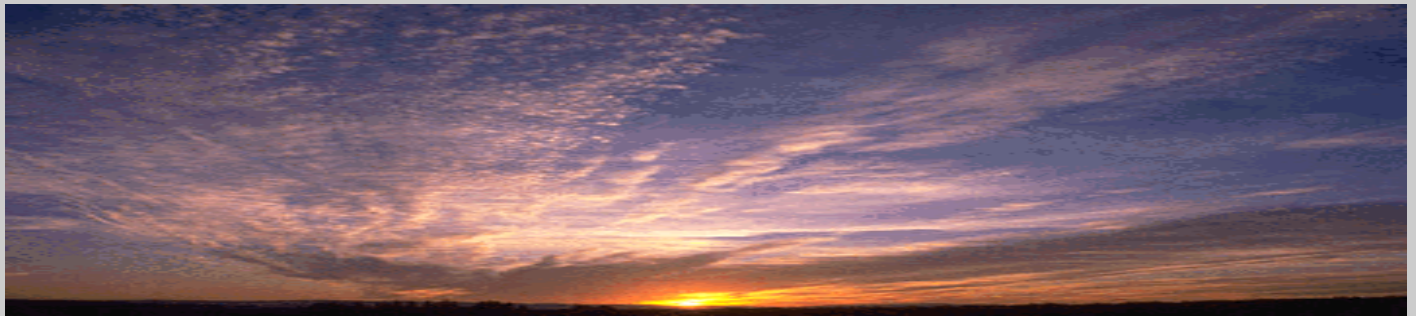
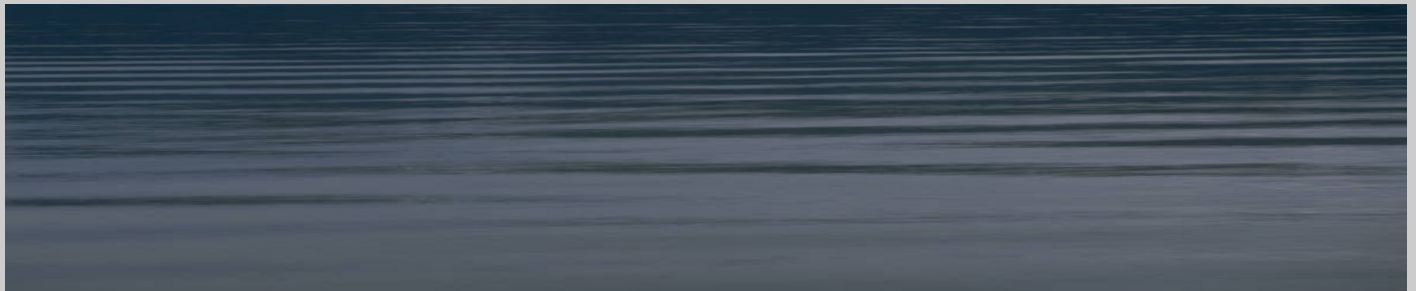


State of the **ENVIRONMENT** *2002*



AIR



WATER



BIOLOGICAL RESOURCES

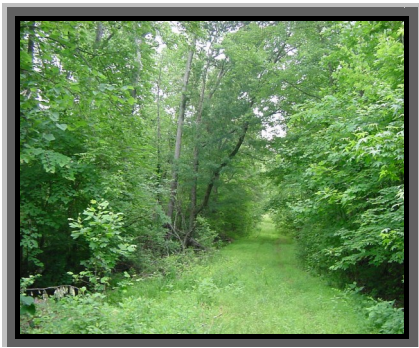


Presented by:
**The Commission for the
Environment**

Purpose:

State of the Environment

- ~ To describe Orange County's current environmental status for the public and the Board of County Commissioners;
- ~ To give the County objective measures to evaluate progress toward a clean, healthy environment;
- ~ To highlight the major issues facing the County; and
- ~ To recommend direction concerning those issues.



The Seven Mile Creek Preserve

Orange County Environment & Resource Conservation

306-A Revere Road / PO Box 8181

Hillsborough, NC 27278

Phone: (919) 245-2597, Fax: (919) 644-3351

January 2003

Orange County is a wonderful place to live and work! The quality of life within the County continues to attract residents and workers at a rapid rate. One of the challenges the County currently faces is accommodating this growth while maintaining the high quality of living that is currently being enjoyed. To be successful the County's environmental policies must ensure that the air is clean, the water is pure and abundant, and the plants and animals are healthy. The sustenance of these fragile elements is crucial to the health and welfare of the entire community within the County.

In the past, the County has been mostly successful in preserving and protecting the natural community but now faces new challenges. These new challenges are mostly related to the rapid increase in development that the County is currently experiencing. In order to adequately address these new challenges, the decision-makers and the public must be equipped with current and accurate information on the status of the environment. The 2002 State of the Environment Report provides this information in detail. The report is comprised of the essential information and recommendations for making policy decisions that effectively preserve and protect our natural resources. Not only does it show the current state of our environment but it is a valuable benchmark that can be systematically used to measure our progress.

The Commission for the Environment has created the State of the Environment Reports to give Orange County staff and elected officials the ability to measure our progress in safeguarding the quality of life for everyone within our County. We hope that this report is helpful and that you will join us in ensuring that Orange County remains a wonderful place to live and work!

Sincerely,

Cara Crisler and Richard Whisnant, Co-Chairs
Commission for the Environment

2002 Orange County State of the Environment Report

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Issues and Recommendations

Since the first Orange County State of the Environment report was written in 2000, the primary purpose of the report is to identify the main environmental issues within the County and make specific recommendations to the Orange County Board of Commissioners. Orange County is a wonderful place to live and work, but is at a pivotal point in its growth that could result in a greatly decreased quality of life within the County. The natural environment, which is directly linked to our quality of life, is susceptible to degradation from the rapid increase in development that Orange County is currently experiencing. In a recent study, Orange County with five other triangle counties ranked as the third most sprawling metropolitan areas in the nation. The study by Reid Ewing of Rutgers University and Rolf Pendall of Cornell University found that sprawling development creates increased levels of ozone pollution and increased consumption of land. In order to safeguard our natural environment and the inherent quality of life that it brings, decision-makers and the public must have a clear understanding of the main environmental issues resulting and the subsequent methods and strategies that will protect our water, air and biological resources.

The Orange County Commission for the Environment (CFE) and the Orange County Environment and Resource Conservation Department (ERCD) have created this report to provide a clear analysis of the current status of the County's natural environment and to make recommendations that will help the County create and implement environmental policies that will effectively address these issues. The report uses indicators to reveal the status and trends in the County's environmental conditions and their impacts on human health and natural resources. The indicators also help identify where additional research, monitoring, and information are needed.

The indicators are grouped into three different categories representing each of the main groups of natural resources: air, biological resources, and water. Each category of indicators was covered by a separate committee within the Commission for the Environment. In developing the report, each committee identified the most representative set of indicators for each natural resource, analyzed existing data and trends, and developed recommendations for the Board's consideration. The issues and recommendations presented below are the overall product from the analysis. For additional information please see the specific section on the indicator which includes: why the indicator was selected, how it was measured, the trend within Orange County, recommendations from CFE, figures, and tables.

ISSUES:

- **Orange County is losing animal and plant species at a more rapid rate over time, this is most likely due to habitat loss.**
- **The number of unhealthy ozone days is increasing which is correlated with the large amount of CO and NOx that is being emitted by cars and trucks on the highway and nonroad mobile sources such as construction and agricultural equipment.**
- **Water resources are inadequate during periods of drought, particularly with small systems.**

RECOMMENDATIONS: Air

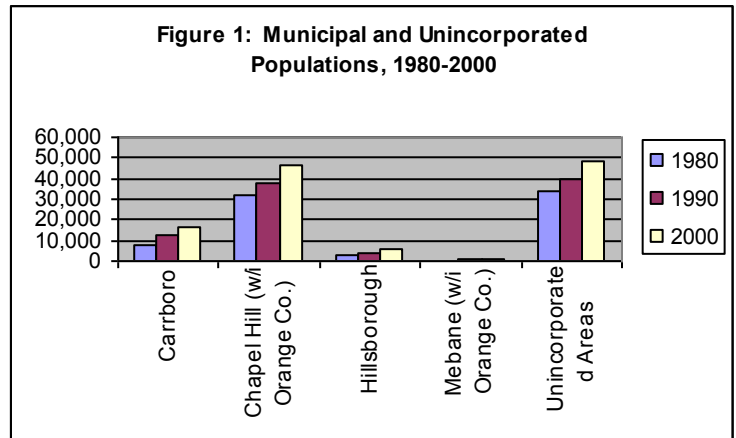
RECOMMENDATIONS: Biological Resources

RECOMMENDATIONS: Water

Basics

Population

Residential growth is the most fundamental factor affecting the pattern of development throughout the County. Orange County continues to experience dramatic population growth. From 1980 to 2000 the County's population grew from 77,055 to 118,327, a 53% increase. In contrast, during the same time period North Carolina grew at 37% and the United States grew at 24%. This rapid increase in population compared to the State and the U.S. reflects the relative locational advantages and attractiveness of Orange County.



Source: U.S. Census Bureau

As shown in Figure 1 this growth has occurred throughout the County. All of the municipal and unincorporated areas have had significant increases in population. The highest rate occurred in Carrboro, a 129% increase over twenty years and Hillsborough had the second highest rate 80% over twenty years. Although the Town of Chapel remains the dominant residential and commercial center, the unincorporated areas continue to contain the largest portion of the population. This poses considerable challenges in planning and supplying this portion of the population with public services.

Table 1: Municipal and Unincorporated Populations, 1980-2000

	1980	1990	2000	% Change '80-'90	% Change '90-'00	% Change '80-'00
Carrboro						
Population	7,336	12,134	16,782	65.4%	38.3%	128.8%
Land area (sq. mi.)	2.47	3.53	4.47	42.9%	26.6%	81.0%
Persons per sq. mi.	2,970	3,437	3,754	15.7%	9.2%	26.4%
Chapel Hill (w/i Orange Co.)						
Population	32,038	37,596	46,798	17.3%	24.5%	46.1%
Land area (sq. mi.)	12.37	15.98	18.37	29.2%	15.0%	48.5%
Persons per sq. mi.	2,590	2,353	2,548	-9.2%	8.3%	-1.6%
Hillsborough						
Population	3,019	4,263	5,446	41.2%	27.8%	80.4%
Land area (sq. mi.)	2.16	3.55	4.58	64.4%	29.0%	112.0%
Persons per sq. mi.	1,398	1,201	1,189	-14.1%	-1.0%	-14.9%
Mebane (w/i Orange Co.)						
Population	379	485	675	28.0%	39.2%	78.1%
Land area (sq. mi.)	0.20	0.25	0.57	25.0%	126.0%	182.5%
Persons per sq. mi.	1,895	1,940	1,195	2.4%	-38.4%	-37.0%
Unincorporated Areas						
Population	34,283	39,373	48,526	14.8%	23.2%	41.5%
Land area (sq. mi.)	383	377	372	-1.6%	-1.2%	-2.8%
Persons per sq. mi.	90	105	130	16.7%	24.8%	45.7%

Source: U.S. Census Bureau

Land Cover

Orange County is gradually changing from a rural settlement pattern into a suburban segment of the larger Triangle metropolitan area. The dramatic increase in development over the past twenty years has had substantial impacts on the land use and natural land cover of the County. As shown in Table 2, from 1982 to 1997 there was a 87% increase in urban land while a 13% decrease in forests and a 4% loss in farmland.

Table 2: Land Cover, 1982-1997

Land Cover Categories	1982	1987	1992	1997	% Change 1982-1997
Farmland	78,900	79,700	74,100	75,500	-4%
Error ₁	18,900	13,600	18,100	18,000	
Forest land	140,400	135,400	129,500	122,200	-13%
Error	11,400	11,600	11,500	10,300	
Minor land cover ₂	5,300	5,300	3,200	3,400	-36%
Error	2,100	2,100	400	500	
Urban	24,400	28,000	40,500	45,600	87%
Error	4,500	5,200	6,000	6,800	
Rural roads and railroads	4,900	4,900	6,000	6,300	29%
Error	500	500	900	800	
Water	2,800	3,400	3,400	3,700	32%
Error	500	800	800	800	
Total Land in County	256,800	256,800	256,800	256,800	0%
Error	7,200	7,200	7,200	7,200	

1 Standard error of the estimate

2 Minor land cover is all other land uses that are not included in the specified land cover categories

Source: USDA NRI

The main form of development that has occurred in the County is decentralized residential development. Large lot subdivisions within easy commuting distance of incorporated centers have continued to dot the landscape. As shown in Table 3, the amount of developed land per person has increased 31% from 1982 to 1997. This implies that Orange County residents are consuming more land and developing in more of a sprawling pattern. This trend supports the sprawl study by Reid Ewing of Rutgers University and Rolf Pendall of Cornell University that ranked the Triangle as the third most sprawling area in the nation. As the region grows economically, this trend will most likely continue unless strong growth management policies are implemented.

Table 3: Per capita land consumption in acres (developed land / population): 1982-1997

	1982	1987	1992	1997	% Change '82-'87	% Change '87-'92	% Change '92-'97	% Change '82-'97
Total land	256,800	256,800	256,800	256,800	0%	0%	0%	0%
Developed land	24,400	28,000	40,500	45,600	14.8%	44.6%	12.6%	86.9%
Population	78,617	87,993	98,900	111,804	11.9%	12.4%	13.0%	42.2%
Developed acres per person	0.310	0.318	0.410	0.408	2.5%	28.7%	-0.4%	31.4%

Source: USDA NRI

AIR

Emissions estimates

Why indicator was selected

Emissions are the gases and particles released into the air from a variety of sources. These sources range from factories and power plants to motor vehicles and even natural sources such as trees and vegetation. For this indicator emissions are provided for NO_x - nitrogen oxides, CO - carbon monoxide, ROG - reactive organic gases. These pollutants pose health risks and contribute to air pollution, global warming and the destruction of the ozone layer. Tracking trends in emissions is critical for planning and developing new strategies to improve overall air quality.

How indicator was measured

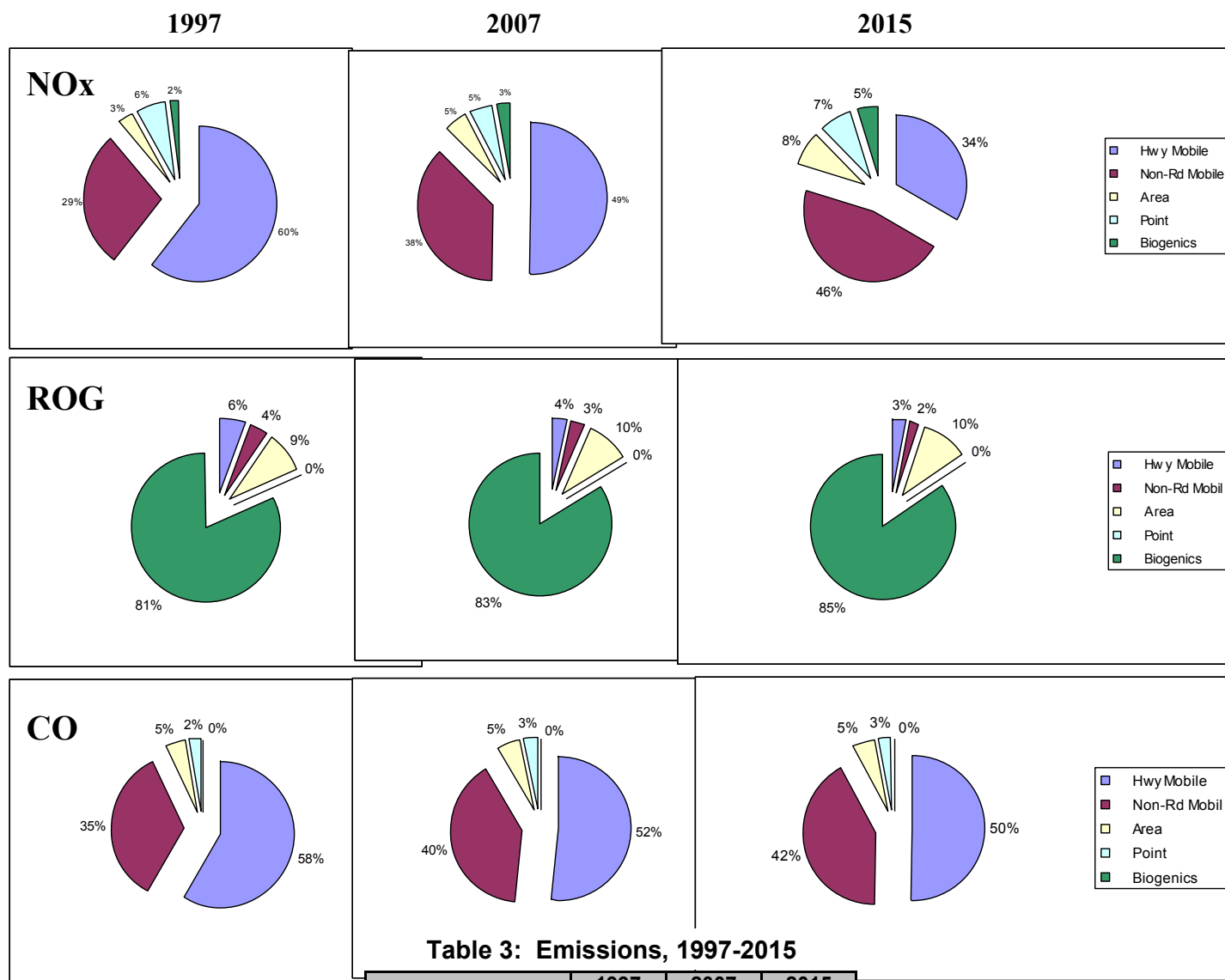
NC DENR, Division of Air Quality estimates emissions by county. Highway mobile sources are automobiles and trucks. These emissions estimates are mainly based on vehicle miles traveled. Nonroad mobile sources are sources that have engines and can move from one place to another, but do not use the highway systems. Examples of this type of source include lawn and garden equipment, marine equipment, agricultural equipment, and construction equipment. The nonroad emissions are estimated by using the EPA draft NONROAD2000 emissions model, except for emissions from aircraft engines and locomotive engines which are calculated using emission factors for various engine types and the estimated number of airplane take offs and landings and the amount of locomotive trackage and freight hauled. Area sources are small stationary sources, such as gas stations, dry cleaners, repair shops, etc., that by themselves are not very large but combined could be significant sources. These emissions are generally estimated from per capita or per employee emissions factors. Point sources are large stationary sources, like factories and electric power plants. Biogenics are emissions created by living organisms such as trees, plants, and cattle.

The trend in Orange County

According to the estimates for the years 1997, 2007 and 2015, NO_x and ROG emissions from area sources and CO from nonroad mobile sources will increase. By 2015 the largest contributors to CO and NO_x emissions are estimated to be highway mobile and nonroad mobile. Biogenics is estimated to be the largest contributor to ROG emissions.

The Orange County CFE recommendations

Figure 2: Percentage of Estimated Emissions by Source, 1997-2015



AIR

Emissions from point sources

Why indicator was selected

Air emissions are typically from three main sources: point, area and mobile sources. Point sources are stationary sources, like factories and electric power plants. Area sources are small stationary sources, such as gas stations, dry cleaners, repair shops, etc., that by themselves are not very large but combined could be significant sources. There are two types of mobile sources: highway mobile and non-road mobile. Highway mobile are automobiles, trucks, and motorcycles and non-road mobile are lawnmowers, bulldozers and other moving objects that do not use highways.

How indicator was measured

NC DENR, Division of Air Quality monitors air pollution from point sources. The data are broken down into the following major pollutants:

- Sulfur Dioxide, SO₂ –A gas formed when fuel containing sulfur, such as coal and oil is burned, and when gasoline is extracted from oil, or metals are extracted from ore.
- Nitrogen Oxides, NO_x - A gas formed when fuel is burned at high temperatures, as in a combustion process.
- Carbon Monoxide, CO - A colorless, odorless gas formed when carbon in fuel is not burned completely.
- Particulate Matter, PM - A term for particles found in the air, including dust, dirt, soot, smoke and liquid droplets. These particles can be suspended in the air for long periods of time. PM 2.5 is particulate matter that has a diameter of less than or equal to 10 micrometers. PM 10 is particulate matter that has a diameter of less than or equal to 2.5 micrometers. PM (TSP) is total amount of suspended particulate matter.
- Volatile Organic Compound, VOC, - Any organic compound of carbon that can easily become a vapor. This contributes to ground level ozone.

All of these pollutants are very harmful for both humans and the natural environment. These pollutants contribute to: respiratory illnesses, aggravate existing heart and lung diseases, help form acid rain, create visibility impairment, contribute to global warming, and cause nutrient overloading that deteriorates water quality.

The trend in Orange County

The largest types of pollutants in Orange County are NO_x and CO, which have tremendously grown since 1993. The large increase in NO_x combined with a gradual increase in VOCs has been largely responsible for the increase in ozone. PM10 and PM (TSP) have decreased the most since 1993.

The Orange County CFE recommendations

Figure 3: Point Source Air Pollution, 1993-1999

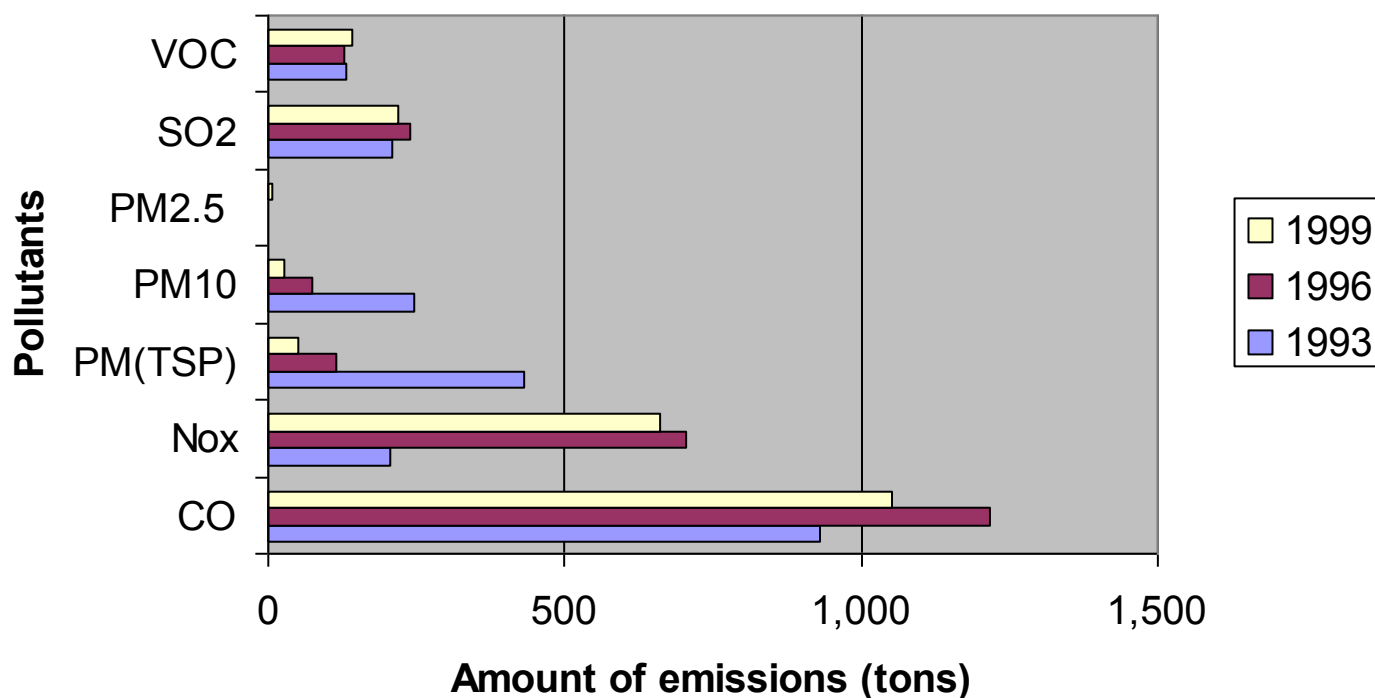


Table 4: Point Source Air Pollution, 1993-1999

Pollutant Name	1993		1996		1999	
	Facilities Reporting	Amount of Output (tons)	Facilities Reporting	Amount of Output (tons)	Facilities Reporting	Amount of Output (tons)
Total facilities reporting	19		21		18	
Criteria pollutants						
CO	10	932	10	1,216	12	1,051
NOx	11	206	11	706	13	661
PM(TSP)	13	432	17	115	15	51
PM10	12	247	16	74	15	28
PM2.5 (not available until 1999)					4	8
SO2	7	208	8	238	11	220
VOC (Meeting Federal Definition as photochemically reactive)	12	133	12	129	10	143

AIR

Hazardous air pollutants

Why indicator was selected

Hazardous air pollutants (HAPs), also known as toxic air pollutants, reported in this section are non-criteria pollutants from point sources. HAPs are a significant portion of the total amount of air pollution and include more than 180 different air pollutants that have been determined to be hazardous. These pollutants are suspected to cause cancer and other serious health effects, such as reproductive and birth defects, or adverse environmental effects. Data on these pollutants must be traced and analyzed in order to account for and address these negative impacts.

How indicator was measured

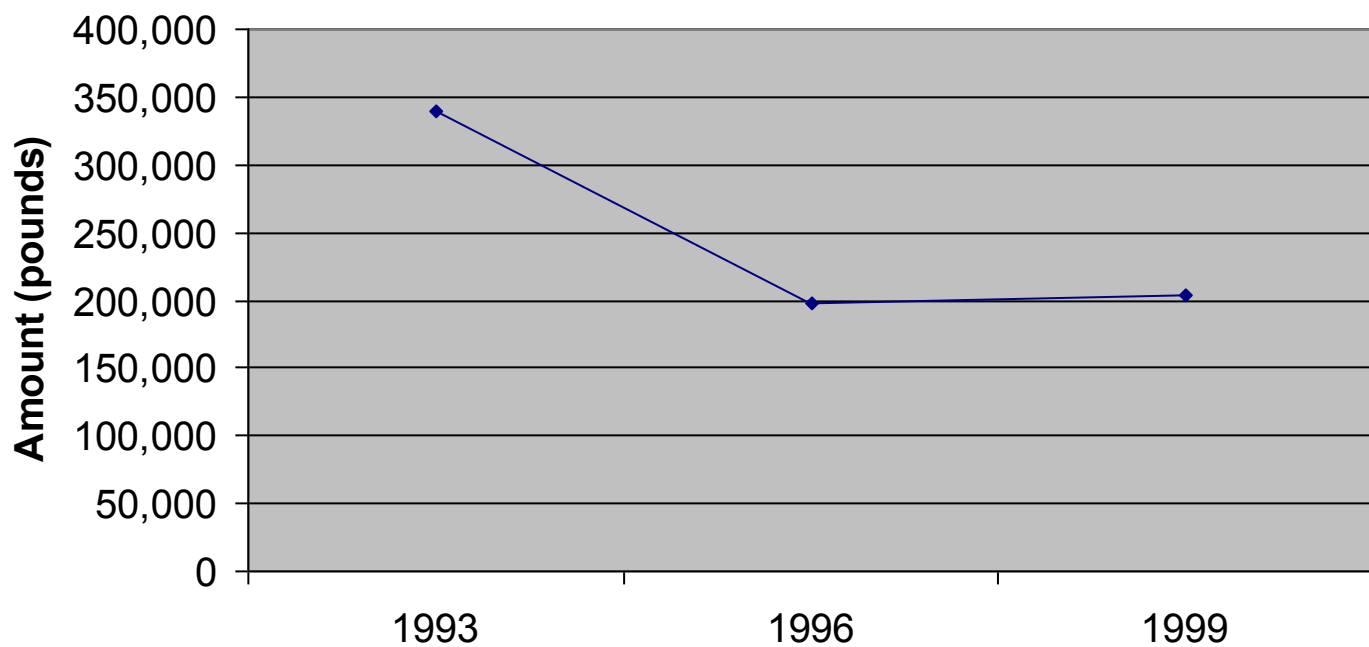
NC DENR, Division of Air Quality monitors hazardous air pollutants. These pollutants are summed and reported in pounds. The data on these pollutants and the criteria pollutants are reported by each facility emitting HAPs within Orange County.

The trend in Orange County

From 1992 to 1996 there was a drop in the amount of HAPs produced within Orange County. From 1996 to 1998 there has been a slight increase.

The Orange County CFE recommendations

**Figure 4: Hazardous Air Pollutants from Point Sources,
1993-1999**



AIR

Ozone exceedances

Why indicator was selected

Ozone, O₃, is a gas created by a chemical reaction between oxides of nitrogen, NO_x, and volatile organic compounds, VOC, in the presence of heat and sunlight. Ozone can be both “good” or “bad” depending on its location to the earth. “Good” ozone is located approximately 10 to 30 miles above the earth’s surface and protects us from the sun’s harmful rays. “Bad” ozone is created at the ground-level through a combination of motor vehicle exhaust, industrial emissions, and other pollutants with heat and sunlight. Ground-level ozone is dangerous since it may cause permanent lung damage, triggers health problems, and destroys plants and ecosystems.

How indicator was measured

NC DENR, Division of Air Quality monitors ozone exceedances. Since there is not a monitor within the County and since ozone exceedances are not relegated to county borders, a compilation of monitors surrounding Orange County is chosen to depict the level of ozone in the County.

The trend in Orange County

The number of ozone exceedances climbed to a spike in 1998 and then decreased and climbed to another spike in 2002. These fluctuations are related to the hot, sunny weather in the summer and therefore will likely continue to increase during this type of weather.

The Orange County CFE recommendations

Figure 5: Trends in Ozone Exceedances at Sites Surrounding Orange County, 1995-2002

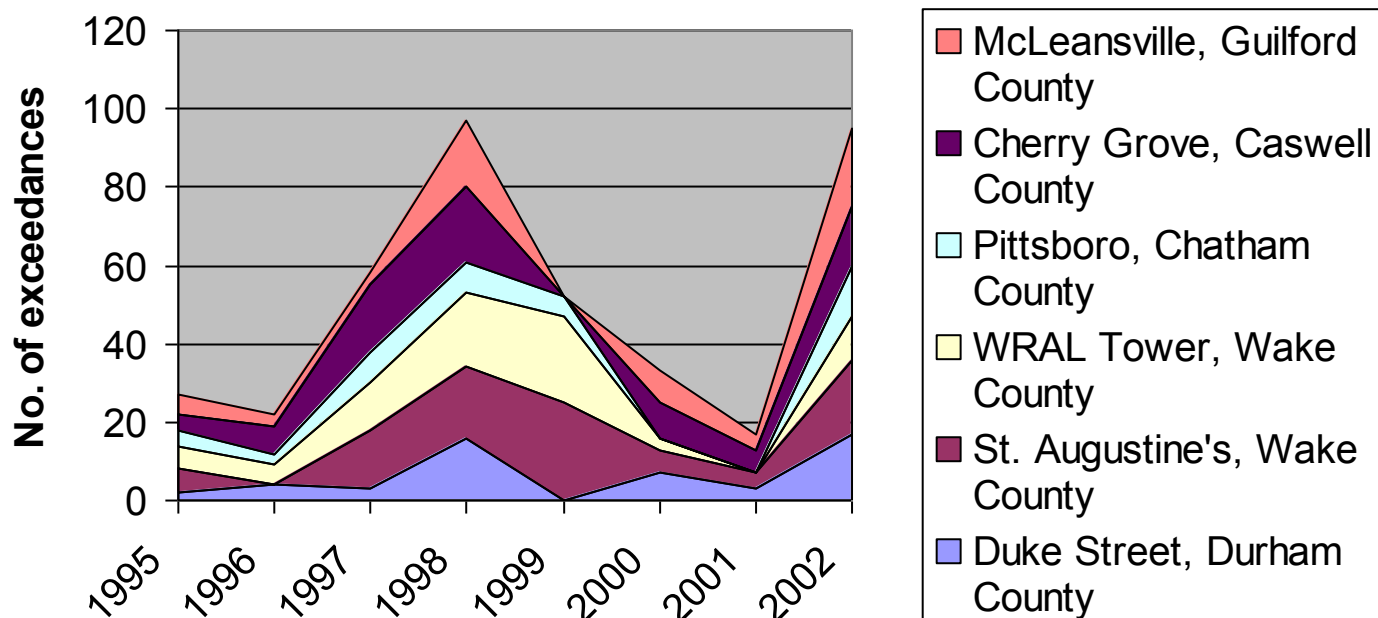


Table 5: Number of Ozone Exceedances at Sites Surrounding Orange County, 1995-2002

Site	Number of Exceedances								
	1995	1996	1997	1998	1999	2000	2001	2002	% change '95-'02
Duke Street, Durham County	2	4	3	16	0	7	3	17	750%
St. Augustine's, Wake County	6	0	15	18	25	6	4	19	217%
WRAL Tower, Wake County	6	5	12	19	22	3	0	11	83%
Pittsboro, Chatham County	4	3	8	8	5	0	0	13	225%
Cherry Grove, Caswell County	4	7	17	19	0	9	6	15	275%
McLeansville, Guilford County	5	3	3	17	0	8	4	20	300%
Triangle - Based on all nine monitors	16	19	26	40	29	13	9	29	81%

AIR

Transportation modes

Why indicator was selected

The use of the automobile is directly related to air quality since the motor vehicle exhaust is the main contributor to criteria pollutants and hazardous air pollutants. Therefore, it is important for local governments to supply attractive alternatives to the single occupancy automobile.

How indicator was measured

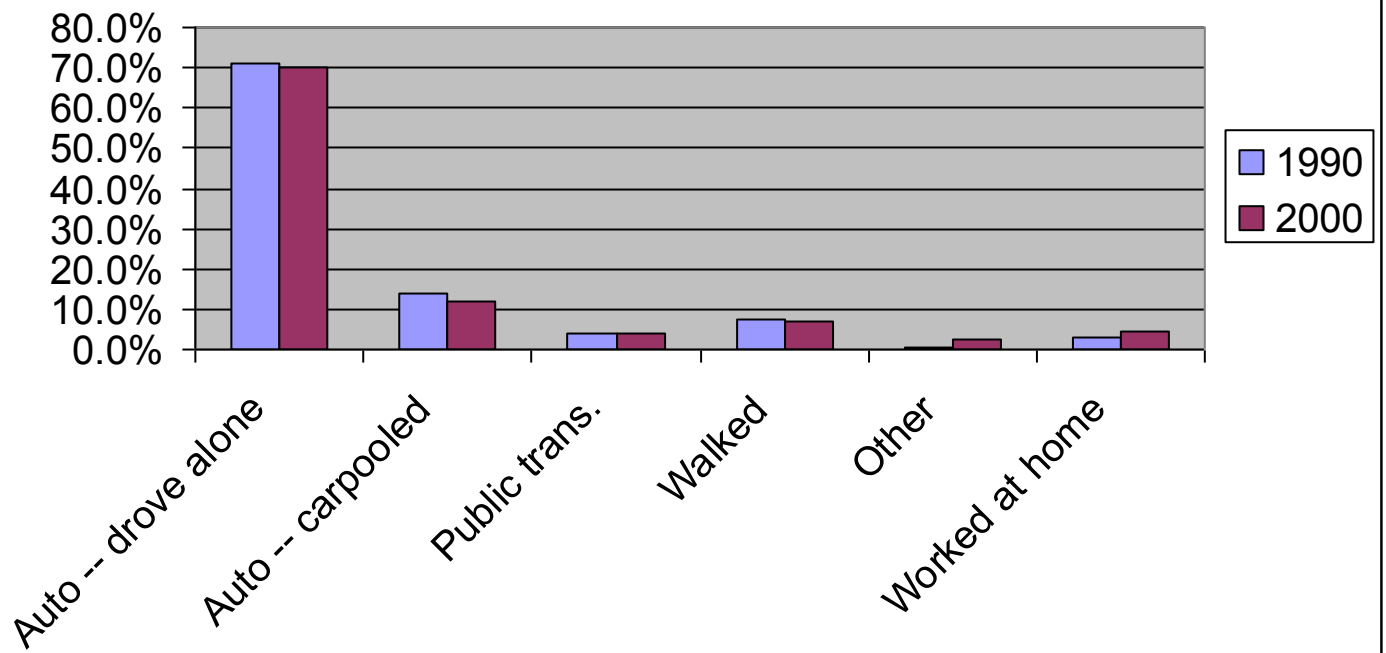
The U.S. Census Bureau provided this information gathered from a sample survey administered during the decennial census. The data is very useful in determining the long-term results of policies that promote transit and pedestrian activity. This data can be used to gauge the success of these policies and determine the proportion of use the non-automobile modes are receiving.

The trend in Orange County

The single-occupancy vehicle is the dominant form of transportation within the County. Carpooling is the second most used mode. From 1990-2000 single occupancy vehicle use did decrease while transit, work at home and other means increased.

The Orange County CFE recommendations

**Figure 6: Percentage of Means of Transportation to Work,
1990-2000**



AIR

Daily vehicle miles traveled

Why indicator was selected

Daily vehicle miles traveled (VMT) determines the amount both County and non-County residents use their automobiles within the County. The analysis of this data over time provides an accurate picture of how much vehicles contribute to the degradation of air quality within the County.

How indicator was measured

NC Department of Motor Vehicles tabulates vehicle miles traveled. The Orange County Environment and Resource Conservation Department compiled the data. Vehicle miles are divided into rural and urban, which is used to specify the geographic area of the County that the mileage is occurring. Within these large categories the mileage is broken down into the type of road driven on. Per capita daily vehicle miles traveled is calculated by dividing the total miles driven by the population during that year.

The trend in Orange County

The trend in VMT is increasing in Orange County. There was a 53% increase in the number of miles driven from 1990 to 2000. When applied to the growth in the County's population, the amount of miles being driven by each person continues to grow over time. In 1990 there were 23.7 miles driven per person per day and in 2000 there were 28.9 miles driven per person per day - a 21.5% increase.

The Orange County CFE recommendations

Figure 7: Daily Vehicle Miles Traveled (DVMT), 1990-2000

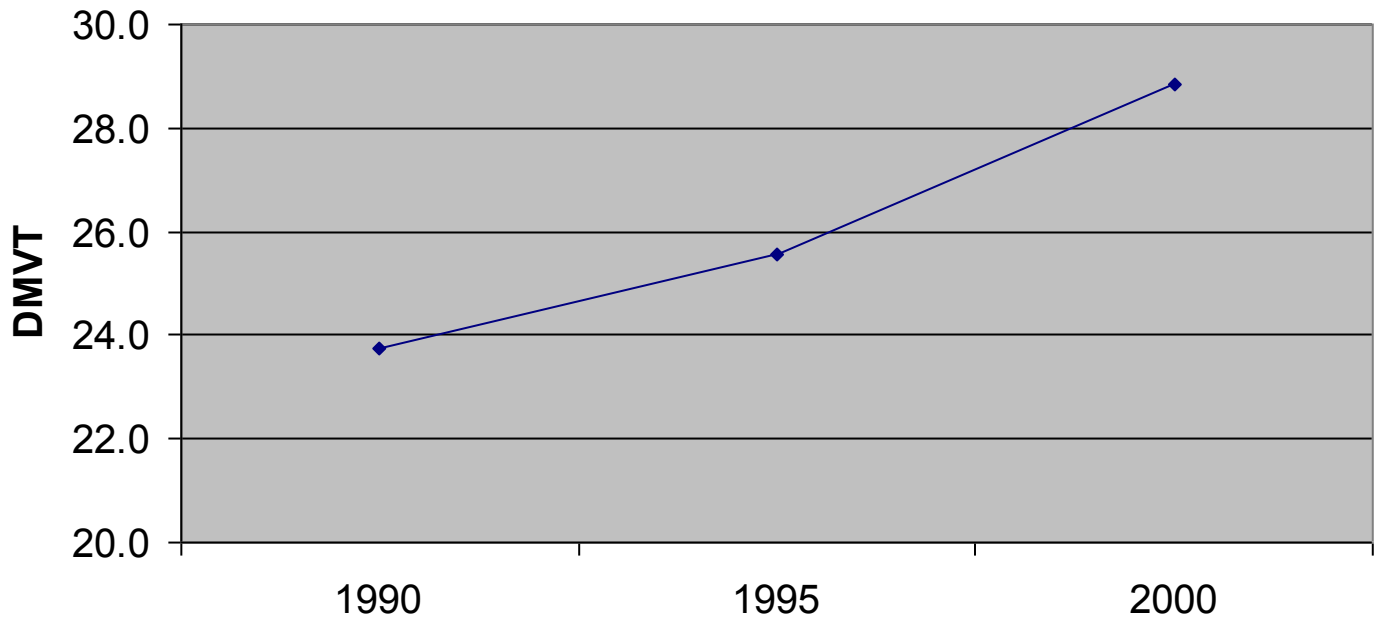


Table 6: Daily Vehicle Miles Traveled (DVMT), 1990-2000

	1990	2000	% change '90-'00
Rural			
Interstate	745,550	1,417,590	90.1%
Arterial	75,700	196,100	159.0%
Collector	569,300	647,630	13.8%
Local	111,300	148,980	33.9%
Total	1,501,850	2,410,300	60.5%
Urban and small urban			
Interstate	21,070	114,320	442.6%
Freeway	53,660	57,420	7.0%
Arterial	558,040	754,080	35.1%
Collector	35,890	41,500	15.6%
Local	57,620	34,080	-40.9%
Total	726,280	1,001,400	37.9%
Grand Total	2,228,130	3,411,700	53.1%
% of Grand Total			
Interstate and Freeway	36.8%	46.6%	26.5%
Per Capita DVMT	23.7	28.9	21.5%

AIR

Vehicles per person

Why indicator was selected

The number of vehicles per person is an indicator of the amount that residents rely on automobiles within the County, which directly contributes to the CO and toxic emissions. The County can use this data in an attempt to determine if people are decreasing their consumption of vehicles over time or if people are relying on a different mode of transportation.

How indicator was measured

The U.S. Census Bureau provided this information gathered from a sample survey administered during the decennial census. The data is presented as the number of vehicles, excluding commercial and heavy duty vehicles, per number of driving age persons, people 15 or older.

The trend in Orange County

Orange County contains many more vehicles than driving age persons. This overconsumption of motor vehicles depicts the County’s reliance on this non-sustainable form of transportation. From 1970 to 1990 the number of vehicles per person rapidly increased and from 1990 to 2000 it has moderately decreased.

The Orange County CFE recommendations

**Figure 8: Vehicles Per Driving Age Person,
1970-2000**

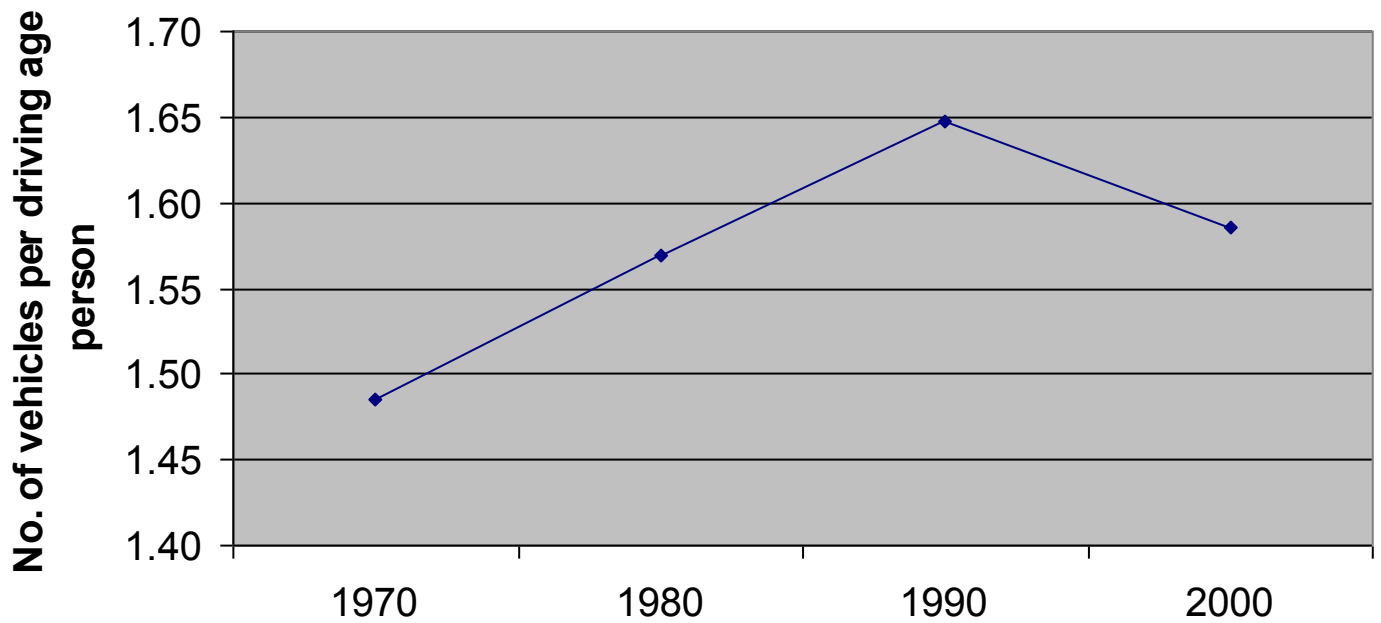


Table 7: Vehicles per driving age person, 1970-2000

	1970	1980	1990	2000
Ages 15 and up	17,001	28,712	38,683	49,289
Registered auto and trucks	25,258	45,046	63,711	78,177
Auto and trucks per driving age person	1.49	1.57	1.65	1.59

AIR

In commuting / out commuting

Why indicator was selected

One method of decreasing the amount that people drive is to reduce their commuting distance by allowing them to live close to their jobs. The in commuting and out commuting statistics help reveal the proportion of residents who are working outside the County or the proportion of workers who are living outside the County for some reason or other. In most cases, the people who are not working or living in the same County are driving more to get to work. These people could be crossing County lines due to their personal choice or due to the inability to pay Orange County housing prices or find a job within the County.

How indicator was measured

The U.S. Census Bureau provided this information gathered from a sample survey administered during the decennial census. The workers are 16 years and older. The out commuting chart is the number of residents who are driving outside the County to get to their work. The in commuting chart is the number of Orange County workers who reside outside the County and therefore are driving outside the County to get from their place of work to their home.

The trend in Orange County

Orange County contains a large and rapidly increasing proportion of residents who are working outside the County. This proportion increased 16% from 1990 to 2000. As shown in **figure** , there is also a large proportion of people traveling from outside the County to get to their place of work – 35%.

The Orange County CFE recommendations

**Figure 9: Out commuting: Percent of workers Residing in Orange County
Who Work Outside County, 1990-2000**

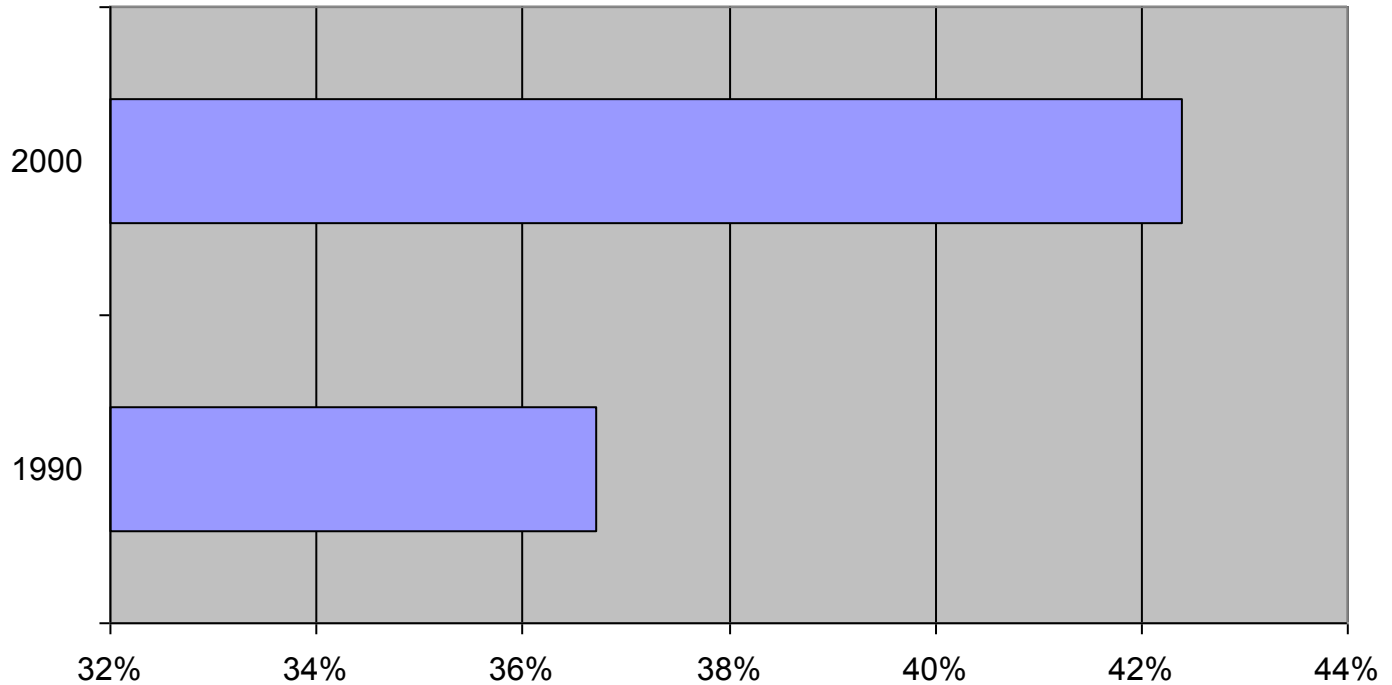


Table 8: Out commuting, 1990-2000

	1990	2000	% change '90-'00
Number of workers residing in Orange County	49,915	65,009	30.2%
Number of workers residing in Orange County working outside County	18,324	27,563	50.4%
Percent of workers residing in Orange County working outside County	36.7%	42.4%	15.5%

Table 9: In commuting, 1990

	1990
Number of workers working in Orange County	48,621
Number of workers residing outside County	17,030
Percent Orange County workers residing outside County	35.0%

AIR

Travel time to work

Why indicator was selected

The amount of time that people spend traveling to work correlates directly to air emissions. Since the dominant mode is the single occupancy vehicle, the statistic can determine how much time people are spending within their vehicles and emitting dangerous air pollutants.

How indicator was measured

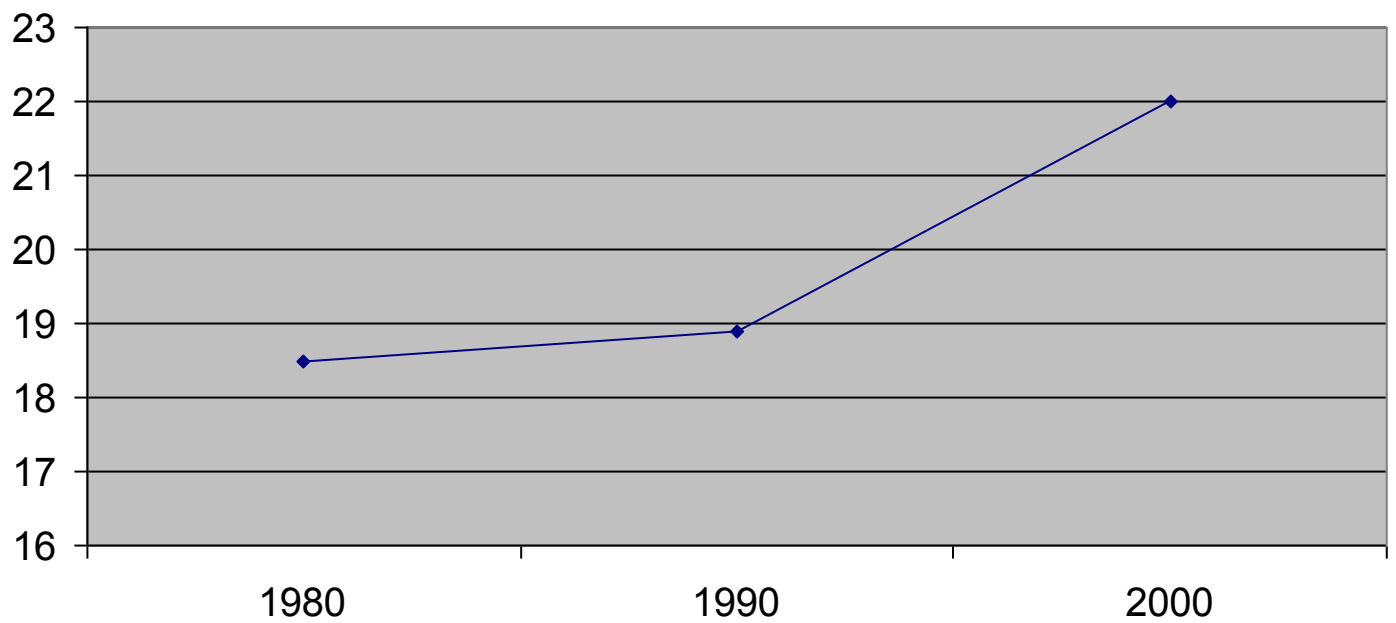
The U.S. Census Bureau provided this information gathered from a sample survey administered during the decennial census. The elapsed time includes time spent waiting for public transportation, picking up passengers in car-pools, and time spent in other activities related to getting to work.

The trend in Orange County

The amount of time Orange County residents are spending to go to work has greatly increased. Just over the ten years from 1990 to 2000 it has increased 16%. Since the large majority of people are using single occupancy vehicles to get to work, they are either driving farther or sitting in more traffic.

The Orange County CFE recommendations

**Figure 10: Mean Travel Time to Work (minutes),
1980-2000**



* The percentage increase from 1980 to 2000 is 19%.

AIR

Miles of maintained roads

Why indicator was selected

The amount of roads within the County over time compared with other indicators reveals how much the added roads has helped increase the amount of vehicle miles traveled. Since adding road miles is a significant factor in encouraging the separation of land uses, the increase in road miles is also linked to the increase in vehicle miles traveled.

How indicator was measured

The data is total mileage of state maintained highways. This data was compiled from the NC Department of Transportation. Since the state maintains almost all of the highways within the County, it is a good representation of the total amount of roads within the County. The amount is in length of roads; therefore, an expansion of a road (e.g. adding additional lanes) does not add additional length.

The trend in Orange County

The magnitude of the road system within the County has grown steadily between 1980 and 2000. The trend is similar to the increase in consumption of land per person and the per capita daily vehicle miles traveled.

The Orange County CFE recommendations

Figure 11: Total State Maintained Highway Road Mileage, 1980-2000

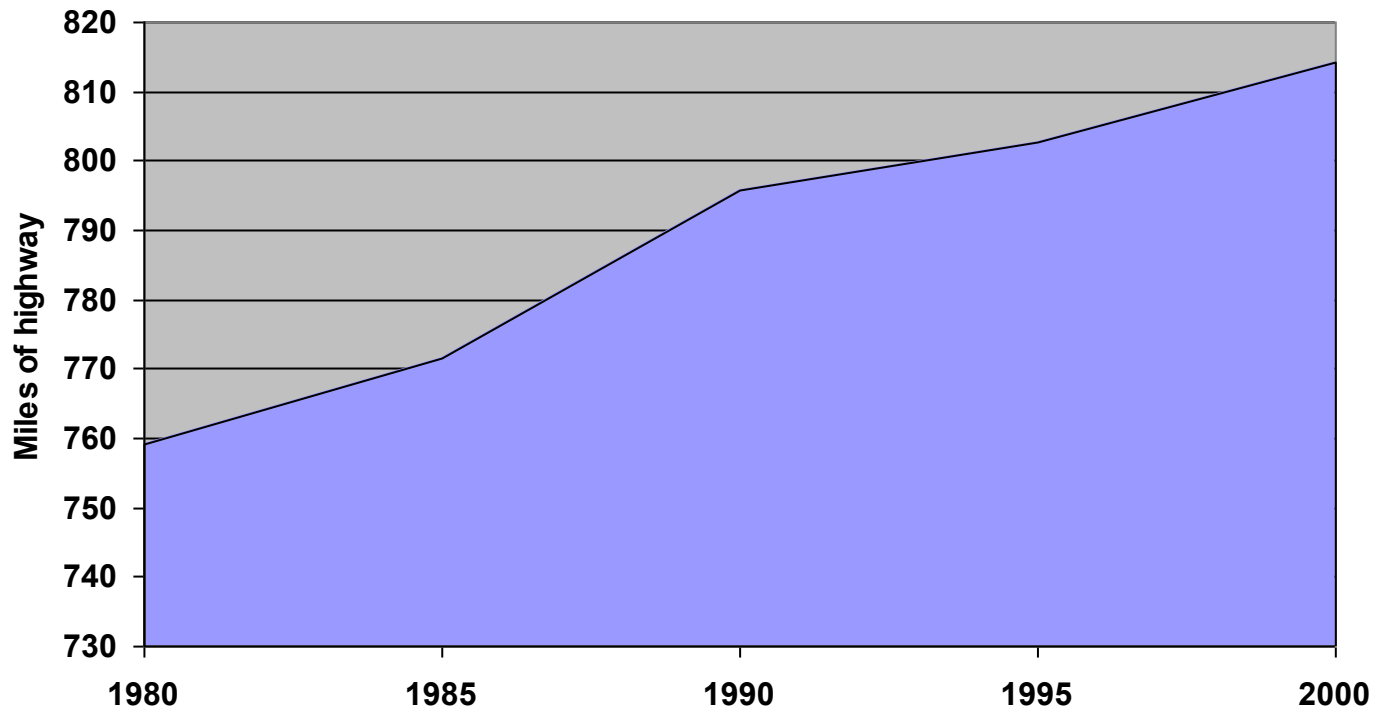


Table 10: State Maintained Highway Road Mileage, 1980-2000

Year	Highway Mileage	Percent Change	
1980	759	80-'85	1.6%
1985	772	85-'90	3.1%
1990	796	90-'95	0.8%
1995	803	95-'00	1.5%
2000	814	Total 80-'00	7.3%

BIOLOGICAL RESOURCES

County land cover

Why indicator was selected

“Land cover” here refers to both the natural state of the land as well as the human uses of the land. All land in the county can be categorized as covered either by “natural” vegetation (e.g., “Forestland”) or by the human use to which it has been put (e.g., “Urban”). Analysis of the relative amounts in different categories of land cover is a key element in planning our communities. By tracking changes in land cover, we can roughly gauge how well the County has integrated the protection of natural land and resources into its planning.

How indicator was measured

The U.S. Department of Agriculture’s Natural Resource Inventory compiles this data from remote sensing, mainly low-level aerial photography, taken every five years. This inventory gives us a general idea of the land cover across the state and contains a high margin of error, as stated in the charts. However, the changes in data over time still provide a useful picture of how land use and land cover in our region are changing.

The trend in Orange County

The chart shows the rapid urbanization that has occurred in Orange County over a 15-year period---a trend that is substantiated by other studies for the larger Triangle region. Urban land cover and rural roads and railroads have both increased significantly, and these increases are directly related to the decreases in farmland, forestland, and minor land cover/uses. The table below the graph gives actual acreage for the same categories of land cover for four different dates spanning the 15-year period.

The Orange County CFE recommendations

Orange County has adopted specific goals and objectives of preserving the county’s rural character (including farmland preservation), preserving water supply watersheds, preserving identified natural areas and wildlife habitats, and integrating principles of sustainability into the County’s decision-making, policy and planning processes. These goals and objectives are implemented through such programs as the Lands Legacy Program. They are also implemented through zoning and subdivision ordinance, however, further amendments to those ordinances are needed to protect significant biological resources.

Figure 12: Land Cover Changes, 1982-1997

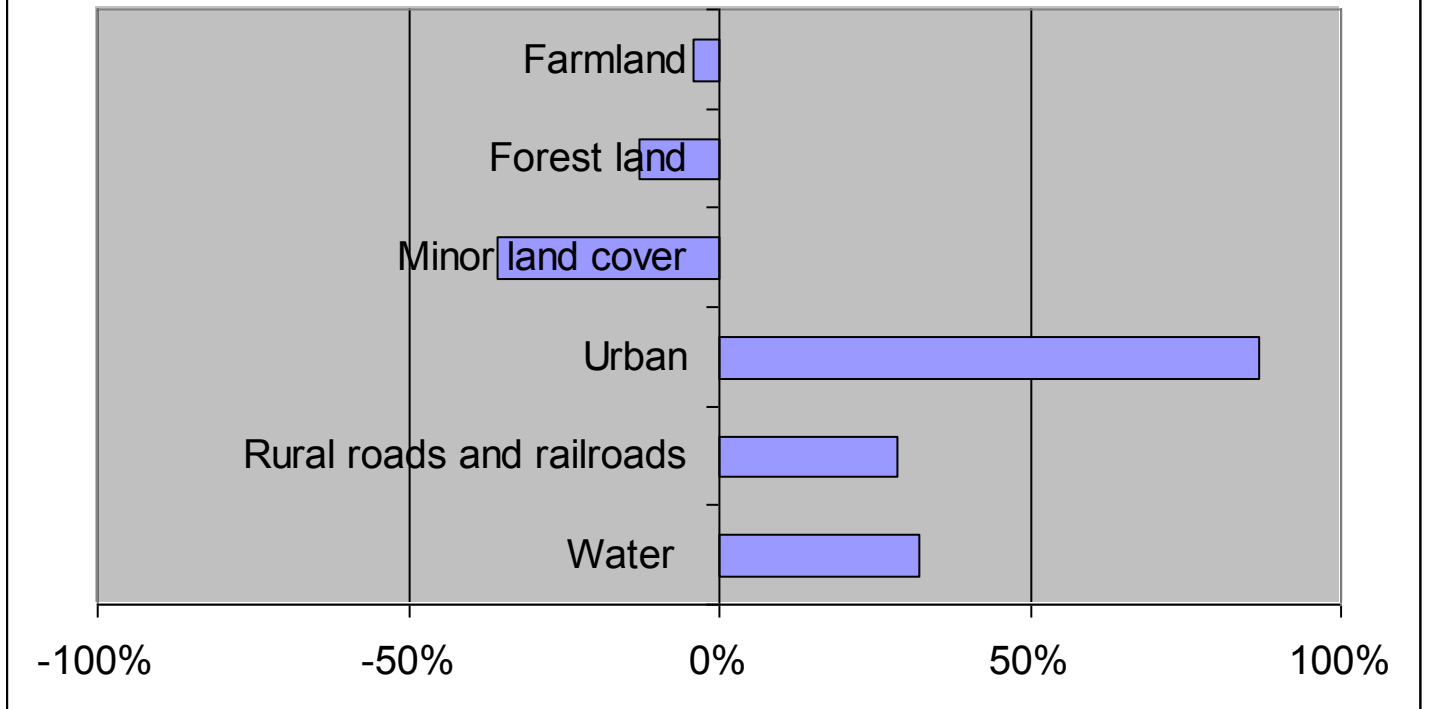


Table 11: Land Cover, 1982-1997

Land Cover Categories	1982	1987	1992	1997	% Change 1982-1997
Farmland	78,900	79,700	74,100	75,500	-4%
Error ₁	18,900	13,600	18,100	18,000	
Forest land	140,400	135,400	129,500	122,200	-13%
Error	11,400	11,600	11,500	10,300	
Minor land cover ₂	5,300	5,300	3,200	3,400	-36%
Error	2,100	2,100	400	500	
Urban	24,400	28,000	40,500	45,600	87%
Error	4,500	5,200	6,000	6,800	
Rural roads and railroads	4,900	4,900	6,000	6,300	29%
Error	500	500	900	800	
Water	2,800	3,400	3,400	3,700	32%
Error	500	800	800	800	
Total Land in County	256,800	256,800	256,800	256,800	0%
Error	7,200	7,200	7,200	7,200	

1 Standard error of the estimate

2 Minor land cover is all other land uses that are not included in the specified land cover categories

BIOLOGICAL RESOURCES

Acres of protected land

Why indicator was selected

Land that is protected for conservation purposes (i.e., not to be used for development) is an important natural resources. The strongest and most comprehensive methods for protecting land are to purchase it (fee simple acquisition) or to purchase a conservation easement on it. A conservation easement is a purchased (or donated) agreement that allows the original owner to continue to own, and in some case live on, the land but without the right to develop and subdivide the land. These actions ensure nearly complete, long-term protection of the natural habitat located on the land (although restoration activities or buffering from neighboring developed land may be needed), and the aesthetic and recreation benefits that this land has for the community.

How indicator was measured

The Orange County Environment and Resource Conservation Department maintains a database of the protected natural and cultural resources within the County. The left-hand chart shows the acreage of land placed in permanent or partially protected status in each of three time periods (1980 and prior, 1981–1990, and 1991–2000). The right-hand chart shows the percentages of total Orange County land area in two categories, permanently protected and partially protected, as of the end of 2001. “Permanently protected” land includes land owned in fee simple by a conservation entity (government department, nonprofit organization, etc.) that is intended to be permanently left in a natural state, and land for which a conservation easement prohibits development. “Partially protected” land is land that is intended to remain in a natural state but which is not bound within a legal contract to remain permanently protected. The table below the charts gives details on owner or easement grantee, date purchased, and type of legal arrangement for the conservation land holders in Orange County.

The trend in Orange County

Orange County governments, residents, and non profit organizations continue to work hard at protecting its most important natural resources while providing recreational parks and open space to the public. These groups have worked together to place over 16, 000 acres under some form of protection. Although this is a significant amount of land, only 3% of the County’s total land is fully protected and many sensitive areas are threatened by development.

The Orange County CFE recommendations

Orange County applauds and supports the efforts of various resource protection entities (land trusts, universities, State of NC, OWASA and others) and private landowners to protect important resource lands, including Duke Forest, Eno River State Park, Cane Creek Reservoir watershed, Mason Farm Biological Preserve, the New Hope Creek corridor, and the Ayr Mount and Moorefields historic properties. Those efforts also include the several hundred acres of prime farmland on active farms protected by conservation easements. With the adoption of the Lands Legacy Program in April 2000, Orange County became a full partner in protecting important natural and cultural resources. The county’s Environment and Resource Conservation Department monitors land protection activities and looks for opportunities for collaboration. The goal stated in the 2000 State of the Environment report remains valid: at least 10% of Orange County land should be in protected status by 2010.

Figure 13: Amount of Land that has been Protected during Time Period, 1980-2000

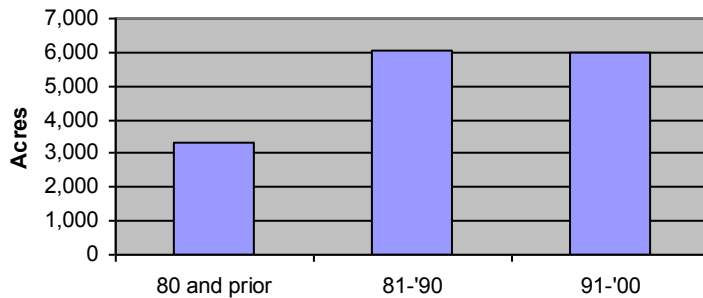


Figure 14: Percent of Total Land that is Protected, 2002

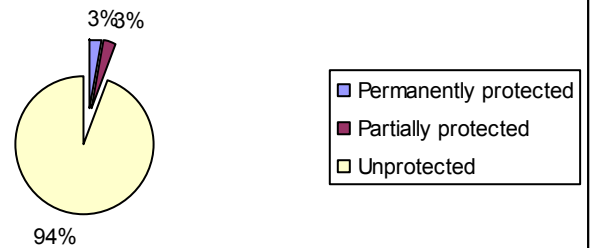


Table 12: Acres of Protected Land, 2002

Owner or Easement Grantee	Date Purchased				Total
Permanently Protected	80 and prior	81-'90	91-'00	01-'02	
Conservation Trust for NC					0
Conservation Easements			143	35	178
Eno River Association			18	9	27
Conservation Easements					0
Draper Savage Memorial Foundation - Moorefields		85			85
Conservation Easements					0
The Nature Conservancy		10			10
Conservation Easements					0
Botanical Garden Foundation, Inc.		17	77		94
Conservation Easements			23		23
Orange County	331	33	101	125	590
Conservation Easements			8	116	124
Orange Water And Sewer Authority	73	1,983	1,300		3,356
Conservation Easements			152	354	506
State of NC					
Occoneechee Mountain			74		74
Eno River State Park		1,974			1,974
Conservation Easements			32	57	89
Triangle Land Conservancy		5	428	35	468
Conservation Easements		9	348	261	618
US Army Corps of Engineers (New Hope Gamelands)	98				98
Conservation Easements					0
U.S. Fish and Wildlife Service					0
Conservation Easements		51			51
Subtotal	502	4,167	2,704	992	8,365
Partially Protected					
Town of Carrboro		28	67	1	96
Town of Chapel Hill	131	152	133	22	438
City of Durham			11		11
Duke University (Duke Forests)	2,419	397	2,175		4,991
Homeowner's Association	70	239	562	224	1,095
Classical American Homes Preservation Trust			263		263
University of NC	200	1,093	90		1,383
Subtotal	2,820	1,909	3,301	247	8,277
TOTAL	3,322	6,076	6,005	1,239	16,642

BIOLOGICAL RESOURCES

Acres of protected recognized natural areas

Why indicator was selected

Principal natural areas include the County's remaining unique and exemplary natural ecosystems, rare species habitats, special wildlife habitats and scenic areas. These areas are critical for the sustenance of rare animals, plants and ecosystems. They also provide educational opportunities, recreational enjoyment, and scenic beauty.

How indicator was measured

Seventy-seven natural areas were first identified in the 1988 "Inventory of the Natural Areas and Wildlife Habitats of Orange County, North Carolina." Orange County Environment and Resource Conservation Department continues to track the status of natural areas and works to protect them. The left-hand chart shows the acreage of land placed in permanent or partially protected status in each of three time periods (1980 and prior, 1981–1990, and 1991–2000). The right-hand chart shows the percentages of total Orange County land area in two categories, permanently protected and partially protected, as of the end of 2001. "Permanently protected" land includes land owned in fee simple by a conservation entity (government department, nonprofit organization, etc.) that is intended to be permanently left in a natural state, and land for which a conservation easement prohibits development. "Partially protected" land is land that is intended to remain in a natural state but which is not bound within a legal contract to remain permanently protected. The table below the charts gives details on owner or easement grantee, date purchased, and type of legal arrangement for the conservation land holders in Orange County.

The trend in Orange County

Orange County placed a substantial amount of natural areas land into protection during the 80's but has not subsequently continued at the same pace. This is unfortunate since close to 6,000 acres of this vulnerable land could be degraded through development.

The Orange County CFE recommendations

Orange County appreciates the efforts of various resource protection entities (land trusts, universities, State of NC and others) and private landowners to protect the most important natural areas that remain as part of our landscape. More than half of the natural areas remains unprotected, including large sections of Oconeechee Mountain, Pickards Mountain, Laurel Hill Ridge, Crabtree Creek Monadnock Ridge, and Southern Shagbark Hickory Forest. Orange County, through its Lands Legacy Program and in consultation with the Commission for the Environment, will continue efforts to protect these areas in collaboration with other conservation partners. The county zoning and subdivision regulations helps guide new development away from these areas, but further refinements to those regulations may be needed to long-term protection. An update to the 1988 inventory of Orange County natural areas will be completed in 2003. That effort will result in changes to the original inventory of 64 sites. The County should develop a process of monitoring these sites on a more regular basis.

Figure 16: Percent of Total Recognized Natural Areas that are Protected, 2002

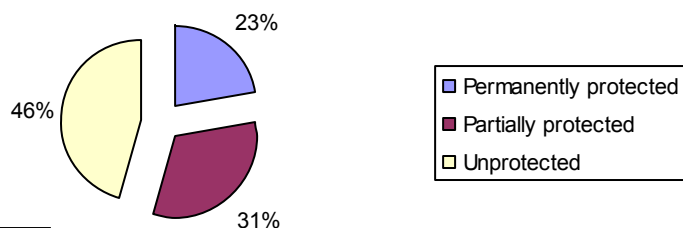


Figure 15: Amount of Recognized Natural Area Land that has been Protected during Time Period, 1980-2000

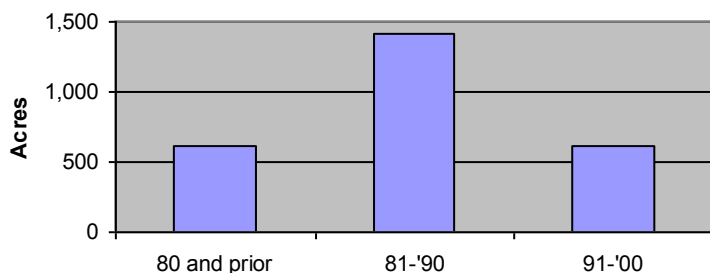


Table 13: Acres of Protected Recognized Natural Areas, 2002

Owner or Easement Grantee	Date Purchased				Total
Permanently Protected	80 and prior	81-'90	91-'00	01-'02	
Conservation Easements	10	28	197	11	246
Eno River Association			0.5		0.5
Orange County	124			49	173
Orange Water And Sewer Authority	29	491	196		716
State of NC	457	202	331		990
The Nature Conservancy		6			6
Triangle Land Conservancy		5	85		90
US Army Corps of Engineers (New Hope Gamelands)	78				78
Subtotal	610	704	613	49	1,976
Partially Protected					
Classical American Homes Preservation Trust			46		46
Duke University (Duke Forests)	584	113	332		1,029
Town of Chapel Hill	1				1
Town of Hillsborough		26			26
University of NC		685			685
Subtotal	1	711	0	0	712
TOTAL	611	1,415	613	49	2,688
Unprotected	8,049	6,634	6,022	5,973	5,973

BIOLOGICAL RESOURCES

Acres of prime forests

Why indicator was selected

Forests dominated the original landscape of Orange County, and as such they provided and still provide habitat for most of the plants and animals *native to this area*. These plants and animals constitute our native biodiversity. Forests also provide certain ecosystem services to the human community—for instance, they are a source of clean water and they provide flood control services. From the above “Land Cover” indicator, we already know that acreage of generalized “forestland” is decreasing in Orange County.

How indicator was measured

“Prime Forest” is here defined as it was in the report, “A Landscape with Wildlife for Orange County, Parts 1 and 2” (Triangle Land Conservancy, 1997 and 1999): tracts of hardwood forest, 10 acres or more in size, and tracts of mixed hardwood-pine forest, 40 acres or more in size, that are undisturbed or slightly disturbed. *Most* of the native plants and animals of Orange County remain restricted to hardwood forests and need forest interior habitat. Others, such as white-tailed deer, raccoons, crows, mockingbirds, have adapted to disturbances to the forest in the form of clearings for houses. Acres and distribution of prime forest were obtained for the TLC report by analyzing 1988 aerial photographs. Changes to this data, as of 1996, were estimated by analyzing building permits issued between 1988 and 1996. The digitized data are on file at the ERCD and are shown on Figure 17. We do not yet have an updated analysis of prime forest cover, though it could be obtained by examining 1999 aerial photographs.

The trend in Orange County

In 1988, Orange County had nearly 90,000 acres of prime forest (ca. 35% of Orange County). About 25,000 acres of this (ca. 10% of County) was “undisturbed hardwood forest” (as defined in the TLC report). Most of these tracts were small—well more than half were no more than 100 acres in size. Based on building permit data from 1988 to 1996, 9000 acres of prime forest (ca. 10% of the total noted on 1988 aerial photos) lie within parcels affected by the building permits. Still other areas—not quantified yet—have been affected by timber harvesting that is not associated with any building permit. Ten percent loss in less than a decade is a rapid rate of deforestation.

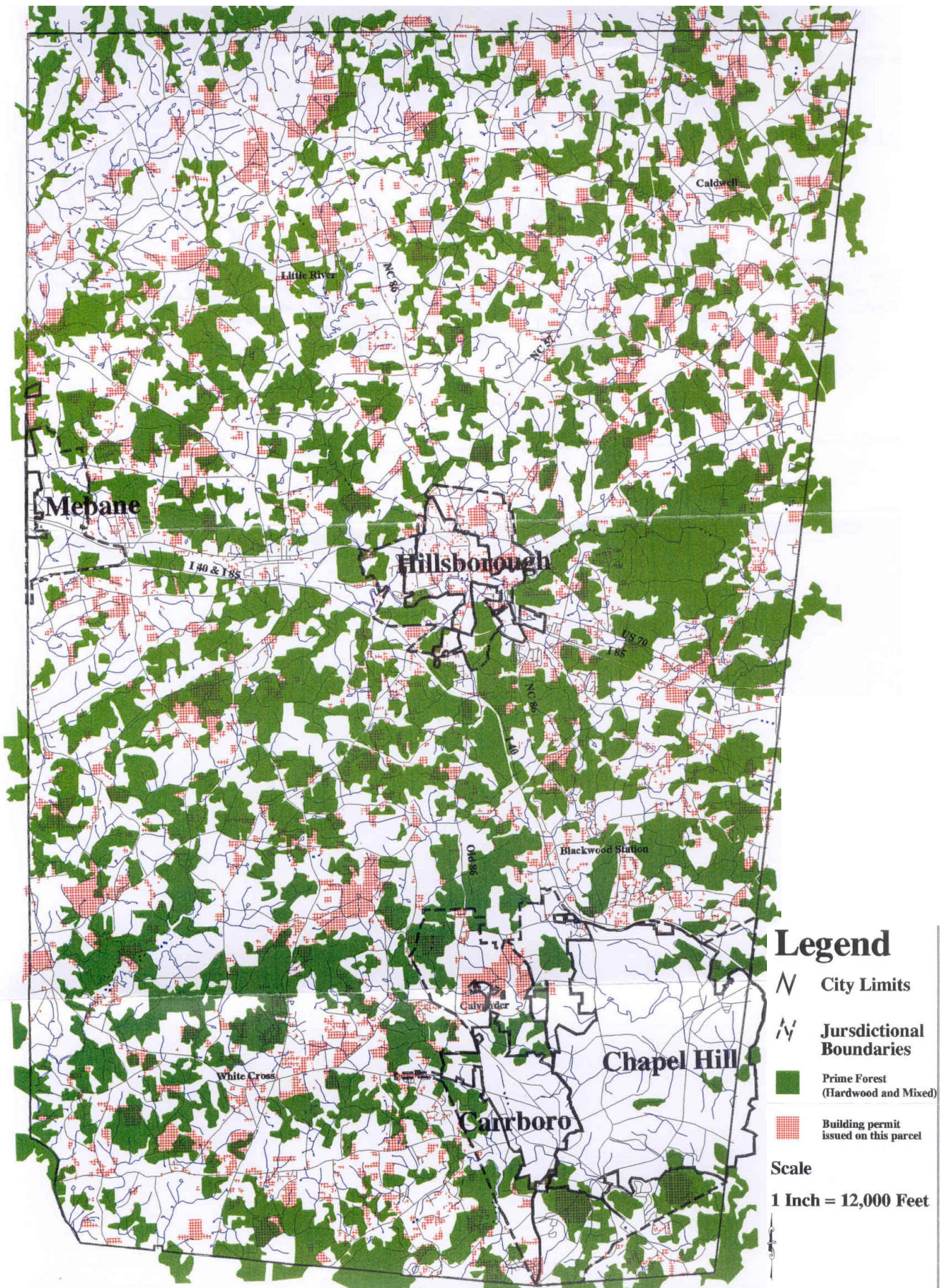
Table 14: Acres of Prime Forests, 1988

Hardwood	24,567
Mixed hardwood-pine	46,814
Total	71,381

The Orange County CFE recommendations

Orange County funded the “Landscape with Wildlife for Orange County” reports (Parts I and II) in order to identify these important forest resources. These data are used by the Environment and Resource Conservation Department (ERCD) to identify priority resource lands to protect through the Lands Legacy Program. ERCD intends to update the prime forest data using 1999 orthophotographic data and present the 10-year change (1988-1999) in the next SOE report.

Figure 17: Disruption of Prime Forest by Building, 1988-1996



BIOLOGICAL RESOURCES

Acres within the forest-use-value and agriculture-use-value programs

Why indicator was selected

North Carolina General Statutes authorize local governments to reduce tax values for individually owned property used for agricultural, horticultural, or forestry management (NCGS 105-277.2 et seq.). Eligibility requirements for the Present Use Value program are different for each use category. Through basing the tax rate on the current use instead of potential development uses, the program helps protect farms and forest from development pressure and speculation. Since Orange County will continue to experience strong development pressure, the program enables farmers to continue providing essential crops to the community and is another important mechanism for helping protect wildlife habitat.

How indicator was measured

The program is administered in Orange County by the Tax Assessor's Office. Lands that are removed from eligibility in the program may be subject to deferred taxes based on the property's full market value.

The trend in Orange County

As shown in the chart, the present use value program is actively used and consists mostly of lands used for agricultural purposes.

The Orange County CFE recommendations

The present use value program provides farm and forest landowners with significant financial incentives to maintain the productivity of these important resource lands. The use value program is one element of a comprehensive approach to preserve farmland and open space in Orange County. Orange County supported the 2002 legislation that allows farm and forest lands that are placed under a conservation easement to remain eligible for the program.

Figure 18: Percentage of Total County Land that is in Present Use Value Program, 2002

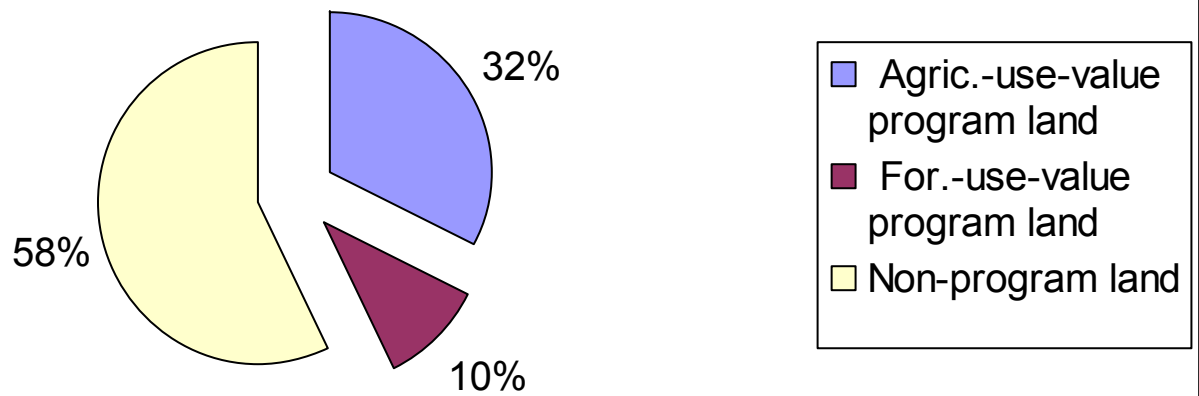


Table 15: Present Use Value Program, 2002

	No. of parcels	Acreage
Agric.-use-value program	2,415	83,267
For.-use-value program	815	26,398
Total land in programs	3,230	109,665
Total land in Orange County	49,616	256,800

BIOLOGICAL RESOURCES

Status of rare plants and animals

Why indicator was selected

Why do rare species matter? As a ecosystem each species depends on the other for survival. The loss of one species can severely impact the livelihood of other species, as each species depends upon the other to operate as a community. With the one species becoming “historic” or “extinct”, comes a loss of biodiversity– a loss in the number and type of genes, species, and ecosystems in a region.

How indicator was measured

The 2002 Orange County rare species list was compiled by the N.C. Natural Heritage Program and the Orange County Environment and Resource Conservation Department. Each species that was designated within the County as “historic” was verified through certified field biologist with local knowledge of Orange County.

The trend in Orange County

According to the chart below, the species have been increasingly becoming historic. Since 1940, species have more rapidly becoming historic within the County. This proposes a serious problem. Since habitat loss is considered the leading cause of endangerment of plant and animal populations, the historic loss could be directly related to the increased development within the County.

Table 16: Last Occurrence of Historic Species

	Pre 1940	1940 - 1959	1960-1980	Total
Bird			1	1
Crustacean		1		1
Insect		1	1	2
Mollusk			1	1
Moss			1	1
Vascular plant	6	7	8	21
Total	6	9	12	27

The Orange County CFE recommendations

Orange County ERCD works with the NC Natural Heritage Program to monitor and update the list of rare plants and animals for the County. Changes to the list are being made as a result of the current update to the 1988 inventory of natural areas, to be completed in 2003. To address the apparent loss of species (though some of these may have always been rare), the County should be aware that loss of habitat and the establishment and spread of invasive species are the major causes of native species extirpation and 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 can use to influence this trend. The County should also consider developing a way to monitor non-rare species as a way to measure the “state of biodiversity” in Orange County.

Table 17: STATE AND COUNTY STATUS OF ORANGE COUNTY'S RARE PLANTS AND ANIMALS

	Common Name	Scientific Name	Fed. Status	State Status					County Status
				Endangered	Threatened	Special Concern	Significantly Rare	Candidate	
Vertebrates									
	Fishes								
	Roanoke Bass	Ambloplites cavifrons					X		Current
	Carolina Darter	Etheostoma collis pop	FSC			X			Current
	Pinewoods Shiner	Lythrurus matutinus	FSC				X		Current
Amphibians									
	Four-toed Salamander	Hemidactylum scutatum				X			Current
	Neuse River Waterdog	Necturus lewisi				X			Current
Birds									
	Sharp-shinned Hawk	Accipiter striatus					X		Current
	Bald Eagle	Haliaeetus leucocephalus	T		X				Current
	Red-cockaded Woodpecker	Picoides borealis	E	X					Historic
	Warbling Vireo	Vireo gilvus					X		Current
Invertebrates									
	Crustacean								
	Carolina Well Diacyclops	Diacyclops jeanneli putei					X		Historic
	Insect								
	Golden Banded-skipper	Autochton cellus					X		Historic
	Northern Oak Hairstreak	Fixsenia favonius ontario					X		Current
	Giant Swallowtail	Papilio crespontes					X		Historic
	Mollusk								
	Dwarf Wedgemussel	Alasmidonta heterodon	E	X					Current
	Triangle Floater	Alasmidonta undulata			X				Current
	Brook Floater	Alasmidonta varicosa	E	X					Current
	Alewife Floater	Anodonta implicata			X				Historic
	Atlantic Pigtoe	Fusconaia masoni	E	X					Current
	Yellow Lampmussel	Lampsilis cariosa	E	X					Current
	Eastern Lampmussel	Lampsilis radiata			X				Current
	Green Floater	Lasmigona subviridis	E	X					Current
	Squawfoot	Strophitus undulatus			X				Current
	Savannah Lilliput	Toxolasma pullus	E		X				Current
	Notched Rainbow	Villosa constricta				X			Current
Vascular Plants									
	Southern Anemone	Anemone berlandieri					X		Current
	Bradley's Spleenwort	Asplenium bradleyi					X		Current
	Prairie Blue Wild Indigo	Baptisia minor			X				Current
	American Barberry	Berberis canadensis					X		Historic
	American Bluehearts	Buchnera americana					X		Historic
	Douglass's Bittercress	Cardamine douglassii					X		Current
	Bush's Sedge	Carex bushii					X		Current
	Wood's Sedge	Carex woodii					X		Historic
	Piedmont Horsebalm	Collinsonia tuberosa					X		Historic
	Creamy Tick-trefoil	Desmodium ochroleucum					X		Historic
	Eastern Shooting Star	Dodecatheon meadia var meadia					X		Historic
	Smooth Coneflower	Echinacea laevigata	E	X					Historic
	Eastern Isopyrum	Enemion biternatum					X		Historic
	Godfrey's Thoroughwort	Eupatorium godfreyanum					X		Historic
	Large Witch-alder	Fothergilla major					X		Current
	Heller's Rabbit Tobacco	Gnaphalium helleri var helleri					X		Historic
	Crested Coralroot	Hexaletris spicata					X		Current
	Lewis's Heartleaf	Hexastylis lewisii					X		Current
	Small Whorled Pogonia	Isotria medeoloides	E	X					Current
	Earle's Blazing Star	Liatris squarulosa					X		Historic
	Glade Milkvine	Matelea decipiens					X		Historic
	Sweet Pinesap	Monotropis odorata	FSC				X		Current
	Wiry Panic Grass	Panicum flexile					X		Historic
	Glade Wilde Quinine	Parthenium auriculatum					X		Historic
	Purple Fringeless Orchid	Platanthera peramoena					X		Current
	Indian Physic	Porteranthus stipulatus					X		Historic
	Torrey's Mountain-mint	Pycnanthemum torrei					X		Current
	Water-plantain Spearwort	Ranunculus ambigens					X		Historic
	Michaux's Sumac	Rhus michauxii	E	X					Historic
	Pursh's Wild-petunia	Reullia purshiana					X		Historic
	Southern Skullcap	Scutellaria australis					X		Historic
	Shale-barren Skullcap	Scutellaria leonardii					X		Current
	Appalachian Golden-banner	Thermopsis mollis sensu stricto					X		Historic
	Glade Bluecurls	Trichostema brachiatum					X		Historic
Nonvascular Plants									
	Moss								
	Closter's Brook-hypnum	Hygrohypnum closteri					X		Historic

WATER

Water demand

Why indicator was selected

Water is a limited resource which we all depend upon. This resource is vital for public health, agricultural production, and economic growth. For Orange County to continue to provide a healthy and affordable place to live and continued growth in the agricultural and economic sector, it must carefully plan and manage the use of this essential resource.

How indicator was measured

The data were provided by NC DENR, Division of Water Resources and U.S. Geological Survey. Figure shows the amount of water that is being used within the County for over a period of 15 years. It separates the usage by the source of water: ground or surface. Figure presents the demand during that year to identify the average amount of water used per person, which is measured in units of gallons per capita per day (gcd).

The trend in Orange County

As the urban areas within the County continue to grow, more and more people are relying on municipal and community supplies. The vast majority of this water supply is from surface waters. There still is a significant proportion of the supply from individual wells for domestic use. The per capita demand reveal that the amount of water being used within the County per person is increasing, 15% from 1985 to 2000.

The Orange County CFE recommendations

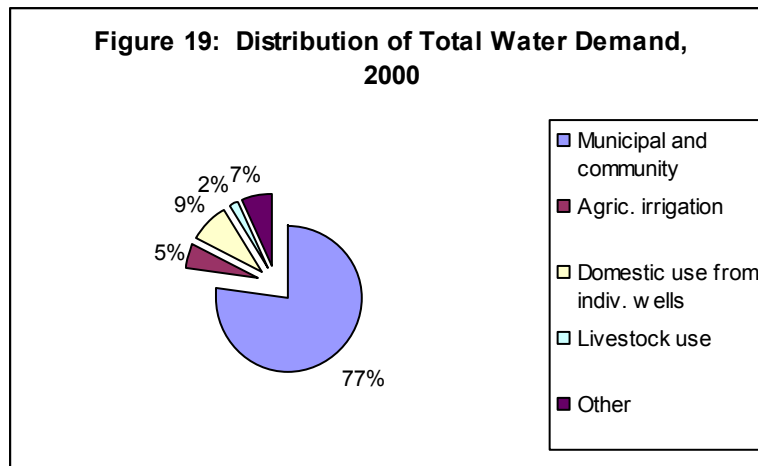


Table 18: Water Usage (mgd), 1985-2000

	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	10.5	10.75	0.52	12.44	12.96
Self supplied industry	0.01		0.01			0			0			0
Agric. irrigation		0.8	0.8	0.08	0.74	0.82	0.76	2.28	3.04	0.22	0.59	0.81
Domestic use from indiv. wells	1.2		1.2	0.71		0.71	1.72		1.72	1.52		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	0.3
Other	0.15	0.24	0.39	0.12	0.3	0.42	0.03		0.03	0.3	0.88	1.18
TOTAL USE	1.71	8.62	10.33	1.27	10.59	11.86	3.11	12.91	16.02	2.8	13.97	16.77

* Preliminary data subject to revision

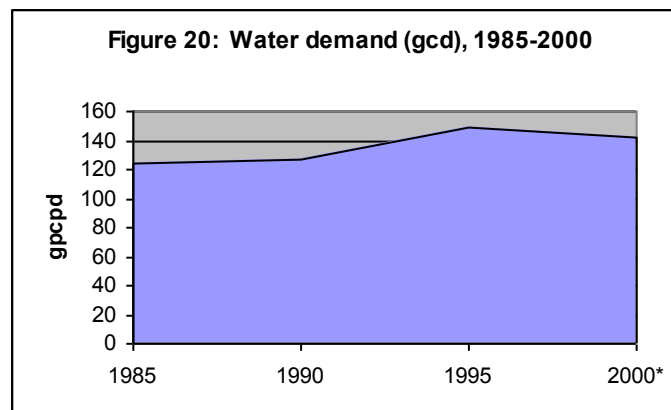


Table 19: Percent Change in Demand (gcd), 1985-2000

	1985	1990	1995	2000* ₁	% change '85-'90	% change '90-'95	% change '95-'00	% change '85-'00
GPD	10,330,000	11,860,000	16,020,000	16,770,000	14.8%	35.1%	4.7%	62.3%
Population	83,581	93,851	107,352	118,227	12.3%	14.4%	10.1%	41.5%
GCD	124	126	149	142	2.2%	18.1%	-4.9%	14.8%

* Preliminary data subject to revision

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 would have remained open and used the same amount of water the gcd would be 150 and therefore the upward trend would have continued.

WATER

Household source of water

Why indicator was selected

In order to effectively plan now for the provision of clean and affordable water in the future without exhausting the resource, the County must have information on how the residents obtain water today.

How indicator was measured

The U.S. Census Bureau provided this information gathered from a sample survey that administered during the decennial census. The chart shows from 1970 to 2000 the total amount of year-round housing units within the County and the number that use well water, public water, or water from another source.

The trend in Orange County

Approximately, a third of the County relies a non-public source of water. This percentage has remained fairly constant over the last thirty years. Thus this large proportion of the County relies on a water source that is only slightly, if at all, monitored; therefore, there are strong implications for the County to better monitor and protect the quantity and quality of water for all its residents.

The Orange County CFE recommendations

Table 20: Household source of water, 1990

Source	% of total
Well Water	28.7%
Public Water	70.7%
Other Water	0.6%

WATER

Type and size of water providers

Why indicator was selected

This indicator was selected because of its' importance for policy makers to be aware of the number and size of water providers within the County. In order to ensure that all residents in the County are being provided with clean and affordable water from a reliable source, the number and type of providers must be tracked.

How indicator was measured

The indicator data were provided by NC DENR, Div. of Environmental Health - Public Water Supply. The chart shows: the names of the 53 water providers within the County, the type of provider they are, the number of connections they serve, the average amount of gallons per day that they serve, and the amount that is from ground water or surface water.

The trend in Orange County

Although the majority of the water is provided by three public water providers: Orange Water and Sewer Authority, Town of Hillsborough, and Orange-Alamance Water System, County residents rely on many other providers. These other providers obtain their water from wells or purchase it from larger providers.

The Orange County CFE recommendations

Table 21: Type and Size of Water Providers: 2002

System Name	Type1	Number of Connections	Daily Flow Requirements (gpd)	Ground Water Amount (gpd)	Surface Water Amount (gpd)
ORANGE WATER & SEWER AUTHORITY	CS		8,800,000		8,800,000
HILLSBOROUGH, TOWN OF	CS		1,800,000		1,800,000
ORANGE-ALAMANCE WATER SYSTEM (Orange)	CS		330,000	70,000	260,000
STONERIDGE MASTER	CG	271	108,400	108,400	
STONEGATE MHP	CG	29	72,300	72,300	
BIRCHWOOD S/D	CG	107	42,800	42,800	
ROBINSWOOD S/D	CG	99	39,600	39,600	
THE TRAILS S/D	CG	94	37,600	37,600	
MAPLE RIDGE PARK	CG	86	21,500	21,500	
COLONIAL PARK WATER ASSOC	CG	51	20,400	20,400	
BINGHAM WOODS	CG	72	18,000	18,000	
WHISPERING PINES	CG	71	17,700	17,700	
WILDCAT CREEK S/D	CG	44	17,600	17,600	
NORTHWOOD S/D	CG	40	16,000	16,000	
RIDGEWOOD MHP	CG	60	15,000	15,000	
SPRING HILL MHP	CG	55	13,700	13,700	
HEARTWOOD S/D	CG	26	10,400	10,400	
OAK GROVE MHP	CG	38	9,500	9,500	
WOODLAND PARK	CG	23	9,200	9,200	
ORANGE MHP	CG	35	8,800	8,800	
HOMESTEAD MHP	CG	35	8,700	8,700	
HILL TOP MHP	CG	33	8,300	8,300	
EUGLENA JUNCTION	CG	31	7,800	7,800	
COUNTRY SQUIRE MHP	CG	31	7,700	7,700	
BAILEY'S MOBILE VILLA	CG	27	6,800	6,800	
ARBOR HILL MHP	CG	27	6,800	6,800	
STURBRIDGE S/D	CG	17	6,800	6,800	
CAROLANTIC PARK	CG	27	6,700	6,700	
RILEY'S MHP	CG	25	6,200	6,200	
THE RANCH MHP	CG	24	6,000	6,000	
CAROLINA FRIENDS SCHOOL	P		6,000	6,000	
WOOD'S MHP	CG	22	5,500	5,500	
TIMBERIDGE MHP	CG	22	5,500	5,500	
FOXBORO ESTATES	CG	20	5,000	5,000	
NORTH ORANGE HUMAN SERVICES	P		5,000	5,000	
OLDE FARM MOBILE COURT	CG	19	4,800	4,800	
MCFARLAND MHP	CG	19	4,700	4,700	
CRAWFORD'S MHP	CG	18	4,500	4,500	
MORRIS GROVE HEIGHTS	CG	13	3,300	3,300	
EMERSON WALDORF GRADE SCHOOL	P		3,200	3,200	
SUNRISE CHURCH	P		3,000	3,000	
UPS	P		2,500	2,500	
KANTNER SCHOOL	P		2,100	2,100	
MAJOR BUSINESS SYSTEMS	P		1,900	1,900	
CAMP NEW HOPE	R		1,100	1,100	
EMERSON WALDORF KINDERGARTEN	P		700	700	
MT HERMON BAPTIST CHURCH DAYCA	P		500	500	
DOMINION RAMSGATE APTS	S		Purchase2		
HIGHLAND HILLS APTS	S		Purchase2		
POPLAR PLACE	S		Purchase2		
BRADFORD PLACE	S		Purchase2		
AUTUMN WOODS APTS	S		Purchase2		
NOTTING HILL APTS	S		Purchase2		
Total			11,540,000	680,000	10,860,000

Type1 = System Types: CG - Community Ground Well, CS - Community Surface, P - Non-Transient Non-Community, S - Sub-metered Apartment, R - Campground

Purchase2 = system purchases water from another supplier (i.e. a city) and then retails to households.

WATER

Customer per capita demand

Why indicator was selected

Knowledge about the water demands on the largest water systems in the County is crucial to planning enough capacity within those systems for a sustainable source of water during all periods of extreme weather. In addition, it is important to predict future growth in order to efficiently accommodate the additional population and businesses.

How indicator was measured

This information was gathered from local water supply plans for 1992 and 1997, as submitted to the North Carolina Division of Water Resources (table data compiled by TJCOG). Data for 2001 were provided by the water service providers, through TJCOG. 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. The indicator is composed of the average amount used by each of the three largest systems in gallons per day, the maximum amount used, and the population served. The per capita demand was derived from the average amount used and the population served.

The trend in Orange County

The graph shows the fluctuation in per capita demand from 1992 to 2001. OWASA's water demand per person has risen 18% over the nine year span. Hillsborough and Orange-Alamance have decreased the amount of water demanded per person, because of reduction in industrial demand. Hillsborough's per capita demand decreased the most -27% due to the closing of Flint Fabrics which demanded 1 million gpd. If Flint Fabrics would have remained open and used the same amount of water the per capita demand would be 192 and therefore the upward trend would have continued.

The Orange County CFE recommendations

Figure 21: Per Capita Demand, 1992-2001

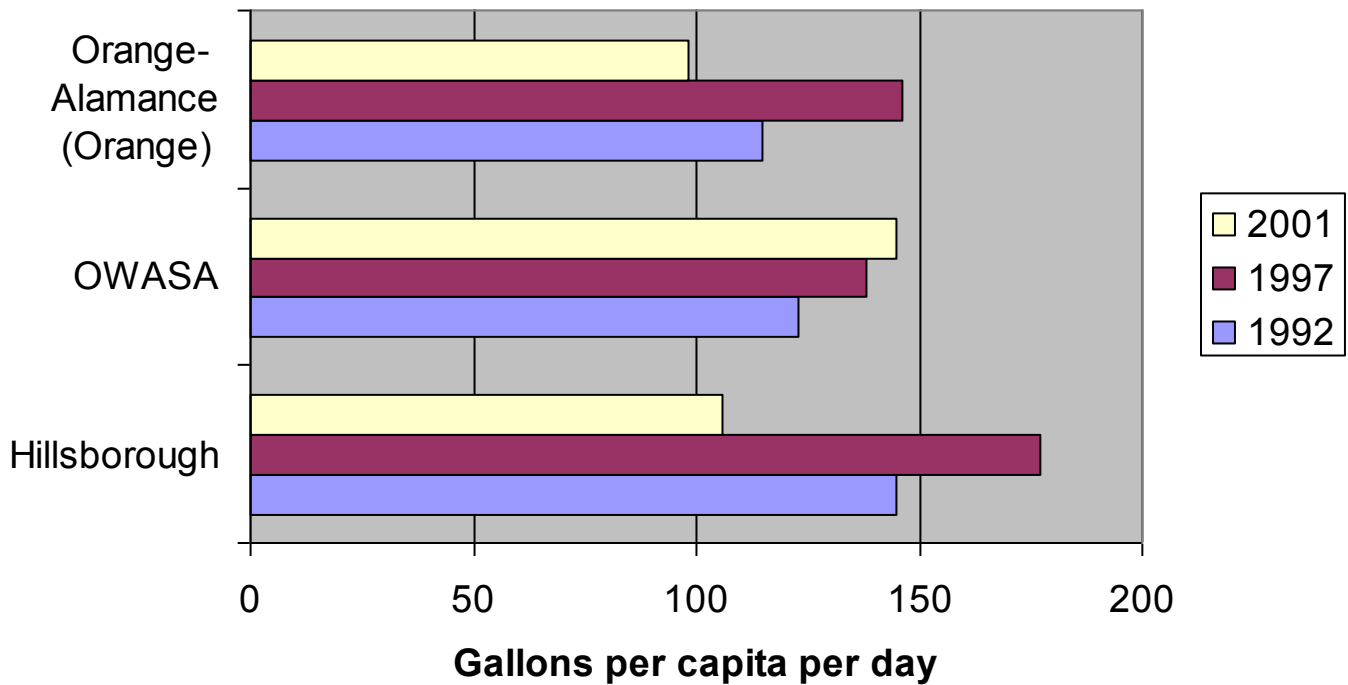


Table 22: Water Demand, 1992-2001

	1992	1997	2001	% Change '92-'97	% Change '97-'01	% Change '92-'01
Hillsborough						
Avg. Day (gpd)	1,460,000	1,824,000	1,227,000	24.9%	-32.7%	-16.0%
Max Day (gpd)	2,044,000	2,650,000	1,872,000	29.6%	-29.4%	-8.4%
Pop. Served	10,092	10,300	11,622	2.1%	12.8%	15.2%
Per Capita Demand	145	177	106	22.1%	-40.1%	-26.9%
OWASA						
Avg. Day (gpd)	7,135,000	8,978,000	10,169,000	25.8%	13.3%	42.5%
Max Day (gpd)	12,000,000	14,342,000	13,751,000	19.5%	-4.1%	14.6%
Pop. Served	57,900	65,000	70,000	12.3%	7.7%	20.9%
Per Capita Demand	123	138	145	12.2%	5.1%	17.9%
Orange-Alamance (Orange)						
Avg. Day (gpd)	241,000	364,000	293,000	51.0%	-19.5%	21.6%
Max Day (gpd)	335,000	438,000	390,000	30.7%	-11.0%	16.4%
Pop. Served	2,098	2,492	3,000	18.8%	20.4%	43.0%
Per Capita Demand	115	146	98	27.0%	-32.9%	-14.8%

* The large decrease in Hillsborough is due to the closing of Flint Fabrics in 2000 which used 1 million gpd

WATER

Public water system safe yields

Why indicator was selected

A twenty year safe yield, which is what this indicator uses, is the amount of water that a system can withdraw on a continuous basis. This implies that if a system's average daily demand is roughly equal to the safe yield then once every 20 years the source will be inadequate. On the average, 19 years out of every 20 years, 95% of the time, the source will be sufficient. This statistic is a useful gauge for determining the resource that is needed within a water system.

How indicator was measured

The indicator only includes the largest systems in Orange County since smaller water service providers are not mandated to identify or report their safe yields. The safe yield information for the three largest Orange County systems were gathered from local water supply plans for 1992 and 1997, as submitted to the North Carolina Division of Water Resources (table data compiled by TJCOG). Data for 2001 were provided by the water service providers, through TJCOG. 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 has 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.

The trend in Orange County

Within the last four years, all three water systems have increased their capacity to accommodate future demands on the system. As shown in the graph, Orange Water and Sewer Authority has significantly larger sources than Hillsborough and Orange-Alamance.

The Orange County CFE recommendations

**Figure 22: Safe Yield (million gallons per day),
1992-2001**

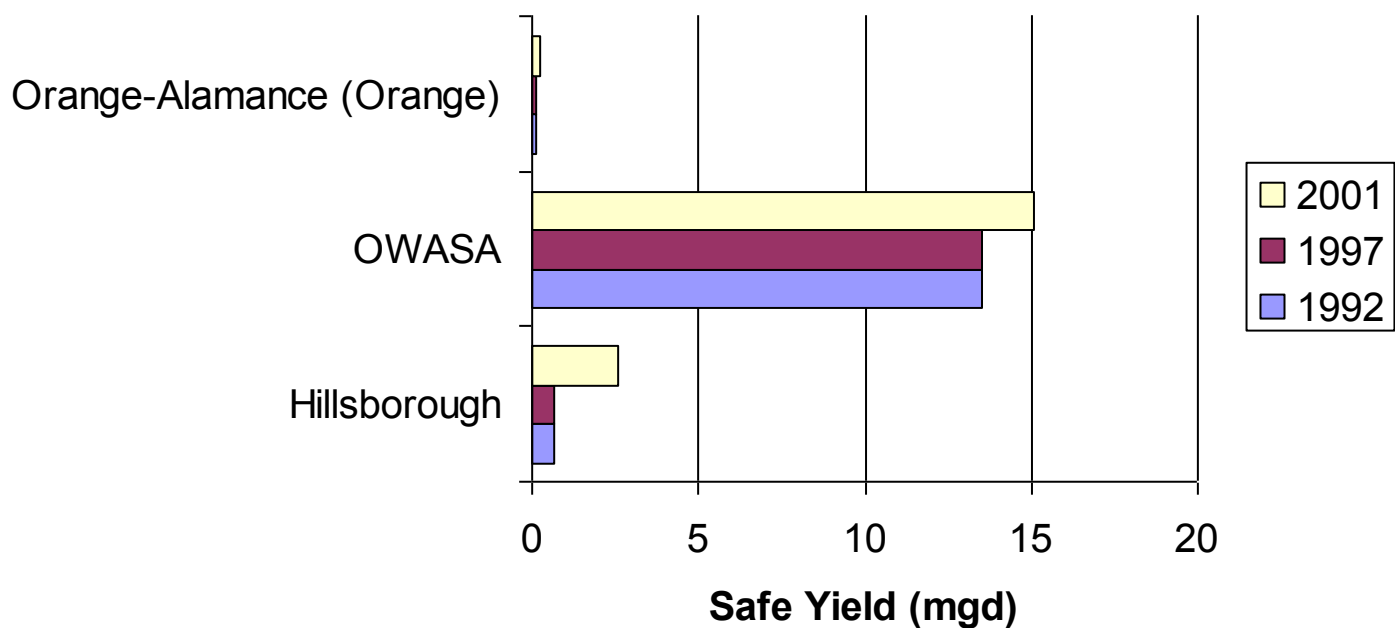


Table 23: Safe Yield, 1992-2001

	1992	1997	2001
Hillsborough (mgd)	0.68	0.68	2.58 ¹
OWASA (mgd)	13.5	13.5	15.1
Orange-Alamance (Orange) (mgd)	0.12	0.12	0.12 ²

¹ Equals 1.9 for W. Fork of Eno plus 0.68 for Lake Ben Johnston

² Plus three wells at 95, 667 gpd specifically for Orange County

Hillsborough's safe yield is adjusted by Eno River Capacity Agreement

WATER

Wastewater permit violations and spill collection

Why indicator was selected

Wastewater treatment is an essential element of the infrastructure of towns and cities. The quality of that service can be shown through the amount of spills and violations that plants have occurred. In addition, the amount of spilled wastewater that reaches surface waters should be analyzed in order to determine how to better protect water quality.

How indicator was measured

NC DENR, Division of Water Quality provided the data for this indicator. The top chart includes the number and volume of spills and the amount that reached surface waters. The bottom chart states the number of violations within the County and the total amount of penalties charged for those penalties.

The trend in Orange County

Wastewater treatment plants have done an excellent job at decreasing the amount of spills. They have decreased the amount by 99%. As shown in the second graph, the wastewater permit violation data reveals a significant problem in 2000 with a large decrease in 2001.

The Orange County CFE recommendations

Figure 23: Total Volume of Wastewater Spills, 1998-2001

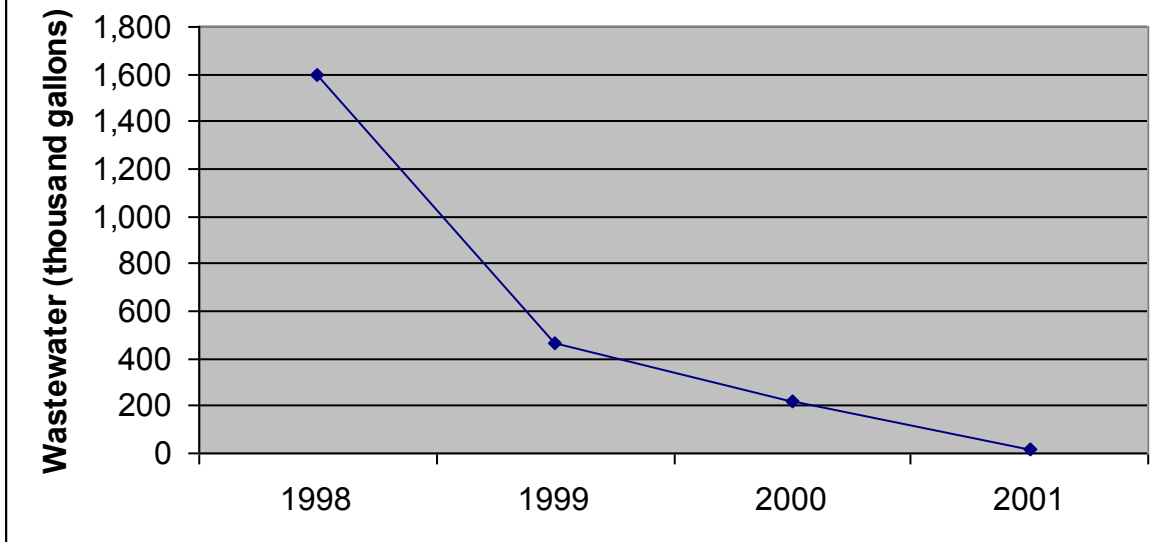


Table 24: Wastewater Spills, 1998-2001

	1998	1999	2000	2001	% change '98-'01
Number of spills	62	55	26	10	-83.9%
Total volume of spills	1,592,970	467,035	215,595	18,305	-98.9%
Total volume reaching surface waters	1,539,495	461,739	196,237	17,495	-98.9%

Figure 24: Wastewater Permit Violations, 1998-2001

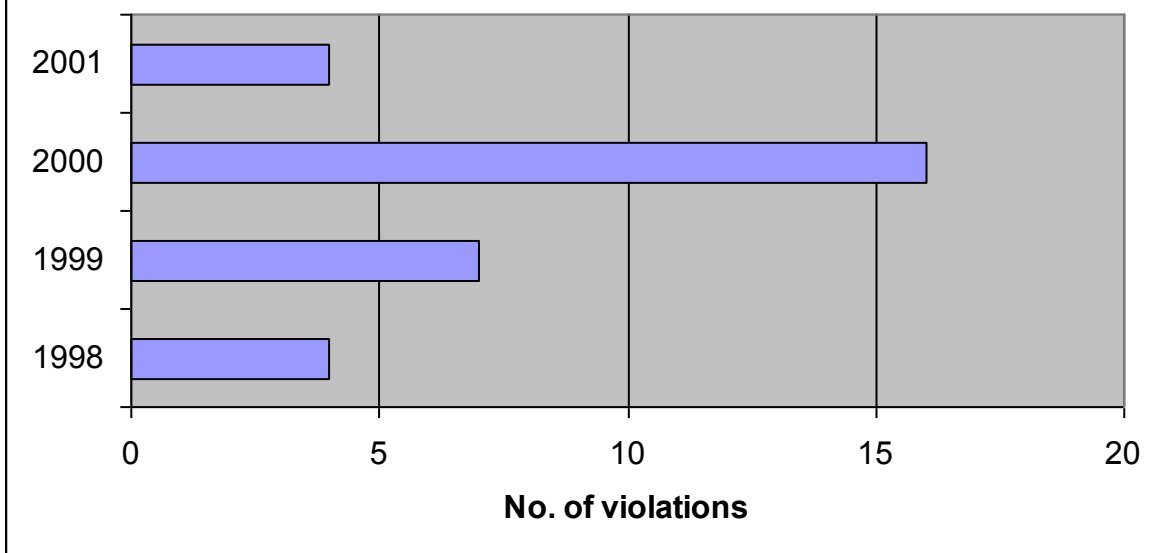


Table 25: Wastewater Permit Violations, 1998-2001

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

WATER

Ground contamination incidents

Why indicator was selected

Ground contamination incidents can contaminate groundwater and soils and therefore can severely damage plants, animals, and groundwater quality. The number of incidents is one of many indicators which describe how well our daily activities are impacting the natural environment surrounding us. The complete remediation of these incidents is vital for protecting the natural community and key resources for our sustenance. The term “closed out” refers to incidents that have been successfully restored back to their natural state.

How indicator was measured

The NC DENR, Division of Waste Management—Underground Storage Tank Section manages the PIRF Incident Management Database. The database provides detailed information on the type, date, amount and status of ground contamination incidents.

The trend in Orange County

Over the past fifteen years, there has been a significant increase in the number of ground contamination incidents. There were 28 incidents from 1986-1990 and 98 incidents from 1996-2001. The percentage of incidents that have been “closed out” also signals a poor trend. During the previous time periods 46% and 50% of the cases were “closed out” while only 43% were “closed out” in the latest period.

The Orange County CFE recommendations

Figure 25: Ground Contamination Incidents, 1986-2001

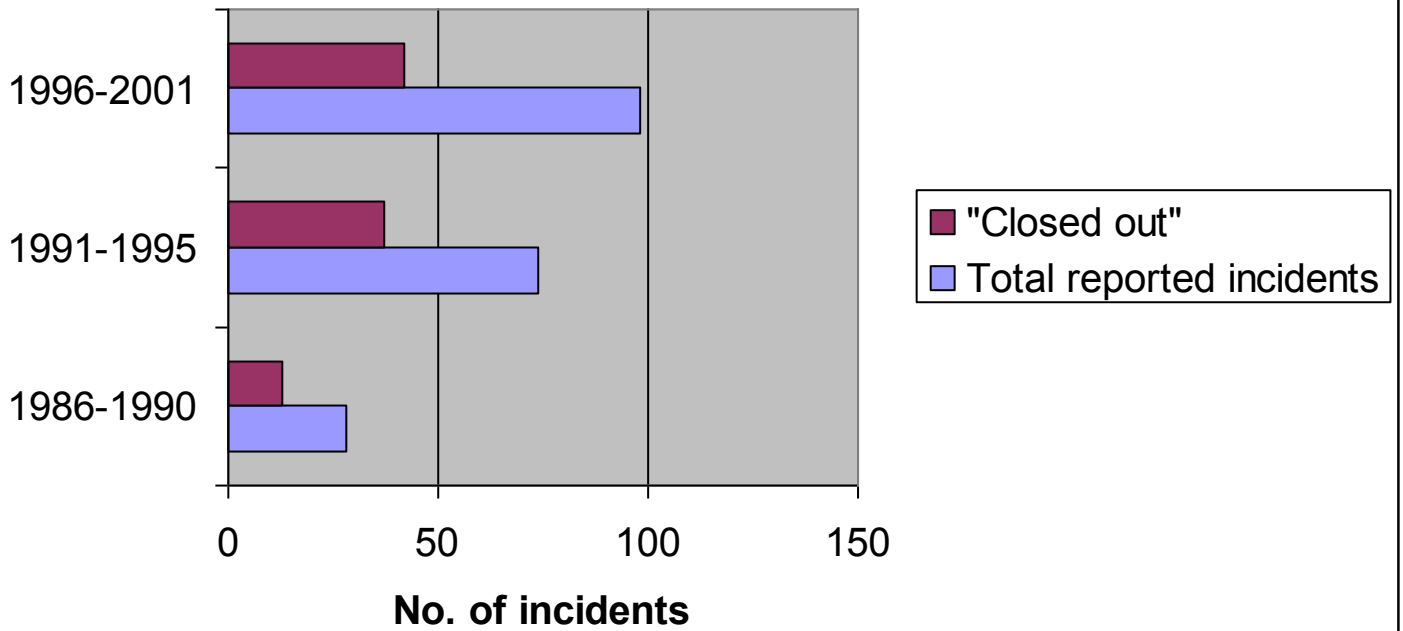


Table 26: Ground Contamination Incidents, 1986-2001

	1986-1990	1991-1995	1996-2001	Total
No. of reported incidents	28	74	98	200
No. that are "Closed Out"	13	37	42	92
Perc. that are "Closed Out"	46.4%	50.0%	42.9%	46.0%

WATER

Streams not meeting classified uses

Why indicator was selected

Since plants, animals, and humans rely on clean surface water, it is critical that local and state governments plan and protect this sensitive resource. One main method that state governments use to ensure clean and safe surface water is applying specific federal standards that water bodies must meet. Each state compiles a list of all water bodies that do not meet water quality standards. The numbers in **Chart** represent the length in miles of water bodies in Orange County that do not meet water quality standards. These impaired water bodies are due to an individual pollutant, multiple pollutants, pollution, or an unknown cause of impairment.

How indicator was measured

NC DENR, Division of Water Quality compiles the list of impaired water bodies. The indicator was measured through a GIS database provided by TJCOG. The list 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 damaged by pollutant(s) or an unknown cause.

The trend in Orange County

Out of the portion of major streams and rivers that NC DWQ have tested, approximately 5% are impaired. This only relates to the streams they have tested and is not a complete representation of all streams or rivers in the County. Furthermore, this indicator only reports the length of the water body and is not necessarily related to quantity.

The Orange County CFE recommendations

Major water bodies that are classified as "not-supporting" or "partially supporting" their 303d classified uses (miles): Orange County, 2000

Table 27: Streams Not Meeting Classified Uses, 2000

Rated stream length	280 miles
Rated "not supporting" or "partially supporting"	15 miles
Percent of rated that are "not-supporting" or "partially supporting"	5.4%

WATER

Percent of benthos site tests that are good or excellent

Why indicator was selected

Benthos site test are used to monitor water quality within rivers or streams. Benthic macroinvertebrates, or benthos, are organisms that live in and on the bottom substrates of rivers and streams. In freshwater, these organisms are primarily 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 also integrates the effects of a wide array of potential pollutant mixtures.

How indicator was measured

The NC DENR, Division of Water Quality administers tests and manages the database on stream quality. The agency uses criteria that have been developed for freshwater to assign bioclassifications ranging from Poor to Excellent to each benthic sample based on the number of taxa present in the intolerant groups Ephemeroptera, Plecoptera, and Trichoptera (EPT S). Higher taxa richness values are associated with better water quality. Likewise, ratings can be assigned with a Biotic Index. This index summarizes tolerance data for all taxa in each collection. The two rankings are given equal weight in final site classification for qualitative samples. Taxa richness alone is used to assign bioclassifications for EPT samples. These bioclassifications primarily reflect the influence of chemical pollutants. The major physical pollutant, sediment, is poorly assessed by a taxa richness analysis.

The trend in Orange County

Orange County has made considerable improvement in stream quality over the last fifteen years. During the '87-'94 time period only 26% of the streams tested were rated "good" or "excellent" while during the '95-'02 time period 42% were rated "good" or "excellent". Even though there has been considerable improvement, the rates are still low.

The Orange County CFE recommendations

**Figure 26: Biotic Tests Rated "Good or Excellent",
1987-2002**

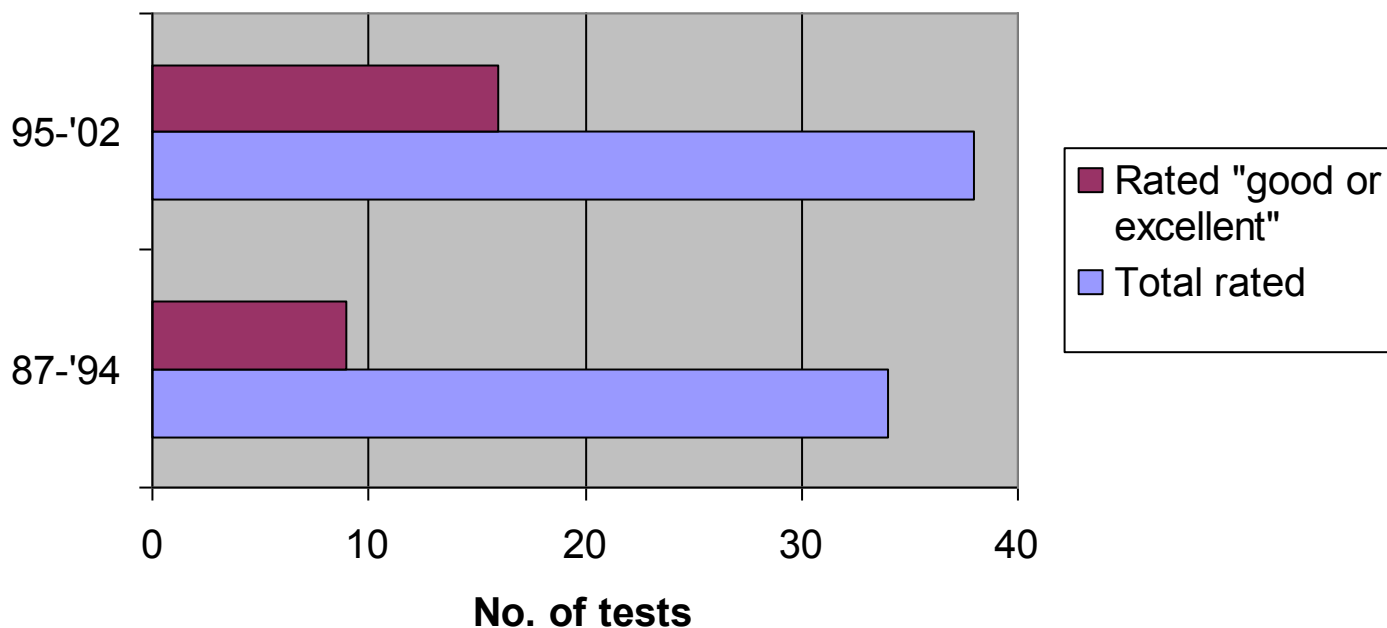


Table 28: Percent of Biotic Tests Rated "Good or Excellent", 1987-2002

	87-'94			95-'02		
	# 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	No Data	No Data	No Data	1	0	0%
Cane Creek	3	1	33%	3	3	100%
Eno River	11	4	36%	5	4	80%
Little Creek	1	0	0%	2	0	0%
Morgan Creek	11	2	18%	6	4	67%
North Fork Little River	No Data	No Data	No Data	4	1	25%
New Hope Creek	1	1	100%	No Data	No Data	No Data
Pritchards Mill Creek	1	0	0%	No Data	No Data	No Data
South Fork Little River	No Data	No Data	No Data	1	0	0%
Sevenmile Creek	1	0	0%	2	1	50%
UT Collins Creek	2	0	0%	No Data	No Data	No Data
Total	34	9	26%	38	16	42%

WATER

Percentage of streams with at least a 50 ft. undisturbed buffer

Why indicator was selected

The SOE Report includes this indicator since there is a lack of data on surface water quality and this indicator provides information on the quality of riparian buffers which have a critical link to surface water quality and an overall healthy ecosystem. Riparian buffers serve numerous important functions such as: filtering out pollutants before they reach surface water, recharge ground water, provide habitat for plants and animals, and control flooding. Therefore local governments must protect natural areas around streams through enforcing land use controls that disallow disturbances in these areas.

How indicator was measured

The Orange County Environment and Resource Conservation Department monitors the effects of land use on the natural environment within the County. The department is currently using GIS coverages to calculate the length of perennial streams with at least a 50 foot buffer. Due to the magnitude of this project, the analysis will be presented in the 2004 State of the Environment Report.

The trend in Orange County

The Orange County CFE recommendations

WATER

Number of stream protection programs

Why indicator was selected

Volunteer organizations play an important role in the protection and monitoring of our natural resources. Stream protection programs attempt to counteract the adverse impacts that development creates. These groups perform various tasks for the supervision and cleaning of the County streams.

How indicator was measured

NC DENR, Division of Water Quality sponsors a stream watch program that identifies groups that conduct environmental work on streams. The Orange County Environment and Resource Conservation Department used the stream watch program participants as a base for determining the number of stream protection programs in the County. ERCDC verified the groups were still active and eliminated inactive groups.

The trend in Orange County

Orange County contains nine volunteer groups that are actively working to protect the quality of our streams. These groups deserve recognition of their hard work. In the future, the number of groups should grow to cover every major stream and river in the County.

The Orange County CFE recommendations

Table 29: Registered Stream Watch Programs, 2002

Organization	River / Stream
1. Cedar Ridge High School	Sand Branch
2. Conservation and Outing Club	Little Creek / Jordan Lake
3. Cub Scout Pack 820	Little Creek
4. Duke Forest Friends	New Hope Creek
5. Eno River Association	Eno River
6. Eno River Association	Eno River Feeder Creeks
7. Falls of the New Hope Stream Watch	New Hope Creek
8. Frank Porter Graham School	Morgan Creek
9. Stoney Creek Ecorangers	Stoney Creek

WATER

Wetland destruction

Why indicator was selected

Wetlands play an essential function in our ecosystem, therefore they are an invaluable resource. Wetlands are protected by the Clean Water Act. The US Army Corps of Engineers permits some wetlands to be filled if they have obtained a 404 Permit. The 404 Permit is only administered to projects that have small impacts or it has been determined that there is no other economically feasible way to mitigate the impacts. Section 401 of the Clean Water Act delegates authority to the states to issue a 401 Water Quality Certification for all projects that require a Federal Permit (such as a Section 404 Permit). The "401" is essentially a verification by the state that a given project will not degrade Waters of the State or otherwise violate water quality standards

How indicator was measured

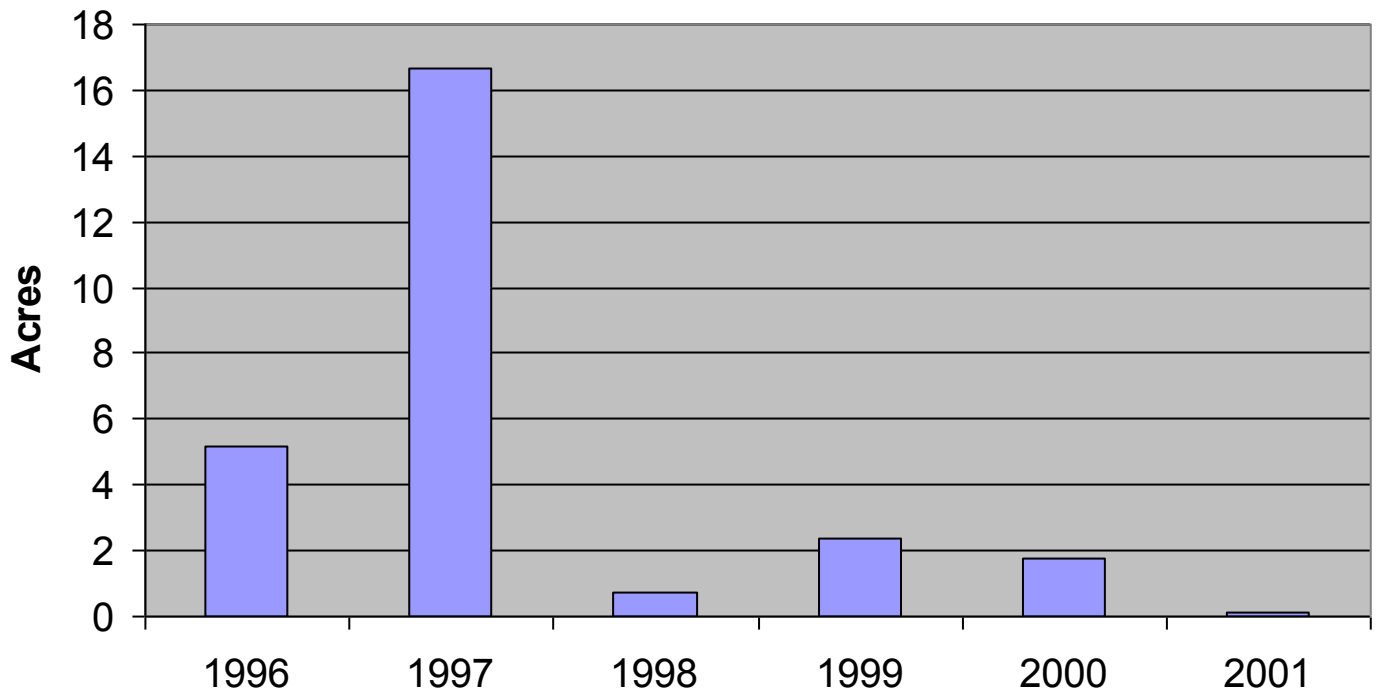
NC DENR, Division of Water Quality - Wetlands Unit manages the 401 permitting process. The indicator specifies the number of wetland acres impacted by the permitting process. For years before 1998, impacted wetlands less than one acre were not reported. Since 1998 all impacts greater than 0.1 acre are reported except for utility, maintenance, and restoration impacts which are not included unless they impact one or more acres of wetlands.

The trend in Orange County

Over the past five years, the impacted wetland acreage has decreased. The 1997 impacts from Hillsborough Reservoir dominate the trend.

The Orange County CFE recommendations

Figure 27: Approved 401 Wetland Impacts, 1996-2001



*The significant increase in 1997 is mainly due to the construction of the Hillsborough Reservoir

Table 30: Impacted Wetlands, 1996-2001

Year	Impacted wetlands (acres)
1996	5.19
1997	16.68
1998	0.76
1999	2.35
2000	1.74
2001	0.1