

THE STATE OF THE ENVIRONMENT



Doyle's Vineyard –Vineyards at Southpoint (Neha Shah)

Written by Amanda Campbell, Environmental Science & Policy Consultant
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ACKNOWLEDGEMENTS

CHATHAM COUNTY STAFF

Tracy Burnett, Director, Parks and Recreation
 Sonya Gilliland, Solid Waste Coordinator, Chatham County Waste Management
 Melissa Guilbeau, AICP, Director, Transportation Planning
 Sam Groce, Director, NC Cooperative Extension
 Ben Howell, AICP, Planner
 David Hughes, PE, Director, Public Works and Utilities
 Dan LaMontagne, PE, Environmental Quality Director
 Andy Siegner, Director, Environmental Health
 Jason Sullivan, AICP, Planning Director, Planning
 Sybil Tate, LEED AP, Manager, Green Buildings and Affordable Housing
 Brenda Williams, Director, Soil and Water Conservation

ADDITIONAL CONTRIBUTORS

Cynthia Van Der Wiele, Ph.D., Principal, Cynthia Van Der Wiele and Associates, LLC

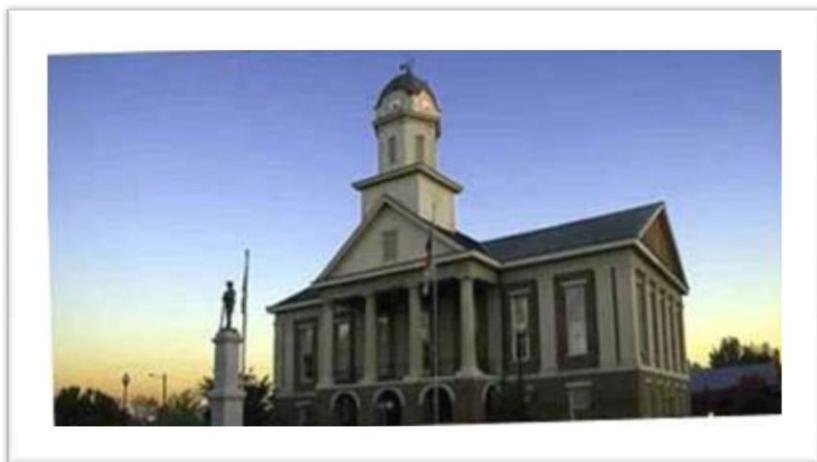
Tara Arnette, Outreach Coordinator, Jordan Lake Visitor Assistance Center
 Ben Baird, Chatham County Forest Ranger, North Carolina Division of Forest Resources
 Paul Black, GISP, Principal Planner, Triangle J Council of Governments
 Elaine Chiosso, Co-Chair, Chatham County Environmental Review Board
 Al Cooke, Agricultural Extension Agent, Chatham County Center, NC Cooperative Extension
 John Finnegan, Information Systems Manager, North Carolina Natural Heritage Program
 Karen Hall, Cooperative Extension, NCSU
 George Hess, Ph.D., Associate Professor, Department of Forestry and Environmental Resources, NCSU
 Paul Horne, Parks Planner, Town of Pittsboro Parks and Recreation
 James Jones, License Supervisor, North Carolina Wildlife Resources Commission
 Paul Kalish, Educational Ranger, Jordan Lake State Educational Forest
 Scott Mouw, Community & Business Assistance Director, NCDENR Pollution Prevention & Environmental Assistance Division
 Steve McMurray, Park Ranger, Jordan Lake State Recreation Area
 Christie Perrin, Cooperative Extension, NCSU
 Debbie Roos, Agricultural Extension Agent, Chatham County Center, NC Cooperative Extension
 Fred Royal, PE, former Director, Environmental Resources, Chatham County
 Mark Seltzer, Environmental Protection Specialist, US Environmental Protection Agency, Office of Resource Conservation & Recovery
 George Strader, Biologist, North Carolina Wildlife Resources Commission
 Rob Taylor, Local Government Assistance Team, NCDENR Environmental Assistance & Outreach Division
 Amber Wagner, Executive Director, Chatham Transit Network
 Allison Weakley, Biologist/Ecologist, Robert J. Goldstein and Associates, Inc.
 Michelle Wheeler, Registrar, Central Carolina Community College
 Steve Wing, Ph.D., Chatham County resident and Professor, University of North Carolina Gillings School of Global Public Health

FROM THE AUTHOR

I would like to express my gratitude to everyone who contributed to this report. It has been truly enjoyable to work with so many North Carolina experts who were generous with their time, data, and resources, and welcomed my many questions.

In creating this document, I relied on other State of the Environment reports as a guide, particularly Orange County's 2009 version. Also, I want to acknowledge the members of a spring 2010 NC State graduate course in which I was enrolled. With guidance from Professor George Hess and the Triangle Land Conservancy, we created the "State of the Environment Report- Triangle Region," posted on the wiki site <http://triangleenvironment.wikispaces.com/>. While the Chatham County report took on a life of its own, I looked to that course and its website at times for data sources and inspiration.

The report grew from the initiative, vision, and leadership of Cynthia Van Der Wiele, former Sustainable Communities Development Department Director and my supervisor for much of this project. Fred Royal and later Dan LaMontagne saw the project through to completion. Finally, I would like to acknowledge the many other people who reviewed the report and contributed their feedback.



ABOUT THIS DOCUMENT

In light of present economic hardships, a holistic analysis of Chatham County's environmental assets can assist in securing a healthy, vibrant future. This report was conducted to provide meaningful information on the state of Chatham County's environment to support strategic planning and decision-making. It identifies data needs, policy opportunities, emerging issues, and successes, utilizing data from multiple local, state, and federal sources. The report is intended to serve as a baseline for future reports. Recommendations reflect the report's findings, and aim to identify synergistic opportunities to maximize natural resource assets—one part Chatham County's diversified economy.

The report is divided into the topic areas of: Introduction, Land Resources, Water Resources, Air Resources, Environmental Education and Recreation, Solid Waste and Hazardous Waste, and a brief Environmental Health section.

Chatham County's current population of 64,722 is expected to increase by 22,000 or 72,000 people by 2030, to a total of 86,722 or 136,722 (depending on the projection source). Each additional person will necessitate development of housing, infrastructure, and services; thoughtful planning and policies can buffer the ensuing environmental impacts. Government, businesses, non-profits, institutions, and individuals can all play a part in balancing growth, environmental protection, and economic development.

TABLE OF CONTENTS

Acknowledgements	ii
About this document	iv
OVERVIEW	1
The Purpose of this Report.....	1
How the Report is Organized	1
Methods and Limitations	1
About the Recommendations	2
The Environment by the Numbers	3
Policy Developments and Environmental Achievement Highlights	4
Recommendation Highlights	6
Chatham County Population	8
LAND RESOURCES	10
Wildlife Habitats.....	11
Indicator: Total number of Plant and Animal Species.....	11
Indicator: Number of At-Risk Species and Natural Communities	11
Special Focus: Deer in Chatham County	15
Indicator: Percentage of Protected Significant Natural Heritage Areas	17
Indicator: Land Cover	18
Indicator: Invasive Plants	22
Agriculture.....	24
Indicator: Acres of Farmland.....	24
Indicator: Certified Organic Agriculture.....	25
Indicator: Local Food Markets	26
Indicator: Community Agriculture	27
Indicator: Participation in the Present Use Value Program	27
Indicator: Participation in Voluntary Agricultural Districts	27
Indicator: Best Management Practices	28
Land Resources: Looking Ahead.....	30
Special Focus: Green Development	30
Special Focus: Chatham Conservation Partnership	32
Land Resources Recommendations	33
WATER RESOURCES	34
Surface Waters	35
Indicator: Major and Minor Discharges	35
Indicator: Impaired Streams	37
Special Focus: Watershed Restoration Initiatives.....	40
Groundwater	41
Indicator: Underground Storage Tank Incidents.....	41
Water Use	42
Indicator: USGS Reported Water Use	42
Indicator: Chatham County Utilities Drinking Water Quality Annual Report, 2009.....	45
Water Resources: Looking Ahead	46
Water Resources Recommendations	50
AiR RESOURCES.....	51
Air Pollution.....	52
Indicator: Air Quality Index.....	52
Indicator: Ground-Level Ozone.....	54
Indicator: Point Source Emissions.....	55
Transportation Choices	56
Indicator: Transportation to work	56
Indicator: Transit ridership and service	58

Indicator: Daily Vehicle Miles Traveled (DVMT)	60
Special Focus: County-to-County Commuting Patterns.....	63
Greenhouse Gas Inventory.....	63
Indicator: Greenhouse Gas Emissions by Sector.....	63
Air Resources: Looking Ahead	67
Air Resources Recommendations	68
Environmental Education and Recreation	69
Environmental Education	70
Indicator: Environmental Education Centers	70
Indicator: Number of Students Attending Programs at Environmental Education Centers	70
Indicator: Higher Education Enrollment in Environmental Fields.....	72
Nature Recreation	74
Indicator: Nature Recreation Activities.....	74
Indicator: Number of Hunting and Fishing Licenses Sold	76
Environmental Education and Nature Recreation: Looking Ahead.....	77
Environmental Education and Nature Recreation Recommendations	77
Solid Waste.....	79
Indicator: Total Tons of Solid Waste	79
Solid Waste and Hazardous Waste	78
Indicator: Tons of Recycled Materials from County-Collected Sources and Municipalities.....	81
Hazardous Waste	83
Indicator: Household Hazardous Waste	83
Indicator: Total Pounds of Hazardous Chemicals Released and Disposed	84
Indicator: 'Inactive' Hazardous Sites and Pollutant-Only Sites	89
Solid Waste and Hazardous Waste: Looking Ahead	90
Solid Waste and Hazardous Waste Recommendations	91
Environmental Health: Policy Achievements and Issues	92
Policy Achievement: Goldston Sewer Bond Referendum	92
Ongoing Issue: Application of Sludge on Agricultural fields.....	92
Policy Opportunity: Childhood Lead Poisoning Prevention Rule	93
Environmental Health Recommendations	94
About the Author.....	95
References.....	96
Appendix.....	101
Appendix 1. Land Cover Definitions	101
Appendix 2. Water Conservation Value Map.	102
Appendix 3. BMPs and Conservation Practices Planned and Applied in Chatham County 2005-2009.....	102

FIGURES

Figure 1. Triangle Population.....	8
Figure 2. Chatham County Population Trends.....	9
Figure 3. At-Risk Species and Natural Communities in Chatham County.....	12
Figure 4. Annual Deer Harvest.....	16
Figure 5. Chatham County Forest Ownership, 2002 (Acres).....	21
Figure 6. Major Discharges By Source.....	36
Figure 7. Total UST Incidents Reported and Closed, 1990-2010.....	42
Figure 8. Water Use in Chatham County, 1985-2005.....	43
Figure 9. Water Use in Chatham County 1985-2005 (Except Thermolectric).....	44
Figure 10. Chatham County Air Quality Index: Moderate to Unhealthy Days.....	53
Figure 11. Chatham County Ozone Monitoring Data.....	54
Figure 12. Transportation to Work In North Carolina and Chatham County, 1990, 2000, And 2005-09.....	57
Figure 13. Average Commute Times for Chatham County and North Carolina, 2005-2009.....	58
Figure 14. Chapel Hill Transit's PX Route Map.....	59
Figure 15. Chapel Hill Transit PX Route Monthly Ridership.....	60
Figure 16. Chatham County Daily Vehicle Miles Traveled (DVMT), Total and Per Capita.....	62
Figure 17. Chatham County Population.....	62
Figure 18. Journey to Work Flows, County-to-County, 2000.....	63
Figure 19. Chatham County Greenhouse Gas Emissions by Sector, 2008.....	66
Figure 20. Us Greenhouse Gas Emissions by Sector, 2008.....	66
Figure 21. Jordan Lake Annual Environmental Education Participation.....	72
Figure 22. Total Annual Enrollment in CCCC Environmental Degree & Certificate Programs, 2002-2010.....	73
Figure 23. Solid Waste and Population Trends in Chatham County, 1999-2009.....	80
Figure 24. Chatham County Pounds of Solid Waste Per Person Per Day, 1999-2009.....	80
Figure 25. Reported Recycling in Chatham County, 1998-2009.....	82
Figure 26. Household Hazardous Wastes Collected by Chatham County Division of Waste Management.....	84
Figure 27. Total Pounds of Chemicals Released/Disposed by Reporting Facilities in Chatham County, 2001-2008.....	88

TABLES

Table 1. At-Risk Species in Chatham County.....	12
Table 2. At-Risk Natural Communities in Chatham County.....	14
Table 3. Land Cover in Chatham County, 1992 and 2001.....	19
Table 4. North Carolina Most Damaging Invasive Species.....	23
Table 5. Farmland Acreage in Chatham County, 1992-2007.....	24
Table 6. Triangle Region Organic Acreage, 2007.....	25
Table 7. Five Year Total (2005-2009) Cost Share Funding.....	28
Table 8. Top Five Applied Single Facility Best Management Practices (BMPs) and Conservation Practices, 2005-2009.....	29
Table 9. Top Five Applied Linear BMPs and Conservation Practices (Ft.), 2005-2009.....	29
Table 10. Top Ten Applied Area BMPs and Conservation Practices (Acres), 2005-2009.....	29
Table 11. Environmentally-Oriented Development Types.....	30

Table 12. Major Discharges To Surface Waters (2004).....	36
Table 13. Minor Discharges To Surface Waters.....	36
Table 14. Impaired Water Segments in Chatham County, 2008	39
Table 15. Chatham County Water Use, 1985-2005 (Million Gallons Per Day)	44
Table 16. Chatham County Watershed Ordinance Categories	49
Table 17. Chatham County Watershed Ordinance Restrictions	49
Table 18. Chatham County AQI, 2000-2008	53
Table 19. Emissions from Reporting Facilities in Chatham County, 2003 & 2008	55
Table 20. Transportation to Work For North Carolina and Chatham County Residents, 1990, 2000, and 2005-2009	57
Table 21. Chatham County Greenhouse Gas Emissions By Sector, 2008	65
Table 24. Environmental Education Centers Located in Chatham County	70
Table 25. Jordan Lake Environmental Education Participation	71
Table 26. Graduation from CCCC Environmental Associates Degree & Certificate Programs, 2006-Summer 2010 ...	73
Table 22. Nature-Oriented Parks Acreage and Facilities in Chatham County	75
Table 23. Planned Nature Oriented Recreation Facilities.....	76
Table 27. Reported Recycling in Chatham County (Tons), 1998-2009	82
Table 28. Household Hazardous Wastes Collected By Chatham County Division of Waste Management	83
Table 29. Release and Disposal of Hazardous Waste by Chatham County Reporting Facilities (in Pounds), 2008	85
Table 30. TRI Reporting Facilities Located in Chatham County, 2008	87
Table 31. Trends By Disposal/Emissions Type, Chatham County Reporting Facilities, 2001-2008	89
Table 32. 'Inactive' Hazardous Sites Located in Chatham County, 2010	90

THE STATE OF THE ENVIRONMENT: CHATHAM COUNTY 2011

OVERVIEW

THE PURPOSE OF THIS REPORT

This report aims to:

- Serve as one resource to inform land use and economic development planning
- Serve as a source of information for individuals, government, non-governmental organizations, and other stakeholders
- Present indicators that are meaningful, objective measures of environmental attributes from available data that can be compared over time
- Highlight successes in policy and in protecting and maintaining Chatham County's environmental resource assets
- Identify gaps in data, emerging issues, potential threats to the environment, and policy opportunities
- Serve as a baseline, template and starting point for future reports, to be revised as new environmental data and priorities emerge
- Present recommendations for policies and incentives that promote economic, environmental, and community vitality

HOW THE REPORT IS ORGANIZED

This report contains seven sections: Overview, Land Resources, Water Resources, Air Resources, Environmental Education and Recreation, Solid Waste and Hazardous Waste, and Environmental Health. Reflecting the interconnectedness of social institutions and natural systems, each section contains some information applicable to other sections. Each larger section contains an introduction and, where applicable, several subsections. Each subsection lists indicators that describe characteristics and trends on that topic. Indicators are introduced with a statement of their 'status' and 'trends.' 'Status' describes the most up-to-date data point, usually in quantitative form. 'Trends' describes how data has changed (or stayed the same) during the period that it covers. In some cases, past data are not readily available, so the 'trends' component is omitted.

For each section, after the indicators are presented, Data Needs, Policy Achievements, and other issues related to the topic are described. Additional information is found in *Special Focus* sections and in sidebars. Finally, each section concludes with recommendations.

METHODS AND LIMITATIONS

This document presents information gleaned from data sources that provide insights into trends, threats, successes, data gaps, and policy opportunities regarding Chatham County's environment.

This report utilizes existing data tracked by multiple agencies at the city, county, regional, state, and national level, and from university and non-profit institutions. The current state of the environment is described using the most recent data available. For many indicators, the author obtained data from the last five to ten years in order to identify recent trends; however, the available time frames vary from

indicator to indicator. Indicators were chosen based on their ability to show meaningful environmental information, balancing accuracy with feasibility of collection. Sources, methods and limitations are noted where applicable. Website links to data sources are noted throughout the document and in the *References* section. Experts lent their input for some sections, and many reviewers participated in the report (see *Acknowledgements*).

The report aims to represent data in an objective fashion. This report does not weigh the relative significance of the various environmental facts and figures; that is left to the audience.

Many of the indicators presented in this report may warrant further investigation to determine causes of recent trends. Additionally, there are many environmental topics that were not included in this report, such as environmental education in Chatham County Schools, pedestrian and bicycle facilities, green infrastructure assessment, and natural hazard mitigation planning. It is likely that other topics will emerge that merit further study, or inclusion in subsequent *State of the Environment* reports.

The report was designed to be updated about every 5 years to evaluate progress against the baseline set forth in this document. Ideally, for the next report, a p set targets and identify priority indicators or areas for further study. The next report can build upon this template, focusing on the topics and issues most relevant to the constituency at that time.

ABOUT THE RECOMMENDATIONS

Recommendations stem from a broad interpretation of the information gathered. Rather than a prescriptive approach, they provide general suggestions of the direction that policymakers, residents, non-profits, institutions, and other interested groups may wish to take to address the issues raised in the report. Recommendations generally fall along these lines of reasoning:

- Continue with successful programs
- Close data gaps to assist in monitoring of progress
- Investigate and consider new policy or program opportunities to address threats to the environment
- Implement existing and draft plans that show promise in addressing environmental challenges

A full cost-benefit analysis of options is beyond the scope of this report. All choices involve tradeoffs; the hope is that solutions emerge that address multiple goals and promote an integrated approach to economic, environmental, and social issues. This report can serve as a starting point of environmental knowledge to assist in the decision-making process.

THE ENVIRONMENT BY THE NUMBERS*

Topic	Status	Recent Trend
General	County population: 64,722 ^a (2009)	Increasing
	2030 population projection: 86,832 ^b to 136,641 ^c	Increasing
	437,200 acres in County ^d	N/A
Wildlife Habitats	43 mammal, 117 bird, & 92 reptile species ^e (2006)	Not Included (N.I.)
	44 at-risk species ^f (mid-2010)	Increasing
	63% of the county's land cover is forestland ^g (2001)	Decreasing
Agriculture	104,171 acres of farmland reported ^h (2007)	Decreasing
	200,345 acres of farm, forest, and horticultural lands participate in Present Use Value program ⁱ (2007)	Increasing
	30,303 acres of BMPs applied to farmland from 2005-2009 ^j	N.I.
Surface Waters	14 million gallons per day discharged to surface waters by Major Dischargers ^k (2004)	Decreasing
	18 'best management practices' installed in Robeson Creek Watershed from 2005-2010 ^l	N/A
Ground Water	126 closed/ 72 open Underground Storage Tank incidents remain since 1990 ^m	Decreasing number of incidents reported
Water Supply	158 million gallons per day estimated total water use ⁿ (2005)	Mixed
	Municipal drinking water quality: four violations out of hundreds of samples taken ^o (2009)	N.I.
Air Pollution	2 unhealthy air quality days ^p (2008)	Mixed
	20,077 tons emitted from point sources ^q (2008)	Decreasing
Transportation	1,892,800 daily vehicle miles traveled ^r (2006)	Steady
Greenhouse Gas Inventory	1,305,107 total tons carbon dioxide equivalent emitted ^s (2008)	N.I.
Environmental Recreation	11,588 hunting and fishing licenses sold ^t (2009)	Increasing
	48,754 acres of nature-oriented parks ^{1u}	N.I.
Environmental Education	6,142 students attended a program at Jordan Lake ^v (2009-10)	Mixed
Solid Waste	32,619 tons of solid waste ^w (2008-09)	Steady/Decreasing
	3,556 tons of county-reported recycling ^x (2008-2009)	Mixed
	2.9 pounds of solid waste per person ^y (2008-09)	Decreasing
Hazardous Waste	2,482,024 lbs hazardous chemicals released/disposed by reporting facilities in the county ^z (2008)	Decreasing

¹ Includes Jordan Lake's nearly 14,000 acres of open water

² State Ranks: S1=Critically imperiled; S2=Imperiled; S3=Vulnerable; S4=Apparently Secure; S5=Secure, ?=uncertain.

³ Global Rank: G1=Critically imperiled; G2=Imperiled; G3=Vulnerable; G4=Apparently Secure; G5=Secure;

*The status and trends in Chatham County environmental data shown in this table indicate the following:

Green = Shows strong potential to be good for the county's environment. Some indicators may warrant more detailed assessment of all implications.

Yellow = Caution—may be concerning. Consider monitoring, investigating further, or taking action.

White = Neutral information, not applicable, or not included (NI)

Gray = Unknown—not enough information analyzed in this study to determine positive or negative implications of data or trend.

POLICY DEVELOPMENTS AND ENVIRONMENTAL ACHIEVEMENT HIGHLIGHTS

LAND RESOURCES: WILDLIFE HABITAT AND AGRICULTURE

Re-forestation: North Carolina's Forest Development Program replanted 31% of harvested acreage in 2009.

Agricultural economy: The agricultural sector of the economy is strong and diversified with 104,171 acres on 1,089 farms in 2007. One land resources- related policy development is the Farmland Preservation Plan.

Access to local food: Local food markets grew to four farmer's markets and eleven CSAs in 2010. Many linear feet, acres, and facilities of 'best management practices' were installed from 2005 to 2009, with expenditures of nearly \$2.5 million in the cost-share program.

The Chatham Conservation Partnership (CCP) has produced separate but related environmental analysis, including the Chatham Conservation Plan, database, policy inventory, and planning tool. The planning tool contains updated data layers to assist in prioritizing wildlife habitat, water quality, agriculture, and forestry.

WATER RESOURCES: SURFACE WATERS, GROUNDWATER, WATER SUPPLY

Watershed restoration: Tick Creek and Robeson Creek are two successful watershed restoration efforts highlighted in this section. The Tick Creek Partnership has recently completed several steps in the planning stage, while Robeson Creek is further along in the process -- recent measurements show significant reductions in pollutants.

Drinking water reports show that municipal supplies are performing well, with 4 violations reported out of hundreds of samples taken, mostly due to by-products of chlorination.

New policies: Recent achievements in water resources include a new electronic database of underground storage tanks, and revisions to the Watershed Ordinance, Stormwater Ordinance, and Soil Erosion and Sedimentation Control Ordinance.

AIR RESOURCES: AIR POLLUTION, TRANSPORTATION CHOICES, GREENHOUSE GAS INVENTORY

Improving air quality: Trends of both Air Quality Index and ground level ozone are mixed or slightly improving.

More transit options are available now than several years ago, including the Chapel Hill Transit PX route, and other service expansions of Chatham Transit Network.

New inventory data: Greenhouse gas emissions in 2008 were estimated at just over 1,300,000 US tons of carbon dioxide equivalents. Proportionally, the county has lower commercial and industrial emissions but higher transportation and residential emissions than the U.S. as a whole.

ENVIRONMENTAL EDUCATION AND RECREATION

Environmental education opportunities: The NC Office of Environmental Education lists at least seven environmental education centers located in Chatham County. Additional programs exist outside of these centers.

Higher education enrollment at Central Carolina Community College's environmental degree and certificate programs has expanded enrollment from 19 students in 2002 to 198 in 2010. Programs include alternative energy technology, sustainable agriculture, and others.

Growing recreation demand: Residents show strong support for nature-oriented recreation such as trails and open space according to the Parks and Recreation Master Plan Survey conducted in 2007. Hunting licenses sold within the county grew slightly from 2005 to 2009.

SOLID WASTE AND HAZARDOUS WASTE

Reducing waste: An average of 2.9 pounds per person per day of solid waste were generated in the county in 2008/09--the lowest in the last ten years.

Reducing hazardous waste: Reporting facilities in the county released or disposed of 34% less hazardous waste in 2008 than in 2001.

Recent policy development: In September, 2010, the new county Construction and Demolition Recycling Ordinance took effect, requiring recycling of construction and

demolition debris from projects larger than 1,000 square feet in the unincorporated areas of the county.

ENVIRONMENTAL HEALTH

Policy Achievement: Goldston Sewer Bond Referendum

In June of 2010, the Town of Goldston successfully passed a bond referendum to finance wastewater treatment infrastructure upgrades. The new facilities are a solution to the septic-system failures that the town has endured. The Chatham County Board of Commissioners committed \$1.5 million to fund a trunk line between Goldston and the city of Sanford (Rigsbee, 2010).

Policy Opportunity: Lead Rule

Chatham County Board of Health is currently finalizing new Childhood Lead Poisoning Prevention Rules. The rule would lower the blood lead levels that trigger investigations. Provisions in the rule are aimed at improving the county's efficacy in protecting the youngest county residents from lead exposure.

RECOMMENDATION HIGHLIGHTS

LAND RESOURCES: WILDLIFE HABITAT AND AGRICULTURE

The county should continue to support conservation planning, balancing growth and development to support biodiversity, natural communities, and agricultural resources.

- Work with local stakeholders and utilize tools to implement a plan for conservation of biologically diverse areas and forestland, such as the Chatham Conservation Partnership Plan
- Implement the Chatham Agriculture Economic Development Plan
- Explore opportunities to create and sustain additional community and school gardens

WATER RESOURCES: SURFACE WATERS, GROUNDWATER, WATER SUPPLY

Chatham County should continue to enhance surface water quality, protect groundwater resources, and plan for future water supply needs

- Continue to implement water quality protection ordinances
- Continue to research the potential threats from shale natural gas extraction and unregulated contaminants in treated wastewater

AIR RESOURCES: AIR POLLUTION, TRANSPORTATION CHOICES, GREENHOUSE GAS INVENTORY

- Continue with the strategic energy planning process, creating a greenhouse gas reduction plan with viable targets and implementation strategies
- Design strategies to support smart growth that enhance alternative transportation choices, such as car and van-pooling, and pedestrian, bicycle, and transit facilities

- Develop and follow strategies to reduce emissions that lead to harmful ground-level ozone conditions

ENVIRONMENTAL EDUCATION AND RECREATION

- Approve and implement the Draft Parks and Recreation Comprehensive Master Plan for 2009-2029, which contains many environmentally-oriented recommendations, such as developing greenways and blueways, upgrading design and daily maintenance, and financing
- Consider creating environmental education goals for Chatham County students, including components such as field trips, on-site gardens and schoolyard habitats
- Consider introducing or expanding environmental education programming in county and municipal parks

SOLID WASTE AND HAZARDOUS WASTE

- Continue to create and promote solid waste reduction and recycling initiatives
- Monitor the success of the construction/demolition recycling ordinance
- Continue to connect local industries with solid and hazardous waste reduction programs implemented through the state Division of Waste Management, such as the National Partnership for Environmental Priorities and the Environmental Stewardship initiatives

ENVIRONMENTAL HEALTH

- Continue supporting science-based precautions in the application of sludge to agricultural lands
- Pass the Childhood Lead Poisoning Prevention Rule to reduce young children's exposure to lead

CHATHAM COUNTY POPULATION

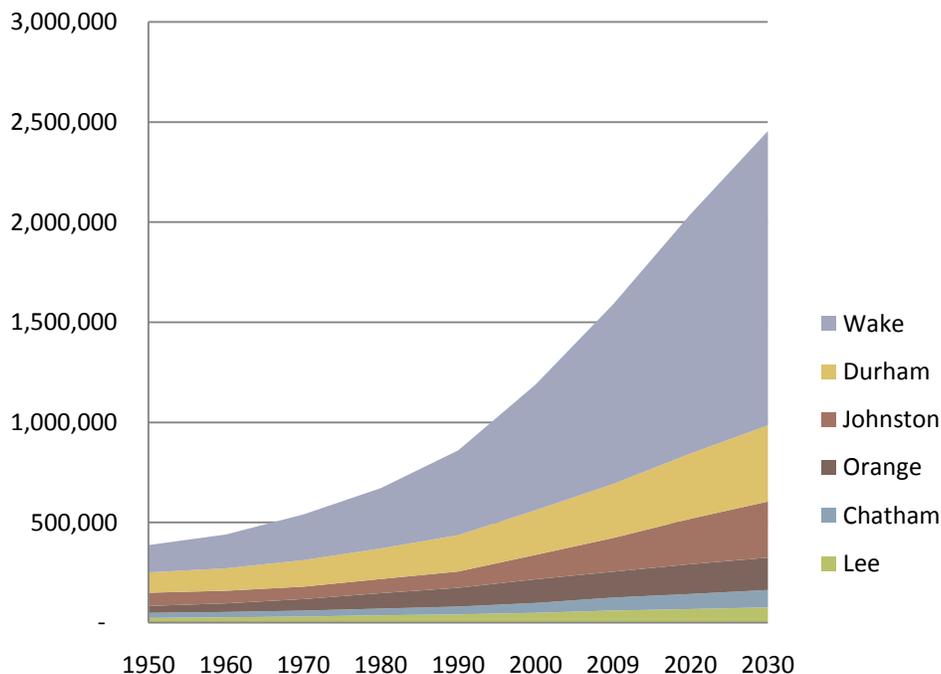
Chatham County’s population has grown rapidly from 25,092 in 1950 to 64,722 in 2009 (see Figure 1). About half of the growth during this 59-year period occurred in the most recent 14 years.

Within the region, many counties’ growth surpassed that of Chatham County’s, as shown in Figure 2. The six-county triangle region was home to 370,000 in 1950, and blossomed to over 1.5 million in 2009, with Wake and Durham Counties absorbing much of the growth in population.

The majority of the population in Chatham County resides outside the incorporated areas of Siler City (8,464), Pittsboro (2,624), Goldston (379) and the Chatham County portions of Cary (320) according to 2007 population estimates. Much the county’s population is concentrated near the northeast, proximate to Research Triangle Park.

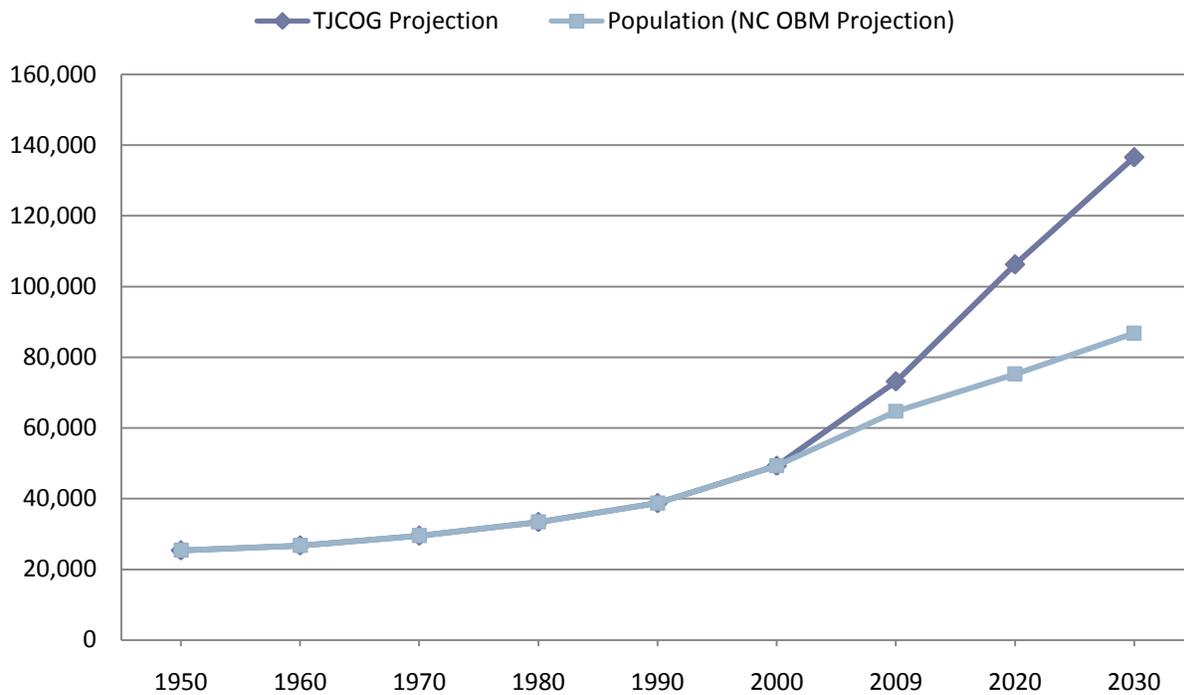
Population projections vary widely by source. According to the NC State Office of Management and Budget, between 2010 and 2030, the county will gain an additional 22,000 people, but according to the Triangle J Council of Governments the county will gain nearly 72,000--more than double the current population (see Figure 2). Each new resident, business, and industry places additional burdens on water, land, and air resources. Costs associated with these impacts can be reduced and mitigated with careful planning and policymaking. Choices that individuals and organizations make also play a crucial part. Balancing growth and development with stewardship of natural resources will be an important challenge in the coming years.

Figure 1. Triangle Population



Source: US Census Bureau (current and historic), NC Office of Management and Budget (projections)

Figure 2. Chatham County Population Trends



Source: US Census Bureau (historic and current estimate), NC Office of Budget and Management (projection), Triangle J Council of Governments (projection)

Note: TJCOG projection curve begins in 2005 and is based on planned and proposed dwelling units and growth of comparable areas, among other factors. The projection curve is normalized to account for recessions. Projections are considered conservative (Paul Black, personal communication, November 11, 2010).



Chatham County spans 707 square miles, or 437,200 acres in North Carolina's piedmont region. Despite its proximity to large population centers in Durham and Wake counties, the landscape is largely rural, with farms edged by large tracts of forests, stream valleys, hardwood swamps, and other exceptional environments. The county's natural amenities not only help filter water and ease flooding, they support a variety of wildlife. The agriculture base is a diverse cultural treasure, including a robust livestock industry and small farms operating in niche businesses. Natural resources contribute to the economy in numerous ways. In addition to farm and forestry industries, Chatham County's lakes, forests, and farms support the economy through tourism and recreation.

Agricultural lands can provide many environmental benefits, such as wildlife habitat, water supply recharge, and greenhouse gas mitigation. Habitat niches for birds and wildlife can be found in fencerows, hedgerows, wetlands, ponds and streams. Agricultural areas have fewer impervious surfaces as compared to urban areas, lowering risks of flooding downstream. The organic matter in agricultural soils and grazing lands can even store carbon, one component of a major greenhouse gas.

This section begins with an assessment of Wildlife Habitats, examining biodiversity and land cover. Indicators presented include number of plant and animal species, number of at-risk species and natural communities, percent of protected Significant Natural Heritage Areas, type and extent of the basic land covers and land cover change, and invasive plants. One ongoing issue investigated in this section is the presence of a large deer population in Chatham County.

The second part of this section describes the state of agriculture in the county. The first indicators presented include acres in farmland and number of farms, certified organic acreage, local food markets, and community agriculture. The next set of indicators show participation in the present use value program, voluntary agricultural districts, and implementation of best management practices. Special topics in this section include the Natural Heritage Program, the Forest Redevelopment Program, sustainable agriculture, local food markets, environmentally-friendly development, and the Chatham Conservation Partnership.

The section concludes with policy achievements, data needs, and recommendations to sustain Chatham County's vibrant and productive land resources.

WILDLIFE HABITATS

INDICATOR: TOTAL NUMBER OF PLANT AND ANIMAL SPECIES

Status: 43 mammal species, 117 bird species, 39 amphibian species, 53 reptile species.

Biodiversity -- the variety of species and genetic diversity -- is important for maintaining thriving natural communities. Chatham County is home to 43 species of mammals, 117 types of birds, 39 species of amphibians, and 53 reptiles, according to a US Geological Survey report (2006). There are also several species of fish, and hundreds of types of invertebrates and plants.

INDICATOR: NUMBER OF AT-RISK SPECIES AND NATURAL COMMUNITIES

Status: 45 at-risk species; 7 imperiled or critically imperiled communities

Trend: From 1996 to 2010, the number of at-risk species increased from 27 to 45, and the number of at-risk natural communities increased from 12 to 21

As Figure 3 illustrates, the number of plant and animal species and natural communities that are considered 'at-risk' increased from 1996 to 2010.

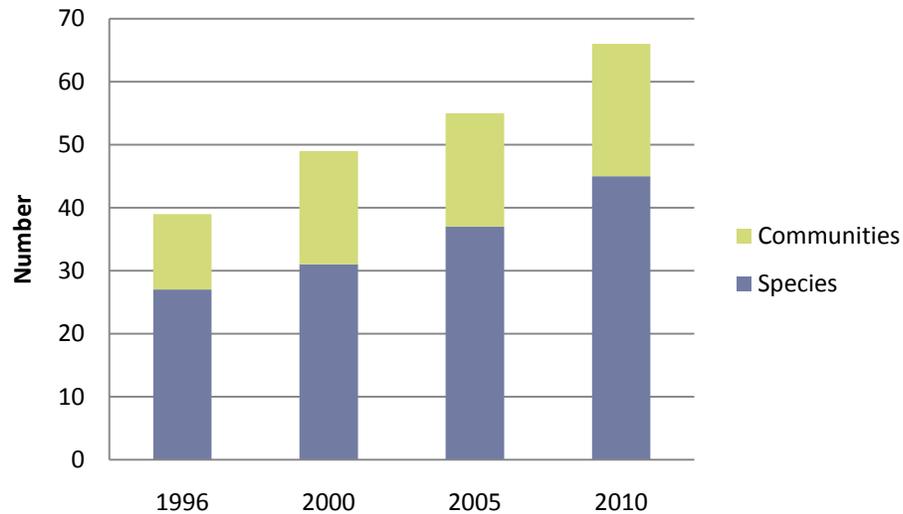
This is not a flawless indicator of biodiversity for several reasons. Some animals or plants may have been removed or added to the list due to taxonomic changes. For example, one species may be re-classified as two separate species. Over time, additional field surveys may uncover rare species or communities that were not previously known to be present. Or new information may reveal the rarity or abundance of species whose status was unknown. The number of listed species may fluctuate partly as a result of changing classifications and new information.

EXPLAINING CHANGES IN SPECIES OCCURRENCE

Animals and plants become rare for a variety of reasons. When natural areas are developed, or habitat becomes polluted or degraded, certain species are particularly vulnerable. Endemic species, such as the Cape Fear Shiner, have naturally limited ranges which compounds their vulnerability (US Fish and Wildlife Service, 1987). Many species, such as mussels, are sensitive to degraded water quality. Others, like the red-cockaded woodpecker and the four-toed salamander, have very specific requirements for breeding habitat. Invasive plants and animals are known to contribute to species extinction as well (Pimentel, 2001). In fact, non-native species are the second greatest threat to biodiversity in the United States after habitat loss (see "Invasive Plants" indicator) (Wilcove et al. 1998).

Some animals that used to exist within the county are no longer thriving here. Red-cockaded woodpeckers and the Virginia quillwort have not been sighted in the county for the last 50 years -- they are considered 'historical' occurrences. The gray wolf was extirpated from the state whereas the Carolina Parakeet became extinct in the early 1900s (Cornell Lab of Ornithology, 2007).

On the other hand, new animals and plants have appeared in the county, either by range expansion or introduction by humans. Some species and communities are discovered anew in the county through reports by botanists and zoologists. Other types of animals and plants thrive in developed areas. These species tend to have flexible and adaptable diet and habitat requirements, such as crows, starlings, squirrels, coyotes, and deer. Some species are increasing in population to the point of becoming nuisances. See Special Focus: Deer in Chatham County for more information on this contentious creature.

Figure 3. At-Risk Species and Natural Communities in Chatham County

Source: NC Natural Heritage Program, retrieved July 14, 2010 from <http://nhpweb.enr.state.nc.us/search/county.html> and files from John Finnegan, Information Systems Manager, NC Natural Heritage Program.

The following 44 organisms and 1 animal assemblage are considered at-risk (Table 1). These plants and animals are listed as either endangered (E) or threatened (T) or rare at the federal or state level, or are species of concern (SC) or special concern. Species of concern or special concern are animals and plants that have the potential of becoming rare.

Table 1. At-Risk Species in Chatham County

Type	Scientific Name	Common Name	State Status	Federal Status	Occurance
Animal Assemblage	N/A	Colonial Wading Bird Colony			Current
Fish	Moxostoma sp. 3	Carolina Redhorse	Threatened	SC	Current
Fish	Ambloplites cavifrons	Roanoke Bass	Significantly Rare	SC	Current
Fish	Etheostoma collis pop. 2	Carolina Darter - Eastern Piedmont Population	Special Concern	SC	Current
Fish	Notropis mekistocholas	Cape Fear Shiner	Endangered	E	Current
Amphibian	Hemidactylium scutatum	Four-toed Salamander	Special Concern		Current
Bird	Haliaeetus leucocephalus	Bald Eagle	Threatened		Current
Bird	Aimophila aestivalis	Bachman's Sparrow	Special Concern	SC	Current
Bird	Lanius ludovicianus	Loggerhead Shrike	Special Concern		Current
Bird	Phalacrocorax auritus	Double-crested Cormorant	Significantly Rare		Current

Bird	<i>Picoides borealis</i>	Red-cockaded Woodpecker	Endangered	E	Historical
Mollusk	<i>Alasmidonta undulata</i>	Triangle Floater	Threatened		Current
Mollusk	<i>Alasmidonta varicosa</i>	Brook Floater	Endangered	SC	Current
Mollusk	<i>Strophitus undulatus</i>	Creepers	Threatened		Current
Mollusk	<i>Toxolasma pullus</i>	Savannah Lilliput	Endangered	SC	Current
Mollusk	<i>Villosa constricta</i>	Notched Rainbow	Special Concern		Current
Mollusk	<i>Villosa delumbis</i>	Eastern Creekshell	Significantly Rare		Current
Mollusk	<i>Villosa vaughaniana</i>	Carolina Creekshell	Endangered	SC	Current
Mollusk	<i>Elliptio roanokensis</i>	Roanoke Slabshell	Threatened		Current
Mollusk	<i>Fusconaia masoni</i>	Atlantic Pigtoe	Endangered	SC	Current
Mollusk	<i>Lampsilis cariosa</i>	Yellow Lampmussel	Endangered	SC	Current
Mollusk	<i>Lampsilis radiata</i>	Eastern Lampmussel	Threatened		Current
Crayfish	<i>Cambarus davidi</i>	Carolina Ladle Crayfish	Significantly Rare		Current
Mayfly	<i>Choroterpes basalis</i>		Significantly Rare		Current
Dragonfly	<i>Gomphus abbreviatus</i>	Spine-crowned Clubtail	Significantly Rare		Obscure
Dragonfly	<i>Gomphus quadricolor</i>	Rapids Clubtail	Significantly Rare		Obscure
Dragonfly	<i>Gomphus septima</i>	Septima's Clubtail	Significantly Rare	SC	Current
Dragonfly	<i>Neurocordulia virginiensis</i>	Cinnamon Shadowdragon	Significantly Rare		Current
Plant	<i>Carex vestita</i>	Velvet Sedge	Significantly Rare		Historical
Plant	<i>Collinsonia tuberosa</i>	Piedmont Horsebalm	Significantly Rare		Current
Plant	<i>Dichanthelium annulum</i>	Ringed Witch Grass	Significantly Rare		Historical
Plant	<i>Enemion biternatum</i>	Eastern Isopyrum	Significantly Rare		Historical
Plant	<i>Eurybia spectabilis</i>	Showy Aster	Significantly Rare		Current
Plant	<i>Fothergilla major</i>	Large Witch-alder	Significantly Rare		Current
Plant	<i>Gillenia stipulata</i>	Indian Physic	Significantly Rare		Historical
Plant	<i>Isoetes virginica</i>	Virginia Quillwort	Significantly Rare	SC	Historical
Plant	<i>Lindera subcoriacea</i>	Bog Spicebush	Threatened	SC	Current
Plant	<i>Monotropis odorata</i>	Sweet Pinesap	Significantly Rare	SC	Current
Plant	<i>Paspalum fluitans</i>	Horsetail Crown Grass	Significantly Rare		Historical
Plant	<i>Phacelia covillei</i>	Buttercup Phacelia	Significantly Rare	SC	Current
Plant	<i>Ptilimnium nodosum</i>	Harperella	Endangered	E	Current
Plant	<i>Scutellaria australis</i>	Southern Skullcap	Significantly Rare		Historical
Plant	<i>Scutellaria nervosa</i>	Veined Skullcap	Significantly Rare		Historical
Plant	<i>Thermopsis mollis</i>	Appalachian Golden-banner	Significantly Rare		Historical
Plant	<i>Trifolium reflexum</i>	Buffalo Clover	Significantly Rare		Historical

Source: NC Natural Heritage Program, July 14, 2010

<http://nhpweb.enr.state.nc.us/search/county.html>.

Note: For full explanation of status, see <http://nhpweb.enr.state.nc.us/search/codes.html>

Table 2 lists natural communities that are considered at-risk, warranting monitoring, according to the North Carolina Natural Heritage Program. Eight of the twenty-one communities are ranked *imperiled* or *critically imperiled*. The communities are ranked according to a universal method developed by scientist experts from natural heritage programs, the Nature Conservancy, Conservation Data Centers, and NatureServe. See below the table for a key to the rankings.

Table 2. At-Risk Natural Communities in Chatham County

Scientific Name	State ² Rank	Global ³ Rank	STATUS
Piedmont longleaf pine forest*	S1	G1?	Current
Piedmont mafic cliff*	S1	G1G2	Current
Basic oak--hickory forest	S3	G4	Current
Rocky bar and shore	S5	G5	Current
Dry-mesic oak--hickory forest	S5	G5	Current
Dry oak--hickory forest	S4	G5	Current
Basic mesic forest (piedmont subtype)*	S2	G5T3	Current
Piedmont/mountain levee forest	S3?	G5	Current
Piedmont monadnock forest	S4	G5	Current
Piedmont/mountain semipermanent impoundment	S4	G5	Current
Mesic mixed hardwood forest (piedmont subtype)	S4	G5T5	Current
Piedmont Boggy Streamhead*	S2?	GNR	Current
Piedmont/coastal plain heath bluff	S3	G4?	Current
Floodplain pool*	S2S3	G3?	Current
Piedmont/low mountain alluvial forest	S5	G5	Current
Hillside seepage bog*	S2	G2	Current
Piedmont/mountain swamp forest*	S1S2	G2	Current
Upland pool*	S1	G1	Current
Piedmont/mountain bottomland forest	S3?	G5	Current
Xeric hardpan forest	S3	G3G4	Current
Upland depression swamp forest	S3	G3	Current

* Ranked Critically Imperiled or Imperiled by state or global code
 Source: North Carolina Natural Heritage Program, retrieved from
<http://nhpweb.enr.state.nc.us/search/county.html> on July 14, 2010
 Explanation of codes: <http://nhpweb.enr.state.nc.us/search/codes.html>
 Further explanation of plant communities can be found at:
<https://www.namethatplant.net/PDFs/class.pdf>

² State Ranks: S1=Critically imperiled; S2=Imperiled; S3=Vulnerable; S4=Apparently Secure; S5=Secure, ?=uncertain.

³ Global Rank: G1=Critically imperiled; G2=Imperiled; G3=Vulnerable; G4=Apparently Secure; G5=Secure; ?=Uncertain; T=subspecies rank; NR=Not Ranked

SPECIAL FOCUS: DEER IN CHATHAM COUNTY

White-tailed deer are one native species that evokes a wide range of opinions and reactions. Some enjoy hunting deer; others fight to protect them. Some people are fascinated by deer as watchable wildlife, but to others they are vilified as a nuisance to crops and gardens. Many people raise concerns in regards to vehicle collisions and threats to forest ecological integrity. This 'special focus' section addresses the question of whether deer are truly overpopulated in Chatham County and illuminates possible causes and solutions to their problematic impacts.



White-tailed deer, Jordan Lake

Over time the eradication of natural predators such as wolves and mountain lions has allowed deer populations to increase in much of the eastern US. Additionally, some human-caused modifications to the landscape have created more habitats favorable to deer. Although their native diet consists of twigs, leaves and herbaceous plants of forests and fields, deer also enjoy browsing on lawns, gardens, and ornamentals. Agricultural areas are not immune to deer's appetite. In fact, deer were responsible for the vast majority of damage due to wildlife predation on soybeans, corn, wheat, peanuts, and cotton -- nearly \$30 million in damage in 2009 in North Carolina -- according to a survey of North Carolina farms (NC Dept. of Ag. and Consumer Services, USDA NASS, 2010). The NC Division of Forest Resources confirms that the damage to Chatham's forests by deer is limited, but damage to agriculture areas is significant (personal interview, Ben Baird, June 22, 2010).

The NC Wildlife Resources Commission (WRC) estimates that Chatham County's 2005 deer population density is approximately 30-45 per square mile, with some areas in the northern and southwestern portions containing greater than 45 (2010). However, population density estimates are only one measure. The Wildlife Resources Commission tracks whether deer are overpopulated by measuring the fat and body weight of hunted animals. If deer are too thin or unhealthy, this is an indication that they are overpopulated, and exceeding the capacity of their habitat. According to WRC biologists, the deer that have been measured are healthy and thus not considered overpopulated in Chatham County at present (George Strader, personal communication, June 27, 2010).

Hunting has contributed to the management of a healthy deer population. Figure 4 shows the annual deer harvest in the County according to Wildlife Resources Commission data (http://www.ncwildlife.org/Wildlife_Species_Con/WSC_Deer.htm). Deer harvests over the last several years have ranged from 2300 to 3200 per year. Still, in developed portions of the county, deer cannot be hunted due to local restrictions or landowner opposition, which creates local pockets of higher deer populations. Local aggravation is fomented by factors such as the rate at which landscaping and garden plants are consumed and number of deer- vehicle collisions. Recently some subdivisions

in the region have responded by initiating an urban bow-hunting program, which allows careful harvesting of deer in areas which cannot accommodate firearms.

Thus, although deer populations have not exceeded their biological carrying capacity, in some areas (often developed areas) they have exceeded their 'cultural carrying capacity'—in other words they are perceived as an unacceptable pest in the minds of local residents (George Strader, personal communication, June 27, 2010).

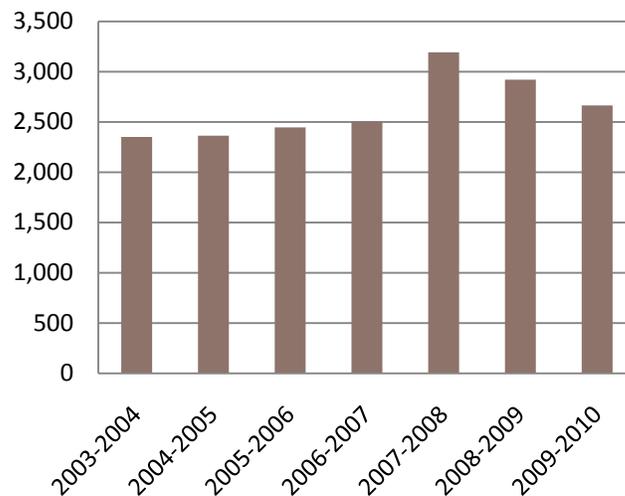
In addition to hunting programs, there are other ways to control damage inflicted by deer. A publication by the WRC describes various repellents and exclusion strategies for residential areas found

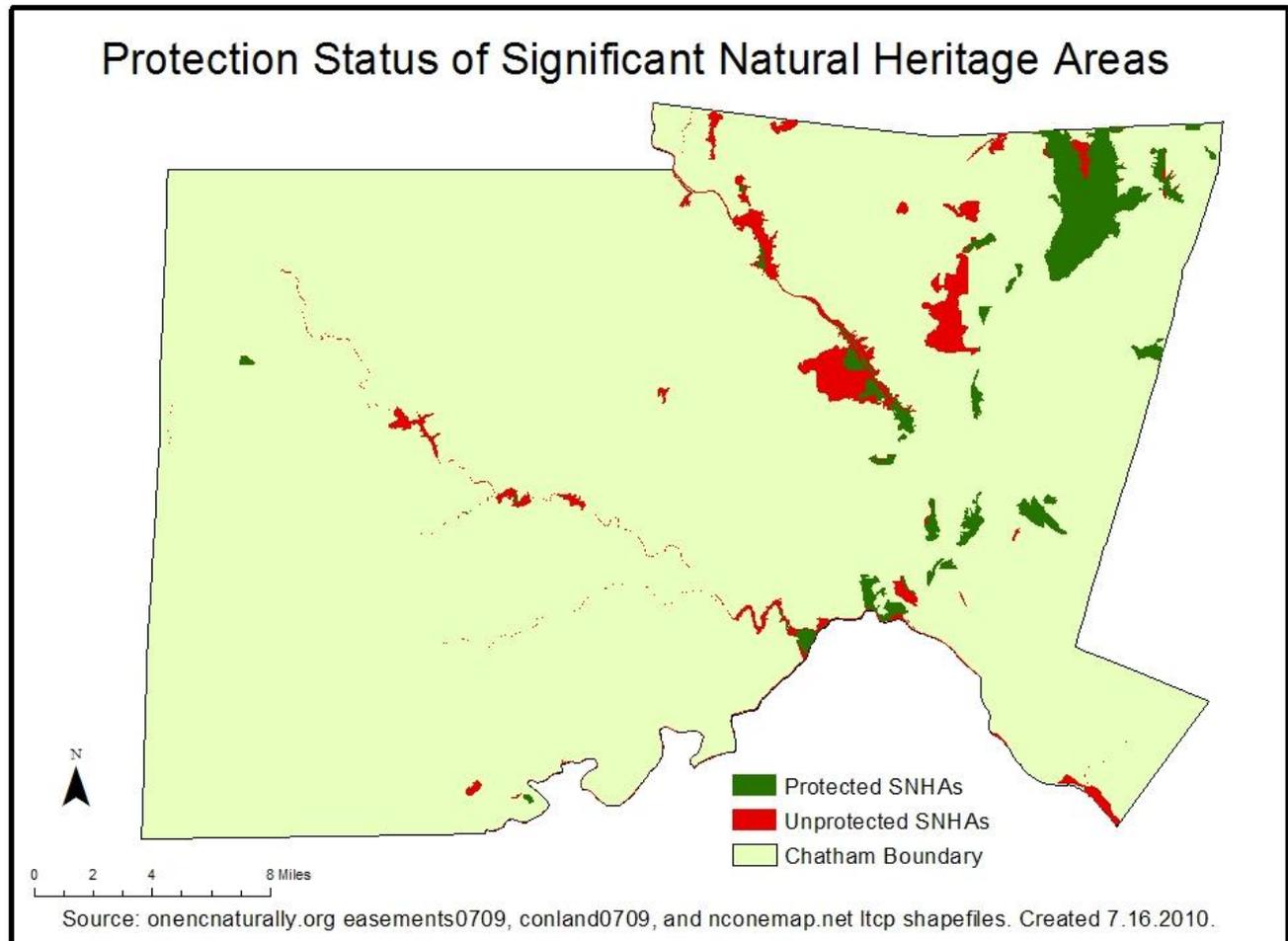
at http://www.ncwildlife.org/Nuisance_Wildlife/documents/pg6a1_deer.pdf. Collisions with vehicles can be reduced by following these tips:

http://www.ncwildlife.org/Nuisance_Wildlife/index.htm. Finally, advice for reducing agricultural damage can be found here:

<http://www.ces.ncsu.edu/nreos/wild/pdf/wildlife/DEER.PDF>

Figure 4. Annual Deer Harvest





INDICATOR: PERCENTAGE OF PROTECTED SIGNIFICANT NATURAL HERITAGE AREAS

Status: 58% in 2001 (consisting largely of Jordan Lake property)

The North Carolina Natural Heritage Program has identified areas that contain rare wildlife and rare natural communities in the county (see 'Natural Heritage Program' side bar). In 2001, 12,057 acres of the total 21,043 acres of Significant Natural Heritage Areas (SNHAs) were protected, about 58%.

Map 1 shows protected and unprotected Natural Heritage Areas. Most of the protected SNHAs are part of federally owned Jordan Lake properties. Some ways in which lands can become protected is through purchase by or donation to land trusts such as the Nature Conservancy and Triangle Land

Conservancy, application for easement status voluntarily by the landowner, purchase by federal, state or local governments for the purposes of conservation, or by the initiation of other voluntary conservation agreements.

Natural Heritage Program

The North Carolina Natural Heritage Program is an initiative of the state's Department of Environment and Natural Resources. The Natural Heritage Program conducts county inventories of animals, plants, and natural communities throughout the state. The program aims to document the status and distribution of rare wildlife and rare habitats in order to inform planning and conservation.

Significant Natural Heritage Areas (SNHAs) are places that Natural Heritage Program biologists deem important for biodiversity conservation. These areas often contain the best examples of natural communities and often include rare and endangered species.

Why are inventories of natural areas needed?

Natural areas are important resources that make North Carolina an attractive place to live in and to visit, providing both recreational and scenic enjoyment. Additionally, they are critical reservoirs of biological diversity and provide habitat for thousands of species. Identifying these resources is the first step towards protecting them. For more information, visit <http://www.ncnhp.org/index.html>

INDICATOR: LAND COVER

Status: 63.2% forest, 18.1% agricultural land, 8.0% grassland/shrub, 5.3% urban, 3.8% open water, 1.3% wetland, and 0.4% barren in 2001

Trend: Decrease in forest; increase in grassland/shrub from 1992-2001

Land cover is measured by the USGS National Land Cover Database, taken from satellite images of the visual light spectrum. Table 3 and Maps 2 and 3 show the land cover in the county in 1992 and 2001 (the most recent data available). Forest covers 63% of the county—a vast and valuable resource for absorbing and cleansing rainwater, reducing flooding, cleaning the air, providing habitat, providing jobs and economic resources, and recreational opportunities.

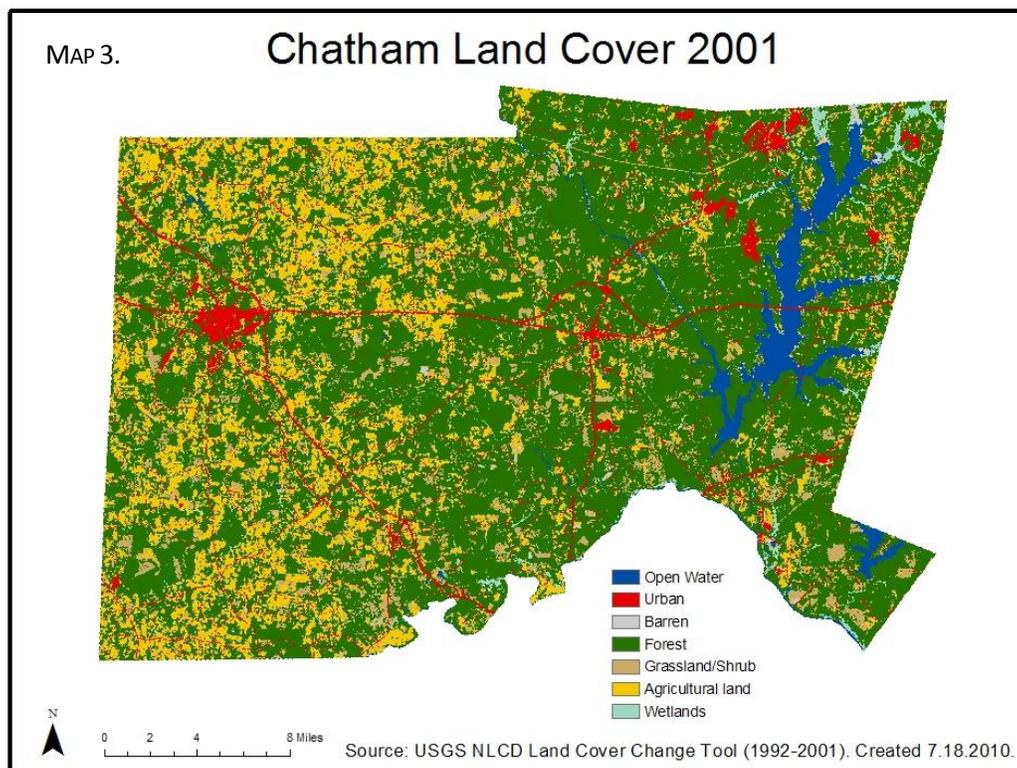
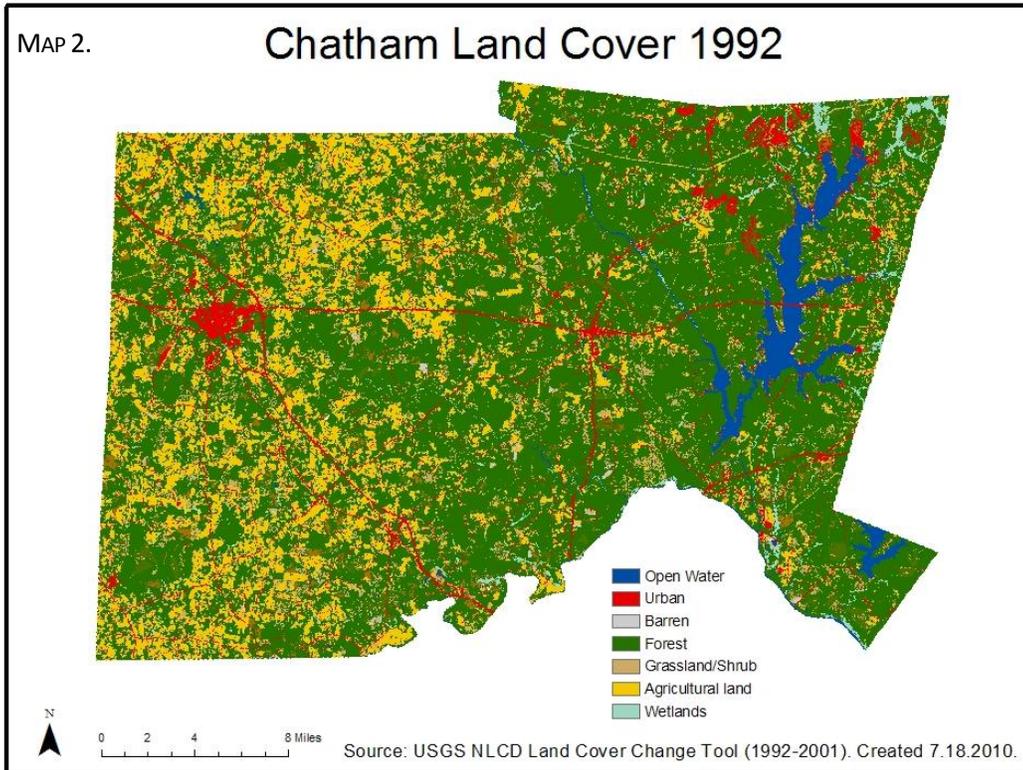
Table 3. Land Cover in Chatham County, 1992 and 2001

	1992	2001	Change
Forest	65.7%	63.2%	↓
Agricultural land	18.8%	18.1%	↓
Grassland/Shrub	5.7%	8.0%	↑
Urban	5.1%	5.3%	↑
Open Water	3.2%	3.8%	↑
Wetlands	1.3%	1.3%	0
Barren	0.2%	0.4%	↑
	100%	100%	

Forest land cover decreased by 2.5%, nearly 10,900 acres. Concurrently, there were slight increases in urban area and barren land. The increase in grassland/shrub land cover likely signifies harvesting of forestland or clearing for development. A positive outcome is that wetlands acreage did not change by this measure.

Note: The Multi-Resolution Consortium's (MLRC) National Land Cover Database (NLCD) measures land cover in 30-meter sized pixels. No formal accuracy assessment has been completed for the NLCD Change Tool. For more information on methods, see <http://pubs.usgs.gov/of/2008/1379/pdf/ofr2008-1379.pdf>

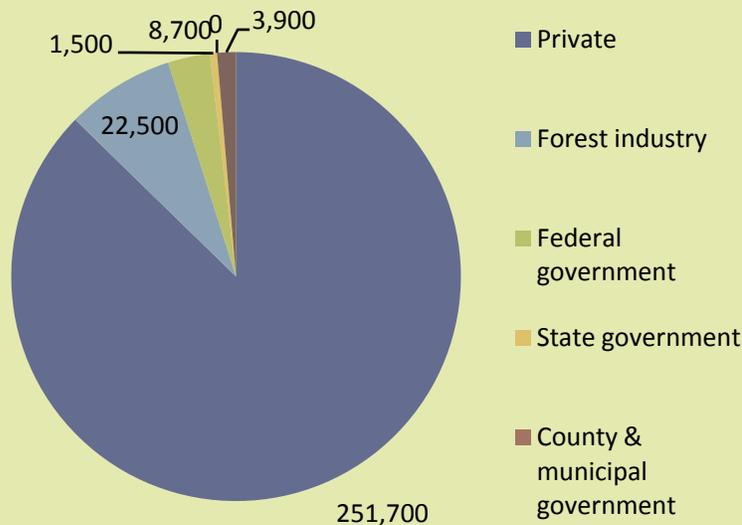
Source: MLRC NLCD 1992-2001 Change Tool



Forest Ownership

As Figure 5 illustrates, the majority of forests in Chatham County are privately owned (89%), followed by the forest industry (8%), and the Federal Government (3%). Some acres are owned by the state. No forest lands are owned by county or municipal governments according to this source.

Figure 5. Chatham County Forest Ownership, 2002 (Acres)

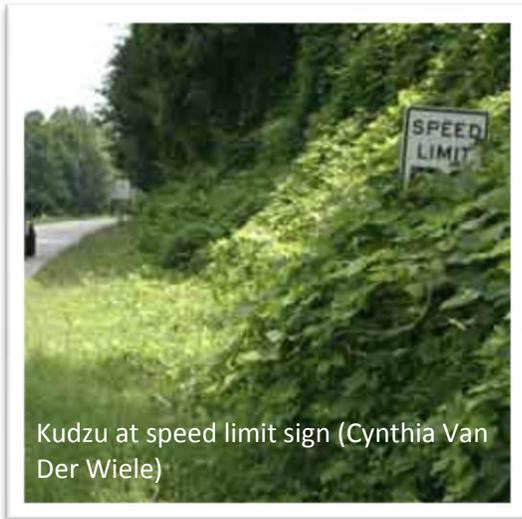


Note: Productive-reserved forest land is 'forest land sufficiently productive to qualify as timberland but withdrawn from timber utilization through statute or administrative regulation' (Brown, 2004)

Source: North Carolina Forest Statistics, 2004. <http://www.treesearch.fs.fed.us/pubs/6274>

North Carolina's Forest Development Program

The state Division of Forestry provides a cost-share program for reforesting clear-cut areas on private land. The program helps reduce erosion, improve water quality, and renew forest resources. A final harvest, or clear cutting, occurred on 1,956 acres owned by private landowners in the county in 2009. Partial harvest occurred on 1,121 acres. Through the program, 945 of all harvested acres were replanted -- about 31%. Even so, Chatham County forest ranger Ben Baird reports that the acreage of harvest and reforestation are unusually low due to the timber market. Normally about 1,000 to 3,000 acres are replanted every year, contributing to sustainable forest resource management in the county (personal communication, June 14, 2010).



Kudzu at speed limit sign (Cynthia Van Der Wiele)

INDICATOR: INVASIVE PLANTS

Status: Unknown

Trends: Unknown

Some plants that are introduced from foreign lands escape into natural areas and become invasive, out-competing native plants and compromising the delicate balance of life in native ecosystems.

Eventually, if no action is taken, some invasive species can permanently alter the structure of native habitat (Wilcox et. al, 1998). Many so-called 'invasives' occur in Chatham County, such as kudzu,

Japanese honeysuckle, and Chinese wisteria. Localized infestations of kudzu are perhaps the most destructive.

Invasive exotic plants are introduced into wild lands in a variety of ways. Some escape from gardens, some were originally planted for wildlife habitat or erosion control purposes, and some were introduced inadvertently, such as spread of seeds lodged in hiking shoes or tire treads. Once established they grow and reproduce rapidly and effectively, whether by vegetative growth, wind dispersal, water dispersal, or spread by animals. They have few if any natural predators or diseases, and thrive in the local climate and soils.

Invasive plants often have an edge in colonizing disturbed land. Once plants have been established, they spread to nearby natural communities. New plants and pests are introduced every year, and the incidence of introduced species should be monitored carefully.

Invasive species can lead to a decrease in biodiversity. In one biologist's words, "we don't look for rare species in areas where kudzu is present" (John Finnegan, personal communication, July 7, 2010). Invasives out-compete native plants for soil, water, sunlight, and space. Vines growing on trees can reduce sunlight available to the tree's leaves, and can weaken and weigh down trees, increasing their susceptibility to disease and blow-downs in storms. Invasive plants on the forest floor can emerge before native spring wildflowers, reducing native plants' access to sunlight. Many invasives have the ability to change the chemical composition of soil, making it less hospitable for native plants. Over time, invasive plants can completely dominate an area, overwhelming all other plants and trees beneath. A paucity of native plants alters the food web upon which native animals depend. This is particularly harmful to rare species and those that have a specialized diet. Non-native species are the second highest threat to endangered species in the United States after habitat loss (Wilcove et al. 1998).

Invasives have other significant environmental and financial consequences. Some invasives, such as English Ivy, can lead to soil erosion on steep slopes and stream banks, affecting water quality. Invasive plants cause economic losses to forests and agriculture and increase roadside maintenance costs (NC Native Plant

Society, 2010). “Non-indigenous species spread at the rate of [about] 700,000 hectares per year in the US with an impact on human economic systems estimated in the billions of dollars” (Pimentel et al. 2001).

Currently there is no county-level invasive plant list. A state list is presented in place of a county list. The following is a list of the most damaging invasive plants.

Table 4. North Carolina Most Damaging Invasive Species

Scientific name	Common name
<i>Ailanthus altissima</i> (Mill.) Swingle	Tree of Heaven
<i>Albizia julibrissin</i> Durz.	Mimosa
<i>Alliaria petiolata</i> (Bieb.) Cavara & Grande	Garlic-mustard
<i>Alternanthera philoxeroides</i> (Mart.) Griseb.	Alligatorweed
<i>Celastrus orbiculatus</i> Thunb.	Asian bittersweet
<i>Elaeagnus angustifolia</i> L.	Russian olive
<i>Elaeagnus umbellata</i> Thunb.	Autumn olive
<i>Hedera helix</i> L.	English ivy
<i>Hydrilla verticillata</i> (L.f.) Royle	Hydrilla
<i>Lespedeza bicolor</i>	Bicolor lespedeza
<i>Lespedeza cuneata</i> (Dum.-Cours.) G. Don	Sericea lespedeza
<i>Ligustrum sinense</i> Lour.	Chinese privet
<i>Lonicera fragrantissima</i> Lindl. & Paxton	Fragrant honeysuckle
<i>Lonicera japonica</i> Thunb.	Japanese honeysuckle
<i>Microstegium vimineum</i> (Trin.) A. Camus	Japanese stilt-grass
<i>Murdannia keisak</i> (Hassk.) Hand.-Mazz.	Asian spiderwort
<i>Myriophyllum aquaticum</i> (Vell.) Verdc.	Parrotfeather
<i>Paulownia tomentosa</i> (Thunb.) Sieb.&Zucc. ex Steud.	Princess tree
<i>Persicaria perfoliata</i> (Linnaeus) H. Gross (= <i>Polygonum perfoliatum</i> L.)	Mile-a-minute vine
<i>Phragmites australis</i> (Cav.) Trin. ssp. <i>australis</i>	Common reed
<i>Pyrus calleryana</i> Decne.	Bradford pear
<i>Polygonum cuspidatum</i> Seib. & Zucc.	Japanese knotweed
<i>Pueraria montana</i> (Lour.) Merr.	Kudzu
<i>Rosa multiflora</i> Thunb.	Multiflora rose
<i>Salvinia molesta</i> Mitchell	Aquarium water-moss
<i>Vitex rotundifolia</i> L.f.	Beach vitex
<i>Wisteria sinensis</i> (Sims) DC	Chinese wisteria

Source: NC Native Plant Society, 2010, <http://www.ncwildflower.org/invasives/list.htm>

A variety of approaches is needed to reduce the damage from invasive plants. First is to avoid planting them –unfortunately, many invasive species are still sold in

plant nurseries. Existing infestations can be address by halting their spread, preventing shoots or vines from becoming established in unaffected areas, and eradicating species from certain areas where possible. Methods used include pulling by hand or with the use of tools and machinery, persistent mowing or cutting, and the use of herbicides (Swearingen et al, 2002). It is important to utilize the most effective method to treat each species. Restoring native plants to degraded areas helps ecosystems recover in some cases. Avoiding disturbance to natural areas reduces their susceptibility to exotic plant invasions (NC Native Plant Society, 2010).

AGRICULTURE

INDICATOR: ACRES OF FARMLAND

Status: 104,171 acres in 2007

Trend: Mixed from 1992-2007

Farm acreage trends are one measure of the strength of the agricultural economy. Since 1950, the US has seen an increase in farm size, a fewer number of farms, and a slight decrease in the overall acres of farmlands. Concurrently, productivity rose and urban and suburban areas expanded into farmland (USDA National Agricultural Statistics Service, 2009). Monitoring the amount of acres in farms, number of farms, and size of farms can help identify local agricultural sector trends.

Chatham County has diverged from the national trends on two measures, and followed trends on two others. In recent years, from 1992 to 2007, the number of farms in Chatham County has increased slightly (926 in 1992, and 1,089 in 2007) and the size of farms has decreased slightly. The average farm size was 117 acres in 1992 and 96 acres in 2007. The amount of land in agricultural production has fluctuated with a net decrease of 4% (see Table 5) (USDA, 2008). The average age of principal farmers rose from 49.3 in 1997 to 57.3 in 2007.

Table 5. Farmland Acreage in Chatham County, 1992-2007

1992	1997	2002	2007	% Change
108,363	112,923	118,752	104,171	-4%

Source: USDA National Agricultural Statistics, <http://www.agcensus.usda.gov/index.asp>



The county's livestock value is exceptional. Chatham County was 1st among counties in North Carolina for sheep, goats and their products in 2007. County farms produced the 7th highest value in poultry and eggs in the state, and 48th among counties in the nation. The county was 3rd in the state for market value of cattle and calves (USDA 2008).

INDICATOR: CERTIFIED ORGANIC AGRICULTURE

Status: 327 acres used for certified organic production (2007)

Trend: 61 additional acres being converted to organic production (2007)

USDA Certified Organic farms must meet rigorous criteria, including production without the use of synthetic fertilizers or pesticides, hormones, or preventative administration of antibiotics (US Congress, 2005). Organic soils and products are periodically tested for residues to ensure their organic status. Manure can be used for fertilizer, but must not harm local waterways, and animals must have some access to pasture.

Consumer demand for Certified US Organic foods and beverages has grown in the last few decades. Sales in 1990 (\$1 billion) have jumped nearly twenty-five fold to \$24.8 billion in 2008 (Organic Trade Association, 2010). Some Chatham County farms have capitalized on this market.

Of the 104,171 acres of farms in Chatham County, 327 were certified organic and 61 were in the process of being converted to organic in 2007 according to the National Agricultural Statistics Service. Among other counties in the Triangle region, Chatham has the highest total organic farm acreage (see Table 6).

Table 6. Triangle Region Organic Acreage, 2007

	Land in farms	Acres used for organic production*	Acres being converted to organic	Acres currently organic + converting organic	Percent farmland currently organic + converting organic
Chatham	104,171	327	61	388	0.4%
Durham	26,150	40	0	40	0.2%
Johnston	194,090	3	61	64	0.0%
Lee	36,210	12	Unknown	12	0.0%
Orange	60,057	171	75	246	0.4%
Wake	84,956	118	0	118	0.1%

Note: Organic acreage data was self-reported

Source: National Agricultural Statistics Service

http://www.agcensus.usda.gov/Publications/2007/Full_Report/Volume_1,_Chapter_2_County_Level/North_Carolina/st37_2_043_043.pdf

*Includes cropland and pastureland

SUSTAINABLE AGRICULTURE IN CHATHAM COUNTY

USDA Organic certification involves meeting rigorous criteria and submitting fees and documentation. Many farmers contend that their practices are the same or even more 'sustainable' than certification requires, but since becoming certified is expensive and difficult, they choose not to do so. Without the benefits of the label, farmers seek other creative means of marketing their earth-friendly fare. Chatham farmers have successfully fostered relationships with local clients, and marketed directly to customers. In fact, these niche markets have such high

demand that often organic certification is not deemed necessary, even if actual farming practices would meet requirements. In a local market, it seems, sustainable farming practices are evident to customers, with or without the official label.

Source: Debbie Roos, personal communication, November 10, 2010

ENVIRONMENTAL, HEALTH, AND ECONOMIC BENEFITS OF LOCAL FOOD MARKETS

Many factors determine the relative environmental benefits of local versus non-local conventional food sourcing. Local food may not necessarily produce less air emissions from transportation. While many conventional food items often travel hundreds of miles, the high volume of goods carried in one truck creates an economy of scale, while local produce may travel several miles in more numerous smaller vehicles to a farmer's market or restaurant.

The benefits to water quality, soil carbon sequestration, and wildlife are other factors that affect the equation. Some consumers find that small, local farms practice environmental stewardship as members of the community, but larger farms can also do their part.

There are many non-environmental benefits of eating local products, such as being able to cultivate relationships with those who grow one's food, which fosters trust, accountability and social cohesion. Health benefits of eating fresh produce and economic benefits to local farmers are clear. According to Harvard Medical School's Center for Health and the Global Environment, local food tends to be more nutritious due to the shorter time period between farm and consumer, and gentler handling (N.d.). Buying locally allows a higher percentage of food expenditures to be returned to the farmer, contributing to a viable farm economy. While it seems likely that local food markets are beneficial overall, further study could illuminate the environmental benefits of Chatham-specific farms, markets, and Community Supported Agriculture.

INDICATOR: LOCAL FOOD MARKETS

Status: 4 farmer's markets and 11 Community Supported Agriculture (CSA) organizations (2010)

Trend: Increasing from two to four farmer's markets from 2005 to 2010, 1 to 11 CSAs from 2001 to 2010.

Depending on various factors, local food markets can contribute to environmental benefits as well as health and economic benefits (see "Environmental, Health and Economic Benefits of Local Food Markets" side box). The demand for local food has risen dramatically in the last 30 years, reflected in the amount of direct farm-to-client sales in the county. This change can be measured by



One farmer's market in Chatham County
(<http://www.ces.ncsu.edu/chatham/ag/SustAg/index.html>)

the increase in the number of CSAs, and the rise in number of farmer's markets. The number of farmer's markets doubled in the last five years, and CSAs have proliferated (Debbie Roos, personal communication, November 10, 2010).

INDICATOR: COMMUNITY AGRICULTURE

Status: 5 community gardens (2010)

Trends: Increasing from 2005 to 2009

Demand for community gardens has risen with increasing development in the county in recent years. Chatham County Community Conservation Assistance Program, which helps educate and connect homeowners with resources for installing BMPs in non-farm lands has been popular, indicating enthusiasm for 'urban agriculture' (Brenda Williams, personal communication, June 14, 2010). Within the last five years a few school-oriented gardens and five community gardens, including Bynum Community Garden, have been implemented with county advice or support (Al Cooke, personal communication, November 12, 2010).

INDICATOR: PARTICIPATION IN THE PRESENT USE VALUE PROGRAM

Status: 200,345 acres (2007)

In the 1970s the North Carolina General Assembly devised the Present Use Value Program to reduce development pressure on working lands -- farmland, forestland, and horticultural lands -- by providing relief from crippling property taxes. Rather than assessing property taxes based on the most expensive potential use, an assessment was made on the 'highest and best use' which in rural areas, was the current use of farmland or forestland (North Carolina Use-Value Advisory Board, 2010). The assessment is based on the rent price of similar agricultural land, or net income from timber production on forestland. Recognizing that working lands are a crucial component of the local economy, the program aims to ensure that farmland, forestlands, and horticulture is protected in areas where it is ideal, and that development is discouraged in inappropriate areas.

In Chatham County in 2007, 46% of all county acreage (200,345 acres) was enrolled in the present use value program (Tina Stone, Tax Administrator, Chatham County Tax Administration, personal communication May 3, 2010; reported in Hess, 2010). This number is higher than the acreage in farms since it includes forests and horticultural lands. This rate of enrollment is on par with surrounding counties: 40% of Orange County acreage is enrolled; in Lee County it is 41% (Reported in Hess, 2010).

Evaluation and monitoring of the program could ensure that it is successful in its goals of preserving prime agricultural and forest land from development.

INDICATOR: PARTICIPATION IN VOLUNTARY AGRICULTURAL DISTRICTS

Status: 26,200 acres (2009)

Chatham County launched a Voluntary Agricultural District program in 2000. The program requires a minimum of 20 acres of one or more farms located within one mile of each other to apply. The program's objectives are to encourage

the preservation of farmland, to provide farmers protection from nuisance suits, and to protect farmers from bearing the financial burden of infrastructure development (NC Cooperative Extension, 2002). To qualify, a farm must participate in the present use value program, be a Natural Resources Conservation Service certified farm, be managed with Soil Conservation Service erosion control practices, or have entered into a conservation agreement. The application is submitted to the Chatham County Agricultural Advisory Board who makes final determinations.

According to the county's Agriculture Land Use Plan, there were **26,200 acres in Voluntary Agricultural Districts in 2009**, which is much higher than other agricultural counties in the region (reported in Hess, 2010). For comparison, Johnston County has 11,110 voluntary agricultural district acres and Orange County has 2,734. More information, including a map of the county's enrolled parcels can be found here: <http://www.ces.ncsu.edu/chatham/ag/FPP/index.html>.

INDICATOR: BEST MANAGEMENT PRACTICES

Status: From 2005-2009, BMPs were applied to 30,303 acres and 107,296 linear feet (such as fencing) and 221 single facilities were installed (such as ponds or wells)

Agricultural Best Management Practices, commonly called 'BMPs,' are actions farmers can take to reduce erosion, improve water quality, and decrease the amount of nutrients entering waterways. Common types of BMPs include excluding livestock from ponds and streams, managing waste, and erosion control. Many BMPs have multiple benefits to farmers, the environment, and the community. Chatham County Soil and Water Conservation Service provides education and outreach and helps to connect farmers with state and federal funding to implement conservation measures.

There is a high rate of participation in Chatham County. Brenda Williams, the Soil and Water Conservation Department Director, reports that funds for projects are usually spent by the end of the fiscal year, reflecting the demand for environmental programs (personal communication, June 14, 2010). Table 7 shows the funds obligated and spent from 2005-2009.

Tables 8, 9, and 10 list the top Best Management Practices and other Conservation Practices by dimension type—whether the BMP is applied to area of land in acres, measured in feet, or a single facility, such as a well. Appendix 3 contains the full list of BMPs.

Table 7. Five Year Total (2005-2009) Cost Share Funding

Source	Obligated	Expended	% Expended	% Remaining
USDA	\$2,106,589	\$1,852,250	88%	12%
State of North Carolina	\$606,678	\$606,678	100%	0%
Total	\$2,713,267	\$2,458,928	91%	9%

Table 8. Top Five Applied Single Facility Best Management Practices (BMPs) and Conservation Practices, 2005-2009

	Number Applied
Watering Facility	76
Water Well	60
Comprehensive Nutrient Management Plan	23
Pumping Plant	17
Stream Crossing	15
All others	30
Total	221

Table 9. Top Five Applied Linear BMPs & Conservation Practices (Ft.), 2005-2009

	Length (ft.) Applied
Fence	58,245
Pipeline	29,601
Firebreak	9,248
Field Border	5,590
Animal Trails and Walkways	4,612
All others	0
Total	107,296

Table 10. Top Ten Applied Area BMPs & Conservation Practices (Acres), 2005-2009

	Area (Acres) Applied
Waste Utilization	6,481
Nutrient Management	6,145
Forage Harvest Management	3,315
Residue and Tillage Management, No Till	3,294
Conservation Crop Rotation	2,598
Residue Management, Seasonal	1,804
Pasture and Hay Planting	1,598
Forest Stand Improvement	1,437
Prescribed Burning	1,359
Long Term No Till	999
Native Plant Restoration and Management	478
All others	795
Total	30,303

Source for Table 8-10: Summary of files received from Brenda Williams, Chatham County Soil and Water Conservation Department Director

LAND RESOURCES: LOOKING AHEAD

POLICIES THAT AFFECT LAND RESOURCES

The main sources of policy protecting biodiversity are at the federal and state levels. Agricultural land is impacted by policies at the federal, state and local levels and broader economic forces. At the local level, land cover is influenced by zoning, land use and comprehensive plans and through the development review process.

POLICY ACHIEVEMENT: CHATHAM COUNTY FARMLAND PRESERVATION PLAN

This plan, which consists of two parts -- Agricultural Economic Development and Agricultural Land Use -- was accepted by the County Commissioners in March, 2010. While the plan is not an environmental plan per se, the document outlines strategies to improve the profitability of farming, protecting agricultural land from development. The plan is found at <http://www.chathamnc.org/Index.aspx?page=1416>.

SPECIAL FOCUS: GREEN DEVELOPMENT

Subdivisions and rural developments range widely in their environmental impacts, depending on where they are located and how sites are designed. Green building, environmental planning and environmental design principles aim to protect water quality, be energy efficient, and preserve wildlife habitat -- ameliorating the impacts of development. Three examples of environmentally-friendly development paradigms are listed in Table 11.

Table 11. Environmentally-Oriented Development Types

Development Type	Main Focus	Link
Low-Impact Development	Water quality	http://www.epa.gov/owow/NPS/lid/
Leadership in Energy & Environmental Design (LEED)	Green building	http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1988
Conservation Subdivisions	Preserving open space & ecological functions	http://www.smartcommunities.ncat.org/greendev/subdivisions.shtml

What makes a development environmental is not always intuitive. The following points help to clarify a few nuances of environmentally-friendly development.

Preservation and renovation of existing buildings tends to be more efficient overall than creating new green buildings.

Construction and materials require a lot of energy. Also, an energy-efficient building that is located far from jobs and services may induce more emissions from transportation than it saves. LEED guidelines now incorporated in these ideas.

Development characteristics can influence the size of residents' 'footprint' on the earth and infrastructure costs per person (see http://www.epa.gov/climatechange/emissions/ind_calculator.html to calculate your carbon footprint).

Efficient, livable communities contain a mix of uses, are compact, pedestrian and bike-friendly, favor hardy vegetation and trees rather than large expanses of lawn, contain a diversity of housing types, are located near jobs, shopping, services, and entertainment, and offer transportation options. These developments have lower infrastructure costs per dwelling unit when compared to traditional sprawl. Aging demographics, changing household composition, and changing tastes mean that smaller lots and more compact developments are becoming more popular, and therefore more profitable, in many areas (Ford, 2010). But for those whose livelihood compels them to live in suburban or rural areas, or for those who choose not to live near an activity center, site design and a variety of individual choices can effectively reduce impacts on the environment.

Building more lanes can bring more traffic.

Some studies show that although widened highways reduce emissions by reducing congestion in the near term, in the long term, the extra lanes induce more vehicles to venture out on the road. Highway widening tends to increase long-term emissions from the combined extra vehicular travel and construction and materials emissions (Williams-Derry, 2007).

Large-lot zoning sometimes has hidden environmental consequences.

Large-lot zoning is appropriate in some locations due to reliance on septic or well systems, fragile environmental conditions, and in areas that are farther from towns and cities. Large-lot zoning is most environmentally protective when lot minimum is very large (20 to 40 acres) so that developers are not encouraged to build continuous 5-acre estates (Center for Watershed Protection, 2008; Daniels and Daniels, 2003). In areas experiencing growth, medium-large lots (2-10 acres) encourage the development of a larger amount of land area. "While large lot zoning does tend to reduce the impervious cover and therefore the amount of stormwater runoff at a particular location, it also spreads development over vast areas [resulting in sprawl]. The road networks required to connect these large lots can actually increase the total amount of imperviousness created for each dwelling unit," increasing environmental impacts (Center for Watershed Protection, 2008).

Green Development Types



Farrington Village, cluster development



Land use patterns



Energy & water efficient buildings



Low-Impact Development

SPECIAL FOCUS: CHATHAM CONSERVATION PARTNERSHIP

The Chatham County Partnership (CCP)'s mission is to build awareness, protection and stewardship of Chatham County's natural resources. The CCP released a Comprehensive Conservation Plan in 2011. The plan's goals are to increase awareness and knowledge of the economic benefits of natural resources, identify threats to their integrity, and to develop preferred strategies to manage and protect important natural areas. The CCP consists of over 50 organizations and participants, including federal, state, and local government agencies, non-profits, business owners, developers, and landowners, including the Chatham County Board of Commissioners. Project leaders also conducted outreach to local environmental boards and the public to gain feedback on setting conservation priorities.

The Chatham Conservation Plan builds on current conservation models such as the NC Conservation Planning Tool, NC State Wildlife Action Plan, the Southern Forest Land Assessment and the NC Forest Resource Assessment. The CCP will provide updates, additions and other modifications so that these tools can be applied at the county and local level.

Elements of the Plan

1. Recommended strategies for implementation and protection/management of important natural resources based on the prioritization of wildlife habitat, water quality, agriculture, and forestry
2. An updated Environmental Resource Database
4. Conservation layers and maps: updates include streams, wetlands, and State Wildlife Action Plan layers
3. A Model: identification of areas that meet the State's Wildlife Action Plan (SWAP) and stakeholder priorities
5. On-line (non-technical) instructions for navigating the plan and the tools
6. A Policy Database: summary of all current policies affecting Chatham's environment

More information on the Chatham Conservation Partnership and Conservation Plan can be found here:

<http://chathamconservation.wikispaces.com/>

LAND RESOURCES RECOMMENDATIONS

The county should continue efforts to balance growth and development to support biodiversity, natural communities, and agricultural resources.

- Work with local stakeholders and utilize tools to implement a plan for conservation of biologically diverse areas and forestland, such as the Chatham Conservation Partnership Plan
- Continue to support efforts of the Natural Heritage Program to track rare species and rare communities
- Work with partners to begin an invasive plants inventory and map
- Work with local landowners to protect land in special habitats
- Continue to support reforestation efforts of the Forest Redevelopment Program
- Monitor deer populations and their local impact on forests
- Implement the Chatham Agriculture Economic Development and Agricultural Land Use Plans to support Chatham County's diverse agricultural economy
- Monitor the effectiveness of Voluntary Agricultural Districts, Present Use Value, and other incentives in preserving working lands in appropriate areas
- Continue to implement agricultural Best Management Practices in the county that are shown to achieve effective environmental objectives
- Continue to explore opportunities to create and sustain additional community and school gardens

WATER RESOURCES

Tick Creek (John Alderman)

Water is a multi-purpose resource, used for drinking, recreation, irrigation, industry, and electric power generation. Water is also an important component of wildlife habitat. These are a few of the many justifications for proper stewardship of water quality in our streams, lakes, rivers, and underground. Groundwater is affected by activities on the land above. Similarly, most of the work to protect surface water quality focuses on activities that occur on the land that drains to given water body, known as a watershed.

There are seventeen main watersheds in North Carolina; Chatham County drains to the Cape Fear River Basin. Zooming in, each river, lake and stream in the county has its own watershed. The county has three major river watersheds, draining to the Haw, Deep, and Cape Fear Rivers. Groundwater follows a similar topography, but it moves much more slowly.



Source: NC DENR

This section begins with an assessment of surface waters, first quantifying major and minor wastewater discharges, and next presenting impaired streams in the County. Then two major watershed restoration initiatives are highlighted: Tick Creek and Robeson Creek.

Second, threats to groundwater are examined, focusing on reported underground storage tank incidents.

Finally, water supply indicators are examined, including water use as reported by the US Geologic Survey, and the latest county drinking water report.

The section concludes with brief summaries of policy achievements, ongoing issues, and recommendations going forward.

SURFACE WATERS

INDICATOR: MAJOR AND MINOR DISCHARGES

Status: Four major dischargers totaling over 14 million gallons a day and 21 minor dischargers totaling 1.4 million gallons a day in 2004

Major and Minor discharges are defined under the Federal Clean Water Act. Entities that discharge wastewater to a surface waterway must obtain a permit under the National Pollutant Discharge Elimination System (NPDES), which places limits on the amount and types of pollutants that can be discharged by different users. NPDES permit holders are classified into two types:

1. Major:

- Publicly Owned Treatment Works (i.e. wastewater treatment plant) facilities with discharge flows of **more than 1 million gallons per day**
- Active industrial facilities that score higher than 80 for six factors⁴ in the 'NPDES Permit Rating Work Sheet'

2. Minor:

- Publicly Owned Treatment Works facilities that discharge **less than 1 million gallons a day** (which generally serve less than 10,000 people)
- Active industrial facilities that score less than 80 on the 'NPDES Permit Rating Work Sheet' (worksheet found here <http://www.epa.gov/npdes/pubs/owm0116.pdf>)

There is some discretion on the part of regional administrators to place facilities in one category or another based on local information in consultation with the permitting authority. For more information, see <http://www.epa.gov/waterscience/standards/academy/supp/permit/page5.htm>.

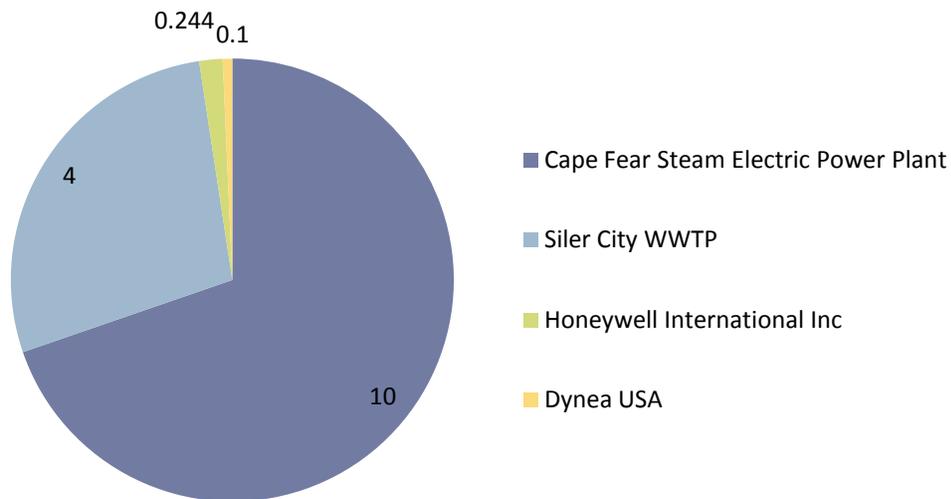
Tables 12 and 13 present the minor and major dischargers, amount in million gallons a day (MGD) permitted, and receiving stream, as of October 27, 2004. There are four major dischargers in the county. The largest is the Cape Fear Steam Electric Power Plant (also a substantial water user). All NPDES permit holders comply with regulations concerning allowable discharges—including the amounts and types of pollutants wastewater contains.

⁴ Six Factors: Toxic Pollutant Potential, Flow/Stream Flow Volume, Conventional Pollutants, Public Health Impact, Water Quality Factors, Proximity to Coastal Waters

Table 12. Major Discharges to Surface Waters (2004)

Property Owner	Facility	MGD	Receiving Stream
Progress Energy Carolinas, Inc	Cape Fear Steam Electric Power Plant	10	Cape Fear River
Town of Siler City	Siler City WWTP	4	Loves Creek
Honeywell International Inc.	Honeywell International Inc	0.24	Haw River
Dynea USA, Inc.	Dynea USA	0.1	Haw River
Total		14.34	

Source: NC Division of Water Quality

Figure 6. Major Discharges by Source (MGD)

Source: NC Division of Water Quality

Table 13. Minor Discharges to Surface Waters

Property Owner	Facility	MGD	Receiving Stream
Town of Pittsboro	Pittsboro WTP	Not limited	Haw River
County of Chatham	Jordan Lake WTP	Not limited	Camp New Hope Lake
Sierrapine Limited	Sierrapine Limited-Moncure	Not limited	Haw River
Town of Pittsboro	Pittsboro WWTP	0.75	Robeson Creek
Ferrington Utilities Inc	Ferrington Util/ WWTP	0.27	Bush Creek
Whippoorwill LLC	Carolina Meadows WWTP	0.18	Morgan Creek
North Chatham Water & Sewer Co. LLC	Cole Park Plaza	0.05	Cub Creek
Nature Trails Association CLP	Nature Trails Mobile Home Park	0.04	Cub Creek

WWTP			
Southern Wood Piedmont Company	Southern Wood Piedmont Company	0.032	Deep River
County of Chatham	Bynum WWTP	0.025	Haw River
NC DOT	Asphalt Testing Site #6	0.0144	Haw River
SS Construction & Rental Inc	SS Mobile Home Park	0.01	Brush Creek
Chatham County Schools	Central Chatham High School	0.01	Bear Creek
Chatham County Schools	Waters Elementary School	0.009	Cedar Creek
Weyerhaeuser Company	Moncure Plywood	0.008	Haw River
Chatham County Schools	Bonlee Elementary School	0.007	Bear Creek
Goldston-Gulf Sanitary District	Goldston-Gulf WTP	0.006	Deep River
Cedar Village Apartments	Cedar Village Apartments	0.005	Cub Creek
Chatham County Schools	Bennett Elementary School WWTP	0.005	Flat Creek
Bidco III LLC	Hill Forest Rest Home	0.003	Bear Creek
Piedmont Health Services Inc	Moncure Community Health Center	0.0025	Deep River
Total		1.4269	

WTP=water treatment plant; WWTP=wastewater treatment plant

Source: NC Division of Water Quality

Many of the major and minor dischargers are wastewater treatment plants, which process a key pollutant source. These numbers can be used to gauge the success of advances in water conservation initiatives and pollution-reduction technologies.

INDICATOR: IMPAIRED STREAMS

Status: 46.4 miles plus much of Jordan Lake (127 linear mi. of the lake's banks)

'Impaired' streams and rivers have not met the water quality standards that are in place to allow them to be safe for the uses designated for them. The standards are determined by the Surface Water Classification to which the water body is assigned. The North Carolina Department of Water Quality assigns a classification to fresh waters based on the uses desired, such as recreation, swimming, fishing, industrial use, water supply, and so forth. Secondary classifications, which may contain additional standards, include high quality waters, nutrient sensitive waters, and other special attributes. All waters are required to meet the standards of Class C waters. For a full explanation of classes, see http://portal.ncdenr.org/c/document_library/get_file?folderId=125637&name=DLFE-8307.pdf. The classifications assist in water quality planning efforts.

Map 4 illustrates the streams and water bodies that have not reached water quality standards for their designated uses, streams that have not been assigned a classification, and streams that are fully 'supporting' their designated uses.

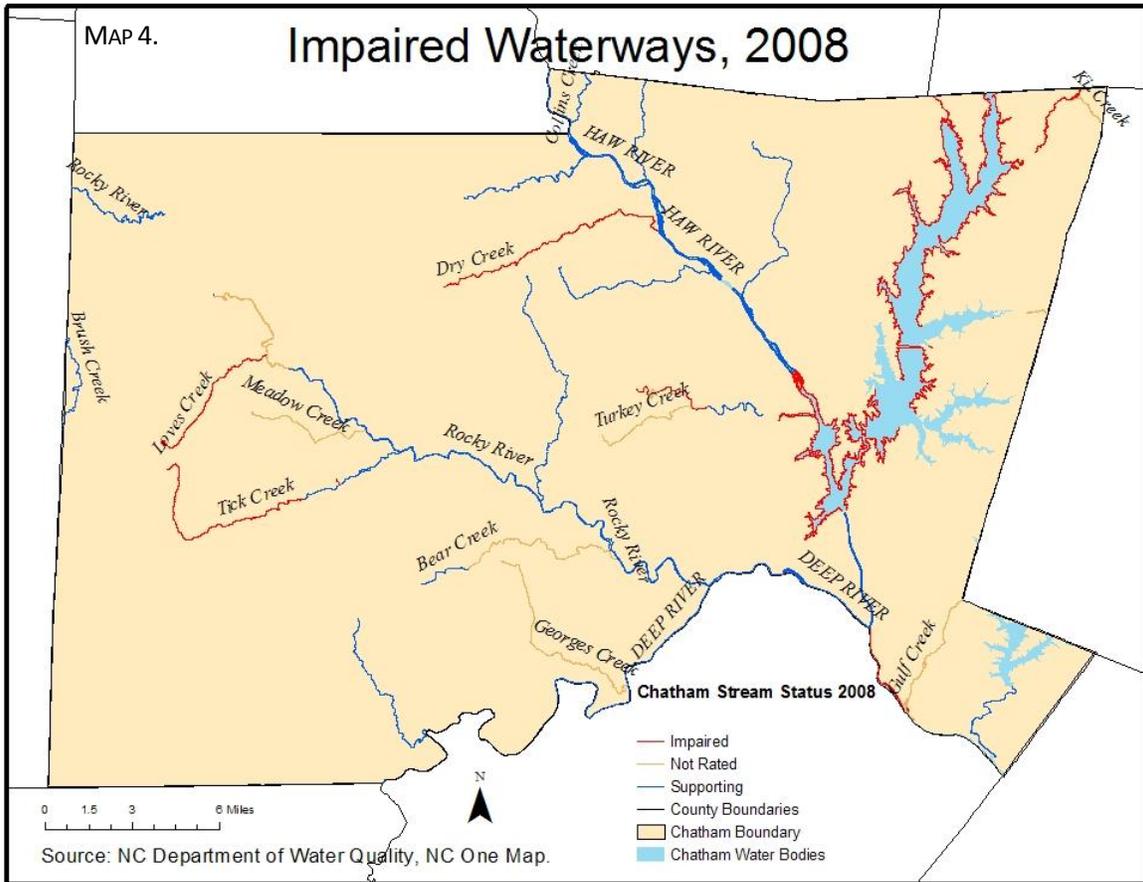


Table 14 shows the locations of impaired segments of rivers and streams, their length, and primary reason for impairment status rating.

Table 14. Impaired Water Segments in Chatham County, 2008

Location	Length (miles)	Reason
Cape Fear River**	3.2	Chlorophyll α
Deep River	9.0	Fish Tissue Mercury-Historical
Dry Creek	10.1	Ecological Integrity -Benthos
Gulf Creek	0.3	Ecological Integrity- Fish
Haw River	0.6	High pH
Loves Creek	6.2	Ecological Integrity -Benthos
Morgan Creek	0.3	Ecological Integrity -Benthos
Northeast Creek	4.7	Zinc
Robeson Creek	3.5	Ecological Integrity -Benthos
Tick Creek	8.6	Ecological Integrity- Fish
Total	46.4	
Jordan Lake Banks*	127	Fish Tissue Mercury-Historical, Turbidity, Chlorophyll α

Note: Lengths were measured using ESRI ArcGIS 'measure' tool unless otherwise noted

Source: NCDWQ Impaired waters shapefiles, 2008

*Impaired linear bank-miles of Jordan Lake

** Both riverbanks of Cape Fear River were labeled impaired in the NCDWQ database. To avoid slight double counting, length was taken from attribute table of the ArcGIS shape file.

A variety of issues are behind the streams' impaired status, such as biological integrity, turbidity (cloudiness), mercury content of fish, or high nitrogen or phosphorous content. There are numerous causes of these conditions. Water pollution comes from direct discharges called 'point sources' (e.g., pipes from industrial operations or wastewater treatment plants), and indirect discharges called 'non-point sources' (e.g. runoff from roads, parking lots, and lawns). For example, over-fertilization of lawns and golf courses allows too many nutrients to enter waterways when it rains, causing algae blooms which are harmful to aquatic habitats. When left untreated, water flowing off of impervious surfaces such as parking lots, highways, and roofs, contributes to poor water quality. Traditional curb-and- gutter systems compound the effects, allowing a large quantity of water to flow unimpeded into streams. High water volume causes bank erosion, and combined with polluted runoff, degrades habitat. Agricultural areas can implement special management practices to reduce erosion and nutrient runoff (see Land Resources: Agriculture).

Fortunately, there are many ways of preventing water pollution and reducing our impacts. In fact, under the federal Clean Water Act and numerous state and local statutes, preserving and restoring water quality is an imperative. Preventing degradation of water quality is generally cost-effective too: for example, it is less expensive than building new treatment plants (USEPA, Pollution Prevention & Control, 2010).

SPECIAL FOCUS: WATERSHED RESTORATION INITIATIVES

Tick Creek Update

Tick Creek is located in the Rocky River watershed in Chatham County. The Tick Creek Partnership was formed in 2008 to address and implement watershed restoration in that area as a first step in response to an outpouring of interest in water quality in the Rocky River from various groups and individuals. The collaboration is funded by an US Environmental Protection Agency Clean Water Act Section 319 grant with matching funds from partners, who include Chatham County, Chatham Extension and Soil and Water Conservation District and Extension agricultural professionals, NC State University, Rocky River Heritage Foundation, Triangle Land Conservancy, and state and federal water resource professionals.

As of October, 2010, the partnership had completed many of its initial goals: information gathering and dissemination, drafting of a watershed management plan, and creation of a listserv and website to facilitate collaboration. Biological surveys and land cover surveys have been conducted in the creek and its watershed, and priority areas have been identified for restoration. In terms of community engagement, the partnership gathered input from stakeholders and began a landowner outreach and engagement program.

The Partnership's next steps include identifying and communicating to landowners in high priority watersheds. Landowners can volunteer to be connected to financial and technical resources to implement simple measures that can go a long way toward improving water quality. Such actions involve 'best management practices' (BMPs) such as fencing cattle out of streams, and re-vegetating stream banks, which reduce erosion and improve stream habitat.

The current funding will only cover the installation of two or three additional BMPs, so the partnership is looking to procure additional resources to continue its watershed restoration efforts. An intensive survey of a cross-section of stakeholders, reported in the Situation Assessment (found here <http://www.ces.ncsu.edu/depts/agecon/WECO/rocky/documents/RockySAfinal.pdf>) revealed that although the Rocky River is many different things to different people, everyone agreed that collaboration for better water quality was in everyone's best interests. For more information, visit <http://www.ces.ncsu.edu/depts/agecon/WECO/rocky/>

Source: Christy Perrin, Project Coordinator, NC State University, personal communication, October 2010

Robeson Creek Update

Similarly, a partnership was formed to protect the Robeson Creek watershed called the Robeson Creek Watershed Council. Co-coordinators of planning and implementation are NC Cooperative Extension - NCSU Water Quality Group, and the Haw River Assembly/Biocenosis, LLC. Participants are Chatham County Soil and Water Conservation District, NC Division of Water Quality, Town of Pittsboro, USDA – NRCS, and NC Cooperative Extension.

The Robeson Creek efforts have been underway for a longer period of time than Tick Creek. Not only have Total Maximum Daily Loads (TMDLs) been set (maximum pollution to meet the water body's classification) and implementation plans submitted, but public outreach has taken place, and many stormwater best management practices have been installed, with help from US Environmental Protection

Agency funds. The Haw River Assembly launched a Stream Steward Campaign, creating a guidebook for landowners and awards program for water-wise businesses. Eighteen Special water-capturing and water-filtering facilities have been installed including rain gardens, stormwater wetlands, and stream bank plantings from 2005 to mid-2010.

The latest report presents water quality monitoring data which shows evidence of widespread improvements in total maximum daily loads and biological indicators. Restoration efforts have shown clear results.

Next steps will entail continuing the momentum to mitigate impacts of development, and improving the watershed so that it is in compliance with all standards. For more information, visit <http://www.bae.ncsu.edu/programs/extension/wqg/srp/robeson.html>

Source: Karen Hall, NCSU Water Quality Group, personal communication, October 5, 2010

GROUNDWATER

INDICATOR: UNDERGROUND STORAGE TANK INCIDENTS

Status: 126 of 198 underground storage tank incident reports were closed (e.g., handled) as of mid-2010

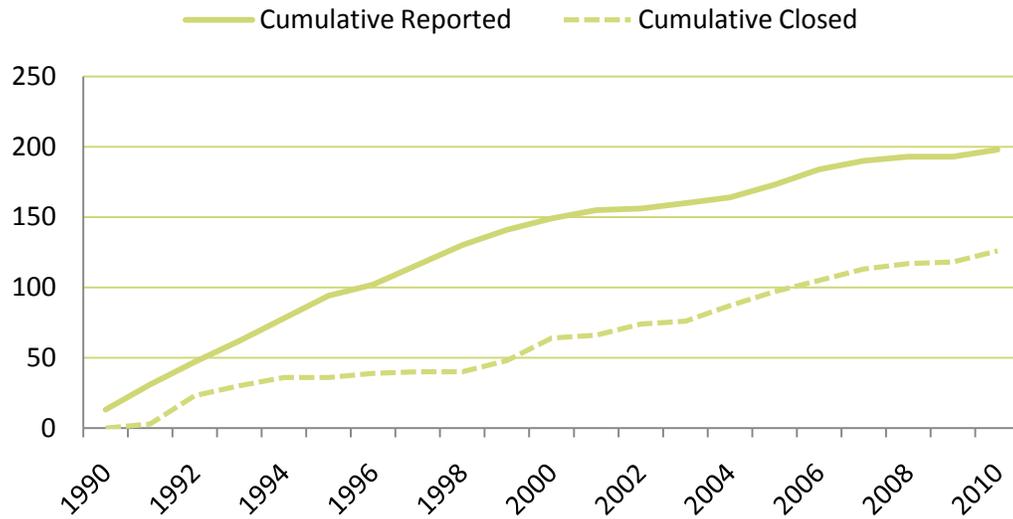
Old and active underground storage tanks (USTs) often house hazardous chemicals such as fuels. Leaking tanks can contaminate soils and groundwater, and can be difficult to clean up. North Carolina Division of Waste Management operates the Underground Storage Tank enforcement program to respond to reports of actual or suspected leaks.

Between 1990 and mid-2010, 198 UST incidents reported to the Division of Waste Management. Comparison of incidents reported to the cumulative number of cases closed (see Figure 7) shows that closed cases are keeping pace with reported cases. A total of 72 cases remained open of those reported between 1990 and mid-year 2010.

A reported UST incident does not necessarily mean that any environmental contamination has occurred. Between 1990 and 2010, 31 reported incidents involving regulated USTs led to a Notice of Regulatory Requirement, and only one incident required a Notice of Violation. 97 incidents involved reports of soil contamination, 76 involved groundwater contamination, and 26 had no contamination resulting. Upon a cursory examination of notes written on the different investigations, there is a wide range of outcomes of incident reports. Some involve actual spills, but many involve none—merely removal of the tank. Of the cases in which some leakage occurred, soils are removed for treatment. Further investigation would be needed to evaluate any actual risk to people or the environment.



Underground storage tank <http://www.leaking-storage-tank.com/tag/leaking-underground-storage-tanks/>

Figure 7. Total Number of UST Incidents Reported and Closed, 1990-2010

Note: Does not include farm or residential motor fuel tanks of 1100 gallons, any tank with a capacity of less than 110 gallons, or any heating oil tank that is for consumptive use on that property.

Source: Retrieved September 17, 2010 from NC Division of Waste Management, <http://portal.ncdenr.org/web/wm/ust/ustmain>

Underground Storage Tank incidents are only one source of potential groundwater contamination. Emerging issues affecting groundwater quality are described in *Water Resources: Looking Ahead* at the conclusion of this section. Hazardous waste releases to land are presented in the Hazardous Waste and Solid Waste section of this report.

WATER USE

INDICATOR: USGS REPORTED WATER USE

Status: County water use in 2005 (million gallons a day): Thermoelectric-145; Domestic public-5.5; Livestock-3.6; Domestic self supplied- 2.3; Irrigation-1.4; Industrial-0.6

Trends: From 1985 to 2005, thermoelectric use has varied widely between 385 and 145 MGD, while total other uses more than doubled from 6.4 to 13.3

Tracking reported water use can identify trends and assist in planning for future needs. The US Geological Survey estimates the amount of water used for the following purposes: Public Water Supply, Livestock, Irrigation, Industrial Use, Domestic Self-Supplied Freshwater Withdrawals, and Thermoelectric power facilities. The following is a summary of the category definitions:

Domestic Self-Supplied Use: Indoor and outdoor uses at residences such as washing dishes, drinking, food preparation, toilet flushing, watering lawns and gardens, etc. Self-supplied domestic water is usually drawn from private sources such as a well or captured as rainwater in a cistern.

Domestic Public Water Supply Use: Water used for domestic purposes that is supplied by a public service.

Livestock: Water use associated with livestock such as watering, feedlots, dairy operations, sanitation, and other on-farm uses. Livestock includes cattle, pigs, chickens, turkeys, sheep, goats, and horses. All livestock withdrawals are considered self-supplied.

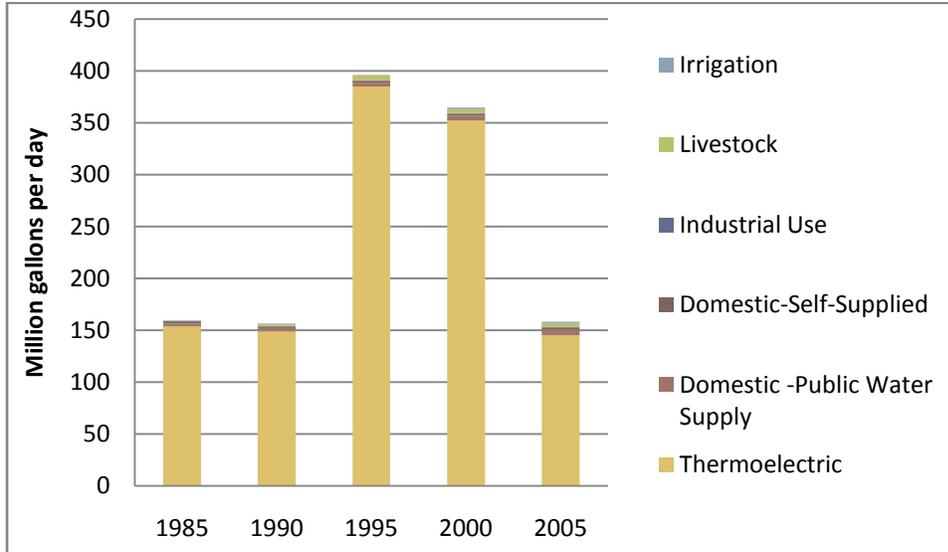
Irrigation: Water supplied to plants in agricultural and horticultural settings including pre-irrigation, frost protection, application of chemicals, dust suppression, and so forth. Also included is irrigation of golf courses, parks, nurseries, and similar commercial irrigation uses.

Industrial Use: Water used in industrial facilities.

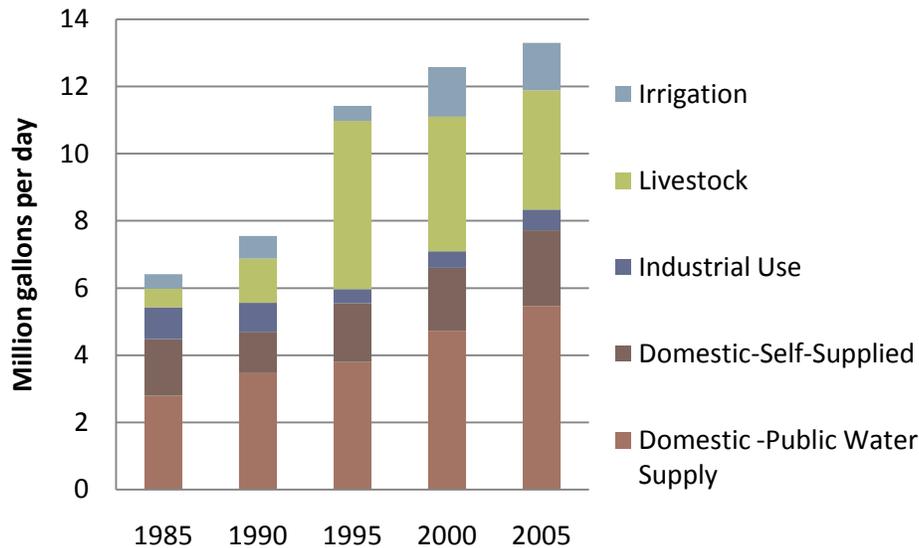
Thermoelectric Power Facilities: Water used in steam-driven turbine generators.

Commercial water use is not included. More detailed definitions and methods can be found in the 2005 U.S. Geological Survey report entitled Estimated Use of Water in the U.S. in 2005 at <http://water.usgs.gov/watuse/>

Figure 8. Water Use in Chatham County, 1985-2005



Source: USGS, Estimated Use of Water in the U.S. in 2005, <http://water.usgs.gov/watuse/>

Figure 9. Water Use in Chatham County 1985-2005 (Except Thermoelectric)

Source: USGS, Water Use in the U.S., <http://water.usgs.gov/watuse/>

Table 15. Chatham County Water Use, 1985-2005 (Million Gallons per Day)

	1985	1990	1995	2000	2005
Industrial Use	0.95	0.86	0.42	0.49	0.62
Irrigation	0.43	0.67	0.44	1.48	1.41
Livestock	0.55	1.32	5.01	4.01	3.55
Thermoelectric	153.53	148.82	385.00	352.00	145.05
Domestic -Public Water Supply	2.79	3.47	3.80	4.73	5.47
Domestic-Self-Supplied	1.69	1.23	1.75	1.87	2.25
Total	159.94	156.37	396.42	364.58	158.35

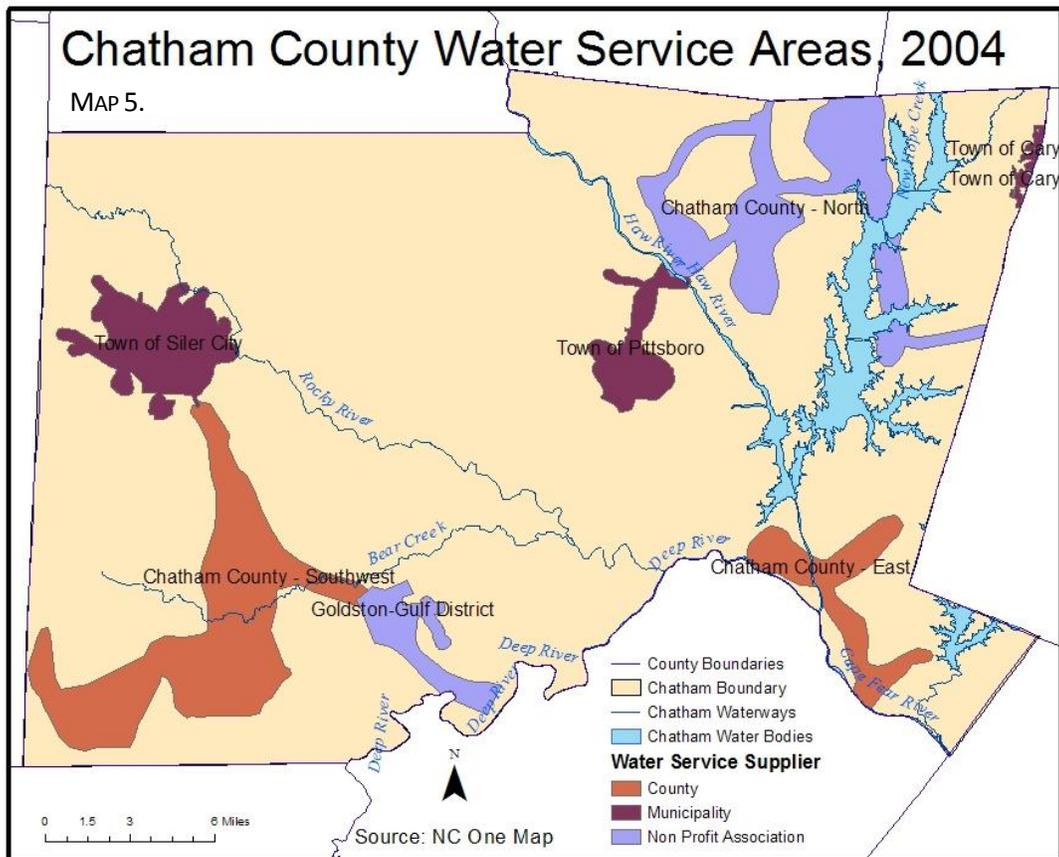
Source: USGS, Water Use in the U.S., <http://water.usgs.gov/watuse/>

Table 15 and Figure 8 show water use trends for all six categories from 1985 to 2005. The largest water user of the six categories (consistent with the US as a whole) is thermoelectric power, which has fluctuated greatly over the 20-year period (see Figure 8 and Table 15). In order to effectively view trends in the other four categories, Figure 9 examines all of the categories *except* thermoelectric power. In general, water use has increased over the period, although industrial use has diminished. Domestic-public water supply use steadily increased, while livestock and irrigation water use have burgeoned. The next USGS report will present 2010 data, providing a more current profile of water use.

INDICATOR: CHATHAM COUNTY UTILITIES DRINKING WATER QUALITY ANNUAL REPORT, 2009

Status: 4 violations out of hundreds of samples taken (2009)

The public water supply is tested regularly for the presence of contaminants in order to ensure that it is healthy. Chatham Utilities serves residents in North Chatham, Corinth, Merry Oaks, Asbury, Southeast Chatham, Southwest, and Silk Hope. Siler City and the Town of Pittsboro have separate municipal water systems. Map 5 depicts the various municipal, county, and non-profit water service areas. The rest of the county is connected to private wells or other local water systems.



The 2009 Chatham County utilities report (accessible here: <http://www.chathamnc.org/Index.aspx?page=383>) shows that of hundreds of water samples tested for the presence of radioactive, biological, inorganic, volatile organic, or synthetic contaminants, only four violations of drinking water standards were reported, all due to byproducts of chlorination. Corrective actions, such as system flushing, are underway.

Water quality testing of private wells is only mandatory when a well is first constructed, although many wells are tested at the point of sale. Monitoring and investigations of problems occurs only after the problem is discovered. It is prudent to have well water voluntarily tested periodically (personal communication, June

15, 2010, Andy Siegner). The County's Environmental Health Department offers testing of bacteria, nitrates, pesticides, petroleum, and inorganic chemicals. More information can be found at <http://chathamnc.org/Index.aspx?page=650>.

WATER RESOURCES: LOOKING AHEAD

EMERGING ISSUE: ENVIRONMENTAL CONTAMINANTS FROM WASTEWATER

Wastewater treatment plants, which also sometimes receive wastewater from industries, are required to treat wastewater's biological, physical, and chemical contaminants according to government standards. However, some organic and chemical contaminants are not regulated. It has been brought to the attention of scientists, the media, and the public in recent years that some pharmaceuticals, personal care products, antibiotics, and other chemicals pass through the treatment process and can persist in the environment, even re-entering water supply. The impacts on human and environmental health are yet to be determined, but one 2007 study conducted by the Triangle Area Water Supply Monitoring Project and the US Geological Survey indicated potential of harm to fish (<http://pubs.usgs.gov/sir/2007/5054/pdf/SIR2007-5054.pdf>) (see also *Ongoing Issue: Application of Sludge to Agricultural Lands*).

DATA NEED: GROUND WATER SUPPLY

The majority of residents in the county obtain water from wells. The supply of ground water is generally more stable than surface water, since it is buffered from changes in weather at the surface. But are Chatham County's groundwater resources limitless? Wells in other counties in the region experienced record lows following recent droughts in 2006-2008 (USGS).

The USGS does not currently monitor groundwater levels in the county. The NC Geologic Survey is slated to continue with detailed geologic studies in the county. The data will identify recharge zones, diabase dikes, and other information pertaining to water quality (Fred Royal, personal communication, December 14, 2010). Although there are lot-size limits for well use, capacity needs to be assessed in light of future development and potential droughts.

ONGOING ISSUE: ABANDONED UNREGULATED UNDERGROUND STORAGE TANKS

From the NC Division of Solid Waste:

"The State of North Carolina does not require that non-regulated USTs be removed from the ground once they are no longer in operation. Additionally, soil samples are not required unless it is obvious that a release has occurred. However, a tank owner is advised to empty a non-regulated tank once it is no longer being used to limit the chances of a release."

The Division of Waste Management adds that it behooves property owners to drain their underground storage tanks in order to improve resale value.

EMERGING ISSUE: NATURAL GAS DEPOSITS AND HYDRAULIC FRACTURING

Mining for shale natural gas deposits using hydraulic fracturing methods is not presently occurring or permitted anywhere in the county or in the state of North Carolina, but if the laws change, this practice could have implications for groundwater resources.

North Carolina Geologic Survey geologists gave a presentation entitled “Shale Gas Deposits in Chatham County” to the County Board of Commissioners in August, 2010. Shale gas deposits exist under approximately 700 acres of land in Chatham County, according to the geologists (Chatham County Board of Commissioners Work Session Minutes, Aug. 16, 2010). Six of twenty-eight monitoring wells in Chatham and Lee Counties found ‘shows’ of oil, gas, or both (Henderson, 2010).

Several factors have led to the recent attention given to these deposits. Recently published data and geologic analysis have identified the extent of the resource in North Carolina. Infrastructure, extraction technologies, and demand for domestic ‘green’ energy sources have made mining of this type of natural gas more feasible (Simons, Reid, and Taylor, 2010). The deposits could be economically mined using a process of hydraulic fracturing and horizontal drilling. Hydraulic fracturing is a process that is used in 90% of the more than 450,000 operating natural gas wells in the US (Zeller, 2010). Sand, water, and small amounts of other chemicals are propelled at high pressure into areas deep below the ground in order to enlarge and prop open fractures in rock, maximizing gas extraction (USEPA, 2010).

The EPA has been conducting a study of the environmental impacts of this form of mining (USEPA, 2010). Although industry leaders argue that there has been no connection between harm to water quality and hydraulic fracturing, critics claim that the link between chemicals used in the process and groundwater contamination have not been thoroughly studied (Zeller, 2010). The NCGS scientists mentioned other potential environmental issues in their presentation: demands on water resources, impacts on groundwater quantity and quality, disposal of solid and hazardous waste and waste water byproducts, and erosion and sedimentation control from construction of well pads, access roads and pipelines (Simons, Reid and Taylor, 2010). Indeed, EPA’s hearings in preparation for their study drew scores of people with stories of well water contamination, rashes, poisoned fish, and deformed livestock (Zeller, 2010). Groundwater can become contaminated if fluids are pumped underground at such a high pressure that fractures extend into water supplies above the gas deposits. Millions of gallons of water are required to form the high-pressure fluid, which once used for fracturing, rise to the surface, and as a pollutant, must be recycled or discharged in accordance with National Pollutant Discharge and Elimination System requirements (USEPA, 2010).

NCGS scientists have been presenting results of state natural gas resource inventories to industry leaders, and report that there is some interest in the state legislature to allow the type of drilling required to extract the resource (Simons, Reid and Taylor, 2010). Oil and Gas industry companies are already purchasing leasing rights in Lee County (Henderson, 2010). State Sierra Club leaders are hopeful that if North Carolina regulations banning hydraulic fracturing procedures are overturned, new environmentally responsible rules can be developed

The key to the categories is as follows:

Table 16. Chatham County Watershed Ordinance Categories

Type	Full Name	Location
WS* II - BW	WS II - Balance of Watershed	Portion of the county that drains to University Lake
WS III - CA	WS III - Critical Area	Land beyond river corridor to a distance of 2640 ft. of the Rocky River Lower Reservoir
WS III - BW	WS III - Balance of Watershed	Land draining to the Siler City water system intake on the Rocky River
WS IV - CA	WS IV - Critical Area	Land within (1) 1 mi. and draining to the water intakes for Pittsboro (Haw R.), Sanford (Cape Fear R.), and Goldston-Gulf (Deep R.); or (2) 0.5 mi from the normal pool level and draining to Jordan Lake
WS IV - PA	WS IV - Protected Area	Land within 10 mi. and draining to water intakes in (1), and within 5 mi. and draining to (2) above.
RC	River Corridor	Land within 2500 ft. of riverbanks
RCSA	RC Special Area	Land within river corridor, but given special designation due to existing infrastructure
LWA	Local Watershed Area	All land outside of des. above and outside municipal watershed jurisdictions

The restrictions on each type are described in Table 17.

Table 17. Chatham County Watershed Ordinance Restrictions

Type	Density	% Built Upon	Land Use Notes
WS II - BW	1 unit/40,000 ft2	12%	Some non-res. land uses prohibited
WS III - CA	1 unit/acre	12%	
WS III - BW	1-2 unit/acre	24%-70%	Must incorporate stormwater BMPs
WS IV - CA	1-2 unit/acre	24%-70%	Additional businesses allowed near I 64 and SR 1008
WS IV - CA- Jordan Lake	5 acre maximum	24%	Crafts, fishing, other services allowed near main intersections
WS IV - PA	1-2 units/acre	24-36%	
RC	1 unit/5 acres min	12%	
RCSA	1-2 unit/acre	24-50%	Must incorporate stormwater BMPs
LWA	1-2 units/acre	24-70%	New sludge application sites and landfills allowed

All (except where noted)

- Require Agriculture 10 ft. stream buffer, Ag. and Forestry BMPS
- Prohibit new sludge application site, landfills, toxic materials
- Allow residential and some non-residential uses

The Watershed Ordinance was amended with provisions required to meet new Jordan Lake protection regulations set by the state of North Carolina.

STORMWATER ORDINANCE

This ordinance sets out stormwater design standards, riparian buffer requirements, and floodplain requirements to further protect water systems from excessive runoff, nutrients and sedimentation.

SOIL EROSION & SEDIMENTATION CONTROL ORDINANCE

Created in 2005 and revised in 2008, the Soil Erosion & Sedimentation Control Ordinance sets out standards for construction, building on slopes, and other erosion reduction measures.

WATER RESOURCES RECOMMENDATIONS

- Prioritize areas of the county for watershed conservation efforts, using Robeson Creek as a model
- Consider creating a database of all potential sources of groundwater contamination
- Create a system of groundwater monitoring wells to ensure future water supply
- Continue to implement water conservation programs to postpone the need for capital investments
- Utilize watershed conservation education and outreach as one tool to achieving water quality goals
- Continue to refine drought response plans
- Continue to implement water quality protection ordinances to preserve existing ecologically intact waters, restore impaired waters, and mitigate impacts of development (such as Low Impact-Development)
- Continue to research the potential threats from shale natural gas extraction and unregulated contaminants in treated wastewater



The atmosphere is a thin protective layer surrounding the earth composed of nitrogen, hydrogen, oxygen, carbon dioxide, water vapor, dust, and other components. The atmosphere performs a multitude of functions, such as shielding the earth's surface from ultraviolet rays, regulating the temperature, and providing weather and gas cycling that support life. Pollutants in the atmosphere can travel farther and faster than pollutants on land or water—local air pollutants can have global impacts.

The US as a whole has made great strides in improving air quality: emissions of criteria air pollutants (ground-level ozone, particle pollution, carbon monoxide, sulfur dioxide, and nitrogen dioxide) decreased by 54% between 1980 and 2008 (US EPA, Air Quality Trends, 2009). Still, the rates of childhood asthma are remaining at historically high levels (Akinbami, 2006).

While criteria air pollutants have declined, total VMT for the U.S. increased 32% between 1980 and 2008 (US EPA, Air Quality Trends, 2009). Whether we choose to drive alone, walk, bicycle, take a bus or carpool influences the amount of pollutants entering the atmosphere. Transportation, an integral part of our economy and our daily lives, plays a role in producing both air pollution and climate change emissions.

It has become evident that the biosphere is not immune to the production of carbon dioxide and other gases from burning fuels. These gases are causing the climate of the earth to change, which will have consequences for humans and wildlife.

Proper stewardship of air resources will avoid the negative consequences of pollution to wildlife, people, and future generations.

This section presents indicators of air pollution, transportation choices, and the balance of human-induced greenhouse gases throughout the county.

The first part, *Air Pollution*, examines some of the data that is collected under the federal Clean Air Act and related regulations, including Air Quality Index, point source emissions, and ozone measurements.

The second part illustrates the transportation choices that residents make using several measures, including transportation to work, daily vehicle miles traveled, and transit service and ridership.

The third part summarizes Chatham County's greenhouse gas inventory conducted in early 2010.

Next, the latest developments in air pollution standards, future transit plans, and climate change emissions policy are summarized.

The *Air* section concludes with recommendations for maintaining healthy air, reducing climate change emissions, and enhancing transportation choices.

AIR POLLUTION

INDICATOR: AIR QUALITY INDEX

Status: Two unhealthy air quality days in 2008

Trend: Mixed

The Air Quality Index (AQI) is an indicator of air quality in relation to human health. Poor air quality conditions can affect breathing and exacerbate other health problems. The EPA calculates the AQI based on measurements of 'criteria air pollutants', the air pollutants regulated under the Clean Air Act (ground-level ozone, particle pollution, carbon monoxide, sulfur dioxide, and nitrogen dioxide). Each of these pollutants has a set standard--if one or more pollutants exceed the threshold alone or in combination, it can lead to poor air quality. The pollutants that are most often responsible for unhealthy air quality are ground-level ozone and particulate matter.

EPA classifies AQI levels according to severity using a color spectrum (the familiar code green, code yellow, etc.) summarized here:

Green: Healthy air

Yellow: Moderate air quality

Orange: Air is unhealthy for sensitive groups: those with heart or lung disease, older adults and children may experience health risks.

Red: Unhealthy air, with possible adverse health effects for the general population.

Purple: Extremely unhealthy air. More serious health effects for most of the population are expected.

Maroon: Health emergency situation

Code purple and Code maroon signify the worst air quality, and are rare⁶. The full explanation of the AQI is available at <http://www.airnow.gov/index.cfm?action=aqibasics.aqi>.

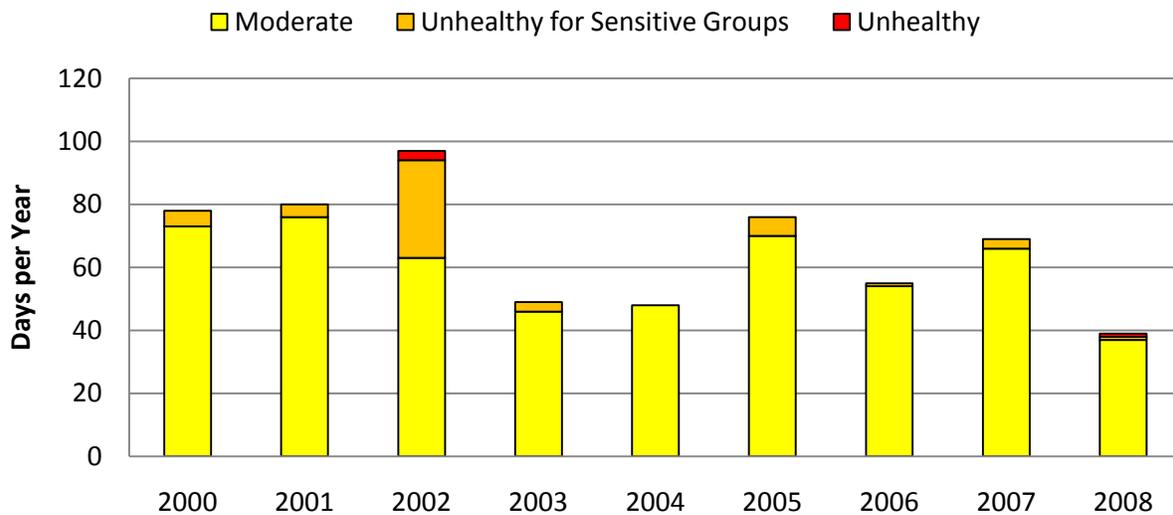
Poor air quality often results from a combination of factors. Weather conditions such as heat, sunlight, and lack of wind interact with mobile and stationary sources of air emissions, creating unhealthy outdoor air.

A system of air quality monitors in place in locations across the country test the air for pollutants. In Chatham County, AQIs are not required to be measured and calculated every day of the year since the population is less than 350,000. Figure 10 shows the number of days per year in which moderate (yellow), unhealthy for sensitive groups (orange), or unhealthy (red) AQIs were

⁶ One case of code purple air occurred in 2008 in the northeast portions of North Carolina due to wildfires.

measured from 2000 to 2008, and Table 18 lists all AQIs calculated during for the period. No purple or maroon code days occurred.

Figure 10. Chatham County Air Quality Index: Moderate to Unhealthy Days



Source: US EPA Air Data, 2009,

<http://www.epa.gov/air/data/monaqi.html?co~37037~Chatham%20Co%2C%20North%20Carolina>

Table 18. Chatham County AQI, 2000-2008

Year	Good	Moderate	Unhealthy for Sensitive Groups	Unhealthy	Days Measured
2000	179	73	5	0	257
2001	285	76	4	0	365
2002	164	63	31	3	261
2003	211	46	3	0	260
2004	215	48	0	0	263
2005	184	70	6	0	260
2006	209	54	1	0	264
2007	191	66	3	0	260
2008	296	37	1	1	335

Note: The EPA does not require communities of less than 350,000 to measure AQI every day of the year.

Source: US EPA Air Data, 2009,

<http://www.epa.gov/air/data/monaqi.html?co~37037~Chatham%20Co%2C%20North%20Carolina>

INDICATOR: GROUND-LEVEL OZONE

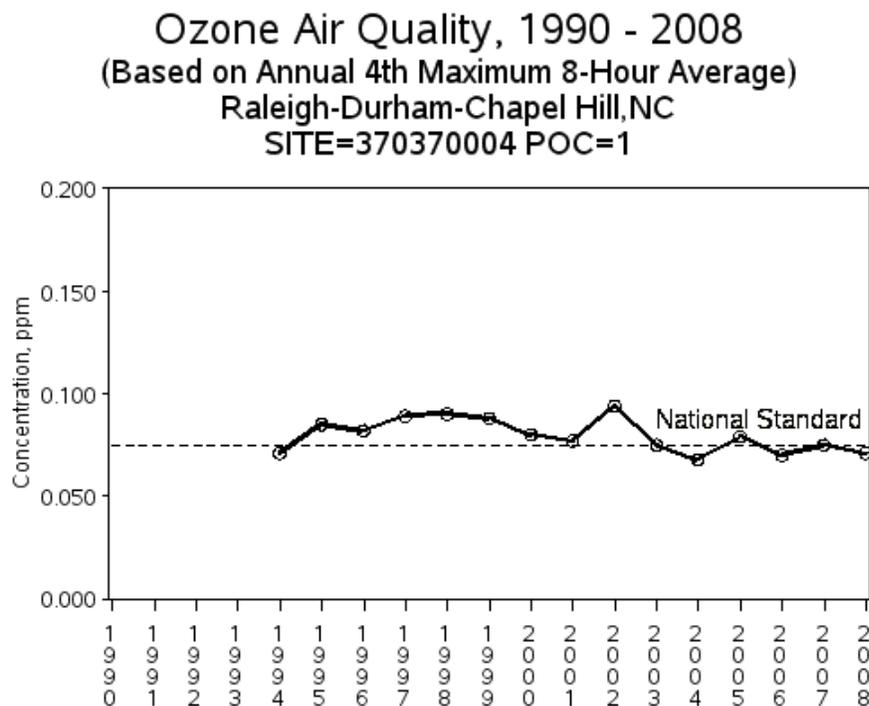
Status: Annual 4th maximum 8-hour average in 2008 was below the National Standard threshold

Trend: Mixed—slight improvement in recent years

Ground-level Ozone, a primary ingredient of smog, forms when pollutants such as NO_x and VOCs (Volatile Organic Compounds) undergo complex photochemical reactions in the presence of sunlight and heat. In the upper atmosphere, ozone plays a protective role by blocking some of the sun's harmful ultra-violet rays, but at ground-level it can be toxic, affecting people with respiratory ailments and those who are active outdoors. Ground-level ozone also damages wild plants and agricultural crops, harming local ecosystems and reducing crop yields (USDA Agricultural Research Service, 2010). Some plants are particularly susceptible to damage from ozone. Soybean crops are more sensitive: seasonal mean ozone average of 0.080 ppm--slightly lower than the National Standard--can reduce yields by over 20% (USDA Agricultural Research Service, 2010).

There is one ground-level ozone monitoring station in Chatham County, located in Pittsboro. Monitoring information from the EPA is shown in Figure 11. The National Standard, which applies to a 3-year average of the 4th highest daily maximum 8-hour ozone concentration, is represented by the dotted line, at 0.085 parts per million. The Pittsboro monitoring station has reported ozone levels at or below the National Standard for five of the last six years, which is an improvement over the previous six years.

Figure 11. Chatham County Ozone Monitoring Data



Source: US EPA, Local Trends in Ozone Levels, 2010

INDICATOR: POINT SOURCE EMISSIONS

Status: 18,937 tons of criteria pollutants and 1,141 hazardous pollutants emitted in 2008

Trend: Emissions decreased from 2003 to 2008

Point source emissions pollutants released from specific facilities. Under the Clean Air Act, state governments require permits and emissions reporting of facilities that release certain air pollutants, including criteria pollutants and hazardous or toxic pollutants. Criteria pollutants include carbon monoxide, nitrogen oxides, particulate matter, sulfur dioxide and volatile organic compounds. More information can be found at <http://www.epa.gov/air/urbanair/>. Hazardous pollutants include those listed in the tables below, plus many others. Some facilities that produce emissions below a certain threshold are not required to report their emissions every year, and their contributions are estimated. More information about the hazardous air pollutants that are tracked by the US EPA can be found here: <http://www.epa.gov/oar/toxicair/newtoxics.html>.

Results (see Table 19) show that emissions for all criteria air pollutants except carbon monoxide and particulate matter-2.5 was lower in 2008 than in 2003. All hazardous pollutant emissions reported were either lower or the same except for Hydrochloric acid, sulfuric acid, and those in the 'other' category, which were higher. Overall, there were less total criteria and hazardous pollutants emitted in 2008, but a slightly higher number of facilities reporting criteria and hazardous emissions in 2008 than 2003.

Table 19. Emissions from Reporting Facilities in Chatham County, 2003 & 2008⁷

Pollutant	Number of Reported Facilities		Total Emissions (tons)*	
	2003	2008	2003	2008
Criteria Pollutants				
Carbon monoxide (CO)	11	12	888	926
Nitrogen oxides (NOx)	11	12	3,015	2,495
Total Suspended Particles	12	13	2,069	1,693
Particulate Matter-10	12	13	1,195	1,043
Particulate Matter-2.5	8	10	527	620
Sulfur Dioxide (SO ₂)	11	11	12,167	11,559
Volatile Organic Compounds	11	12	611	600
Subtotal	76	83	20,473	18,937
Hazardous Pollutants				
Hydrochloric acid	5	6	712	766
Fluorides	4	1	201	99
Hydrogen fluoride	3	3	163	78
Ethylene glycol	1	5	131	65
Methanol	1	6	88	34
Formaldehyde	8	12	71	30

⁷ Toxic Air Pollutants regulated by the state Division of Air Quality overlap with Hazardous Air Pollutants federally regulated under the Clean Air Act which are reported in the Hazardous Waste section of this report. For more information see <http://daq.state.nc.us/toxics/hap/>

Sulfuric acid	1	1	14	17
Other	356	422	40	50
Subtotal	379	456	1,418	1,141
Grand Total	455	539	21,891	20,077

Source: NC Division of Air Quality. Retrieved 7.22.2010 from <http://xapps.enr.state.nc.us/air/ToxicsReportServlet?ibeam=true&year=2008&physical=037&overrideType=All&toxics=all&sortorder=1&viewreport=View+Report>, and <http://xapps.enr.state.nc.us/air/ToxicsReport/Toxrpt.jsp?ibeam=true>
 *Includes reported emissions and assumed emissions from non-reporting facilities

TRANSPORTATION CHOICES

INDICATOR: TRANSPORTATION TO WORK

Status: 76.2% of county workers drove alone, 11.1% carpooled, 2.5% bicycled or walked, 1% used transit 0.9% used other means, and 5.6% worked at home in 2005-2009 (US Census American Community Survey)

Trend: Slightly improving- fewer drove alone in 2005-2009 estimates than in 2000

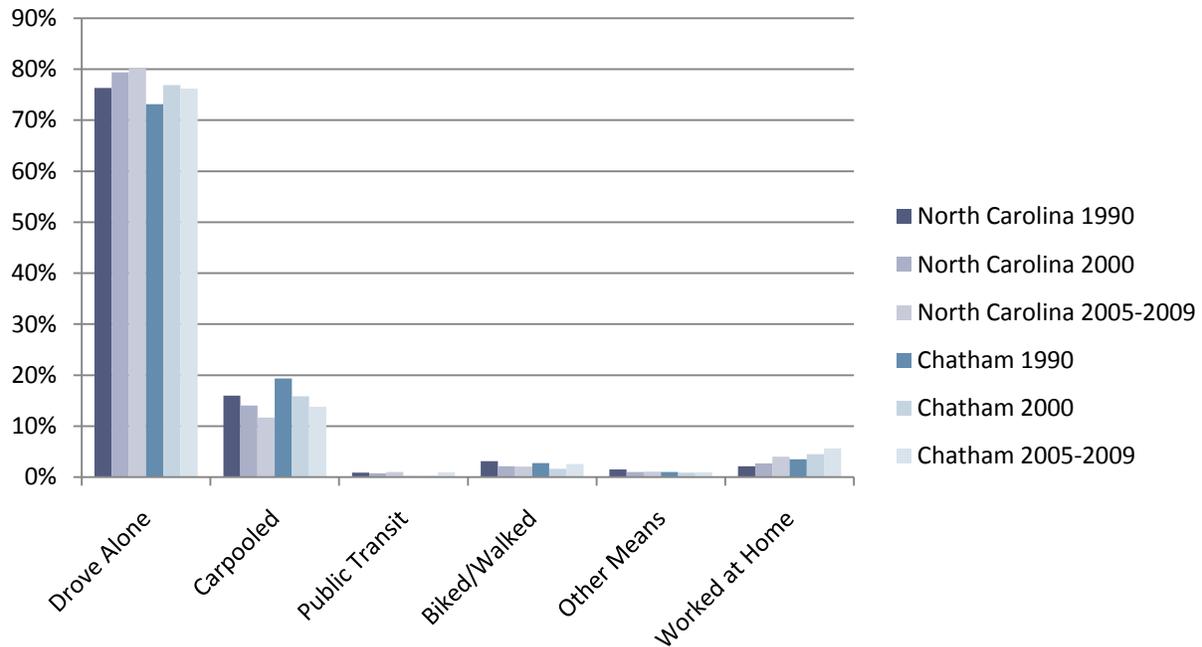
How we choose to travel to work not only indicates amount of air pollution generated, but can provide other insights about the built environment. The journey to work is perhaps the most routine trip that residents take, and can signal the types of transportation options and facilities available and their relative appeal.

The United States Census monitors mode choice to work as part of the American Community Survey. The most recent available data for Chatham County is an estimate of 2005-2009 survey responses.

Both Chatham County and the residents of North Carolina predominantly drive alone to work, followed by carpooling as Figure 12 and Table 20 illustrate. Carpooling in the state and the county has shown a declining trend. The average commute time in Chatham County is higher than in the state—25 minutes in the county as compared to 23 minutes in the state in 2005-2009. As Figure 15 shows, Chatham County residents not only had more commutes of longer distances, but fewer commutes of shorter distances on average compared to the state as a whole (except for less than 5-minute commutes).

However, trends in the County seem to be slightly improving. A lower percentage of commuters drove alone to work in the Census estimate for 2005-2009 than in 2000. Also, the proportion of commuters taking transit in the county leapt from 0.2% in 1990 and 2000 to 1% in 2005-2009. Some of these changes may have been spurred by the rising costs of fuel, increases in transit service, or other influences which could be examined further. The next section examines the most recent data on transit ridership.

Figure 12. Transportation to Work In North Carolina and Chatham County, 1990, 2000, And 2005-09



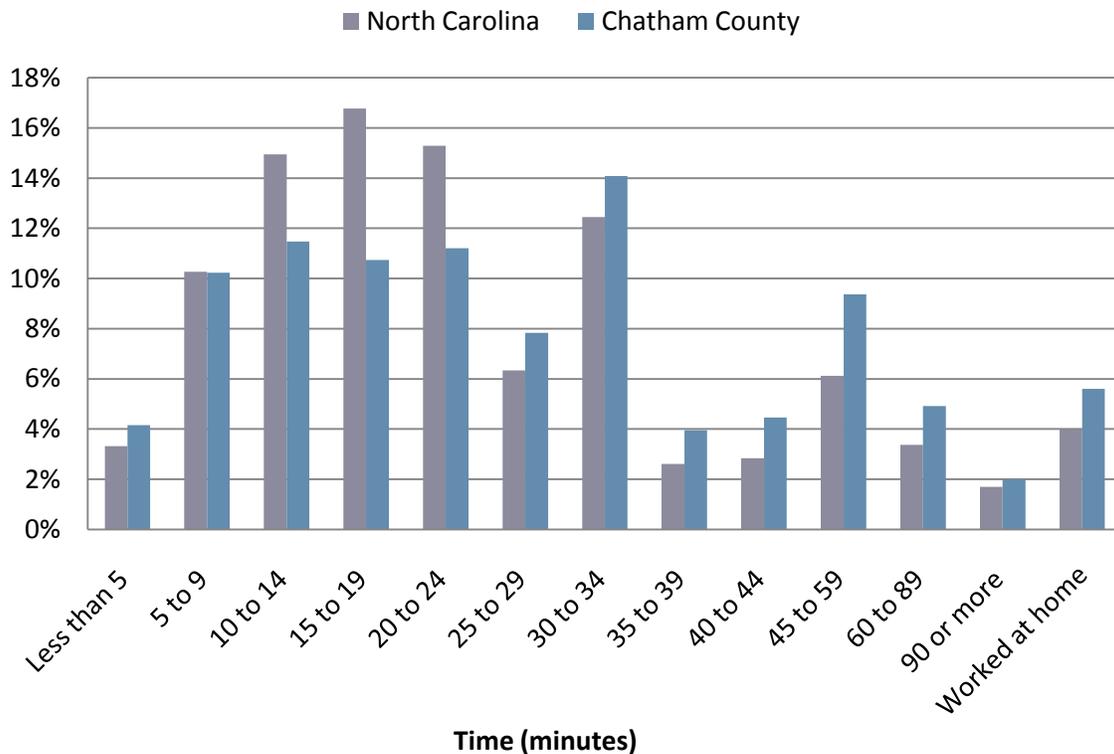
Source: US Census and American Community Survey estimates

Table 20. Transportation to Work For North Carolina and Chatham County Residents, 1990, 2000, and 2005-2009

	North Carolina			Chatham County		
	1990	2000	2005-2009	1990	2000	2005-2009
Drove Alone	76.3%	79.4%	80.2%	73.1%	76.9%	76.2%
Carpooled	16.0%	14.0%	11.7%	19.4%	15.8%	13.8%
Public Transit	0.9%	0.8%	1.0%	0.2%	0.2%	1.0%
Biked/Walked	3.1%	2.1%	2.1%	2.8%	1.6%	2.5%
Other Means	1.5%	1.0%	1.0%	1.0%	0.9%	0.9%
Worked at Home	2.1%	2.7%	4.0%	3.5%	4.5%	5.6%

Source: US Census and American Community Survey estimates

Figure 13. Average Commute Times for Chatham County and North Carolina, 2005-2009



Source: US Census American Community Survey

INDICATOR: TRANSIT RIDERSHIP AND SERVICE

Status: Highest monthly ridership in 2010 for Chapel Hill Transit's PX line-- 3381 trips; two fixed transit lines in operation (Melissa Guilbeau, personal communication, June 30, 2010)

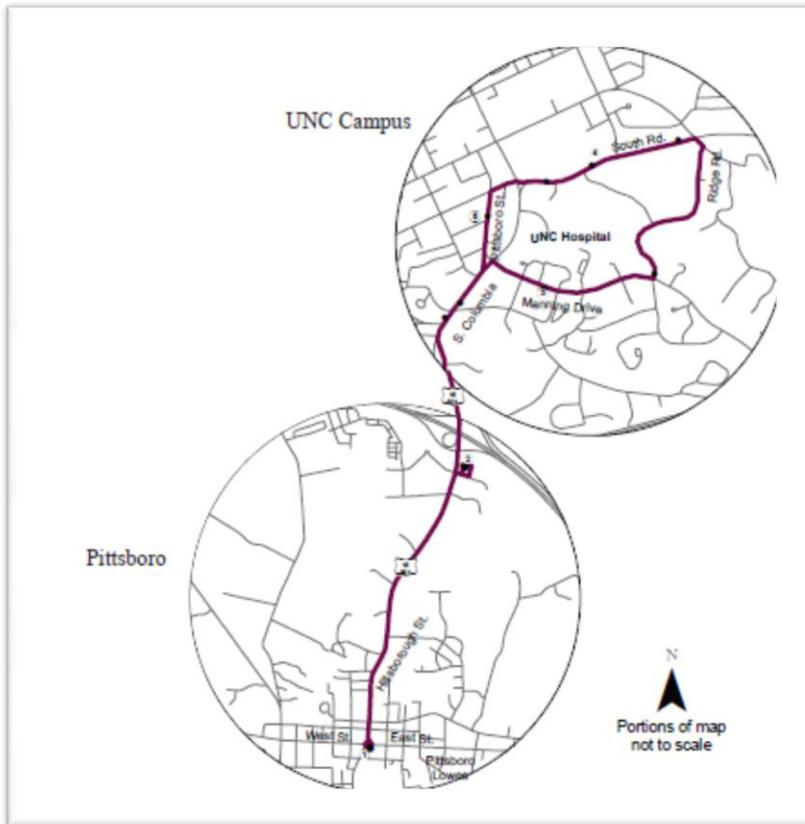
Trend: Increasing ridership and service in recent years

Availability of travel alternatives to expensive single-occupant vehicles is important for a vibrant economy, cleaner air, and healthier people. Alternative transportation incorporates healthful physical exercise and reduces air pollution from vehicle travel. When travelers choose to ride public transit instead of personal vehicles, they tend to burn less fuel per passenger, leading to lower emissions and more energy-efficient travel. This is better for the environment, and can be less expensive overall than owning a vehicle, and contributes to the economy by increasing accessibility of jobs and services.

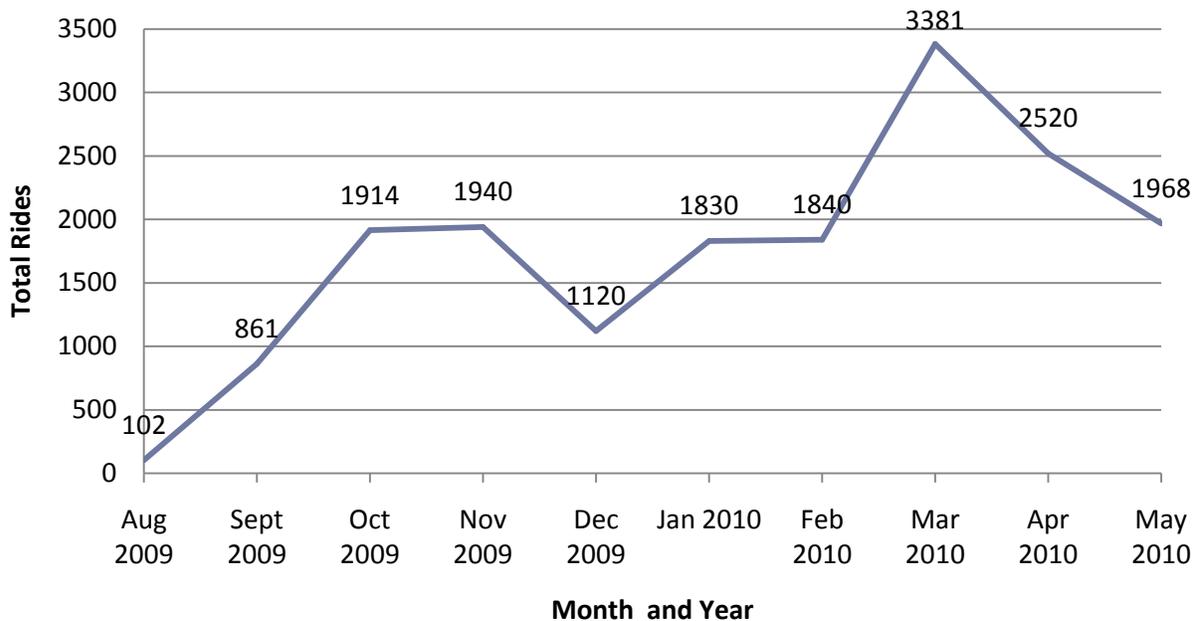
Public transportation in Chatham County has expanded and ridership is growing at a fast pace. Chatham County is currently served by two transit systems: Chapel Hill Transit, and Chatham Transit Network which is operated as a non-profit business. In August of 2009, Chapel Hill Transit launched the PX bus

route, or the Pittsboro Express. Figure 14 illustrates the PX route. Monthly ridership of the route is shown in Figure 15. Ridership exhibits seasonal fluctuations.

Figure 14. Chapel Hill Transit's PX Route Map



Source: Chapel Hill Transit, 2010

Figure 15. Chapel Hill Transit PX Route Monthly Ridership

Source: Melissa Guilbeau, Chatham County Transportation Director

INDICATOR: DAILY VEHICLE MILES TRAVELED (DVMT)

Status 1,892,800 in 2006; 31.8 DVMT per capita in 2006 (NCDOT)

Trends DVMT increasing from 1987-2006; DVMT per capita remaining stable 2003-2006

Like most counties in the US, Chatham County's transportation system relies heavily on personal and commercial vehicles. Conventional vehicles contribute to air pollution and climate change, which has health, economic, and environmental impacts. The transportation sector accounted for 34% of Chatham County's greenhouse gas emissions in 2008 (see Indicator: Greenhouse Gas Emissions by Sector).

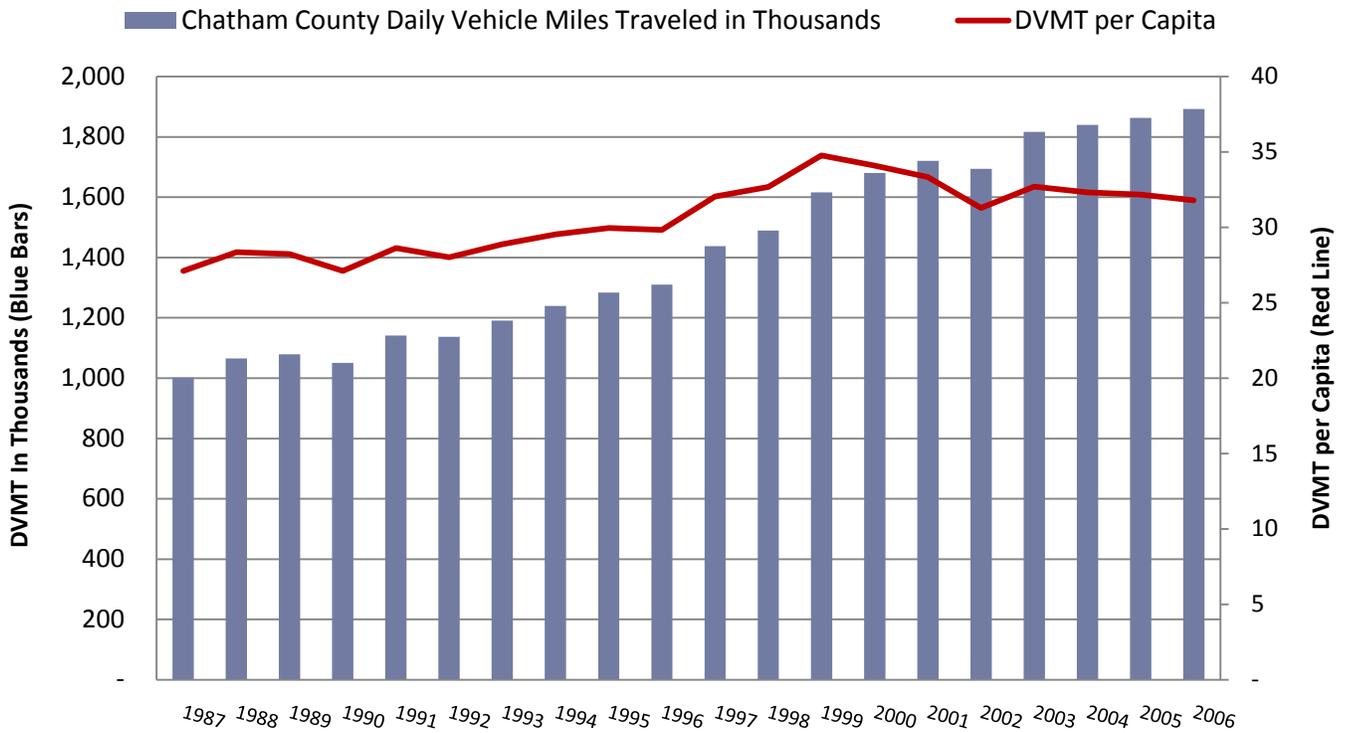
The North Carolina Department of Transportation conducts traffic counts annually to estimate the daily vehicle miles traveled (DVMT) by county. Chatham County's trends in DVMT and DVMT per capita show interesting results. Figure 16 shows DVMT (blue bars) and DVMT per capita (red line) in Chatham County from 1987 to 2006. The total DVMT has been climbing steadily during the twenty-year period. Population growth, an obvious contributor, also shows a steady incline (Figure 17). But when the daily miles traveled per person is examined, more nuanced trends emerge. The expectation is that per person, if all other factors remain the same, miles driven per day would remain static. In fact, DVMT per capita stayed steady from 1987 to 1993 (around 28), then rose from 1993 to 1999 (to a high of 34.8), then began a slight decline or leveling off until 2006 (31.8). Whatever the cause (gas consumption can be influenced by many factors such as pricing, the economy, demographics, and alternative

transportation availability) a decrease in DVMT per person means fewer air emissions -- a positive indication for air quality.

The DVMT survey does not distinguish personal and commercial vehicle miles traveled, so actual mileage per personal vehicle may be lower. In addition, the VMT estimates are based on traffic counts which may or may not represent a perfect sample of a day's worth of driving for that county. Traffic counts observe all traffic including through-traffic, whether vehicles originate in Chatham County or elsewhere. The severity of environmental impacts of driving behavior depends partly on the type of vehicle, i.e., how many miles per gallon it burns, whether it is a hybrid or alternative fuel vehicle, and the speed of travel. Also, the actual number of people of driving age or possessing drivers licences was not analyzed separately from the population as a whole.

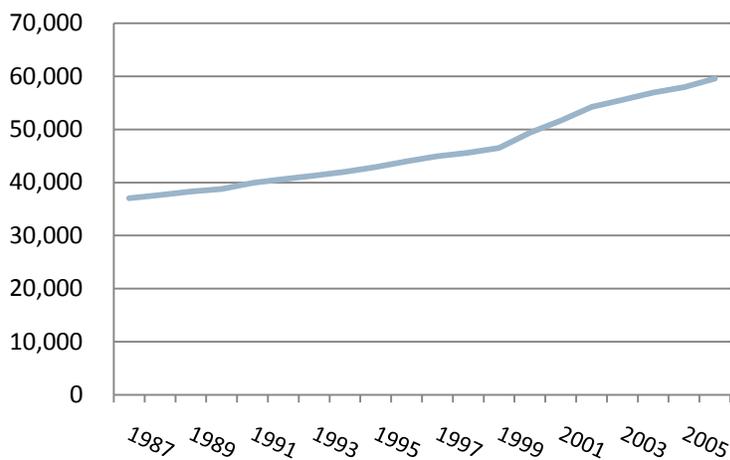
Average daily vehicle miles traveled may be not as much an indicator of environmental values as it is an indicator of the outcomes of land use and transportation policies. The choices that are available to residents can shape behavior, which in turn impacts the environment. If sidewalks and crosswalks exist, they can allow more people to walk safely. When services, institutions, and entertainment are clustered in one area, fewer trips are necessary to conduct multiple errands. The separation of housing from jobs and other services can make transportation more difficult for those who do not drive, such as youth, the elderly, and the disabled. See "Special Focus, Green Development" for more information about environmentally-friendly development patterns.

Figure 16. Chatham County Daily Vehicle Miles Traveled (DVMT), Total and Per Capita



Source: NCDOT data received from Ellen Beckman, Transportation Planner for the City of Durham/DCHC MPO ; US Census Bureau (multiple tables)

Figure 17. Chatham County Population

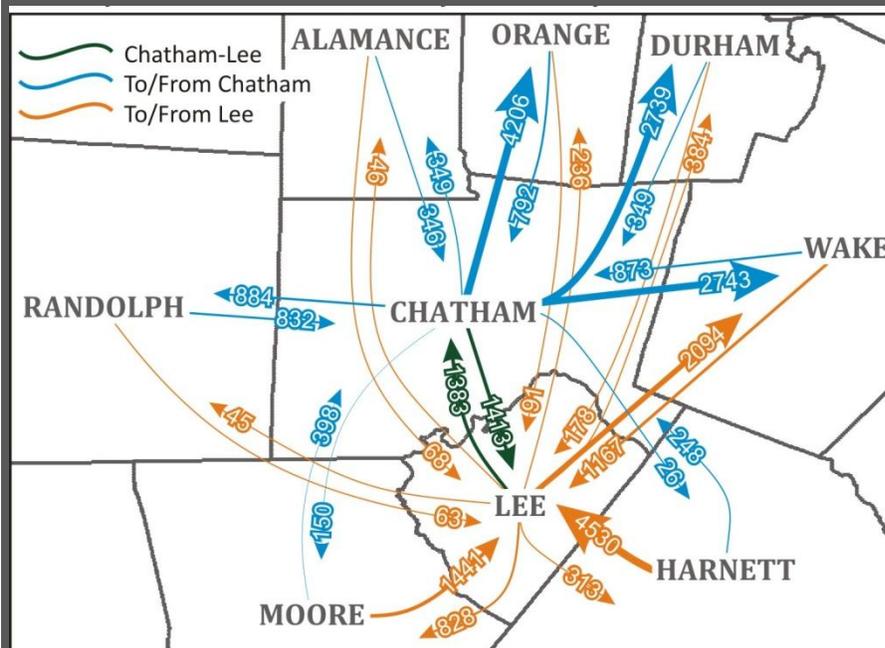


Source: US Census Bureau (multiple tables)

SPECIAL FOCUS: COUNTY-TO-COUNTY COMMUTING PATTERNS

Figure 18 shows commuting patterns in Chatham and Lee Counties in the year 2000. About 12,500 Chatham County commuters traveled outside of the county to work. Orange County is their principal destination, followed by Durham, Wake, and finally Lee County. About 5,200 commuted from the counties shown into Chatham to work. In-commuting and out-commuting is relatively balanced between Chatham and Randolph or Alamance. Slightly more workers commute in to Chatham from Harnett and Moore than commute out to those counties. This information can assist in economic development, land use, and transportation planning to foster jobs-housing balance and efficient transportation patterns.

Figure 18. Journey to Work Flows, County-to-County, 2000



Source: Melissa Guilbeau, Chatham County Transportation Director

GREENHOUSE GAS INVENTORY

INDICATOR: GREENHOUSE GAS EMISSIONS BY SECTOR

Status: 1,305,107 US Tons of CO₂ equivalents in 2008

Greenhouse gases contribute to climate change by trapping heat in the earth's atmosphere, much like a greenhouse. Greenhouse gases such as water vapor, carbon dioxide, and methane are generally beneficial—in fact, they maintain our planet's comfortable climate. However, human's combustion of fossil fuels such as coal for electricity or petroleum for transportation has increased greenhouse gas concentrations in the atmosphere by about 35% since

the 1750s. The Intergovernmental Panel on Climate Change (IPCC) reports that “warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level” (2007). The IPCC concludes with “very high confidence” that the warming is due to human activities (2007). Indeed, the climate has already warmed about 1.8 degrees Fahrenheit in the last century, and projections of warming over the next century range from 1.4 to 6.4 degrees Celsius (IPCC, 2007).

An increase in the global average temperature is a concern because it results in changes in climate that will vary regionally. In North Carolina, observed and expected changes include higher frequency of droughts, floods, wildfires, heat waves, and more intense hurricanes and storms. Sea level rise will affect the coast. In Chatham County, although it is difficult to predict specifics, some of the weather extremes listed above may increase in frequency. More information can be found at <http://www.epa.gov/climatechange/>.

Climate change is a global phenomenon, but much of the emissions that contribute to climate change are produced at a local level. Therefore, Chatham County inhabitants and businesses can play a role by reducing their emissions. Chatham County is participating in the Local Governments for Sustainability initiative, otherwise known as ICLEI, which outlines a pathway towards creating targets and achieving reductions in greenhouse gas emissions. For more information on ICLEI’s process see <http://www.iclei.org/index.php?id=810>. A greenhouse gas baseline inventory was conducted for the county with support from Duke’s Nicholas School of the Environment in order to form a starting point in the process.

Using electricity and fuel use data as inputs, ICLEI’s software formulas calculate emissions in terms of tons of ‘carbon dioxide equivalents.’ The reason for these units is that human activities produce several greenhouse gases -- carbon dioxide, methane, nitrous oxide, and other fluorinated gases such as chlorofluorocarbons-- that exhibit different properties. Their ability to trap heat in the atmosphere per pound of gas varies widely. For simplicity, emissions inventories are expressed in ‘carbon dioxide equivalents’ to account for these differences. For example, since methane is about 21 times as potent as carbon dioxide, 1 pound of methane is expressed as 21 pounds of carbon dioxide (CO₂) equivalents.

Table 21. Chatham County Greenhouse Gas Emissions by Sector, 2008

Sector	Tons of CO ₂ Equivalent	Percent Share
Transportation	449,182	34%
Residential	287,107	22%
Industry	222,784	17%
Agriculture	211,049	16%
Commercial	112,019	9%
Waste	22,966	2%
Total	1,305,107	100%

Note: Waste was calculated separately from the sector that produced it.

Source: Chatham County Greenhouse Gas Inventory, 2010

Figure 19 and 20 compare greenhouse gas emission by sector for Chatham County and the US in 2008. In Chatham County, the proportion of transportation, residential, and agriculture emissions is higher, while industry and commercial emissions are at a lower percentage than in the US.

Figure 19. Chatham County Greenhouse Gas Emissions by Sector, 2008

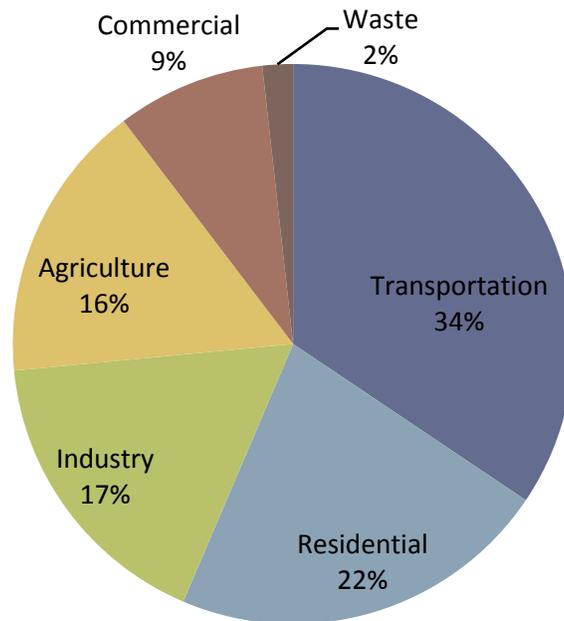
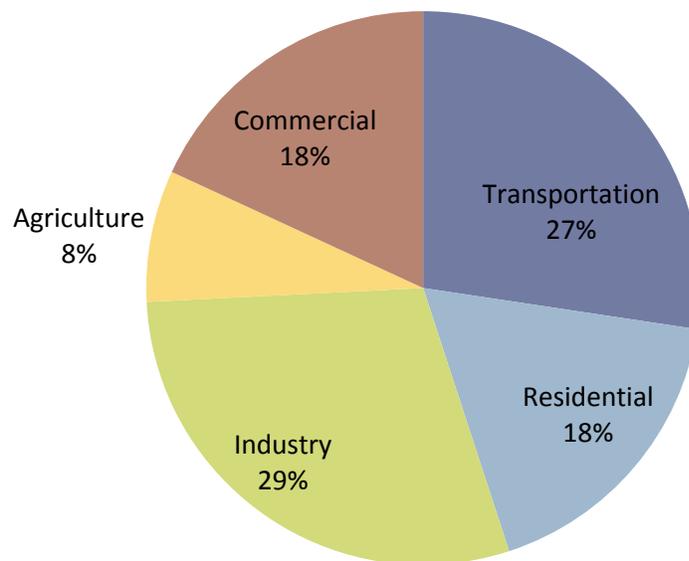


Figure 20. US Greenhouse Gas Emissions by Sector, 2008



Source Figure 19: Chatham County Greenhouse Gas Inventory, 2010.

Source Figure 20: US Environmental Protection Agency, *Inventory of US greenhouse gas emissions and sinks 1990-2008*, 2010

http://epa.gov/climatechange/emissions/downloads10/US-GHG-Inventory-2010_ExecutiveSummary.pdf

The county inventory is a best estimate using available data. For more information on methods and limitations, see

<http://www.icleiusa.org/tools/cacp-2009>

AIR RESOURCES: LOOKING AHEAD

CHANGING AIR POLLUTION STANDARDS

New standards have been recently developed by the North Carolina Department of Natural Resources (DENR) and the US Environmental Protection Agency (EPA) for the Raleigh-Durham-Chapel Hill region, which includes four townships in the northeast portion of the county. The new standards for ozone will be more stringent, and accordingly, the region is expected to fall into 'non-attainment' or below the standard. Continued progress will need to be made in reducing emissions that lead to ground-level ozone in order to meet the new standards.

FUTURE TRANSIT PLANS

There are several plans in the works in Chatham transportation. A new transit service between Pittsboro, Siler City and Sanford is being planned, and the county is soon launching an emergency ride home program for county employees. In the short-term, a new fixed route will be launched in Siler City.

CURRENT CLIMATE CHANGE EMISSIONS POLICIES

As of the writing of this document, there were no caps on greenhouse gas emissions in Chatham County. North Carolina has numerous incentives and rebates for various clean technologies and energy efficiency investments, and some municipalities have special building codes, listed on this website:

<http://www.dsireusa.org/incentives/index.cfm?State=NC>.

Neither the state of North Carolina nor the EPA requires reporting of greenhouse gas emissions from permitted facilities, but this may change in the future. Voluntary reporting is encouraged, and in fact, many facilities have chosen to report their greenhouse gas emissions through NC Division of Air Quality's online reporting system (NCDENR, 2009).

COUNTY ENERGY EFFICIENCY MEASURES

The county conducted an energy audit through Johnston Controls for county facilities in 2009-2010 which resulted in energy savings and greenhouse gas emissions reductions.

AIR RESOURCES RECOMMENDATIONS

- Continue working through the strategic energy planning process, creating a greenhouse gas reduction plan with viable targets and implementation strategies
- Consider policies such as incorporating energy-efficiency guidelines in new development, and connecting residents and businesses with existing energy-efficiency rebates and incentives
- Design strategies to support smart growth that enhance transportation choices other than the single-occupant vehicle, such as car and van-pooling, and pedestrian, bicycle, and transit facilities
- Continue to support multimodal transportation planning in the county, working with regional partners
- Develop and follow strategies to reduce emissions that lead to harmful ground-level ozone conditions
- Publicize unhealthy AQI days and promote working from home on those days



ENVIRONMENTAL EDUCATION AND RECREATION

Jordan Lake State Recreational Area

Environmental education helps us understand our place in the natural world. Outdoor exercise and fresh air support our health, providing relief from modern stresses. Playing in nature is an important part of children's development, health, and appreciation of the natural sciences. As more and more of our time is programmed and "plugged in," we must foster the connections with nature that can sustain a vibrant, healthy lifestyle.

Here, we gauge Chatham County's main assets and opportunities for connecting people with nature. These opportunities help instill stewardship values as we encounter nature's wonders and learn about our dependence on natural cycles and resources. Recreation and environmental education are important components of what makes Chatham County a unique place to visit, learn, work, and play. In addition to health, aesthetics, and educational benefits, environmental recreation creates jobs and economic returns.

Chatham County residents prioritize trails, beauty, and open space over other recreational facilities. Respondents to the 2007 Chatham County Parks and Recreation Master Plan Survey ranked thirty-six types of recreation facilities for future development. Nature-based recreation facilities (hiking trails, equestrian trails, etc.) received a significant amount of votes for top priority. In fact, of the top eleven facilities on the list, eight were nature-oriented.

The *Environmental Education* sub-section describes the County's prominent environmental education centers, and presents a measure of their participation rates. This sub-section also characterizes availability and enrollment at environmental higher education.

Nature Recreation presents the number and acreage of accessible parks and their activities and number of hunting and fishing licenses sold in the county.

Many organizations and activities not analyzed nonetheless conduct valuable environmental education in the county. These include environmental advocacy non-profits and neighborhood organizations such as Haw River Assembly, Girl Scouts and Boy Scouts and others. Public education and outreach programs are another source of environmental education for adults and families. For example, education relating to stormwater and water quality is a central required component of the Jordan Lake restoration initiatives.

Additionally, throughout public school from K-12th grade, students learn environmental science as part of state public instruction standards. The state Board of Education's science course of study is found at <http://www.ncpublicschools.org/curriculum/science/scos/2004/>.

ENVIRONMENTAL EDUCATION

INDICATOR: ENVIRONMENTAL EDUCATION CENTERS

Status: 7 Environmental Education Centers in 2010 (EEnorthcarolina.org)

Hands-on outdoor activities assist in learning and development. The following table describes the environmental education centers that are located in Chatham County. More information can be found at the Office of Environmental Education's website: <http://www.eenorthcarolina.org/>.

Table 22. Environmental Education Centers Located in Chatham County

Name	Description of EE offerings	Website
Screech Owl Farm School	After school, summer camp, and adult programs on botany, horses and farm ecology	www.screechowl.com/
American Livestock Breeds Conservancy	Online/print information and curriculum regarding heirloom livestock breeds	www.albc-usa.org/
The Abundance Coop	Children's sustainability and energy tour, public tours of Piedmont Biofuels, Vermiculture, pollinator garden, and more	http://theabundancefoundation.org/
Jordan Lake State Recreational Area	Natural area recreation open to the public: camping, fishing, hiking, swimming, boating, wildlife viewing. Also public and group EE programs	www.ncparks.gov/Visit/parks/jord/main.php
Jordan Lake Educational State Forest	School group EE programs, Educator workshops	www.ncesf.org/JLESF/home.htm
Jordan Lake Visitor Assistance Center	School group EE programs and tours, Junior Ranger program	www.saw.usace.army.mil/jordan/index.htm
Carolina Tiger Rescue	Public tours by reservation, internships, animal enrichment craft programs	www.carolinatigerrescue.org/

Source: North Carolina Office of Environmental Education

<http://www.eenorthcarolina.org/>

INDICATOR: NUMBER OF STUDENTS ATTENDING PROGRAMS AT ENVIRONMENTAL EDUCATION CENTERS

*Status: 6142 students attended a program at Jordan Lake 2009-2010**Trend: Mixed from 2005-2006 to 2009-2010*

Environmental education programs, centered on topics such as water quality, wildlife, the food chain, and other aspects of natural science, can enhance a child's learning experience. Three of the largest providers of school-age environmental education programs in Chatham County are Jordan Lake State Recreational Area, Jordan Lake Educational State Forest, and Jordan Lake Visitor Center. Data was obtained from only these three centers regarding

annual attendance at Ranger or Naturalist-led environmental programs. Information from other environmental education providers was limited.⁸

Table 25 and Figure 21 below summarize the results. Participation levels fluctuated in the last six years at the State Forest and the Visitor Assistance Center, while participation at the State Recreation Area decreased. Rangers at each of the three facilities report their perception that over the long term, travel budgets for school systems have been slowly reduced, leading to fewer field trips. Also, Rangers at the State Recreational Area have experienced recent cuts in staff which has contributed to a decline in program offerings there in 2009-2010.

These numbers reflect program participation and not overall visitation. The students that the three centers serve hail from schools throughout the region-- Wake, Orange, Durham, Alamance, and Chatham counties.

Table 23. Jordan Lake Environmental Education Participation

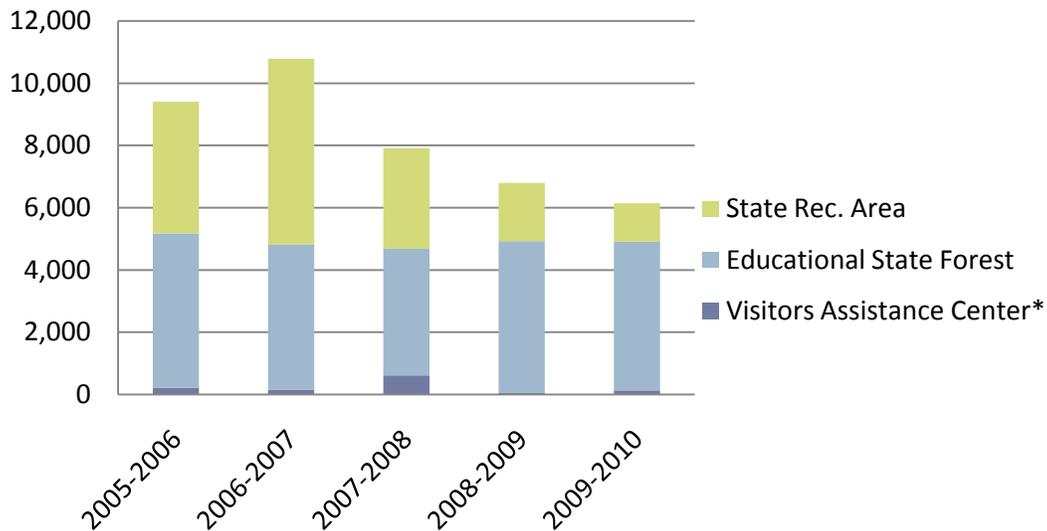
Jordan Lake Environmental Education Participation			
Year	Visitors Assistance Center*	Educational State Forest	State Rec. Area
2005-2006	212	4,961	4,230
2006-2007	151	4,678	5,956
2007-2008	612	4,065	3,235
2008-2009	65	4,861	1,875
2009-2010	133	4,770	1,239

Source: Data obtained from staff at each site.

*Army Corps of Engineers property. Includes on-site programs only.

⁸ Screech Owl Farm School did not have an operational email address or phone number; American Livestock Breeds Conservancy solely provides print materials; Piedmont Biofuels is covered under the Higher Education section; and Carolina Tiger Rescue did not return telephone calls.

Figure 21. Jordan Lake Annual Environmental Education Participation



Source: Steve McMurray, Jordan Lake State Recreation Area; Paul Kalish, Jordan Lake Educational State Forest; Tara Arnette, Jordan Lake Visitors Assistance Center.

*Army Corps of Engineers property. Includes on-site programs only.

INDICATOR: HIGHER EDUCATION ENROLLMENT IN ENVIRONMENTAL FIELDS

Status: 198 students in 2010

Trend: Increasing from 19 (2002) to 198 (2010)

Central Carolina Community College offers a variety of environmental tracks at the Pittsboro location. The following are the associate’s degree and certificate opportunities. Continuing education options are also available.

Associates Degrees:

- Sustainable Technologies
- Sustainable Agriculture
- Alternative Energy Technology: Biofuels

Certificates:

- Green Building
- Renewable Energy

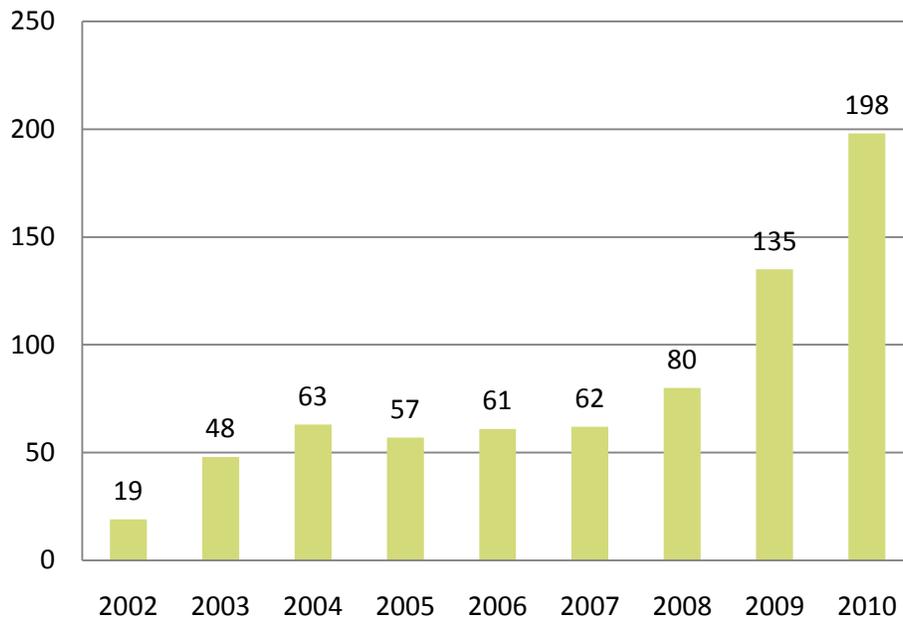
- Ecotourism
- Sustainable Agriculture
- Sustainable Agriculture Livestock
- Sustainable Agriculture Vegetable Production



Lyle Estill, Piedmont Biofuels (Neha Shah)

Enrollment and graduation from these programs has been increasing since the programs launched. Figure 22 shows the number of students registered as pursuing associates degrees or certificates in any of the curriculum mentioned above. Table 26 displays the CCCC’s increasing environmental program graduation rate.

Figure 22. Total Annual Enrollment in CCCC Environmental Degree & Certificate Programs, 2002-2010



Source: Michelle Wheeler, CCCC

Table 24. Graduation from CCCC Environmental Associates Degree & Certificate Programs, 2006-Summer 2010

	2006	2007	2008	2009	2010	Total
Associates*	0	4	3	3	5	15
Certificates**	8	2	2	6	17	35
Total	8	6	5	9	22	50

*Includes: Alternative Energy: Biofuels, Sustainable Agriculture, Sustainability Technologies

**Includes: Biofuels Production, Sustainable Agriculture, Sustainable Livestock, Sustainable Vegetable Production (Ecotourism was not available)

Source: Michelle Wheeler, Registrar, CCCC

Much of the CCCC's environmental curriculum is also offered to non-degree and non-certificate students through continuing education enrollment. Courses range from water conservation to wild plant identification and uses, ecotourism, organic vegetable gardening, and sustainable practices for horse owners. More information about these innovative programs can be found at <http://www.cccc.edu/locations/chatham/countypage/>.

Environmental Education Resources

- If you spot an animal while visiting Jordan Lake State Recreation Area, you can identify it using the wildlife photo gallery at http://149.168.1.196/nrid/gallery_park.php?park=JORD. Select the group of animals you are seeking from the drop down menu on the right.
- The NC Wildlife Resources Commission offers profiles of North Carolina wildlife at http://www.ncwildlife.org/wildlife_species_con/WSC_Profiles.htm
- The National Wildlife Federation's Enature.com website contains a vast wildlife profile database at <http://www.enature.com/home/>
- Find information about centers and an environmental education library at North Carolina's Office of Environmental Education <http://www.eenorthcarolina.org/index.htm>

NATURE RECREATION

INDICATOR: NATURE RECREATION ACTIVITIES

Nature Recreation can include biking, hiking, walking, wildlife watching, boating, fishing, camping, and picnicking. Access to nature recreation activities is important for health and well being, and there is high demand for such activities in Chatham County and elsewhere. Table 22 describes the wide range of nature-oriented recreation activities available to residents and visitors.

Table 25. Nature-Oriented Parks Acreage and Facilities in Chatham County

PARK NAME	TYPE	ACRES	FACILITIES OFFERED					
			Hike/ Walk	Bicycle	Picnic	Boat/ Canoe/ Kayak	Fish	Camp
Town Lake Park	Town (Pittsboro)	36	X		X		X	
Mary Hayes Barber Holmes Park	Town (Pittsboro)	10	X	X	X			
Southwest Community Park	County	25	X		X			
Northwest District Park	County	118	X		X		X	
Bynum Beach Canoe Access	County	1				X		
Lower Haw River State Natural Area	State	1,000	X			X		
Jordan Lake State Recreation Area	State	46,768	X	X		X	X	X
American Tobacco Trail	Multi- Agency	61	X					
Condoret Nature Preserve	TLC*	85	X					
La Grange Riparian Reserve	TLC*	308	X			X		
Wood's Mill Bend	TLC*	22	X					
Mclver Landing	TLC*	5				X		
White Pines Nature Preserve	TLC*	275	X					
Deep River Park	DRPA**	40			X	X		
TOTALS:		48,714	10	1	4	4	3	1

Sources: Chatham County Parks and Recreation, Pittsboro Parks and Recreation, Siler City Parks and Recreation, Triangle Land Conservancy, Lands Managed for Conservation and Open Space shapefile from NCONemap.com, North Carolina Division of Parks and Recreation.

*Triangle Land Conservancy

**Deep River Park Association

Several parks with nature-oriented recreation areas are planned, shown in Table 23, to meet the growing demand from county residents. Resources for finding nature-oriented recreation are listed in the sidebar.

Table 26. Planned Nature Oriented Recreation Facilities

PARK NAME	TYPE	ACRES	Hiking/ Walking	Biking	Picnic	Boating/ Canoeing/ Kayaking	Fishing	Camping
Southern Park	Municipal	52	X	X	X			
Pittsboro Town Park	Municipal	N/A	X					
Briar Chapel Park	County	N/A	X					
Northeast District Park	County	65	X	X	X		X	
Bynum Beach Canoe Access	County	1				X		
Haw River Trail	State	N/A	X	X		X		
Deep River State Trail	State	N/A	X			X		

Sources: Chatham County Parks and Recreation, Pittsboro Parks and Recreation, North Carolina Division of Parks and Recreation, Triangle Land Conservancy.

Nature-Oriented Recreation Resources

- Pittsboro Parks <http://pittsboronc.gov/> (Choose 'Parks' in list on left)
- Chatham County Parks <http://www.chathamnc.org/Index.aspx?page=708>
- North Carolina State Parks <http://www.ncparks.gov/Visit/main.php>
- American Tobacco Trail <http://www.triangletrails.org/ATT.HTM>
- Triangle Land Conservancy http://www.triangleland.org/lands/places_to_visit.shtml

INDICATOR: NUMBER OF HUNTING AND FISHING LICENSES SOLD

Status: 11,588 sold in 2009

Trend: Increased slightly from 2005-2009

The number of hunting and fishing licenses sold in Chatham County indicates outdoor recreation participation rates. Outdoor recreation such as hunting and fishing promotes interaction with and appreciation of the outdoors. Also, hunting and fishing has important economic functions. With 1.7 million participants, hunting and fishing in North Carolina generated \$1.7 billion in sales and supported 29,000 jobs in 2006—quite significant even without accounting for ripple effects (Southwick Associates, Inc., 2008).

In Chatham County, the number of hunting and fishing licenses sold increased modestly over the last four years. In 2005, 11,315 licenses were sold but in 2009, the number was 11,588, an increase of 2.4% (James Jones, personal communication, July 1, 2010). These numbers do not include online licenses sold, which account for about 500 to 1,000 licenses annually. Figures include licenses sold to all customers, regardless of residence.

ENVIRONMENTAL EDUCATION AND NATURE RECREATION: LOOKING AHEAD

DATA NEEDS

Further investigation could assess the integration of environmental education in schools. How many of Chatham County School students participate in an environmental education program as part of K-12 education? In addition, a full assessment of other environmental education sources in the county would provide a more complete picture of this sector.

IMMINENT POLICY ACHIEVEMENT: PARKS AND RECREATION MASTER PLAN

The county developed a new *Parks and Recreation Comprehensive Master Plan* with input from the public, conservation consultants, other agencies, and the county commissioners. It is currently working through the approval process. The plan will help shape future parks and facilities investments. There are several recommendations in the plan that will help preserve and support Chatham County's natural environment while simultaneously providing opportunities for encounters with nature and healthy outdoor recreation.

The Town of Pittsboro is also updating its Parks Master Plan, which should be completed in December of 2010 (Paul Horne, electronic mail communication, October 21, 2010).

ENVIRONMENTAL EDUCATION AND NATURE RECREATION RECOMMENDATIONS

- Approve the draft *Parks and Recreation Comprehensive Master Plan for 2009-2029*, which contains many excellent environmentally-oriented recommendations, including:
 - **Greenways and blueways:** Develop a greenways system and a bicycle network, working towards connectivity of parks and walkability within local developments; develop greenways and stream buffers along rivers.
 - **Design and daily maintenance:** Design parks in an environmentally-sensitive and energy-efficient manner (Town of Pittsboro's parks department models these principles).
 - **Implementation:** Support public financing of parks facilities to respond to community needs; promote inter-agency coordination within government and other organizations, including schools, CCCC, and Cooperative Extension; foster partnerships; and enable novel land acquisition and funding mechanisms.
- Integrate the *Parks and Recreation Comprehensive Master Plan* as recommended with the Greenways Master Plan, a new Open Space plan, as well as other transportation (i.e. bicycle transportation plans), land use, and conservation plans.
- Consider creating outdoor environmental science education goals for Chatham County students, including components such as field trips, on-site gardens and schoolyard habitats.
- Consider introducing or expanding environmental education programming in county and municipal parks.



SOLID WASTE AND HAZARDOUS WASTE

Solid waste, hazardous waste, and recycling volumes produced over time reflect our ability to conserve material resources. In ecosystems, all waste becomes naturally recycled, or decomposed, into nutrients that fuel the next generation's growth. The waste products from one organism become the inputs for another. The more closely human processes can mimic this model, the less burden waste creates on society from transport, storage, treatment, and disposal needs.

County and private haulers handle solid waste, and the state tracks it. Hazardous waste is one special class of solid waste, that, due to its potentially harmful nature, Federal agencies regulate and track. Industrial and commercial hazardous wastes are processed and regulated in a separate system from household waste. The county's Division of Waste Management runs a program to collect and process household hazardous waste.

Industry and society produces much more solid waste than hazardous waste. To provide an idea of the relative volume of the two types of waste, hazardous waste accounts for about 3% of the county's total waste stream. Accordingly, solid waste is reported by the ton; hazardous waste is reported by the pound.

In the US as a whole, solid waste per capita has leveled off recently, while hazardous waste volume decreased. From 1960 to 1990, solid waste per capita in the US increased from 2.7 to 4.5 lbs., but then held at 4.5 and 4.7 lbs. per capita from 1990 to 2008 (US EPA, *Municipal solid waste generation, recycling, and disposal in the United States*, 2009). Total US hazardous waste decreased dramatically due to programs related to the Toxics Release Inventory (TRI). Between 1988 and 1998, total releases decreased by 45% (Sterner, 2003).

The Solid Waste sub-section examines tons of solid waste and recycled waste reported by the county and the state as well as solid waste per person.

The Hazardous Waste component reports household hazardous waste, pounds of hazardous chemical releases, number of facilities reporting emissions, and inactive hazardous waste sites.

Next, *Looking Ahead* summarizes additional programs, emerging issues and policy achievements. The section concludes with recommendations.

SOLID WASTE

INDICATOR: TOTAL TONS OF SOLID WASTE

Status: 32,612 tons in 2008-09

Trend: Holding steady or decreasing while population rises since 2002-03

Waste reduction and recycling avoids many environmental and societal costs including energy use, landfill space, water use, and impacts associated with harvesting new materials. According to the Carolina Recycling Association, residential recycling in Chatham County saved 49,384 BTUs of energy and 14,557 barrels of oil in 2008.

Storing trash in landfills requires space; siting new landfills or expanding existing ones can be difficult and costly. New local landfill proposals often provoke a “not in my backyard” or NIMBY reaction from the public, although nearly everyone contributes to the need for trash storage space. Many have a sense that landfills are more likely to be located in neighborhoods with disadvantaged populations who are left out of the decision-making process (whether or not it is the case) (Lake, 1996; Foreman, 1997; Scarlett, 2000). Land is valuable: the less trash is produced, the less space needs to be reserved for landfills, and the more space is available for more productive uses.

The North Carolina Department of Environment and Natural Resources Waste Management Division tracks tons of solid waste by county in the state.

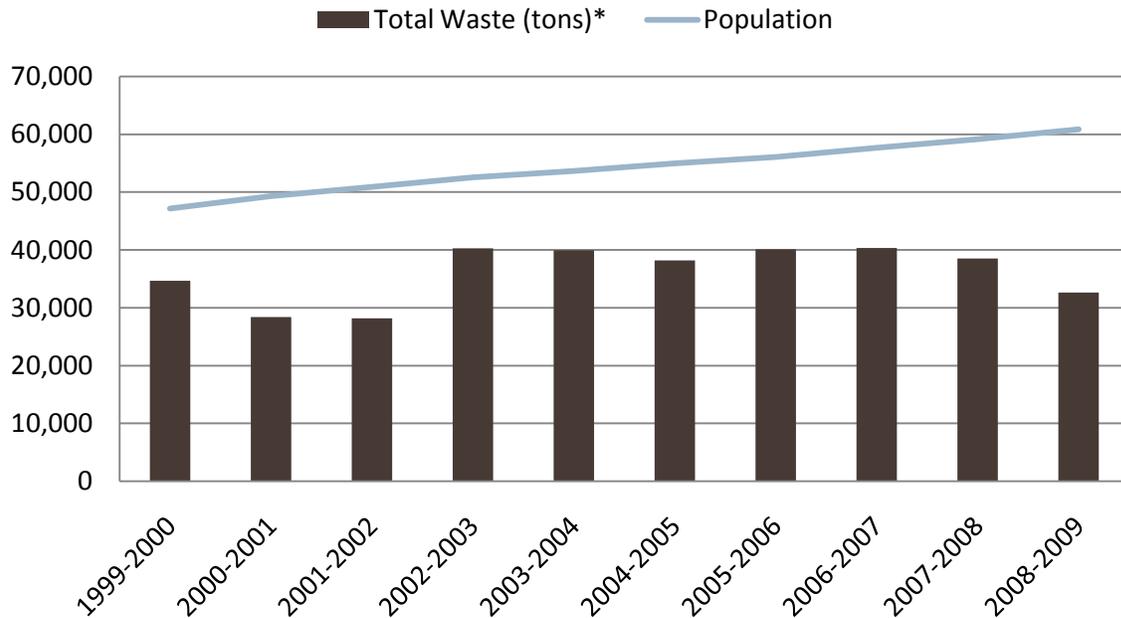
According to data, shown in Figure 23, as population has slowly increased, total waste produced in the county has fluctuated, then leveled out around 40,000 tons from 2002-2008. The last year saw a decrease of almost 6,000 tons. The county has avoided waste stream increases even while population rose.

Pounds of waste produced per person per day, illustrated in Figure 26, fluctuated similarly early in the decade, but has decreased slightly in five of the last six years.

Compared to North Carolina and the United States average, Chatham County has a lower per capita solid waste disposal. In Chatham County, according to the NC Division of Waste Management, in 2008, the average waste per person per day was 2.9 pounds, whereas in North Carolina, it is 7.3 pounds⁹ (2009). The rate for the US as a whole is 4.5 pounds per person per day (US EPA, Municipal Solid Waste Generation, Recycling, and Disposal in the US, 2009). The county’s low rate is reportedly due to the county’s recycling and waste reduction programs (Richardson Smith Gardner, 2009), but it could also reflect reduced industry presence in the county (Sybil Tate, personal communication, November 4, 2010). More study is needed to determine the causes of this potentially environmentally beneficial trend.

⁹ Includes industrial waste

Figure 23. Solid Waste and Population Trends in Chatham County, 1999-2009

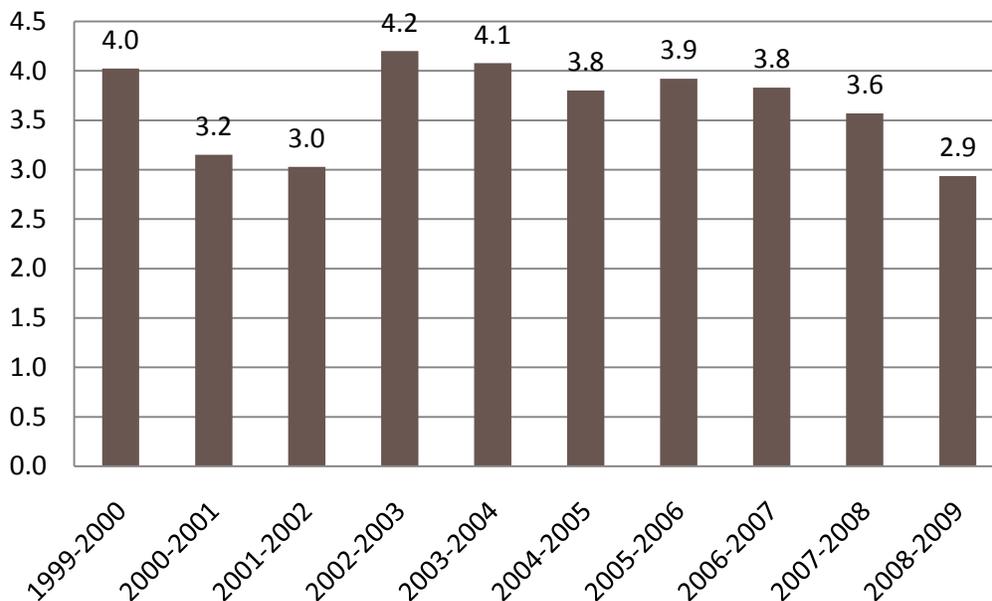


Note: Data for each year is July 1 to June 30.

Source: Population and waste from County Solid Waste Disposal Report, NC Division of Waste Management at <http://portal.ncdenr.org/web/wm/sw/reports>

* Calculated amount of waste disposed by county = [Municipal solid waste landfills + construction and demolition landfills + nonrecycled + exports + transferred out of county] - [imports+ waste received by transfer stations from other counties + non-recycled waste received from other counties]

Figure 24. Chatham County Pounds of Solid Waste per Person per Day, 1999-2009



Source: Calculated with population and waste data from County Solid Waste Disposal Report, NC Division of Waste Management, <http://portal.ncdenr.org/web/wm/sw/reports>

INDICATOR: TONS OF RECYCLED MATERIALS FROM COUNTY-COLLECTED SOURCES AND MUNICIPALITIES

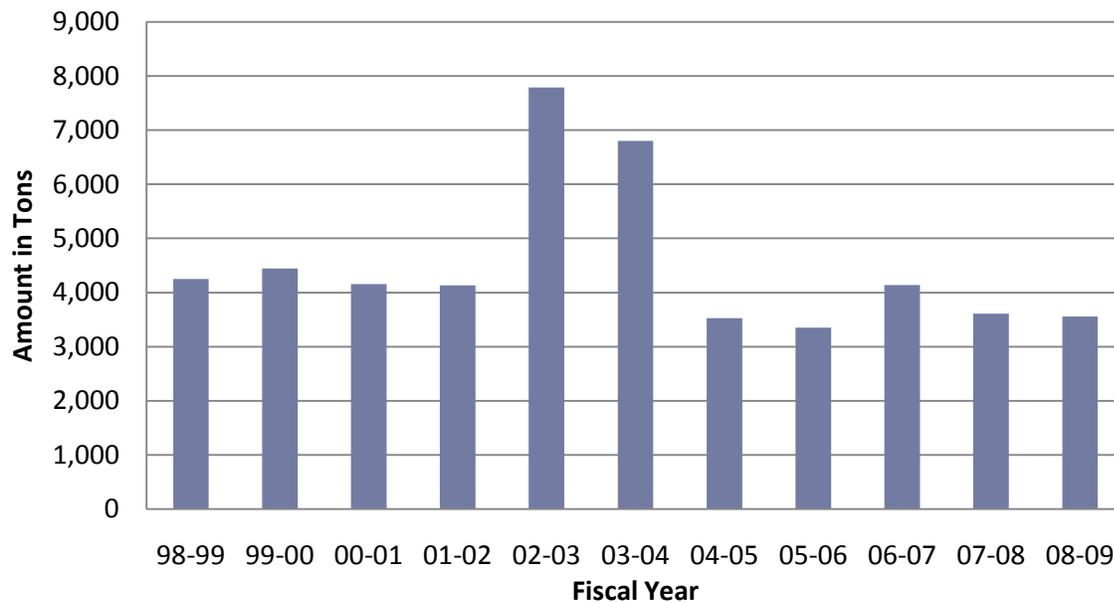
Status: 3,556 tons recycled in 2008-2009

Trend: Mixed

Chatham County's Waste Management Department accepts full range of recyclables including aluminum and steel cans, mixed paper, milk cartons, juice boxes, newspapers, cardboard, glass, plastic, appliances and scrap metal, motor oil and filters, tires, auto batteries, electronics, and cooking oil. There is also a 'swap shop' for clothing, toys, used furniture and so forth. The county began accepting plastic margarine and yogurt tubs in February, 2010.

The Waste Management Department reports the waste and recycled materials by weight collected and transferred through its drop-off centers, the Waste Management Facility, and through other programs with schools, special events and so forth. The department also keeps track of recycled materials collected by the three municipalities: Goldston, Siler City and Pittsboro, although Goldston does not yet have recycling service. The data excludes recycled materials managed by any private companies.

The Figure 25 and Table 27 display the total tons of recycled materials that the Waste Management Department reported from 1998 to 2009 by fiscal year. Occasionally natural events such as storms increase the recycling totals, as in 02-03 and 03-04 when an ice storm generated excessive yard waste such as fallen tree branches (Sonya Gilliland, personal communication, November 23, 2010). The figures are comparable over time (aside from storm-caused variations), but do not reflect actual total recycling for all county sectors due to lack of private haulers' data. No clear trends emerge from the data, but they provide a baseline against which future progress can be measured.

Figure 25. Reported Recycling in Chatham County, 1998-2009

Note: Includes County collected waste and Town reported waste. Does not include waste/recycling from private haulers, which serve some residential and most commercial and industrial sectors.

Source: Chatham County Division of Waste Management

Table 27. Reported Recycling in Chatham County (Tons), 1998-2009

Year	98-99	99-00	00-01	01-02	02-03	03-04	04-05	05-06	06-07	07-08	08-09
Collection Centers	3,198	3,213	3,304	3,269	2,851	2,571	2,482	2,418	2,249	2,250	2,456
Goldston* Municipal	-	-	-	-	-	-	-	-	-	-	-
Pittsboro Municipal	132	204	147	95	115	129	120	89	99	113	154
Siler City Municipal	352	404	231	208	230	313	212	153	144	124	165
Other**	568	621	474	562	4,712	3,787	710	693	1,647	1,121	780
Total	4,249	4,442	4,156	4,133	7,907	6,800	3,524	3,353	4,140	3,607	3,556

Note: Includes County collected waste and municipal reported waste. Does not include waste/recycling from private haulers, which serve some residential and most commercial and industrial sectors.

Source: Chatham County Division of Waste Management

*Goldston does not have a recycling service

**Includes Schools, Events, County Waste facility, County Offices, and Car Meadows that the County handles

HAZARDOUS WASTE

INDICATOR: HOUSEHOLD HAZARDOUS WASTE

Status: 46,276 lbs. collected in 2009-2010

Trend: Overall, increasing quantities collected between 2006 and 2010

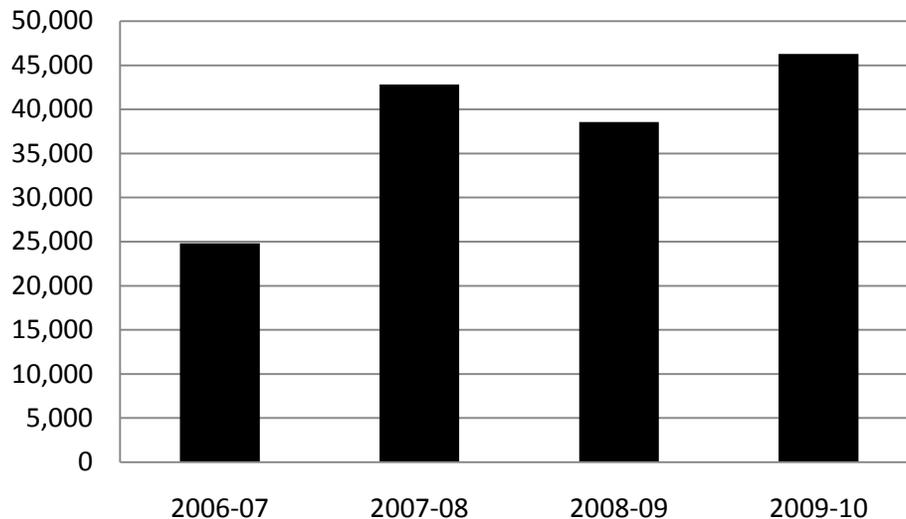
Many household products are considered hazardous wastes. Household hazardous chemicals are ignitable, corrosive, reactive or toxic such as bleach, antifreeze, fuels, paints, or herbicides. When these products are no longer wanted, they should not be thrown in the trash, poured down the sink, or into streets or waterways where they cause pollution. The proper way to dispose of unwanted household chemicals is to take them to a Chatham County Household Hazardous Waste Collection Facility. Household hazardous wastes (HHW) are collected at special events held nine times a year. HHW are recycled when feasible. The county also operates a 'reuse paint-mobile' for all recyclable latex paint. The HHW facility is open the third Saturday of the month, March-November. For more information, visit <http://www.chathamnc.org/Index.aspx?page=526> and <http://www.epa.gov/osw/consERVE/materials/hhw.htm>. Tips for reducing household hazardous waste can be found here <http://portal.ncdenr.org/web/wm/sw/hhw>

Chatham County Division of Waste Management reports that thousands of pounds of household hazardous wastes are collected every year, keeping these wastes out of the environment and keeping garage shelves clear of unwanted chemicals. Table 28 and Figure 26 show the number of pounds collected annually from 2006-2010.

Table 28. Household Hazardous Wastes Collected By Chatham County Division of Waste Management

Fiscal Year	Pounds Collected
2006-07	24,805
2007-08	42,833
2008-09	38,560
2009-10	46,276

Figure 26. Household Hazardous Wastes Collected By Chatham County Division of Waste Management



INDICATOR: TOTAL POUNDS OF HAZARDOUS CHEMICALS RELEASED AND DISPOSED

Status: 2,482,024 pounds in 2008

Trends: Decreased 34% from 2001 to 2008

The Federal Government has a variety of regulations that require proper handling and disposal of hazardous solid waste under the Resource Conservation and Recovery Act (RCRA) (USEPA, 2010). Waste is deemed RCRA hazardous if it is a solid waste which meets characteristic requirements for ignitability, reactivity, corrosively, fails the Toxicity Leaching Characteristic Test, or is otherwise listed as RCRA Hazardous Waste (though various RCRA exemptions may apply). For more information on the general categories of hazardous waste see <http://www.epa.gov/osw/hazard/wastetypes/index.htm>.

Once a waste is deemed RCRA Hazardous, appropriate handling, manifest and disposal approaches must be taken to ensure the waste is tracked from generation to disposal (for more information, see <http://www.epa.gov/compliance/civil/rcra/rcraenfstatreq.html>). Certain types of facilities are required to report the disposal or release of toxic chemicals under a federal law that the US Congress passed in 1986 called the Emergency Planning and Community Right-to-Know Act (EPCRA). Later, in 1990, The Pollution Prevention Act required industries to report additional information on toxic waste management and source reduction. The Toxics Release Inventory (TRI) is the vehicle for reporting this information and making it publicly accessible.

Facilities that must report to the Toxics Release Inventory include manufacturing and mining operations, electrical utilities, chemical wholesalers, and others who process the chemicals. Facilities are exempted from reporting if they have fewer than 10 full-time employees or if the facility manufactures or

processes less than 25,000 pounds or otherwise uses 10,000 pounds of listed chemicals. The TRI contains 600 tracked or 'listed' chemicals.

Knowledge about the occurrence or location of hazardous waste disposal is only the first step in assessing risk to humans or the environment. Rules that govern chemical handling do not end with the TRI. Facilities are required to adhere to regulations governing how many chemicals may be lawfully released, disposed of, or recycled. Residents, businesses and public officials can use the TRI as one of many sources to inform decision-making. Researchers estimate risk from a range of factors such as toxicity, population exposure, amount released, and the fate of the chemicals after disposal or release. For more information about the Toxics Release Inventory, see <http://www.epa.gov/tri/triprogram/FactorsToConPDF.pdf>.

While industrial facilities in Chatham County have decreased the amount of hazardous waste generated in the last decade, the county still ranks twelfth highest among counties in North Carolina (USEPA, 2010). Table 29 displays amounts of TRI-tracked main chemical groups that facilities located in Chatham County disposed of or released. The total is nearly 2.5 million pounds. Some chemicals were disposed of or released on-site; others were sent to another facility (off-site) for recycling/disposal.

Table 29. Release and Disposal of Hazardous Waste by Chatham County Reporting Facilities (in Pounds), 2008¹⁰

Chemical	Total On-site Disposal or Other Releases*	Total Off-site Disposal or Other Releases**	Total On- and Off-site Disposal or Other Releases
Ammonia	1,220		1,220
Anthracene	7	130	138
Antimony Compounds	425	2,355	2,780
Arsenic Compounds		190	190
Barium Compounds	149,293	1	149,294
Benzo (G,H,I) Perylene			
Biphenyl	5,251	339	5,590
Chromium Compounds (Ext. Chromite Ore Mined In Transvaal Region)	26,361	693	27,054
Copper Compounds	26,216	74	26,290
Dibenzofuran	214	180	394
Dioxin and Dioxin-Like Compounds			
Ethylene Glycol	198,253	5,123	203,376

¹⁰ Hazardous Air Pollutants, federally regulated under the Clean Air Act, overlap with Toxic Air Pollutants regulated by the state Division of Air Quality (reported in the Air Pollution sub-section of this report). For more information see <http://daq.state.nc.us/toxics/hap/>

Formaldehyde	59,508	107	59,615
Hydrochloric Acid (1995 and After "Acid Aerosols" Only)	1,530,532		1,530,532
Hydrogen Fluoride	147,432		147,432
Lead	48		48
Lead Compounds	12,644	5	12,649
Manganese	100		100
Manganese Compounds	53,863	41	53,904
Mercury Compounds	155		155
Methanol	114,158		114,158
N-Hexane			
Naphthalene	1,890	610	2,501
Nickel Compounds	23,310		23,310
Phenanthrene	33	605	638
Phenol	1,819	5	1,824
Polychlorinated Biphenyls			
Polycyclic Aromatic Compounds	6	419	425
Sodium Nitrite			
Sulfuric Acid (1994 and After "Acid Aerosols" Only)	35,000		35,000
Vanadium Compounds	49,475		49,475
Zinc Compounds	32,728	1,204	33,932
Total (pounds)	2,469,942	12,082	2,482,024

Note: Includes only facilities that are required to report chemical release or disposal to the Toxics Release Inventory. Reports of hazardous waste release or disposal does not confirm a risk to human or environmental health, or that the facility is in violation of any regulation.

Source: EPA TRI Explorer (<http://www.epa.gov/triexplorer/>)

* Underground Injection to Class I Wells, RCRA Subtitle C Landfills, Other Landfills, Fugitive or Non-point Air Emissions, Stack or Point Air Emissions, Surface Water Discharges, Class II-V Wells, Land Treatment/Application Farming, Surface Impoundments and Other Land Disposal

** Off-site Disposal or Other Releases include from Section 6.2 Underground Injection, RCRA Subtitle C Landfills, Other Landfills, Storage Only, Solidification/Stabilization - Metals and Metal Compounds only, Wastewater Treatment (excluding POTWs) - Metals and Metal Compounds only, Surface Impoundments, Land Treatment, Other Land Disposal, Other Off-site Management, Transfers to Waste Broker - Disposal (M94, M91), and Unknown (M99) and, from Section 6.1 Transfers to POTWs (metals and metal compounds only). For more information regarding types of disposal/releases, see <http://www.epa.gov/triexplorer/metadata.pdf>.

Eleven industrial facilities report to the Toxics Release Inventory. Table 30 lists the pounds by facility, and indicates whether wastes were disposed or released on the site of the facility or at another facility (off-site). This information can be used to track progress over time.

Table 30. TRI Reporting Facilities Located in Chatham County, 2008

Facility	Location	Total On-site Disposal or Other Releases	Total Off-site Disposal or Other Releases	Total On- and Off-site Disposal or Other Releases
Carolina Power & Light Co - Cape Fear Steam Electric Plant	500 Cp&L Rd, Moncure, NC 27559	1,975,314	326	1,975,640
Performance Fibers Inc.	338 Pea Ridge Rd, New Hill, NC 27562	203,929	7,817	211,746
Uniboard Usa LLC.	985 Corinth Rd, Moncure, NC 27559	168,446	97	168,543
General Shale Brick Inc Moncure Facility Plants 24 & 25	300 Brick Plant Rd, Moncure, NC 27559	68,064		68,064
3m Co - Pittsboro	4191 Hwy 87 S, Moncure, NC 27559	27,197	1,793	28,990
Moncure Plywood LLC.	306 Corinth Rd, Moncure, NC 27559	17,768		17,768
Arclin Usa Inc.	790 Corinth Rd, Moncure, NC 27559	7,087	15	7,102
General Timber Inc.	625 Farmville Mine Rd, Sanford, NC 27330	2,137	2,034	4,171
Pilgrim's Pride Corp Bonlee Feed Mill	3732 Old Us Hwy 421 N, Bonlee, NC 27213	Z*	Z	Z
Townsend Farms Inc. Bonlee	(9215). 4460 Old Hwy 421 S, Bonlee, NC 27213	Z	Z	Z
Townsend Inc. Pittsboro Plant	270 Moncure Pittsboro Rd, Moncure, NC 27559	Z	Z	Z

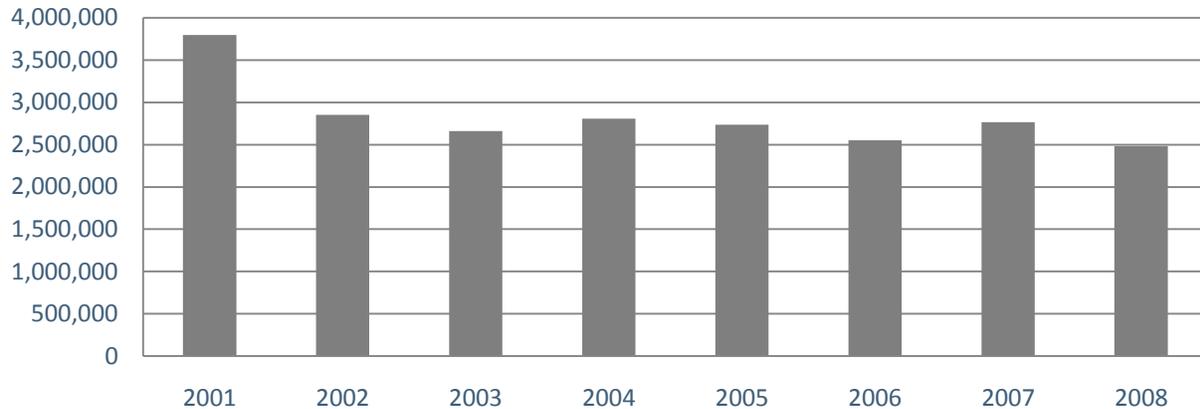
*The author of this report was unable to confirm what 'Z' signifies. Some facilities are not required to report annually.

Note: Reports of hazardous waste release or disposal does not confirm a risk to human or environmental health, or that the facility is in violation of any regulation.

Source: EPA TRI Explorer, <http://www.epa.gov/triexplorer/>

Figure 27 shows that the total weight of toxic chemicals that reporting facilities in Chatham County disposed of or released has declined overall between 2001 and 2008.

Figure 27. Total Pounds of Chemicals Released/Disposed by Reporting Facilities in Chatham County, 2001-2008



Note: Includes facilities that are required to report hazardous chemical release or disposal to the Toxics Release Inventory

Source: EPA TRI Explorer, <http://www.epa.gov/triexplorer/>

The US Environmental Protection Agency requires facilities to report their toxic chemical disposals and releases by the medium in which they are disposed, whether to air, water, or land, either on-site or off-site. The Table 31 shows trends from 2001 to 2008 by medium of discharge or release. As Table 31 indicates, the majority of toxic materials are disposed of by air, followed by land, and only a small percentage is released to water. Facilities treated or disposed of most toxics on-site. Depending on a range of other factors mentioned previously, this may or may not have implications for residents or the environment near such facilities.

Trends show that fewer toxics were released to the air in 2008 than in 2001. There appears to be some shift towards land disposal. The implications of this should be explored further. Overall, the amount of toxics disposed of by reporting facilities in the county is trending downwards.

Table 31. Trends by Disposal/Emissions Type, Chatham County Reporting Facilities, 2001-2008

Year	On-site Disposal or Other Releases				Off-site Disposal or Other Releases	Total On- and Off-site Disposal or Other Releases (pounds)
	Total Air Emissions	Total Releases to Land	Surface Water Discharges	Subtotal	Subtotal	
2001	92%	7%	0.02%	99.4%	0.6%	3,798,666
2002	88%	11%	0.03%	99.6%	0.4%	2,852,512
2003	88%	11%	0.05%	98.9%	1.1%	2,659,849
2004	87%	12%	0.04%	99.0%	1.0%	2,806,309
2005	86%	13%	0.04%	99.0%	1.0%	2,735,727
2006	85%	14%	0.05%	99.1%	0.9%	2,552,395
2007	85%	15%	0.03%	99.4%	0.6%	2,764,603
2008	85%	14%	0.04%	99.5%	0.5%	2,482,024

Note: Total Off-site Disposal or Other Releases includes landfill/surface impoundment, solidification/stabilization of metals, off-site waste broker or other management or other land disposal

Note: Total On-site Releases to Land includes surface impoundments, on-site land treatment application-farming, on-site landfills, and other

Source: EPA TRI Explorer, <http://www.epa.gov/triexplorer/>

INDICATOR: 'INACTIVE' HAZARDOUS SITES AND POLLUTANT-ONLY SITES

Status: 10 sites

There are no superfund sites, brownfield sites, cleanups with multiple program systems, or water monitoring stations in Chatham County. Neither are there any reports on chemical emergency and removal cleanups. Furthermore, there are no 'large quantity generators' of hazardous waste (EPA, 2010).

There are several sites that are deemed 'inactive' hazardous sites, listed in Table 32. These are locations where hazardous substance release has occurred, but clean up was inactive at the time of program enactment. The list in Table 32 does not include sites that have been labeled 'no further action' sites. There are about a dozen other hazardous waste site types that are not included in this list, such as dry cleaners, gas plants, and agriculture areas. For full description of exceptions, see <http://portal.ncdenr.org/web/wm/sf/ihs/home>.

Table 32. 'Inactive' Hazardous Sites Located in Chatham County, 2010

Company Name	Location
Boise Cascade	Moncure
Carolina P&L Co.	Moncure
Chatham Mills, Inc.	Pittsboro
Dynea	Moncure
High Falls Oil Company, Inc.	US Hwy. 902
Hydro Tube South	Pittsboro
Lee Paving/NCDOT	Griffins Crossroads
Reichhold Chemical, Inc.	Moncure
Southern Wood Piedmont Co.	Gulf
Weyerhaeuser Co./Moncure	Moncure

Source: North Carolina Department of the Environment,
http://portal.ncdenr.org/c/document_library/get_file?uuid=bc36cebd-0da1-4199-be4c-1044a7f1343c&groupId=38361

SOLID WASTE AND HAZARDOUS WASTE: LOOKING AHEAD

ADDITIONAL PROGRAMS

POLICY ACHIEVEMENT: CHATHAM COUNTY CONSTRUCTION AND DEMOLITION RECYCLING ORDINANCE

Since September 1, 2010, the County has required any construction or demolition project located in the unincorporated areas and 1,000 square feet or greater to document recycling of project-generated debris. Mixed debris must be transported to a county-licensed construction and demolition recycling facility. The ordinance is found at this link: <http://www.chathamnc.org/Index.aspx?page=1373>. The ordinance aims to reduce landfill waste.

ONGOING ISSUES: LANDFILL SITING

Chatham County is in the process of evaluating sites for additional future landfills within the county. Since 1993, solid waste has been disposed of outside county borders, resulting in fluctuations in pricing, and uncertainty about future availability of landfill space. A new landfill under county control would reduce these risks. The Chatham County Solid Waste Disposal Feasibility

Study was conducted in 2009 to identify potential new landfill sites. Criteria used in the analysis included economic, social, and environmental components. Landfill siting criteria excludes environmentally sensitive areas and prioritizes sites with shorter hauling distances to reduce vehicle emissions and fuel costs. Criteria also consider geologic information as well as proximity to population centers. The county is conducting public hearings to gather community feedback as the site selection process advances.

SOLID WASTE AND HAZARDOUS WASTE RECOMMENDATIONS

- Continue to create and promote solid waste reduction and recycling initiatives
- Investigate the causes behind the reduction in hazardous waste and solid waste in recent years
- Monitor the success of the construction/demolition recycling ordinance
- Continue to connect local industries with solid and hazardous waste reduction programs implemented through the state Division of Waste Management, such as the National Partnership for Environmental Priorities and the Environmental Stewardship initiatives

ENVIRONMENTAL HEALTH: POLICY ACHIEVEMENTS AND ISSUES

POLICY ACHIEVEMENT: GOLDSTON SEWER BOND REFERENDUM

In June of 2010, the Town of Goldston's leadership successfully passed a bond referendum to finance wastewater treatment infrastructure for the town. The new facilities will finally address the septic-system failures that the town has endured. To support the initiative, Chatham County's Board of Commissioners also committed \$1.5 million to fund a trunk line between Goldston and the city of Sanford (Rigsbee, 2010).

Older or ill-maintained septic systems are prone to failure, leading to sewage leakage into surrounding areas. Failed septic systems are a health hazard, especially if wells are located nearby. Furthermore, sewage can seep through or over the ground into nearby waterways, causing damage to aquatic habitats and posing a risk to water quality. One solution, installing water and sewer infrastructure, can be a financial challenge. Goldston residents have struggled for years with aging septic systems-- a nuisance, a health hazard and a detractor to property values. The lack of a municipal wastewater treatment system has also dampened economic growth. The leadership of the town of Goldston and Chatham County are investing in infrastructure that will benefit the whole community: the economy, the environment, and public health.

ONGOING ISSUE: APPLICATION OF SLUDGE ON AGRICULTURAL FIELDS

In Chatham County, about 5,000,000 gallons of sewerage sludge are applied to agricultural fields annually (Chatham County Board of Commissioners, 2008). Sludge, sometimes called biosolids, is solid matter that is leftover from the wastewater treatment process, and is often applied to farm fields as fertilizer. After some bacteria are treated, liquids are removed and recycled. The sludge that remains is largely organic matter. Sludge is high in nutrients such as nitrogen and phosphorous. It also contains many other chemicals, metals, and toxins. Wastewater treatment plants handle sewage not only from residents' household drains, but industry effluents, landfill leachate, and sometimes runoff from rainwater. The Clean Water Act is the federal law that regulates the extent to which sludge must be treated before it is applied to land. Wastewater treatment plant chemists are required to test several chemicals and bacteria to ensure safety. However, not all potential toxins are tested for, which is cause for concern.

In January, 2009, the EPA released a study on the contents of sludge. Testing for hundreds of chemicals, the study detected the presence of 27 metals, several semi-volatile organics, pharmaceuticals, steroids, and flame retardants. The EPA determined that more research is needed to determine what happens to these chemicals after being applied to a farm, if they are washed into nearby waterways, and whether they are transmitted to animals who consume treated crops. Those familiar with the issues widely agree that more study is needed to determine whether or not significant health or

environmental risks exist. In the US (including North Carolina), residents have lodged complaints of illness associated with sludge land application (Harrison, 2002).

Alternatives to spreading sludge, such as landfilling or incineration, carry high monetary costs and other risks. The federal government banned the practice of dumping sludge into the ocean in the 1990s to protect marine habitat (Cowell, 2010). Given the volume of sludge that results from wastewater treatment plants it seems unlikely that a quick disposal alternative will be found. In the meantime, farmers often depend on this free fertilizer to make ends meet, especially in the economic slowdown. Many farms in Chatham County utilize sludge (Andy Siegner, personal communication, June 15, 2010).

Federal regulations guide the processing and application of sludge, but the law allows states to enforce more stringent guidelines, such as setbacks or neighbor notification. States allow varying degrees of local control. In North Carolina, a recent court decision in Granville County sided against localities' demands to pass tighter sludge application restrictions, making local control difficult (Cowell, 2010). Locally, Orange County and Chatham County are interested in pursuing rules to protect health and watersheds. Chatham County Board of Commissioners approved a statement sent to the North Carolina Division of Water Quality recommending that regulations be updated to include larger setbacks, monitoring of nearby streams and wells, further testing of heavy metals and organic contaminants, posting of signs to notify adjoining landowners, indemnity coverage for the land application permittee, and maintenance of public records of neighbor-reported health problems (2009). These measures are a positive first step toward applying the precautionary principle to protect human health and the environment.

POLICY OPPORTUNITY: CHILDHOOD LEAD POISONING PREVENTION RULE

Chatham County Board of Health is finalizing a new Childhood Lead Poisoning Prevention Rule to protect children's health from lead exposure. Older paints contain lead, which residents can inadvertently inhale or ingest, causing lead poisoning. Although lead poisoning is not a threat to the natural environment per se, it *is* an environmental health issue. The Lead Rule carefully outlines a plan for identifying and remediating potential hazardous buildings, lowering the action threshold for blood lead levels, increasing screening rates, and establishing an outreach program. The Rule requires primary care physicians to test for lead during well-child exams at age 1 and 2.

The current action threshold for blood lead levels is 20 micrograms per deciliter. Although exact numbers are yet to be determined, the proposed Rule would require a lead investigation and remediation at a lowered threshold (10 micrograms per deciliter), and the health department would offer a voluntary investigation to identify potential home hazards at around 4 to 9 micrograms per deciliter blood lead level. The ordinance aims to reduce the lead exposure of the youngest county residents, who are the most vulnerable to its effects.

ENVIRONMENTAL HEALTH RECOMMENDATIONS

- Continue to address septic system failure to protect groundwater quality and human health
- Continue supporting science-based precautions in the application of sludge to agricultural lands
- Pass the Childhood Lead Poisoning Prevention Rule to reduce young children's exposure to lead

ABOUT THE AUTHOR

Amanda Campbell completed a Master's degree from UNC Department of City and Regional Planning, with an environmental/land use specialization, in May, 2010. She interned for Chatham County in spring 2010, quantifying the carbon balance of forests and soils for the countywide greenhouse gas inventory, with funding from the American Planning Association Small Town and Rural Planning Division. Her Master's Project focused on methods to evaluate progress of plans in local government, such as indicator tracking. Graduate coursework included Transportation Policy, Environmental Policy, Development Environmental Management, Development Impact Assessment, State of the Environment-Triangle Region, and Water Resources Planning.

Prior to attending UNC, she served as Park Naturalist for Arlington County, VA. She has also worked as a science teacher for Fairfax County Public Schools, VA, and as an instructor/program coordinator at Catalina Island Marine Institute, CA. Over a decade, she taught tens of thousands of children and adults about all aspects of the natural world. She obtained a Bachelor's in Biology, concentration in Ecology, and minors in Environmental Studies and Music from James Madison University, VA in 1997.

Now, she is launching a new career that combines environmental stewardship and sustainable development. She recently began a new position as Climate and Energy Research Assistant with the Metropolitan Washington Council of Governments in Washington, DC.

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APPENDIX

APPENDIX 1. LAND COVER DEFINITIONS

Source: http://www.mrlc.gov/changeproduct_definitions.ph

* Agriculture - including cultivated crops and pasture/hay – Cultivated crops are described as areas used for the production of annual crops, such as corn, soybeans, vegetables, tobacco, and cotton, and also perennial woody crops such as orchards and vineyards. This class also includes all actively tilled land. Pasture/Hay is described as grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle.

* Barren - Barren areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, sand dunes, strip mines, gravel pits, and other accumulations of earthen material. Generally, vegetation accounts for less than 15% of total cover.

* Forest - Areas dominated by trees generally taller than 5 meters, and greater than 20% of total vegetation cover. Includes deciduous forest, evergreen forest, and mixed forest. Pixels coded to a value of 4 have not changed between 1992 and 2001.

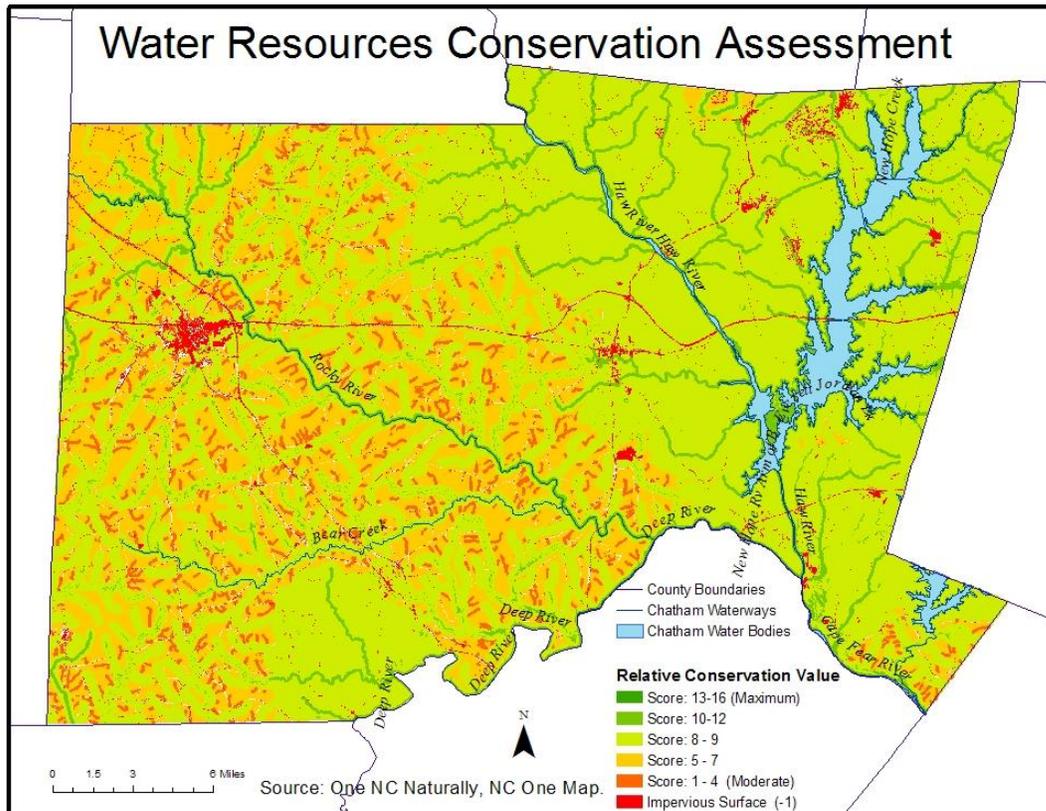
* Grassland/Shrub - Includes grassland areas dominated by gramminoid or herbaceous vegetation and shrub/scrub areas dominated by shrubs less than 5 meters tall with shrub canopy typically greater than 20% of total vegetation, including true shrubs, young trees in an early successional stage, or trees stunted due to harsh environmental conditions.

* Open Water - All areas of open water, generally with less than 25% vegetation or soil cover.

* Urban - Includes developed open spaces with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses such as large-lot single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes. Also included are lands of low, medium, and high intensity with a mixture of constructed materials and vegetation, such as single-family housing units, multifamily housing units, and areas of retail, commercial, and industrial uses.

* Wetlands - including woody wetlands and herbaceous wetlands – Areas where forest or shrubland vegetation accounts for greater than 20 percent of vegetative cover and the soil or substrate is periodically saturated with or covered with water. This class also includes areas where perennial herbaceous vegetation accounts for greater than 80 percent of vegetative cover and the soil or substrate is periodically saturated with or covered with water.

APPENDIX 2. WATER CONSERVATION VALUE MAP.



This map was created using multiple data sources and map layers, such as wetlands, biodiversity, water uses, classification values, current land uses, and proximity to population. It creates a framework for prioritizing the lands that will carry multiple water resources conservation values, taking into account water quality, water quantity and water uses. It is not meant to be prescriptive; land use decisions must not only take into account environmental and water supply issues, but cultural, historical, economic, and community values that cannot be easily represented in a county-wide map. For a full explanation of the methods, see http://www.onencnaturally.org/PDFs/CHAPTER_6_WATER_SERVICES.pdf. Data was downloaded from <http://www.onencnaturally.org/pages/ConservationPlanningTool.html>.

APPENDIX 3. BMPs AND CONSERVATION PRACTICES PLANNED AND APPLIED IN CHATHAM COUNTY 2005-2009

Area (Acres)	Total Planned	Total Applied
Waste Utilization	5,874	6,481
Nutrient Management	5,742	6,145
Forage Harvest Management	3,874	3,315

Residue and Tillage Management, No Till	4,417	3,294
Conservation Crop Rotation	796	2,598
Residue Management, Seasonal	3,063	1,804
Pasture and Hay Planting	4,744	1,598
Forest Stand Improvement	1,830	1,437
Prescribed Burning	846	1,359
Long Term No Till	528	999
Native Plant Restoration and Management	1,410	478
Upland Wildlife Habitat Management	525	154
Prescribed Grazing	358	148
Pest Management	0	137
Cover Crop	110	110
Land Clearing	481	56
Early Successional Habitat Development/Management	78	50
Contour Farming	1,133	38
Conservation Cover	3	33
Riparian Forest Buffer	31	29
Waste Water & Feedlot Runoff Control	19	19
Heavy Use Area Protection	37	18
Critical Area Planning	11	3
Restoration and Management of Rare and Declining Habitats	274	0
Tree/Shrub Establishment	103	0
Grassed Waterway	66	0
Irrigation System, Microirrigation	38	0
Strip Cropping	20	0
Use Exclusion	4	0
Filter Strip	4	0
Mulching	2	0
Contour Farming	2	0
	36,423	30,303
Single Facility (Number)		
Watering Facility	279	76
Water Well	62	60
Comprehensive Nutrient Management Plan	33	23
Pumping Plant	65	17
Stream Crossing	40	15
Waste Storage Facility	42	8
Animal Mortality Facility	14	6
Composting Facility	12	6
Waste Management System	3	5
Pond	7	3
Spring Development	7	1

Incinerator	1	1
Closure of Waste Impoundment	10	0
	575	221
Linear (feet)		
Fence	260,177	58,245
Pipeline	192,324	29,601
Firebreak	84,235	9,248
Field Border	49,817	5,590
Animal Trails and Walkways	13,818	4,612
Terrace	1,500	0
Diversion	130	0
Surface Drainage, Field Ditch	60	0
	602,061	107,296

^a U.S. Census Bureau

^b NC Office of Budget and Management

^c Triangle J Council of Governments

^d Chatham County Website

^e USGS (2006)

^f North Carolina Natural Heritage Program

^g MLRC NLCD 1992-2001 Change Tool

^h USDA National Agricultural Statistics, <http://www.agcensus.usda.gov/index.asp>

ⁱ Tina Stone, Tax Administrator, Chatham County Tax Administration, personal communication May 3, 2010; reported in Hess, 2010

^j Brenda Williams, Director, Chatham County Soil and Water Conservation, personal communication October 8, 2010

^k NC Division of Water Quality

^l Karen Hall, NCSU Water Quality Group, personal communication, October 5, 2010

^m Retrieved September 17, 2010 from NC Division of Waste Management,

<http://portal.ncdenr.org/web/wm/ust/ustmain>

ⁿ USGS, Water Use in the U.S., <http://water.usgs.gov/watuse/>

^o Chatham County Utilities Drinking Water Quality Annual Report, 2009,

<http://www.chathamnc.org/Index.aspx?page=383>

^p US EPA Air Data, 2009,

<http://www.epa.gov/air/data/monaqi.html?co~37037~Chatham%20Co%2C%20North%20Carolina>

^q NC Division of Air Quality. Retrieved 7.22.2010 from

<http://xapps.enr.state.nc.us/air/aq/ToxicsReportServlet?ibeam=true&year=2008&physical=037&overridetype=All&toxics=all&sortorder=1&viewreport=View+Report>, and

<http://xapps.enr.state.nc.us/air/aq/ToxicsReport/Toxrpt.jsp?ibeam=true>

^r NCDOT data received from Ellen Beckman, Transportation Planner for the City of

Durham/DCHC MPO ; US Census Bureau (multiple tables)

^s Chatham County 2008 Greenhouse Gas Baseline Inventory, 2010

^t James Jones, personal communication, July 1, 2010

^u Chatham County Parks and Recreation, Pittsboro Parks and Recreation, Siler City Parks and Recreation, Triangle Land Conservancy, Lands Managed for Conservation and Open Space shapefile from NCONemap.com, North Carolina Division of Parks and Recreation

^v Steve McMurray, Jordan Lake State Recreation Area; Paul Kalish, Jordan Lake Educational State Forest; Tara Arnette, Jordan Lake Visitors Assistance Center

^w Population and waste from County Solid Waste Disposal Report, NC Division of Waste Management at <http://portal.ncdenr.org/web/wm/sw/reports>

^x Chatham County Division of Waste Management

^y Chatham County Division of Waste Management

^z EPA TRI Explorer (<http://www.epa.gov/triexplorer/>)