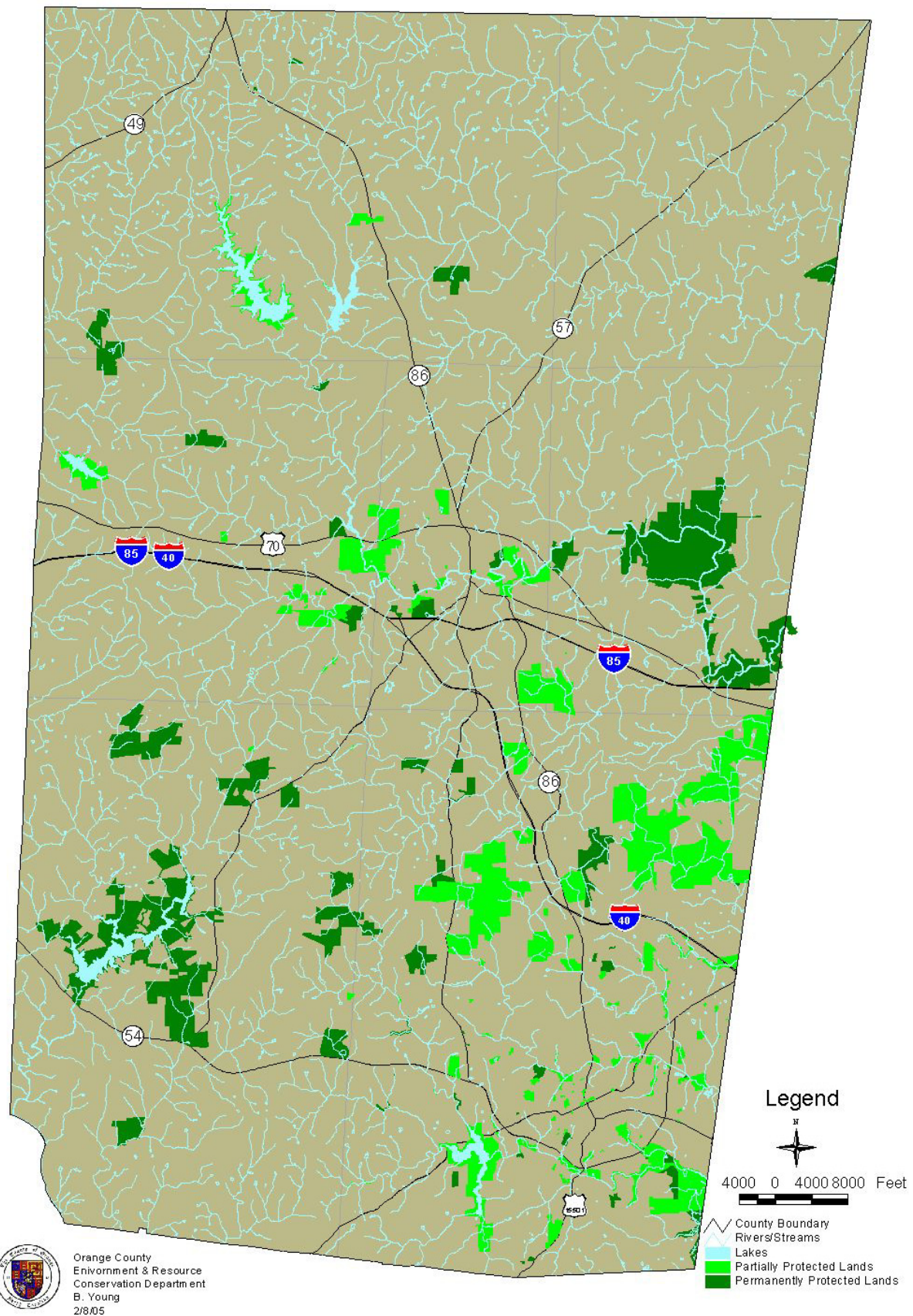


Figure 13: Protected Lands in Orange County, 2004





Orange County purchased the Blackwood Farm, which is located on State Highway 86 between Hillsborough and Chapel Hill, for conservation and future education/recreation purposes.





BIOLOGICAL RESOURCES

Prime forest

Why the indicator was selected

Prime forests are defined as largely undisturbed tracts of hardwood forest and mixed hardwood-pine forest. These types of forests were prominent in the pre-European settlement landscape of Orange County, and they provide habitat for many indigenous plant and animal species that are restricted to hardwood forest habitats. In the past 20 years, the county may have lost as much as 25% of its prime forestland and many other forests have become fragmented to the point where they can no longer accommodate diverse species.¹ Mature forests dominated by oaks, hickories and other hardwoods are critical habitat for many native species such as the Wood Thrush and the Hooded Warbler. In addition to providing habitat for the plant and animal communities, forests also help the human community by improving air and water quality and by providing flood control.

How the indicator was measured

Orange County first mapped the size and distribution of prime forest in the county using 1988 aerial photographs. Those data were further refined in 1999 to identify the remaining forested lands most suitable as wildlife habitat. An updated version of digitized forest cover was completed recently using 2003 aerial photographs. Figure 12 shows a qualitative comparison of prime forest cover in 1988 and 2003. These forest patches include only those sites that are larger than 40 acres and large enough to support wildlife.

The trend in Orange County

Indeterminate

In 1988, Orange County had about 71,000 acres of prime forest (28% of Orange County). The analysis of prime forest was redone in 2004, but it is not sufficiently accurate to compare differences in actual acreage. The comparison does, however, illustrate changes in key areas of prime forest between 1988 and 2003 (see Figure 14). Forest loss over this period has been largely due to commercial timber harvesting and development.

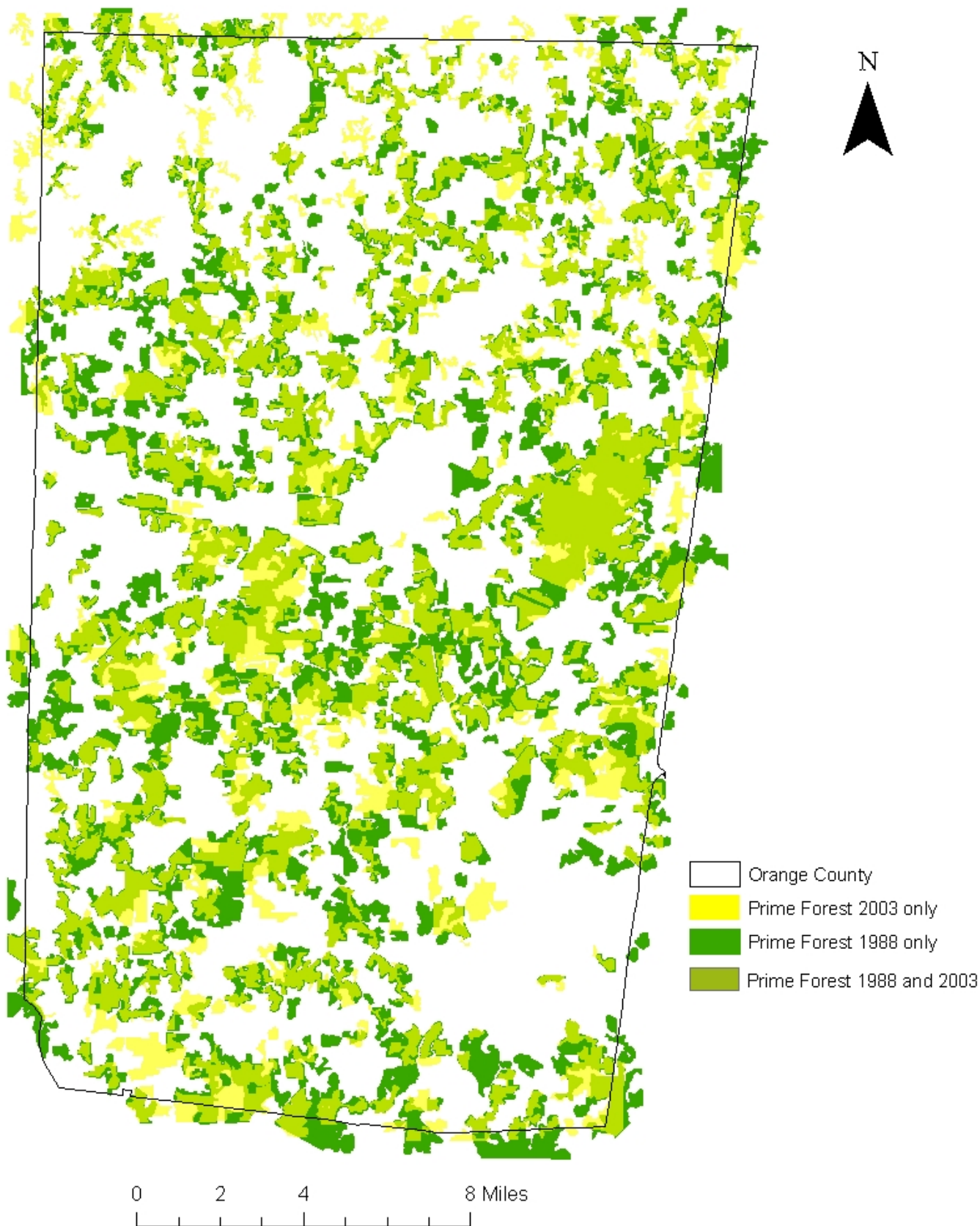
Recommendations

Orange County should:

- Intensify its efforts to achieve permanent protection for some of the remaining hardwood and mixed hardwood-pine forests. Primary ways to achieve this goal are to purchase key forestlands and to acquire conservation easements.
- Protect connectivity between protected forest tracts and buffer these sites from disturbance-generating activities (e.g., encroachment by invasive plant species and development).

¹ *A Landscape with Wildlife for Orange County, Parts 1 and 2* (Triangle Land Conservancy, 1997 & 1999).

Figure 14: Orange County Forest Cover Change from 1988 to 2003





BIOLOGICAL RESOURCES

Acres within the present use value program

Why the indicator was selected

The State of North Carolina authorizes local governments such as Orange County to reduce local property tax valuations for land used for agricultural, forestry, or horticultural purposes (NCGS 105-277.2 *et seq.*). By basing the tax rate on a property's *current* use (e.g., farm) instead of its potential use (e.g., residential development), this present use valuation is a strategy that makes land more affordable for the owner to keep and reduces the pressure to sell the land. The Present Use Value Program helps to enable farmers and forest landowners to provide essential products for the community while also protecting large open spaces that provide wildlife habitats essential to maintaining a healthy diversity of native plant and animal species ("biodiversity") in Orange County.

How the indicator was measured

The Present Use Value Program is administered by the Orange County Tax Assessor's Office, which maintains a database of properties participating in the program. Table 13 shows the number of properties in the three categories—agriculture, forestry, and horticulture—that have enrolled in the Present Use Value Program since 1993.

The trend in Orange County

Declining

Table 13 shows that about 40% of the land in Orange County is enrolled in the Present Use Value Program. Figure 15 shows that between 1993 and 2004, the acreage within the agriculture and forestry categories has decreased slightly (about 2,000 and 3,000 acres respectively) while the acreage within the horticulture category has increased. Horticulture makes up only a small portion of the land enrolled in the program.

The Present Use Value Program provides farm and forest landowners with significant financial incentives to maintain the productivity and the rural nature of important resource lands. In 2002, Orange County supported legislation that allows farm and forestlands protected by conservation easements to remain eligible for the Present Use Value Program benefits.

Recommendation

Orange County should:

- Implement new legislation proposed by the State of North Carolina's Commission on Smart Growth, Growth Management, and Development that would create an additional *Conservation* category within the program. This category would allow forest landowners to remain eligible for the program and to receive the tax benefit without having to harvest trees (Smart Growth Commission 2001).

Figure 15: Acres of County Land in the Present Use Value Program, 1993-2004

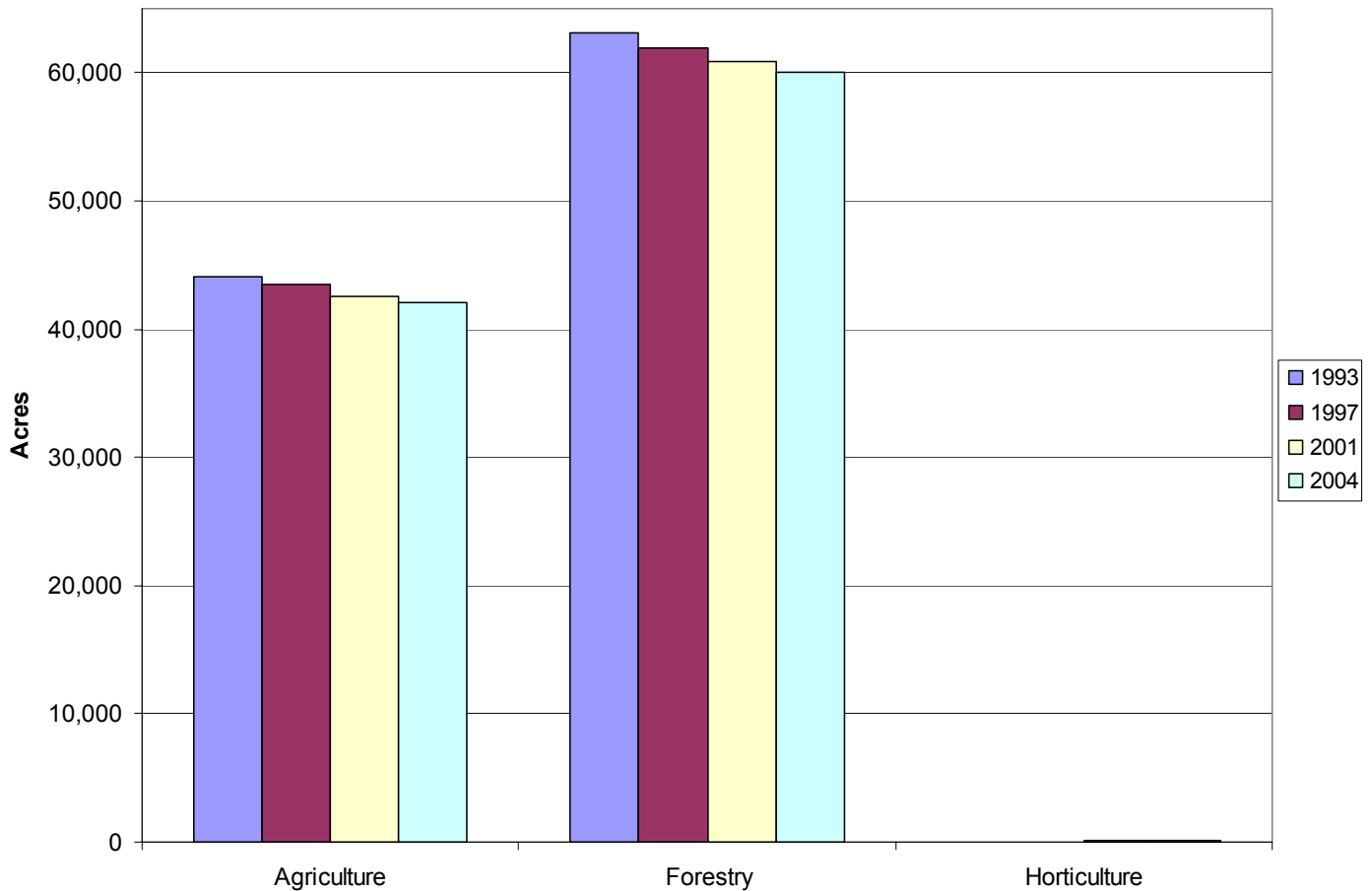


Table 13: Total Acreage in Present Use Value Program, 1993-2004

	1993		1997		2001 ²		2004	
	Number of Parcels	Acreage	Number of Parcels	Acreage	Number of Parcels	Acreage	Number of Parcels	Acreage
Agriculture	1672	44,051	1717	43,469	1735	42,571	1717	42,126
Forestry	1930	63,112	1972	61,951	2091	60,884	2079	60,001
Horticulture	1	5	6	49	17	138	17	138
Total land in County¹	37,906	256,800	41,669	256,800	45,038	256,800	48,752	256,800

¹ This figure excludes land in the county that is not measured in acres such as subdivision plots. Some parcels are included in multiple categories such as both agriculture and forestry.

² The *State of the Environment* 2002 report presented incorrect data for this indicator. The data were corrected for this report.



BIOLOGICAL RESOURCES

Status of rare plants and animals

Why the indicator was selected

Why do rare species matter? Within an ecosystem there is a complex interrelationship among organisms, and the loss of one species (plant or animal) can have a severe impact on the livelihood of other species. When one species is extirpated (eliminated) from a region, there is a loss of biodiversity, which results in a decrease in the number and type of genes, species, and/or ecosystems in that region.

How the indicator was measured

The status of rare plants and animals throughout North Carolina is monitored by the North Carolina Natural Heritage Program (NHP). The NHP maintains a current list of important species for each county. The status of Orange County's rare plant and animal species is provided in Table 14.

Federal status (species of concern, threatened, or endangered) is determined by the U.S. Fish and Wildlife Service as required under the federal Endangered Species Act. State status (endangered, threatened, special concern, or significantly rare) is determined by the State Plant Conservation Program and the Endangered Wildlife Program of the North Carolina Wildlife Resources Commission. The far right-hand column of the table ("Last Observed") denotes when the species was last observed and documented in Orange County: a "historic" species was last observed more than 20 years ago; "current" species have been spotted within the past 20 years; and "obscure" indicates the date the species was last observed is uncertain.

The trend in Orange County

The conversion of natural lands to urban/suburban uses results in habitat loss for our native plants and animals and can result in loss of native species. Since 2002 another three species (Carolina darter, sharp-shinned hawk, and the small whorled pogonia) have been moved from the "Current" to the "Historic" column of Table 14, meaning that they have not been observed in the past 20 years.

Indeterminate
(likely declining)

A recent update of the Orange County *Inventory of Natural Areas and Wildlife Habitat* confirmed the previous documentation of several rare species within the county's natural areas and added one new species, the Carolina Ladle Crayfish (*Camberus davidi*).

Recommendations

Orange County should:

- Support more fieldwork to document the continued presence of rare plant and animal species in the county.
- Remain mindful that loss of habitat and the spread of invasive species are the major causes of native species extirpation and local extinction. Setting aside land that will remain in its natural state, providing for wildlife corridors, and promoting the use of native species for landscaping are actions that the county should use to influence this trend.
- Consider developing a way to monitor non-rare indicator species as a way to measure the "state of biodiversity" in Orange County.

Table 14: Status of Orange County's Rare Plants and Animals

	Common Name	Scientific Name	Federal Status	State Status	Last Observed
Vertebrates	Amphibians				
	Four-toed Salamander	<i>Hemidactylium scutatum</i>	None	Special Concern	Current
	Neuse River Waterdog	<i>Necturus lewisi</i>	None	Special Concern	Current
	Birds				
	Sharp-shinned Hawk	<i>Accipiter striatus</i>	None	Significantly Rare	Historic
	Bald Eagle	<i>Haliaeetus leucocephalus</i>	Threatened	Threatened	Current
	Red-cockaded Woodpecker	<i>Picoides borealis</i>	Endangered	Endangered	Historic
	Warbling Vireo	<i>Vireo gilvus</i>	None	Significantly Rare	Current
	Fishes				
	Roanoke Bass	<i>Ambloplites cavifrons</i>	None	Significantly Rare	Current
	Carolina Darter	<i>Etheostoma collis pop</i>	Species of Concern	Special Concern	Historic
	Pinewoods Shiner	<i>Lythrurus matutinus</i>	Species of Concern	Significantly Rare	Current
Invertebrates	Crustacean				
	Carolina Well Diacyclops	<i>Diacyclops jeanneli putei</i>	None	Significantly Rare	Historic
	Carolina Ladle Crayfish	<i>Cambarus davidi</i>	None	Significantly Rare	Current
	Insect				
	Golden Banded-skipper	<i>Autochton cellus</i>	None	Significantly Rare	Historic
	Northern Oak Hairstreak	<i>Fixsenia favonius ontario</i>	None	Significantly Rare	Current
	Giant Swallowtail	<i>Papilio cresphontes</i>	None	Significantly Rare	Historic
	Mollusk				
	Dwarf Wedgemussel	<i>Alasmidonta heterodon</i>	Endangered	Endangered	Current
	Triangle Floater	<i>Alasmidonta undulata</i>	None	Threatened	Current
	Brook Floater	<i>Alasmidonta varicosa</i>	Species of Concern	Endangered	Current
	Atlantic Pigtoe	<i>Fusconaia masoni</i>	Species of Concern	Endangered	Current
	Yellow Lampmussel	<i>Lampsilis cariosa</i>	Species of Concern	Endangered	Current
	Carolina Fatmucket	<i>Lampsilis radiata conspicua</i>	None	Threatened	Current
	Green Floater	<i>Lasmigona subviridis</i>	Species of Concern	Endangered	Current
	Creeper	<i>Strophitus undulatus</i>	None	Threatened	Current
	Savannah Lilliput	<i>Toxolasma pullus</i>	Species of Concern	Endangered	Current
	Notched Rainbow	<i>Villosa constricta</i>	None	Special Concern	Current
Vascular Plants	Southern Anemone	<i>Anemone berlandieri</i>	None	Significantly Rare	Current
	Bradley's Spleenwort	<i>Asplenium bradleyi</i>	None	Significantly Rare	Current
	Prairie Blue Wild Indigo	<i>Baptisia minor</i>	None	Threatened	Obscure
	American Barberry	<i>Berberis canadensis</i>	None	Significantly Rare	Historic
	American Bluehearts	<i>Buchnera americana</i>	None	Significantly Rare	Historic
	Douglass's Bittercress	<i>Cardamine douglassii</i>	None	Significantly Rare	Obscure
	Bush's Sedge	<i>Carex bushii</i>	None	Significantly Rare	Current
	Wood's Sedge	<i>Carex woodii</i>	None	Significantly Rare	Historic
	Piedmont Horsebalm	<i>Collinsonia tuberosa</i>	None	Significantly Rare	Historic
	Creamy Tick-trefoil	<i>Desmodium ochroleucum</i>	Species of Concern	Significantly Rare	Historic
	A witch grass	<i>Dichanthium annulum</i>	None	Significantly Rare	Historic
	Eastern Shooting Star	<i>Dodecatheon meadia var meadia</i>	None	Significantly Rare	Historic
	Smooth Coneflower	<i>Echinacea laevigata</i>	Endangered	Endangered	Historic
	Eastern Isopyrum	<i>Enemion biternatum</i>	None	Significantly Rare	Historic
	Godfrey's Thoroughwort	<i>Eupatorium godfreyanum</i>	None	Significantly Rare	Historic
	Large Witch-alder	<i>Fothergilla major</i>	None	Significantly Rare	Current
	Heller's Rabbit Tobacco	<i>Gnaphalium helleri var helleri</i>	None	Significantly Rare	Historic
	Crested Coralroot	<i>Hexaletris spicata</i>	None	Significantly Rare	Current
	Lewis's Heartleaf	<i>Hexastylis lewisii</i>	None	Significantly Rare	Current
	Small Whorled Pogonia	<i>Isotria medeoloides</i>	Threatened	Endangered	Historic
	Earle's Blazing Star	<i>Liatris squarrulosa</i>	None	Significantly Rare	Historic
	Glade Milkvine	<i>Matelea decipiens</i>	None	Significantly Rare	Historic
	Sweet Pinesap	<i>Monotropsis odorata</i>	Species of Concern	Significantly Rare	Current
	Wiry Panic Grass	<i>Panicum flexile</i>	None	Significantly Rare	Historic
	Glade Wilde Quinine	<i>Parthenium auriculatum</i>	None	Significantly Rare	Historic
	Purple Fringeless Orchid	<i>Platanthera peramoena</i>	None	Significantly Rare	Current
	Indian Physic	<i>Porteranthus stipulatus</i>	None	Significantly Rare	Historic
	Torrey's Mountain-mint	<i>Pycnanthemum torrei</i>	Species of Concern	Significantly Rare	Current
	Water-plantain Spearwort	<i>Ranunculus ambigens</i>	None	Significantly Rare	Historic
	Michaux's Sumac	<i>Rhus michauxii</i>	Endangered	Endangered	Historic
	Pursh's Wild-petunia	<i>Reullia purshiana</i>	None	Significantly Rare	Historic
	Southern Skullcap	<i>Scutellaria australis</i>	None	Significantly Rare	Historic
	Shale-barren Skullcap	<i>Scutellaria leonardii</i>	None	Significantly Rare	Current
	Appalachian Golden-banner	<i>Thermopsis mollis sensu stricto</i>	None	Significantly Rare	Historic
	Glade Bluecurls	<i>Trichostema brachiatum</i>	None	Significantly Rare	Historic
Nonvascular Plants	Closter's Brook-hypnum	<i>Hygrohypnum closteri</i>	None	Significantly Rare	Historic



Shown here is the confluence of the east and west forks of the Eno River (northwest of Hillsborough) where Orange County acquired a conservation easement to protect the area in 2004.

WATER RESOURCES

The condition and quantity of water resources in Orange County continues to be an essential area to track. Both ground and surface water supplies require monitoring and protection to ensure that we maintain safe and adequate drinking water and conserve key aquatic habitats.

Currently, Orange County is meeting its water supply needs for local citizens. But the county needs to ensure that we will continue to have sufficient supplies for our growing population. With a significant portion of the county's residents dependent on groundwater as their primary source, Orange County must track contamination incidents and potential sources of pollution in these underground systems. A 2001 report completed by the United States Geological Survey detailed the current conditions of our groundwater supply and provided the necessary background for understanding our local groundwater. Surface water supplies are also imperative to track. In 2002, the region was struck by a severe drought that emphasized the importance of having adequate water supplies available under extreme conditions.

In an effort to further protect local water supplies, Orange County is in the process of preparing a Water Resources Initiative that will bring together many years of work and research. This initiative will propose alternatives for addressing the issues of droughts, floods, groundwater contamination, and water resource outreach among citizens. There are also other ongoing efforts to conserve and preserve the county's water resources. One of these is the collaboration between the University of North Carolina at Chapel Hill (UNC-Chapel Hill) and the Orange Sewer and Water Authority (OWASA) to create a water reclamation system at the university's upcoming campus addition. Another is the active involvement of citizens in stream watch projects; currently, nine volunteer groups monitor the water quality of the county's creeks and rivers.

This water resources section provides a number of indicators that track both ground and surface water conditions in Orange County. "Water demand" shows the different types of water sources in the county and the ways in which this water is used by the public. "Public water system safe yields" summarizes the safe limits that the local public water providers can deliver to their customers. The indicator "Groundwater contamination incidents" lists the number of incidents where a spill has occurred and has contaminated underground water supplies. Similarly, "Wastewater permit violations and spill collection" tracks the number of above-ground spills and the types of penalties incurred by the responsible parties. In order to track the condition of local water bodies, there is also an indicator on "Streams not meeting classified uses." The health of water bodies is also followed by looking at the "Percent of benthos site tests that are good or excellent." Stream and watershed protection is greatly aided by the number of local citizens involved in monitoring streams, as seen in the indicator "Number of stream protection programs." Finally, the number of wetland acres that were destroyed as allowed by the State of North Carolina's permitting process is seen in the "Wetland destruction" indicator.



WATER RESOURCES

Water demand

Why the indicator was selected

Water is a finite resource that we all need. This resource is vital for public health, agricultural production, and economic growth. To continue to provide a healthy environment along with sustainable growth in agriculture and industry, Orange County must manage carefully the use of its water resources.

How the indicator was measured

The data were provided by the North Carolina Division of Water Resources (NCDWR) and U.S. Geological Survey. Table 15 shows the amount of water used within the county over a 15-year period in million gallons per day (mgd). It separates the usage by the source of water: ground or surface. Table 16 tracks the average amount of water used per person from 1985 to 2000, reporting usage in units of gallons per day per person (gpd/p). For this table, gpd/p is calculated by dividing the total average amount of water used per day by the current population and includes all residential, commercial, and industrial uses. Figures 16 and 17 show the distributed uses of water and the change in demand over time.

The trend in Orange County

Increasing

As the urban areas within the county continue to grow, more people are relying on municipal and community supplies. Most of this water supply comes from surface waters. However, a significant proportion of the domestic water supply still comes from individual wells. The data on per person demand reveal that the amount of water used per person increased from 124 gpd/p in 1985 to 145 gpd/p in 2000, a 17% increase. This increase would have been higher if Flint Fabrics, which used 1 million gpd, had not closed in 2000.

Recommendations

Orange County should:

- Publicize water conservation techniques. The county should educate local citizens about the importance of minimizing water usage and about the various ways to reduce personal household consumption.
- Create a network of observation wells to monitor groundwater levels and study how groundwater may be affected by drought or other factors. Because a large proportion of county residents use well water, it is important to track the status of this resource.

Figure 16: Distribution of Total Water Demand, 2000

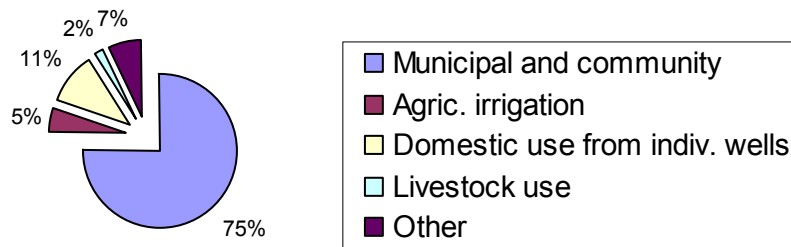


Table 15: Water Usage (mgd), 1985-2000

	1985			1990			1995			2000		
	Ground	Surface	Total	Ground	Surface	Total	Ground	Surface	Total	Ground	Surface	Total
Municipal and community		7.52	7.52		9.49	9.49	0.25	10.50	10.75	0.52	12.44	12.96
Self-supplied industry	0.01		0.01			0			0			0
Irrigation		0.80	0.80	0.08	0.74	0.82	0.76	2.28	3.04	0.22	0.59	0.81
Domestic use from wells	1.20		1.20	0.71		0.71	1.72		1.72	1.94		1.52
Livestock use	0.35	0.06	0.41	0.36	0.06	0.42	0.35	0.13	0.48	0.24	0.06	0.30
Other	0.15	0.24	0.39	0.12	0.30	0.42	0.03		0.03	0.30	0.88	1.18
TOTAL USE	1.71	8.62	10.33	1.27	10.59	11.86	3.11	12.91	16.02	3.22	13.97	17.19

Figure 17. Water Demand (GPD/P), 1985-2000

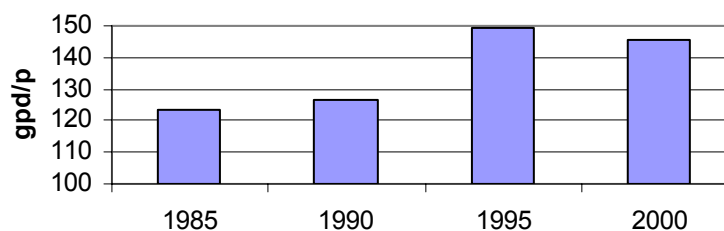


Table 16: Percent Change in Demand (GPD/P), 1985-2000

	1985	1990	1995	2000 ¹	% change 1985-1990	% change 1990-1995	% change 1995-2000	% change 1985-2000
MGD	10.3	11.9	16.0	17.2	14.8%	35.1%	7.3%	66.4%
Population	83,581	93,851	107,352	118,227	12.3%	14.4%	10.1%	41.5%
GPD/P	124	126	149	145	2.2%	18.1%	-2.6%	17.6%

¹ The decrease in 2000 demand is heavily attributed to the closing of Flint Fabrics in 2000, which used 1 million gpd. If Flint Fabrics had remained open and used the same amount of water, the gpd/p would be 150 and the upward trend would have continued.



WATER RESOURCES

Public water system safe yields

Why the indicator was selected

The U.S. Environmental Protection Agency (EPA) defines a safe yield as “the annual amount of water that can be taken from a source of supply over a period of years without depleting the source beyond its abilities to be replenished naturally in ‘wet’ years.” This statistic is a useful gauge for determining the resource capacity that is needed within a water system.

How the indicator was measured

The indicator includes only the largest systems in Orange County, because smaller water service providers are not required to identify or report their safe yields. The North Carolina Division of Water Resources (NCDWR) and the Triangle J Council of Governments (TJCOG) compiled these data from local water supply plans for 1992 and 1997. TJCOG and the water service providers contributed data for 2001 and 2003. This information is shown in Table 17. Since one-third of Orange-Alamance Water System customers are in Orange County, the reported numbers for the system were multiplied by one-third to distinguish Orange County trends. It should be noted that Hillsborough bought finished water from Durham during extended periods over the past several years. Orange-Alamance Water System has also bought water from Graham-Mebane and Hillsborough. Those supplemental supply sources are not factored into the safe yields, since the purchase arrangements are not permanent in nature and can be discontinued at any time by the party selling the water. Table 18 reveals the average and maximum daily demands on the water systems within that year.

The trend in Orange County

Increasing

Within the last four years, all three water systems have increased their capacity to accommodate future demands on the system. As shown, Orange Water and Sewer Authority (OWASA) has significantly larger sources than Hillsborough and Orange-Alamance. However, OWASA’s safe yield was recalculated in 2003 with more conservative modeling. The low safe yields for Hillsborough and Orange-Alamance systems reveal their dependence on purchasing water from other public water systems.

Recommendation

Orange County should:

- Support wastewater reclamation and reuse projects such as the ongoing collaboration between the Orange Sewer and Water Authority (OWASA) and the University of North Carolina at Chapel Hill, which are developing a water reuse program for a planned addition to the university. The refurbished water system should come into action during the latter part of 2007 and provide approximately 600,000 gallons/day, which is currently 6-7% of OWASA’s daily demand. Such projects will help alleviate the water demand from urban populations.

Table 17: Public Water Supply Safe Yield, 1992-2003

	1992	1997	2001	2003
OWASA (mgd)¹	13.50	13.50	15.10	12.5 ²
Hillsborough (mgd)	0.68	0.68	2.58	2.58 ³
Orange-Alamance (mgd) (Orange County portion)	0.12	0.12	0.12	0.12

¹ mgd = million gallons per day.

² Decrease due to change in OWASA's modeling using a more conservation estimate of 30-year drought condition safe yield.

³ Equals 1.9 for W. Fork of Eno plus 0.68 for Lake Ben Johnston.

Table 18: Average and Maximum Daily Demand Per Year, 1992-2003

Water Provider	1992	1997	2001	2003
OWASA				
Average Daily Demand (mgd)	7.14	8.98	10.17	8.22
Maximum Daily Demand (mgd)	12.00	14.34	13.75	12.81
Hillsborough				
Average Daily Demand (mgd)	1.46	1.82	1.23	1.20
Maximum Daily Demand (mgd)	2.04	2.65	1.87	1.83
Orange-Alamance (Orange County Portion)				
Average Daily Demand (mgd)	0.24	0.36	0.29	0.30
Maximum Daily Demand (mgd)	0.34	0.44	0.39	0.40

Figure 18: Water and Sewer Management Planning and Boundary Agreement, 2001

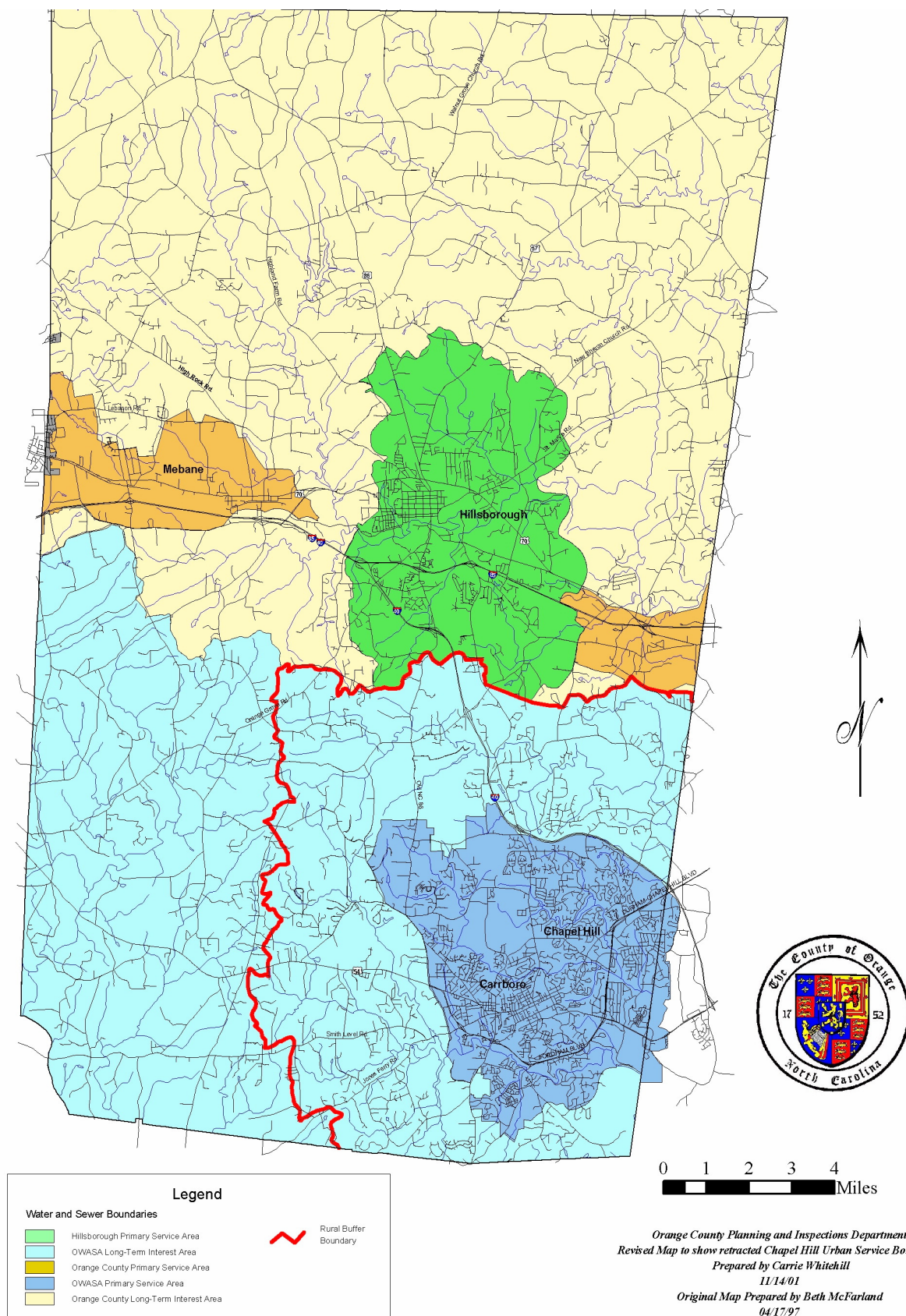
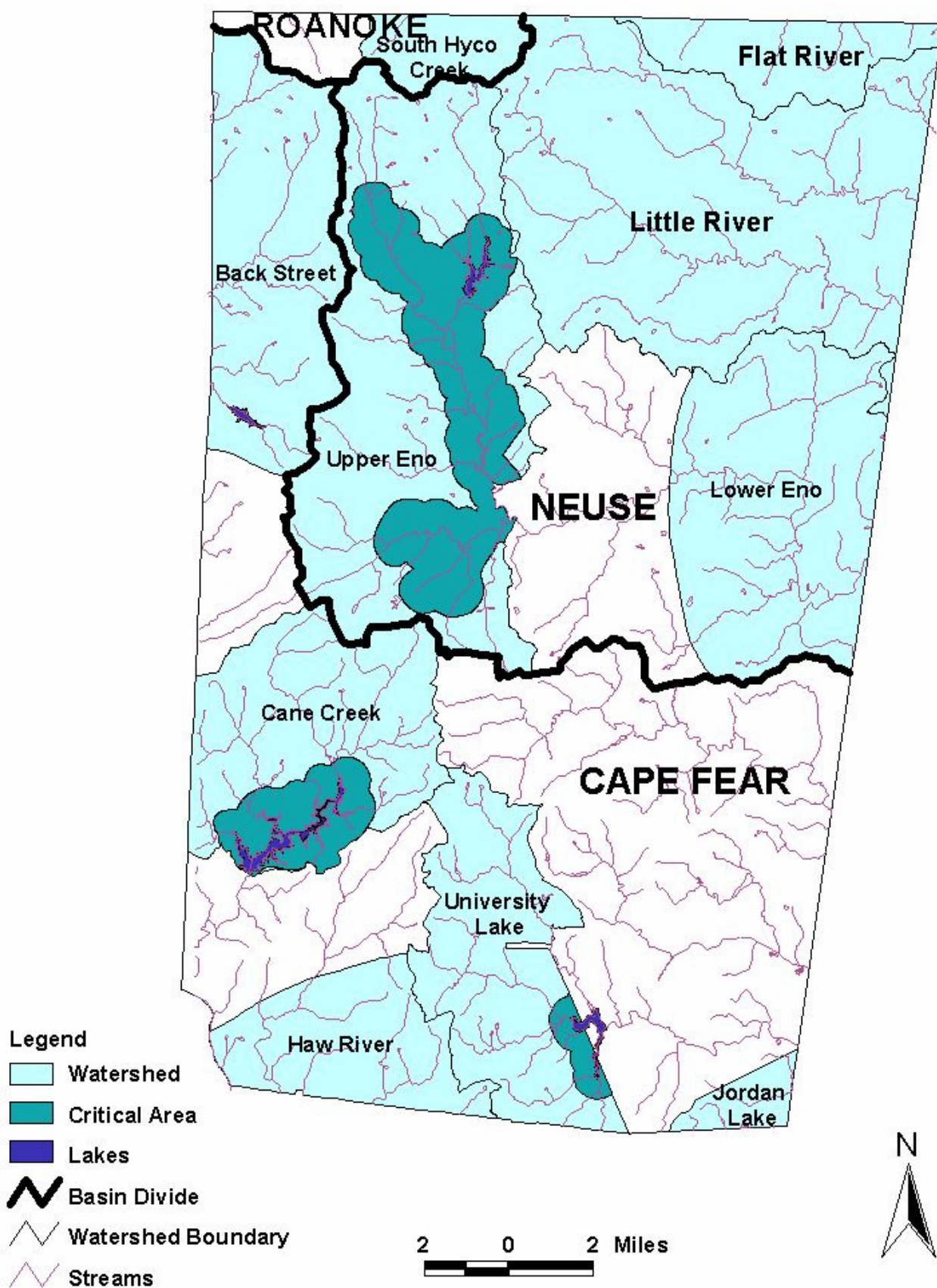


Figure 19: Protected Watersheds in Orange County





WATER RESOURCES

Groundwater contamination incidents

Why the indicator was selected

Ground contamination incidents can contaminate groundwater and soils and severely damage plants, animals, and groundwater quality. The number of such incidents is one indicator that describes how critically our daily activities impact the natural environment. In order to protect our water quality, it is necessary to stop those daily activities that have such an impact. Incidents that have been successfully restored to a non-polluting state are identified by the term “closed out.”

How the indicator was measured

The North Carolina Division of Waste Management—Underground Storage Tank Section manages the Pollution Incident Response Form (PIRF) Management Database. The database provides detailed information on the type, date, amount, and status of ground contamination incidents.

The trend in Orange County
Increasing

As Table 19 indicates, the number of groundwater contamination has increased significantly over the past fifteen years. Only 28 incidents were reported between 1986 and 1990 while 92 were reported between 2001 and 2004. Most of this increase occurred between 1986-1990 and 1991-1995 when reported incidents climbed from 28 to 85. While the number of reported incidents that have been investigated and “closed out” has grown each year, the increase has not kept pace with the accelerating number of incidents reported. As illustrated in Figure 20, an average of only 50% of contamination incidents are managed properly.

Recommendations

Orange County should:

- Alert residents to check their wells where groundwater contamination is a concern. Groundwater contamination reports are filed with the state from many sources. Yet no one follows up on these reports to ensure that groundwater users in the vicinity of the contamination check their water supply.
- Compile the locations of older existing wells. The current wellhead protection program in the county tracks the location of new wells, but no one records the location of older wells.

Figure 20: "Closed Out" Groundwater Contamination Incidents, 1986-2004

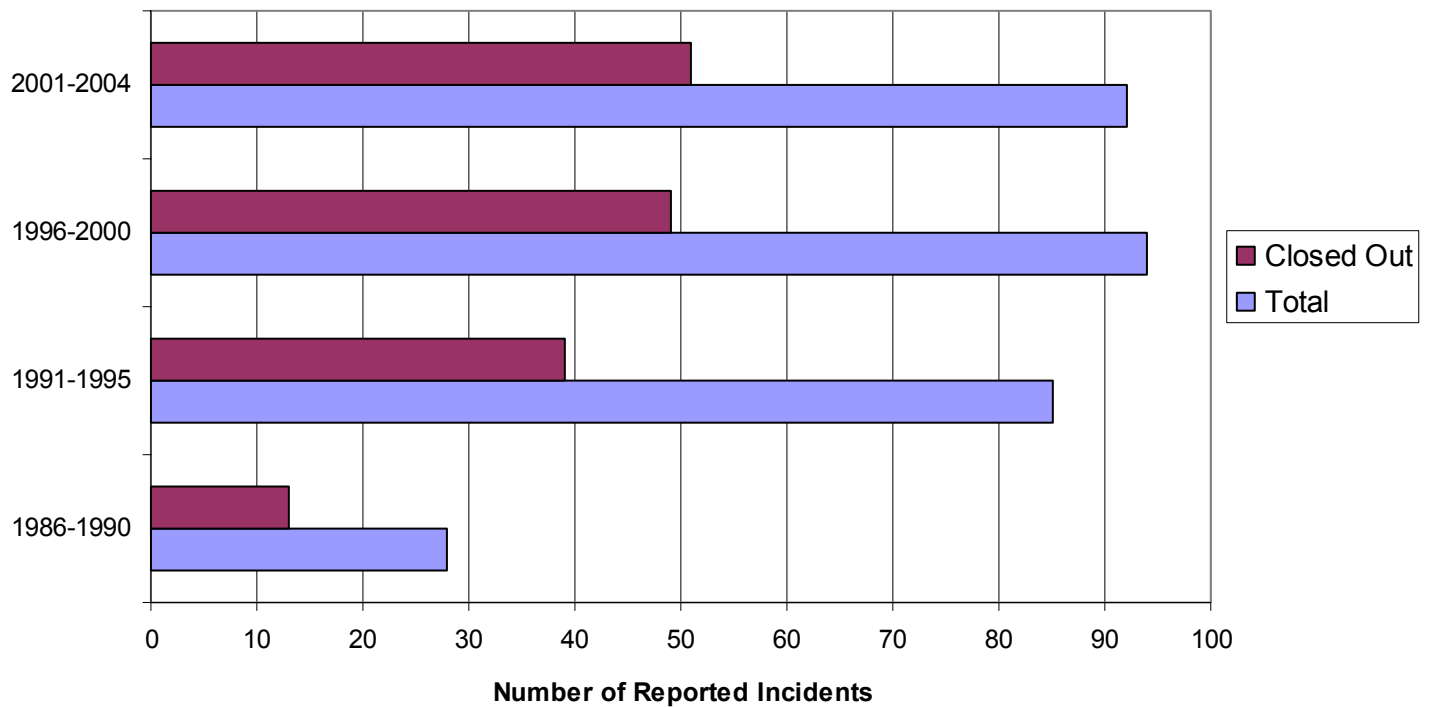


Table 19: Ground Contamination Incidents, 1986-2004

	1986-1990	1991-1995	1996-2000	2001-2004 ¹	Total
Total Reported Incidents	28	85	94	92	299
Number of Incidents "Closed Out"	13	39	49	51	152
Percent of Incidents "Closed Out"	46.4%	45.9%	52.1%	55.4%	50.8%

¹ As of August 2004.



WATER RESOURCES

Wastewater permit violations and spill collection

Why the indicator was selected

Wastewater treatment and containment is an essential service for urban centers and cities. The quality of that service can be evaluated by observing the number and volume of wastewater spills, which can contribute excess nutrients and pollutants to surface waters. These spills occur particularly during heavy rainfall events when the loading to treatment plants exceeds capacity.

How the indicator was measured

The North Carolina Division of Water Quality (NCDWQ) provide the data for this indicator. Figure 21 reports the amount of total wastewater released on an annual basis. Table 20 shows the number and volume of spills and the amount of wastewater that reached surface waters. Table 21 states the number of violations that occurred within the county and the total amount of penalties charged for those incidents.

The trend in Orange County
Improving

Wastewater treatment plants vary from year to year in the amount of wastewater violations. As shown in Figure 22, the wastewater permit violation data reveal a significant problem in 2000 with a large decrease in violations in 2001. There is an increase again in 2002 and two more spills in 2003 than in 2002, but the volume has gone down. Volume figures show large changes from year to year.

Recommendations

Orange County should

- Continue to track the number of wastewater spills. It is encouraging that the number of violations has decreased in recent years.
- Work to decrease the risk of a spill by working with other local entities to better manage stormwater.

Figure 21: Total Volume of Wastewater Spills, 1998-2003

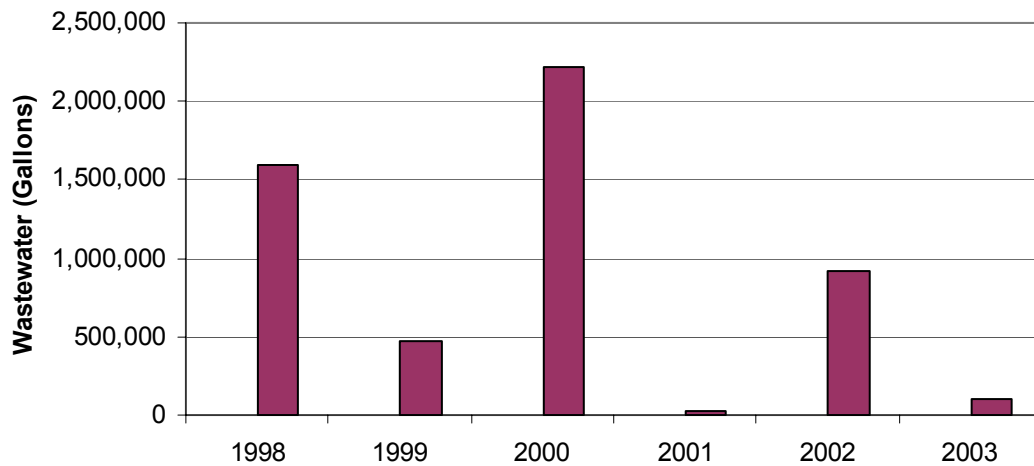


Table 20: Wastewater Spills, 1998-2003

	1998	1999	2000	2001	2002	2003	% change '98-'03
Number of spills	62	55	26	10	31	33	-46.8%
Total volume of spills	1,592,970	467,035	2,224,980	19,220	920,680	107,321	-93.3%
Total volume reaching surface waters	1,539,495	461,739	2,204,327	18,110	217,460	94,212	-93.9%

Figure 22: Wastewater Permit Violations, 1998-2003

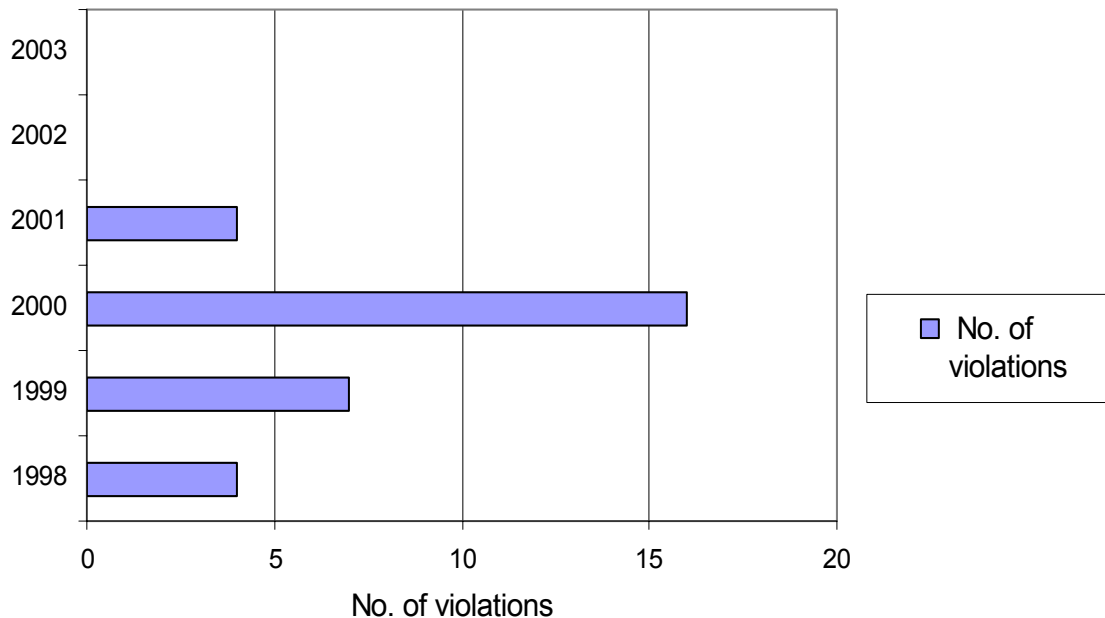


Table 21: Wastewater Permit Violations, 1998-2003

	1998	1999	2000	2001	2002	2003
Number of violations	4	7	16	4	0	0
Total penalties assessed	\$5,425	\$10,425	\$24,836	\$3,500	\$0	\$0



WATER RESOURCES

Streams not meeting classified uses

Why the indicator was selected

As required under the federal Clean Water Act, the State of North Carolina compiles the 303(d) list of all water bodies that do not meet water quality standards. Generally speaking, these standards require water bodies to be “fishable and swimmable.” The impairment of these water bodies may be due to an individual pollutant, multiple pollutants, or an unknown cause. Since plants, animals, and humans rely on clean surface water, it is critical that local and state governments protect this sensitive resource.

How the indicator was measured

Impaired streams in Orange County are identified in Figure 23. The North Carolina Division of Water Quality (NCDWQ) rates sections of major streams and rivers as either “fully supporting” their designated use, “partially supporting” their use, or “not supporting.” “Partially supporting” or “non supporting” implies that the stream or river has been impaired by pollutant(s) or by an unknown cause.

The trend in Orange County
Improving

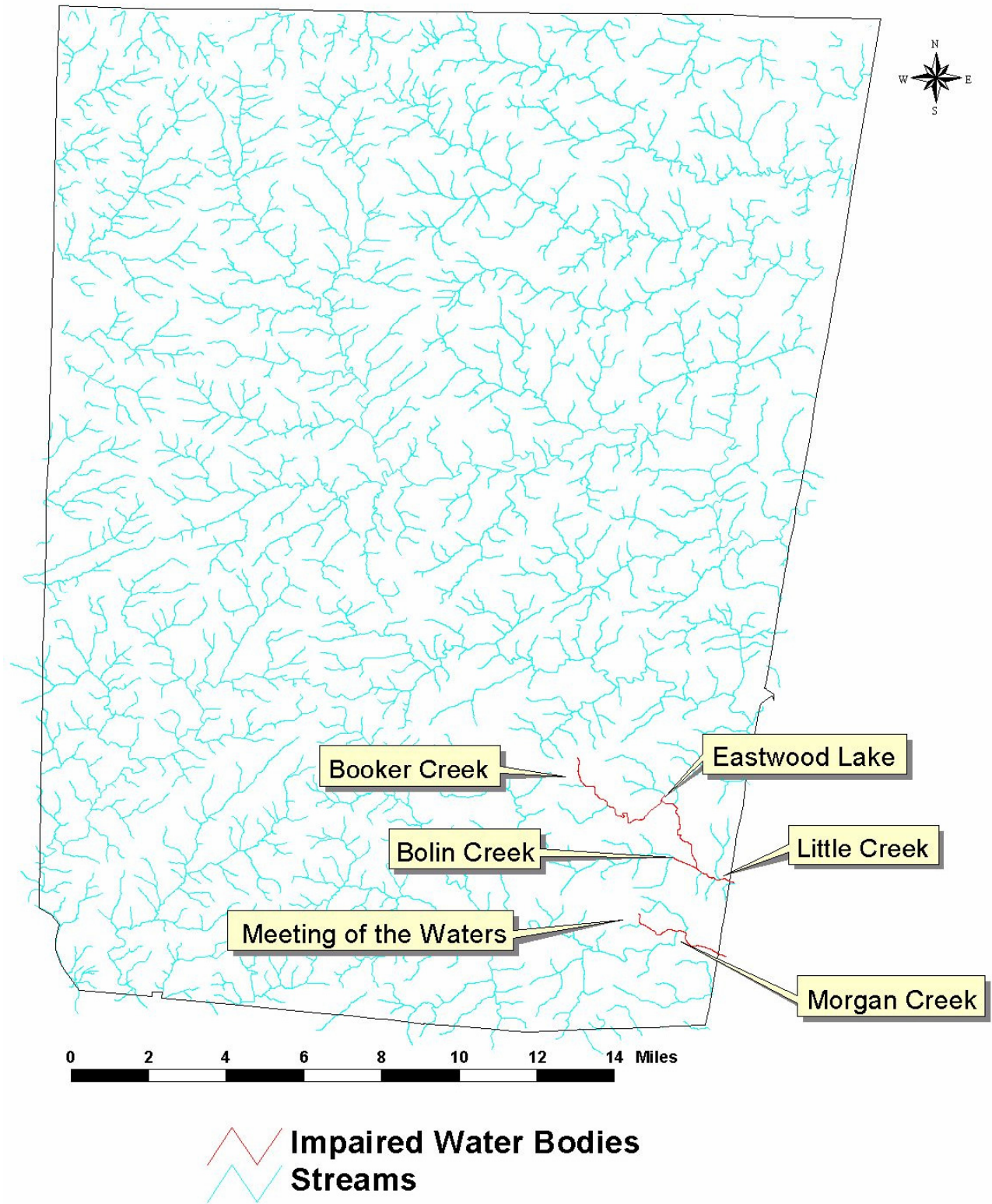
According to the State of North Carolina’s draft 2004 303(d) list, the North Fork Little River is no longer impaired, but there have been no other improvements or declines in stream classifications since 2002. All of the impaired water bodies in the county are located in the Cape Fear Basin and drain into Jordan Lake. These water bodies also flow through the urban areas of Chapel Hill and Carrboro.

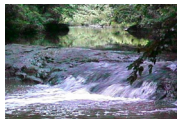
Recommendations

Orange County should:

- Continue to work with other local governments and organizations to improve water quality and stream integrity. The ongoing Jordan Lake Stakeholder Project has brought together many different parties to work on improving the water quality in Jordan Lake and its upstream inputs. In particular, the project is attempting to reduce the amount of nutrients entering Jordan Lake.
- Investigate options available for reducing nonpoint sources of nutrients and other pollutants that make their way into the county’s water bodies.

Figure 23: Impaired Water Bodies, 2004





WATER RESOURCES

Percent of benthos site tests that are good or excellent

Why the indicator was selected

Benthos site tests are used to monitor water quality within rivers or streams. Benthic macroinvertebrates, or benthos, are organisms that live on the bottom of rivers and streams. In freshwater systems, many of these organisms consist of aquatic insect larvae. The use of benthos data has proven to be a reliable monitoring tool, as benthic macroinvertebrates are sensitive to subtle changes in water quality. The benthic community stands as a measure of the effects of a wide array of potential pollutant mixtures.

How the indicator was measured

The North Carolina Division of Water Quality (NCDWQ) administers tests of stream quality and manages the database created by the results. Using criteria that have been developed for freshwater, the agency assigns each benthic sample a classification that reflects the influence of chemical pollutants. These bioclassifications range from Poor to Excellent and may be based on one of two ratings: (a) the number of different species present in the intolerant groups Ephemeroptera, Plecoptera, and Trichoptera (EPT S) with higher richness values associated with better water quality, or (b) a biotic index that summarizes tolerance data for all species in each collection. The two rankings are given equal weight in final site classifications for qualitative samples. Species richness alone is used to assign bioclassifications for EPT samples, but provides a poor measure of sediment, the major physical pollutant.

The trend in Orange County

Improving

Orange County has made considerable improvement in stream quality over the last fifteen years. As seen in Table 22, during the 1987-1994 time period only 26% of the streams tested were rated “good” or “excellent” while during the 1995-2003 time period 38% were rated “good” or “excellent.” But despite this considerable improvement, more than half of the streams tested are in an unhealthy condition. Figure 24 indicates that only one-third of the tested streams are rated good or excellent.

Recommendations

Orange County should:

- Continue to acquire property or conservation easements that protect important stream corridors.
- Maintain streamside buffer regulations that provide a degree of protection for aquatic species.

Figure 24: Biotic Tests Rated "Good or Excellent", 1987-2003

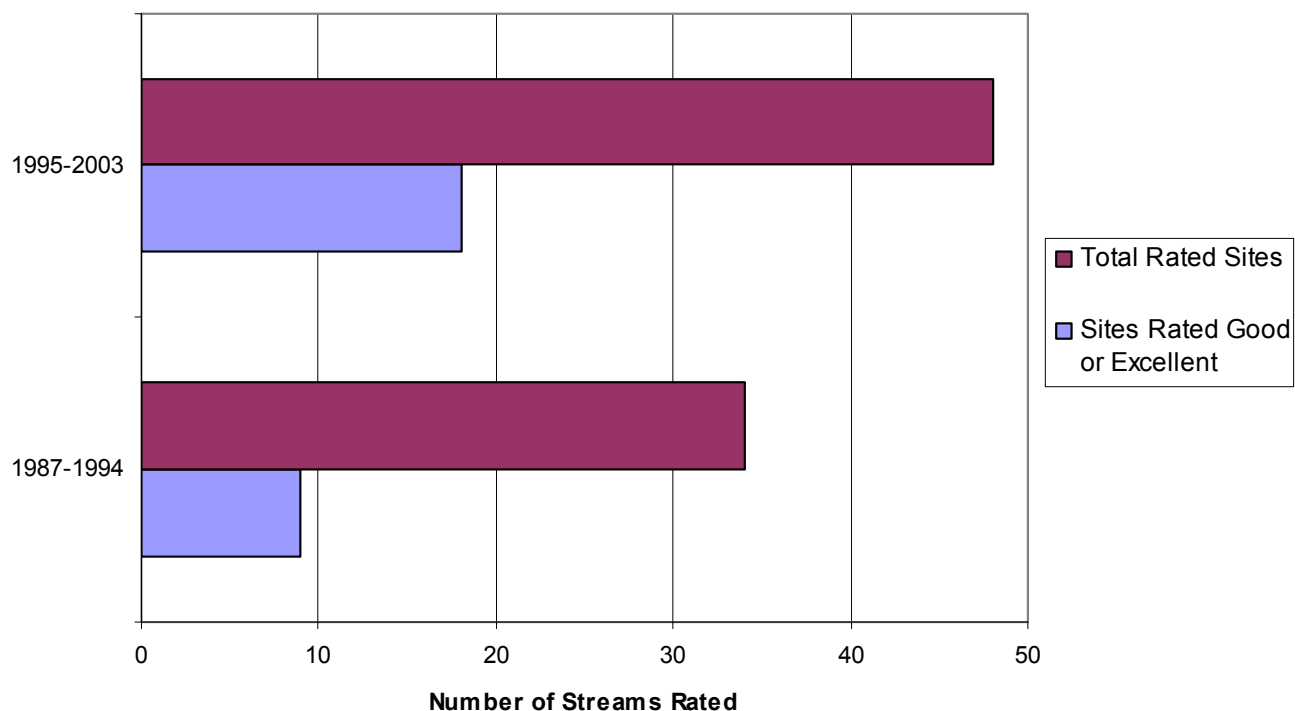


Table 22: Percent of Biotic Tests Rated "Good or Excellent", 1987-2003

Water Body	1987-1994			1995-2003		
	# rated	# rated "good or excellent"	% "good or excellent"	# rated	# rated "good or excellent"	% "good or excellent"
Bolin Creek	3	1	33%	14	3	21%
Booker Creek	-	-	-	1	0	0%
Cane Creek	3	1	33%	5	3	40%
Eno River	11	4	36%	6	5	83%
Little Creek	1	0	0%	2	0	0%
Morgan Creek	11	2	18%	12	5	42%
North Fork Little River	-	-	-	4	1	25%
New Hope Creek	1	1	100%	1	0	0%
Pritchards Mill Creek	1	0	0%	-	-	-
South Fork Little River	-	-	-	1	0	0%
Sevenmile Creek	1	0	0%	2	1	50%
UT Collins Creek	2	0	0%	-	-	-
Total	34	9	26%	48	18	38%



WATER RESOURCES

Number of stream protection programs

Why the indicator was selected

Volunteer organizations play an important role in the protection and monitoring of our natural resources. Stream protection programs monitor to track any adverse impacts that development creates. These groups measure water quality parameters and organize stream clean-ups for their designated water body.

How the indicator was measured

The North Carolina Division of Water Resources (NCDWR) sponsors a stream watch program that recognizes groups conducting water quality monitoring in streams and rivers. The Orange County Environment and Resource Conservation Department (ERCD) verified that the groups are still active and eliminated inactive groups from its database.

The trend in Orange County
Unchanged

Table 23 shows that as of 2004 Orange County has nine volunteer groups that are actively working to protect the quality of our streams. This is one more than the number active in 2002, although some of the groups have changed. In the future, the number of groups should grow to cover every major stream and river in the county.

Recommendations

Orange County should:

- Continue to stay in contact with these local stream watch groups. Local volunteer groups are an integral part of natural resource protection. Participants should be asked to share their data with the county so that there can be a greater information pool.
- Inform parties interested in creating a stream watch group of the opportunities available under the NCDWR's program.

Table 23: Registered Stream Watch Programs, 2004

Organization	River / Stream	Contact	Email/Phone
1. Duke Forest Friends	New Hope Creek	John Kent	jkent@tmug.org
2. Eno River Association	Eno River	Kathy Lee	(919) 309-4830
3. Falls of New Hope Explorers	New Hope Creek	Jonathan Farber	(919) 383-7385
4. Frank Porter Graham Elementary School	Morgan Creek	Livy Ludington	lludington@chccs.k12.nc.us
5. Neville Creek Stream Watch	Neville Creek	Lois Herring	(919) 942-6695
6. Streamwalkers	Cape Fear Basin	Sue Patrick	(919) 967-9720
7. Unaffiliated	Stony Creek	Kathleen Davis	(919) 644-0227
8. Unaffiliated	Morgan Creek	Mark Dubowski	mark.dubowski@ncwildlife.org
9. UNC-Chapel Hill Center for Math/ Science	Morgan Creek	Pat Shane	pshane@unc.edu



WATER RESOURCES

Wetland destruction

Why the indicator was selected

Wetlands have an essential function in our environment by providing wildlife habitat, mitigating floods, and improving water quality. They are regarded as an invaluable resource and have been designated for protection under the federal Clean Water Act. However, projects with a small impact or no other economically feasible option may still fill in wetland areas if the developer obtains a 404 permit from the U.S. Army Corps of Engineers. The state must also issue a 401 Water Quality permit verifying that the project will not degrade the waters of the state or otherwise violate water quality standards.

How the indicator was measured

The North Carolina Division of Water Quality (NCDWQ) - Wetlands Unit manages the 401 permitting process and records the number of wetland acres impacted by the process. For the years before 1998, impacted wetlands less than one acre were not reported. Since 1998 all impacts greater than 0.2 acre are reported. An exception is made for utility, maintenance, and restoration impacts, which are not included unless they impact one or more acres of wetlands.

The trend in Orange County

Improving

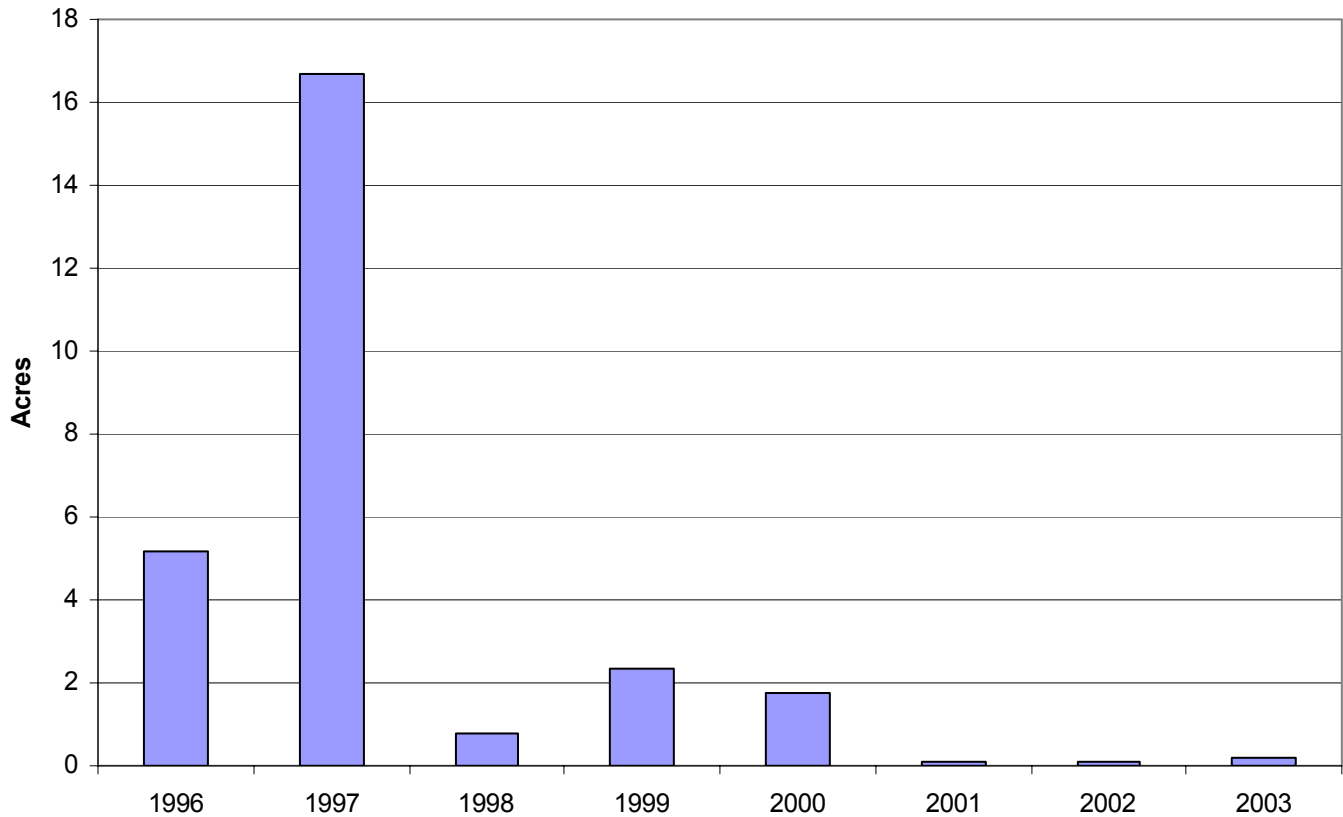
Over the past five years, the impacted wetland acreage in Orange County has decreased. Figure 25 shows that there has been a drastic decrease in the acres of affected wetlands. Table 24 displays the actual acreage impacted; since 2000 the annual number has remained below a quarter of an acre. The 1997 impacts from construction of Hillsborough's West Fork of the Eno Reservoir represents an exception to the trend. However, these reported figures may not cover all wetland acreage that has been impacted in some way.

Recommendation

Orange County should:

- Work with local citizens to protect wetland habitats. The county can encourage education and outreach about the importance of wetland ecosystems and the benefits they provide.

Figure 25: Approved 401 Wetland Impacts, 1996-2003



*The significant increase in 1997 is mainly due to the construction of Hillsborough's West Fork of the Eno Reservoir

Table 24: Impacted Wetlands, 1996-2003

Year	Impacted Wetlands (acres)
1996	5.19
1997	16.68
1998	0.76
1999	2.35
2000	1.74
2001	0.10
2002	0.10
2003	0.18

ORANGE COUNTY'S LANDS LEGACY PROGRAM

In April 2000, the Orange County Board of Commissioners adopted the Lands Legacy Program to protect the county's most important natural and cultural areas through voluntary means, including purchasing land or working with private landowners to develop conservation easements.

As of December 2004, Orange County has:

- Acquired **757** acres of new land for county parkland and nature preserves.
- Protected **648** acres of natural areas and farmland through conservation easements.

Currently, the Lands Legacy Program has protected a total of **1,405** acres of Orange County lands.

