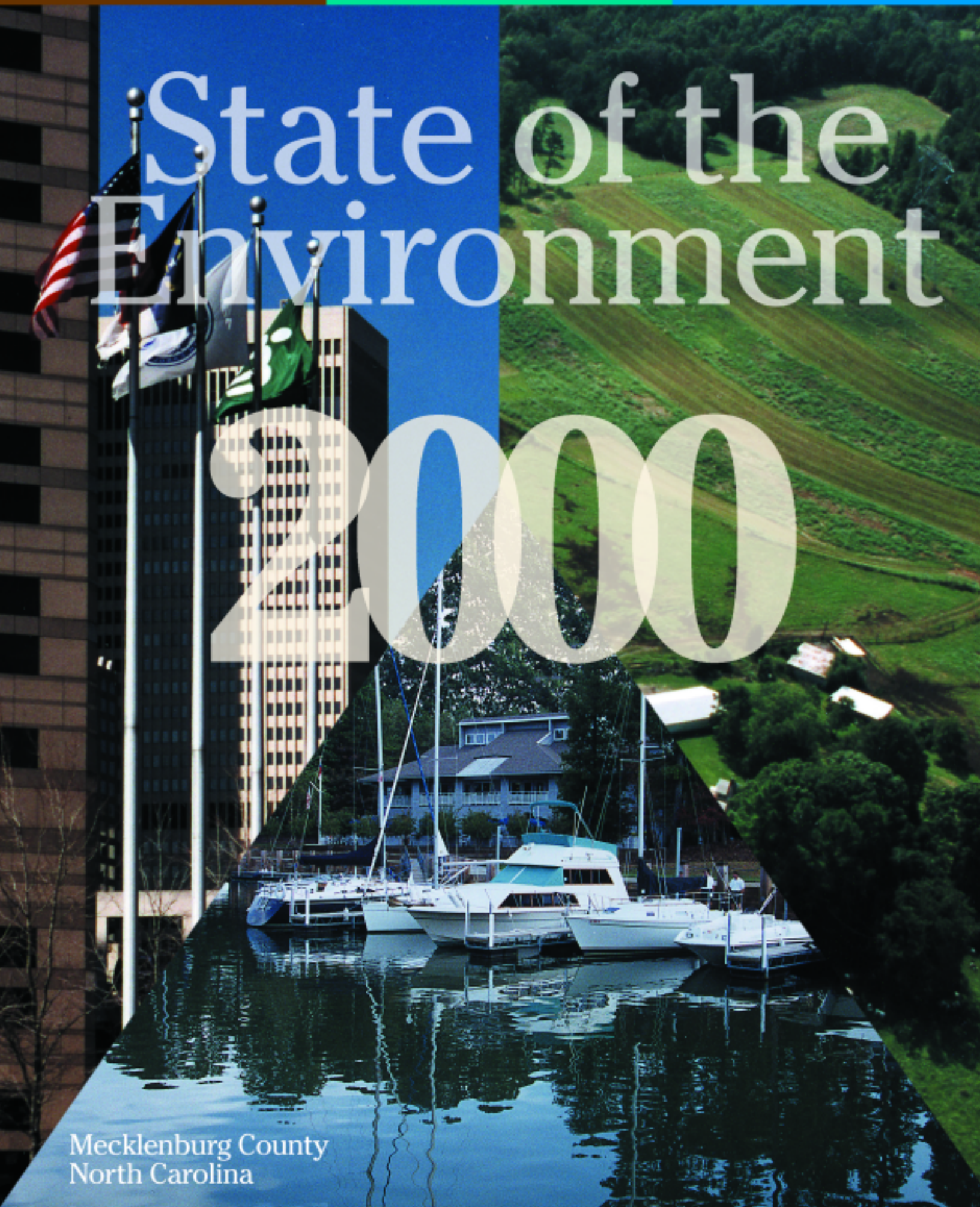
LAND 8 WATER QUALITY 36 AIR QUALITY 96



State of the Environment 2000

Mecklenburg County
North Carolina

For Your Information

Since 1987 purpose of the State of the Environment Report has been and remains:

(1) to describe Mecklenburg County's current environmental status for the public and the Board of County Commissioners;

(2) to give the County objective measures to evaluate progress toward a clean, healthy environment;

(3) to highlight the major issues facing the County; and

(4) to recommend direction concerning those issues.

As we enter a new century, these concepts are even more important as our community and region continue to grow at a rapid pace.

Charlotte - Mecklenburg Annual Survey

Results from Environmental Questions: Importance of Environment in Mecklenburg County

Category and Percent Responding	1991	1993	1995	1997	1999
1. Importance of protecting the environment in Mecklenburg					
Very important	86.3	82.0	84.0	81.8	86.7
Some importance	12.7	16.7	14.7	17.6	12.4
Not important	1.0	1.3	1.3	0.6	0.9
2. Believe the environment receives correct amount of attention					
Too much attention	1.7	5.5	3.6	3.6	4.5
Right amount of attention	23.8	31.5	35.1	34.3	33.9
Not enough attention	74.4	63.0	61.3	62.1	61.6
3. Would pay higher taxes to protect the environment					
Yes	73.0	62.7	64.9	59.1	61.1
No	27.0	37.3	35.1	32.5	38.9
4. Level of government best for environmental regulations					
Local	41.2	55.2	43.3	46.9	17.8
State	16.4	21.5	30.2	26.7	8.5
Federal	18.4	18.5	23.5	17.5	4.4
Combination	22.7	4.9	3.1	8.9	69.4
Other	1.2	-	-	-	-
5. Rank of environment vs. education, economics, crime, health					
Very high priority	12.6	12.2	-	-	-
High Priority	35.1	30.5	25.8	25.1	24.4
Medium Priority	41.5	42.4	55.7	59.1	59.3
Low Priority	10.7	14.9	14.3	12.8	13.3
Very low priority	-	-	-	3.0	3.0

Source: UNCC Urban Institute Annual Surveys, October 1991, 1993, 1995, 1997, 1999
Sample size 850. With 98% certainty, responses are within +/- 4% of the responses one would receive from a survey of the entire adult population of Mecklenburg County.

ACKNOWLEDGMENTS

2000 State of the Environment Report

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Growth – But Will It Be Smart?

H. Parks Helms
Chairman, Board of County Commissioners

Surrounded by gloom of the Great Depression, my grandfather William G. Parks worked the red clay soil of Long Creek Township, just west of Huntersville, growing corn, cotton, and a tiny bit of wheat, oats, soybeans and sweet potatoes. Much has changed from the 1930s, when farms outnumbered office buildings in Mecklenburg County; when bankruptcies were as common as stock splits are today; when $45 bought seed and fertilizer for 37-acres of land.

Now it seems you cannot go anywhere in Mecklenburg County without seeing signs of phenomenal growth. The rolling hills and peaceful pastures of Long Creek are being converted into residential neighborhoods with cul-de-sacs and comfortable homes. As a native Charlottean, I have seen and I understand the positive and negative impacts of growth. As Chairman of the Board of County Commissioners, I believe that growth-related issues are among the greatest challenges facing out community. This growth is enhancing — yet at the same time threatening — the livability of our community. I believe that we are all responsible for assuring that our economic growth is "smart growth," benefitting all of our community and not adversely affecting our quality of life and environment. It has become a balancing act to encourage wise growth and economic vitality that improves – yet does not overwhelm – our community's quality of life.

In the last half of the 20th Century, the number of people living in Charlotte increased by more than 400%, to over 440,000 people. For a moment, envision with me what Charlotte and Mecklenburg County might look like 25 years from now. Our county's population is expected to increase by another third-of-a-million people by then. Another third of a million people with us on our roads and in our office complexes, schools, shopping centers, apartment complexes and subdivisions. This will certainly be growth – but will it be smart growth? For example, if we increase the number of homes or residential units built on each acre of land, how would that affect school crowding, water pressure, traffic congestion, mass transit use, housing availability, housing availability, property values, air and water pollution, the property tax rate, and again, our overall quality of life?

Take for example the southern part of Mecklenburg County. This is one of our most populated areas, with the highest population density and the least amount of open space. According to staff monitoring results, this conglomeration of single family and multifamily homes, industry and commercial development contaminates our streams with fecal coliform bacteria. As development density increases, pollutants from yards and paved surfaces increase. In turn, our stream water quality decreases. The northern and northwestern portions of the County, which drain into Mt. Island Lake and upper Lake Wylie, have the overall best stream water quality – not unexpected since this is the least developed part of our County.

continued

Look also at the state of our air quality. Our decades of growth have outpaced improvements to our infrastructure such as roads and adequate mass transit, Mecklenburg County's air quality – as did that of the surrounding region – declined to a state where we are frequently out of compliance with federal ozone and carbon monoxide requirements. Why? Partially because we have an average of over 20,000,000 vehicles miles driven each and every day in Mecklenburg County alone. Partially because we have a great need for regional smarter growth policies including provisions for mass transit. Partially because our industries continue to emit pollutants that go into the formation of ground level ozone. But most importantly because we need to change our commuter culture.

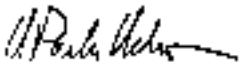
However, there are environmental bright spots on the horizon. Realizing the importance of our surface water quality to our health and quality of life, we have adopted and are implementing our Surface Water Improvements and Management plan. It is designed to maintain the good quality of some of our streams and improve the quality in others. This along with improvements in stormwater management and realizations that we need to protect buffers along streams and lakes, often through conversion of creekside areas into greenways, will help to improve the quality of water in our creeks – and thus improve one of the basic amenities of a good quality of life for the region.

This past year, we also began a new "Smart Growth Initiative" through which we hope to begin developing the community's vision of what it means to "grow smart." This Smart Growth Roundtable will help public officials and the community as a whole grapple with growth.

Our Smart Growth Initiative must consider both the forest and the trees. It must look at growth issues from an overall perspective; in other words, "How will a decision, or lack of a decision, affect the entire community?" For example, if we increase the number of homes or residential units built on each acre of land, how would that affect school crowding, water pressure, traffic congestion, mass transit use, housing availability, property values, air and water pollution, the property tax rate, or quality of life?

We turn to the Smart Growth Roundtable to help us set priorities and seek solutions. It will build on existing policies and plans to sharpen our focus. Existing blueprints for growth will undergo scrutiny. The Roundtable will guide us as leaders, businesspeople and citizens to encourage wise growth and economic vitality that improves – yet does not overwhelm – our community's outstanding quality of life. Activities such as this and others will help us envision the future, plan for the future, prepare for the future and see new avenues for protecting the state of Mecklenburg County's environment.

My grandfather understood that he and his land were partners. He planted, cultivated, nurtured and harvested his crops, knowing that his family's health and well being depended on wise use of his land and God-given resources. In the same way, Mecklenburg County residents are partners with our land. Few of us work the soil to feed our families and pay our bills. But we realize that wise use of our land and natural resources, in other words "Smart Growth," is essential for our personal and our community's quality of life and economic security.



H. Parks Helms
Chairman, Board of County Commissioners

Local Regionalism

Steve Weber
Chairman, Mecklenburg County
Environmental Protection Commission

When I was appointed chairman of the Mecklenburg County Environmental Protection Commission ("EPC") by the Board of County Commissioners ("BOCC") in 1999, I took a look back at the charter that created the EPC, and that governs the EPC today. The 1988 charter lists seven basic functions of the EPC: (1) to continually study and review the County environmental protection program and to recommend County policies and changes whenever and wherever appropriate; (2) to continually study methods to protect the community from elements that could adversely affect the environment; (3) to continually evaluate methods of waste disposal and make recommendations relating to new advances in the technology of disposal and reclamation of wastes; (4) to participate in the appeals review process; (5) to review and make recommendations on the annual budget; (6) to provide cooperation and coordination with state, federal, and local municipalities in Mecklenburg County; and (7) to generally interpret the environmental protection program and encourage the understanding and attainment of the program's objectives.

The EPC's seven functions raise two important points for the year 2000 and beyond. First, each function requires activity. In seven paragraphs, the charter empowers the EPC to "continually study," to "continually evaluate," to "review and make recommendations," to "participate," to "provide cooperation and coordination," to "interpret", and to "encourage." This is a tall order. The EPC is not limited to acting only when the BOCC seeks the EPC's advice. Rather, the EPC was created to have a proactive role in the community as the environmental eyes and ears of the County. We have an independent duty to stay abreast of important issues that affect the County environmentally and economically (these two are inextricably linked).

Second, the EPC's sixth function charter touches on a "hot-button" issue in Mecklenburg and other parts of the country, that of regionalism. The EPC is specifically charged with providing cooperation and coordination with state and federal agencies as well as the municipalities in Mecklenburg. This is a good first step, but it does not go far enough.

Environmental issues affecting the Carolinas point to the need for a regional environmental focus. Many of the most pressing environmental concerns are not governed by political boundaries. For example Mecklenburg County's ozone problems result, in part, from pollutants moving into Mecklenburg from other jurisdictions by wind and other weather patterns. Similarly, citizens of upstate South Carolina are directly affected by what Mecklenburg residents discharge into our creeks and lakes.

The EPC is, in my opinion, uniquely poised to assist in this movement toward regionalism. What "regionalism" is depends on your perspective. The Voice & Choices group implicitly defines regionalism as a fourteen county region of the North and South Carolina Piedmont. While this is certainly true, my view of regionalism is much more narrow. Regionalism begins inside the borders of Mecklenburg County. We cannot cooperate and coordinate on a broad regional level until we cooperate and coordinate locally. Mecklenburg County, for example, includes Charlotte and six smaller municipalities. We cannot begin to look beyond Mecklenburg until we coordinate among jurisdictions in the County.

continued

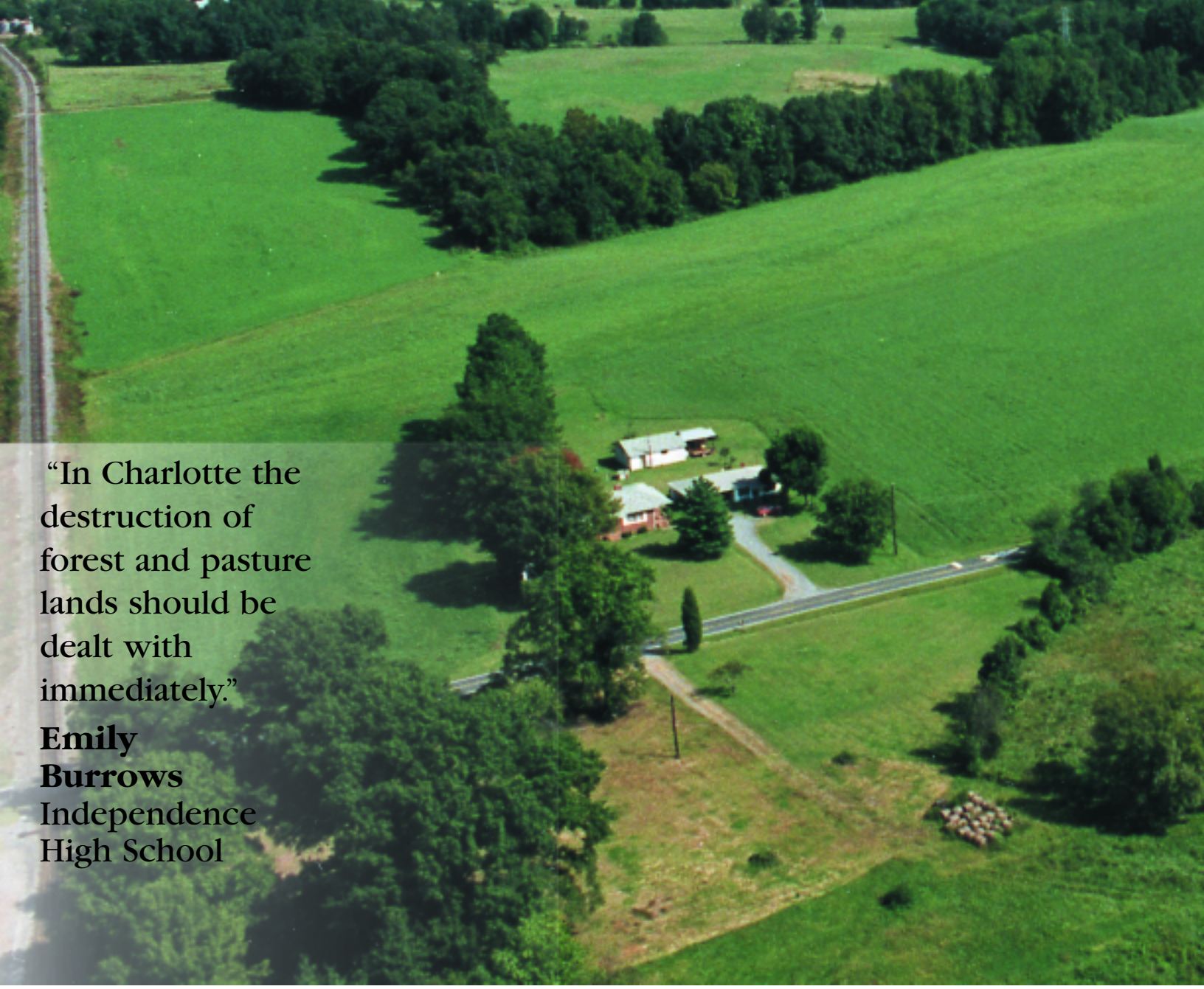
I offer two possible suggestions for beginning the pursuit of regionalism locally. First, I would suggest offering the local jurisdictions a greater voice on the EPC and other environmental boards. While the EPC has residents in various parts of Mecklenburg, all of its members except one have a Charlotte address. I would guess this to be true for the other County advisory boards as well. Expanding the voice of citizens of the local towns on the fringes of Mecklenburg can only have a positive affect on the environment and on the goal of true regionalism.

Second, it may be helpful consider if any of the scattered citizen advisory boards in Mecklenburg should bundle their efforts toward common goals. The EPC studies environmental issues generally while other boards such as the Waste Management Advisory Board grapple with very specific environmental concerns. Other boards such as the Storm Water Advisory Committee, the Park and Recreation Commission, the lake marine commissions, and others also consider environmental issues. The problems and issues these boards study overlap considerably. If our goal is to begin to approach the environment consistently at the local level and ultimately on a regional basis, our advisory boards should coordinate with one another on common issues.

In bringing these various boards to the table, we must, of course, strike a balance between the two competing adages, “two heads are better than one” and “too many cooks spoil the soup.” If a balance is struck, however, and the various boards are able to forge a common path, Mecklenburg then may be better prepared to tackle a broader area that is generally considered to be the “region.”

There is no denying that Mecklenburg is the hub in the regional wheel. In this stead, Mecklenburg has the exciting opportunity to incite the region into action environmentally. Environmental efforts are taking place across the region. We in Mecklenburg need to act locally and think regionally. We need to act locally by maintaining our obligations to our local environment and marshaling our forces to expand to a broader area. We need to think regionally by looking to tap into the similar efforts taking place throughout the region. Our efforts here, in conjunction with the work taking place by our neighbors, can become a regional environmental collaborative that brings consistency and true change in the region.

The EPC intends diligently examine the local environmental issues in Mecklenburg in the year 2000 and beyond. I am hopeful that we, as a commission, can examine these local issues through regional spectacles.



"In Charlotte the destruction of forest and pasture lands should be dealt with immediately."

Emily Burrows
Independence High School

OPEN Space?

What is **"open space?"** Open space means different things to different people. To some it conjures up images of the rural countryside with scenic vistas of farms, fields, pastures and woods. To others, it's the "pocket park" in their urban neighborhood - a refreshing oasis of green in the midst of concrete and asphalt. Open space can be privately or publicly owned, protected and preserved for future generations' benefit, or available for conversion to other more intensely-developed uses.

Open space can be a nature preserve with walking trails and wildlife observation stands, but it can also be soccer fields and baseball diamonds, or a favorite golf course. A stand of managed timber, a Christmas tree farm, a soybean field and a dairy cow pasture are all open space. So is a creek side greenway that lets floodplains serve multiple purposes, providing natural stormwater management, important habitat corridors for wildlife, and places for people to walk, jog, bike, and enjoy the natural setting. Even suburban lawns, planted medians on our roads, and landscaped plantings at shopping centers provide important "open space" functions by allowing rain to soak in rather than running off into storm sewers, thus replenishing groundwater, and by cleaning and cooling our air in summer.

Within Mecklenburg County, several government agencies acquire and manage or regulate open space for different purposes: the Parks & Recreation Department, School System, Utility Department, Stormwater Services and Engineering & Property Management, among others. Some of this open space is privately owned but affected and regulated by city or county utility easements or ordinances.

In the private sector, permanent protection for sensitive natural areas or important habitat areas is being furthered by a nonprofit local land trust, the Catawba Lands Conservancy, and its colleagues at the Trust for Public Land. Duke Energy's power company subsidiary manages thousands of acres of open space along its lakes on the Catawba River under its federally-mandated shoreline management plan. Mecklenburg County is also home to hundreds of small farms.

There is increasing recognition that open space makes an important contribution to our community's quality of life and even our economic vitality:

- Mecklenburg County voters approved a $220 million land purchase bond referendum in November 1999 to be used for purchasing land at current prices in anticipation of rising land prices and future needs for land for parks, schools and libraries and another $52 million in parks bonds were also approved.
- A public-private collaboration was formed in 1998 to protect land around Mountain Island Lake, from which Mecklenburg County draws all its drinking water; the Mountain Island Lake Initiative has set a goal of protecting 80% of the undeveloped land along the shores and tributaries of the Lake.
- In 1999 Mecklenburg County, the City of Charlotte and three of the county's incorporated towns (Huntersville, Cornelius, and Davidson) adopted stream buffer regulations more stringent than those required by the state. These regulations are designed to protect water quality in the streams by maintaining natural vegetation along the streams to filter runoff before it reaches the stream. These jurisdictions have also adopted more stringent restrictions on floodplain development to reduce flood risk and preserve the floodplains' natural floodwater absorption capacity.
- Open Space was identified as one of six key issues at the 1998 Regional Environmental Summit, which drew more than 550 participants from Mecklenburg and 13 surrounding counties; a citizen-based volunteer team worked throughout 1999 to develop an Open Space Action Plan, providing an initial template for regional open space planning and implementation

- Huntersville, Cornelius, and Davidson have adopted revisions to their land use plans and zoning ordinances that facilitate and encourage open space protection as an integral part of land development.
- Charlotte and Mecklenburg have adopted a "corridors and wedges" land use plan that envisions denser development along five key transportation corridors and ess dense development in the wedges between corridors.
- Mecklenburg County's Natural Heritage Inventory was completed in 1999, providing a wealth of information regarding the location of important native plant and animal species and their habitats that can be used in planning open space protection efforts.
- The Charlotte Tree Advisory Commission is in the process of revising the city's tree ordinance, with an eye toward extending the current regulations which affect businesses to include residences as well Trees are a critical part of open space planning. In addition to their shade-providing and air-filtering benefits, trees provide habitats and protect and condition the soil.
- The Brownfields program encourages redevelopment of underutilized or abandoned sites in or near the city center that are already served by public water, sewer and roads, thus reducing pressure to develop outlying "greenfields."

Despite these encouraging signs reflecting the importance of open space to our county, there is much still to be done. For example, there is no unified open space plan for the county, nor a central source of open space data from which to create such a plan. With so many ways of defining "open space," and so many different owners and managers of different types of open space, attempting to evaluate and monitor our open space is a daunting task. And yet, the task is critical, because we know that our county is becoming more and more urban in character and is projected to be fully developed or "built out" sometime between 2010 and 2015.

Nor have any of the local governments in Mecklenburg have established a program for the purchase of development rights ("PDR"). Under PDR programs, government agencies pay landowners to place conservation easements on their land. The landowner retains title to and full use of the land, except for development of it, and the public secures permanently protected open space at a fraction of the cost of acquiring title to it.

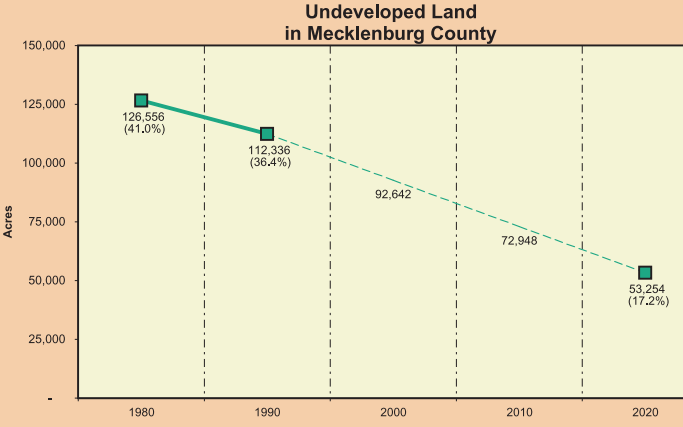
And other than for floodplains and stream buffers, none of the Mecklenburg jurisdictions have adopted ordinances to protect open space in environmentally sensitive areas such as wetlands, steep slopes or natural heritage inventory sites. The City of Durham adopted its Natural Resources Protection Standards in 1999, creating a comprehensive set of ordinances covering open space protection in floodplains, stream buffers, steep slopes, wetlands, and providing for future protection of natural heritage inventory sites.

Where do we stand now?

One way of evaluating open space is by using satellite imagery and computer analysis to distinguish between developed land and undeveloped land. This can give us a rough approximation of total open space, without regard to public versus private ownership, or use for farming versus recreation or wildlife habitat.

The Carolinas Land Conservation Network, a nonprofit land conservation research and education organization based at UNC-Charlotte, has created a computer model nicknamed the "Piedmont Green Plan" that identifies open space as it existed in 1980 and 1990 based on satellite imagery. It also uses population projections and adopted land use plans to project conversion of open space to developed uses for the year 2020. For Mecklenburg County, the model reports a decline in open space from 41% of total land area to 36% for the 1980 - 1990 time period, with a projected further drop to 17% by 2020.

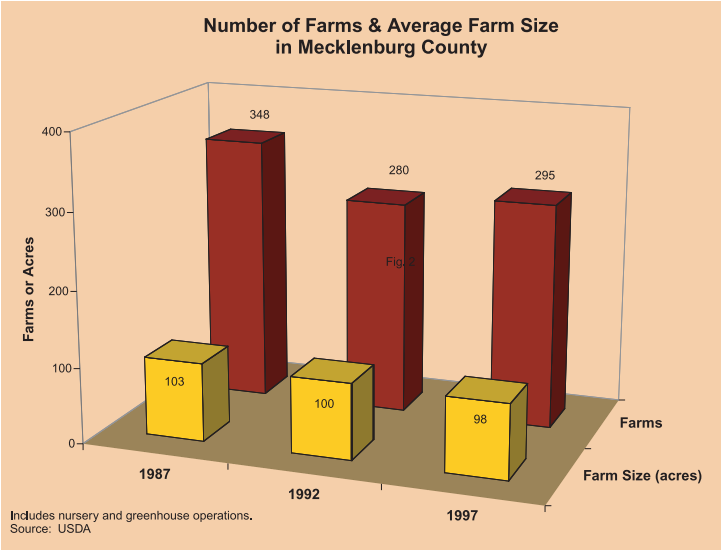
This is the equivalent of 5 acres a day throughout the 40-year period of 1980 to 2020.



Based on satellite imagery for 1980 & 1990, with projection to 2020 based on population projections and adopted land use plans.
The 2000 & 2010 values are estimations based on straight-line extrapolation.
Source: Carolinas Land Conservation Network, 1998

The model also displays its results in map form, showing not only how much open space is likely to be converted to developed uses, but where this conversion is likely to occur. The model provides the citizens, planners and elected officials with a starting point for public dialogue about how densely to develop, where to develop, how much open space to retain and where to retain it. In light of the newly-adopted corridors and wedges plan, public dialogue and tools such as the Piedmont Green Plan are essential.

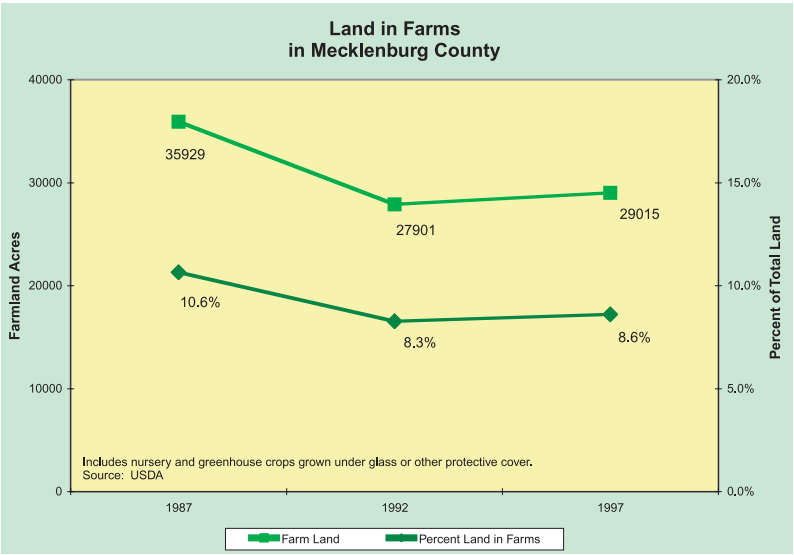
Another way of assessing the current status of open space in the county is to look at official statistics for selected types of open space. The U.S. Department of Agriculture conducts an extensive Census of Agriculture every five years, reporting results for every county and state in the nation. The number of farms, and acres of land in farms, is one of the key pieces of data available from those censuses. Farms are defined as operations producing more than $1,000 in income per year, whether from crops or livestock.



The last three agricultural censuses show that Mecklenburg County's farms have declined over a ten year period (1987-1997) both in number and in average size.

As a result, total acres in farms has shrunk from 10.6% of total land area in 1987 to 8.6% in 1997, a drop from about 36,000 acres to about 29,000. Interestingly, the five-year figures, for 1992-1997, show a modest increase: acres in farms had dropped to as low as 8.3% of total land area in 1992 before rebounding slightly in 1997.

Several options are available to farmers who want to continue farming, but feel the pressure of increasing land prices as development continues around them. The state provides property tax relief through its "agricultural use" valuation procedures, which allow the tax value to be determined by the land's agricultural value rather than its development value. Placing an agricultural conservation easement on the farmland also serves to lower its tax valuation, and can provide income tax credits under North Carolina's innovative conservation tax credit program. Farmers are also experimenting with shifting from traditional farm products such as large-scale dairying to "transitional" farm products, like organic and specialty produce designed to meet urban restaurant demands.



The other readily available set of data on open space is the amount of land owned and managed by the Parks & Recreation Department. The Department's holding range from nature preserves dedicated primarily to passive recreation and wildlife habitat protection (such as Latta Plantation's roughly 1,300 acres), down to neighborhood parks (with as little as 2 acres, providing mostly active recreation in the form of playgrounds), and include segments of creekside greenways throughout the county. In total, the Parks & Recreation Department owns and manages or leases over 13,000 acres of open space, representing 3.9% of the county's total land area, and providing 22 acres of recreational open space per 1,000 residents. The County recently revised its master greenways plan, more than doubling the number of miles of planned greenway. The master parks plan was last updated in 1989 and is now due for another revision. Parks bonds approved in November, 1999, will help land acquisition keep pace with the needs outlined in the master plans.

Conclusion

As a leader in the region, the county has before it an opportunity to make "open space protection" a household word in the same way that "environmental protection" became a household word more than 20 years ago. Integrating into mainstream consciousness the concepts of open space protection and understanding the value of protecting a wide range of open space uses may be the most important steps we can take to ensure that our future includes an adequate supply and equitable distribution of open space, even as our county continues to become more fully urban. However, we are just beginning to understand the importance of a comprehensive, collaborative approach to planning for our open space needs. The first steps in such an approach must be to arrive at useful ways of defining and inventorying open space and to establish measures that will allow us to determine whether we are successful in meeting our goals for open space for our future.

www.

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SOER

A Reflection on Our Attitudes about Solid Waste

The history of solid waste management in Mecklenburg County is not so much a story of how much garbage was generated and disposed, but a story of unprecedented growth, prosperity and changing attitudes. Until late in the 20th century, attitudes about the accepted practices of solid waste generation and disposal in Mecklenburg County, or for that matter, in the whole United States had changed little. Open dumping and burning of waste on land and in crude incinerators which produced noxious smoke were the predominant means of disposal during most of the 20th century. Sanitary landfilling of solid waste in unlined landfills began to become the accepted practice after WWII. Sanitary landfilling had become the ultimate solution to our solid waste disposal needs. When sanitary landfilling was first initiated in the United States, the Surgeon General stated that landfilling posed no health or safety concerns to the public. Voila, the solid waste problem had been solved and with that, like the solid waste that was being buried in landfills, the problem seemingly vanished.

When recently asked at a family dinner to throw the garbage away, I asked for directions to this place called "away." After hearing none, I simply placed the bag of garbage into the roll out container for the weekly collection. We have become accustomed to throwing garbage into an inexpensive place called away. This place "away" does not appear on any known maps or navigational charts, but like the mythical childhood places of "Never Land" and "Oz," "away" exists in our minds ultimately affecting the way people perceive garbage disposal. Why should any one person worry about the cost and logistics of garbage disposal when that person can discard ten bags of garbage for the same cost as one. Every community has one or more places called "away" nearby and much of what has been put into away has contaminated the ground and surface water many of us drink and bathe in. Gaseous emissions from landfills have also affected our atmosphere.

Our garbage poised to go to that place called "away."

Mecklenburg County was established in 1762 in honor of the new Queen of England, Princess Charlotte of Mecklenburg. Our ingenuity and industrialism tamed this land much quicker than anyone could have imagined. By 1896, Charlotte and Mecklenburg County had also experienced industrial growth with the expansion of rail roads and proliferation of textile mills. The population of Charlotte and Mecklenburg County's 53 towns and postal stops swelled to 42,424 people. The massing of people in limited spaces resulted in never before faced problems of managing the sanitation of daily life. Excavations south of the downtown where stone had been quarried for Charlotte's growing skyline served as convenient open dumps for garbage. Abandoned mine shafts were also filled with garbage. Groundwater contamination around garbage dumps was not an important health issue of the day. Water from wells was reported to be much cleaner than the public water supply which was drawn directly from Irwin Creek within two miles of downtown until 1904.

The industrial revolution that began more than a century ago changed our lives and land forever. It was only in the last few decades of the 20th century that we began to understand pollution and the carrying capacity of our land. Late in the 1960s we embarked upon a wholesale endeavor to implement measures to better manage, protect and preserve our resources. The attitude which inspired this endeavor actually began

A Reflection on Our Attitudes about Solid Waste

shortly after the end of the 19th century during the industrial revolution when President Theodore Roosevelt with the aid of naturalist Gifford Pinchot, locally famous for the Biltmore Forest, set aside land containing natural wonders as the first national parks. The park lands contained vast deposits of coal, metals and minerals. America decided that protecting our land's natural resources was more important than mining it's wealth of industrial resources. The infant conservation movement was further fueled by writings like *A Sand County Almanac* by Aldo Leopold published in 1949. Leopold linked mans survival to the survival of the land and our natural resources. Leopold's story unfolds on an abandoned farm in Sand County Wisconsin left barren after the droughts of the great depression. The writings of Leopold and others like him had limited impact in their day but planted the seeds which have ultimately grown into our understanding that what affects the land also affects what the land produces and ultimately affects our quality of life.

> "I'm not sure where my trash goes, but I assume it goes to a nearby landfill."
>
> **Heidi Iravani**
> Myers Park High School

Not very much waste went into Mecklenburg County landfills during the depression. People didn't have a lot then and wasted little. By 1949, following WWII, Mecklenburg County was again experiencing unprecedented growth. Similar to the solid waste management of 1896, waste generated from the war production years and the years of domestic industrial production that followed was hauled just a short distance to be buried in one of two unlined landfills. Those landfills located on Statesville Avenue and Tyvola Road still sit as vacant unusable properties today. Experiments with developing parks, golf courses and businesses on other closed landfills in Mecklenburg County have had limited and expensive success. Building on these sites requires extensive engineering and poses risks to people and property.

A century has passed since the industrial revolution swept through our community but the same set of solid waste management problems remain to be solved. How do we accommodate large numbers of people living in cities with all of the necessities and conveniences of modern living while economically managing the waste created by this living arrangement? An added concern is how do we do this economically while minimizing negative impacts to the environment, a topic which was given little consideration until late in the 1960's when the pollution created by wasteful practices began to manifest itself as dead rivers, polluted groundwater, and dirty air. In 1962, Rachel Carson's book, *Silent Spring* awoke many Americans to the dangers of toxins in our environment. The majority of Americans went about their routines, but in America's universities, a change had begun. Environmental sciences were now being taught to students and the newly formed U.S. Environmental Protection Agency began to administer new legislation from the Congress such as the Clean Water, Clean Air and Resource Conservation and Recovery Acts. However, garbage was left behind. It would take until 1986 for the Federal Government to address garbage disposal in unlined landfills as a major source of pollution.

Leachate discharge (light colored liquid) at a closed landfill. Leachate is formed by water percolating through waste.

Until the Charlotte Observer reported in July of 1981 about the York Road Landfill that "Charlotte's principle garbage site is nearly full" most of us did not concern ourselves with garbage unless it had something to do with getting it picked up out of our backyards. People opposed roll out collection, wanting sanitation workers to continue twice a week backyard collection. However, when it came time to build a new landfill, the cry "not in my backyard" was heard. We wanted trash removed twice a week from the cans in our back yards but no one wanted their backyards anywhere near the landfill.

Although our land has been finitely measured and recorded, many people still tend to believe the availability of places to put our trash is virtually infinite. This attitude may change as large landfills in the crowded northeast receiving as much as 25,000 tons per day of garbage close and send their waste south. The logistics and economics of garbage disposal continue to change also. Soon each of us may be required to pay for the exact amount of garbage we discard called pay as you throw. Are you ready for that?

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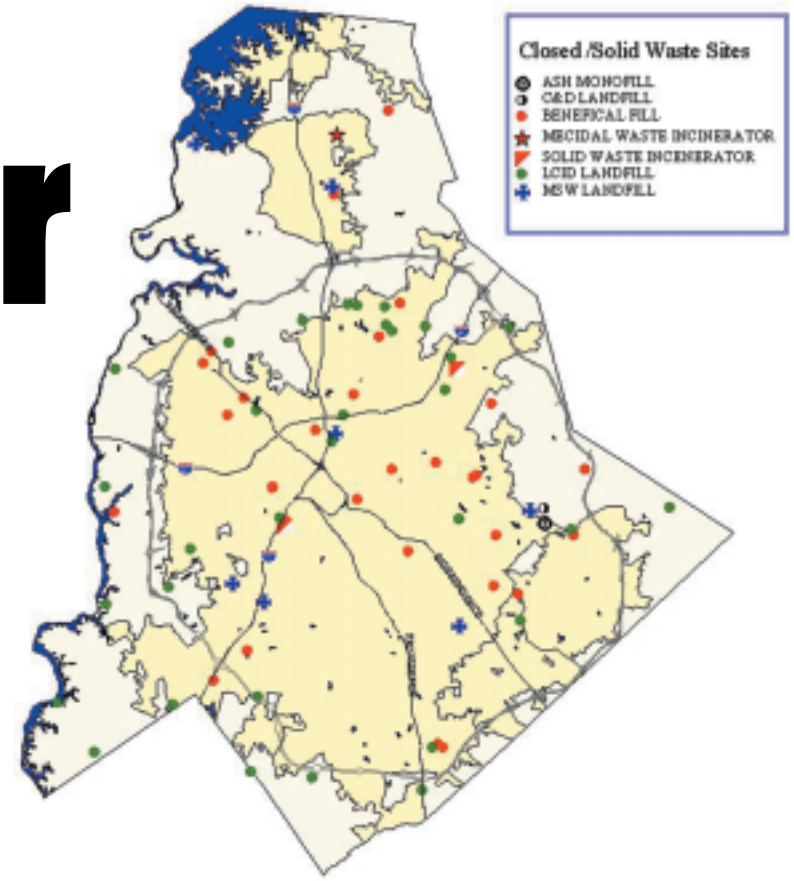
Where does our waste go?



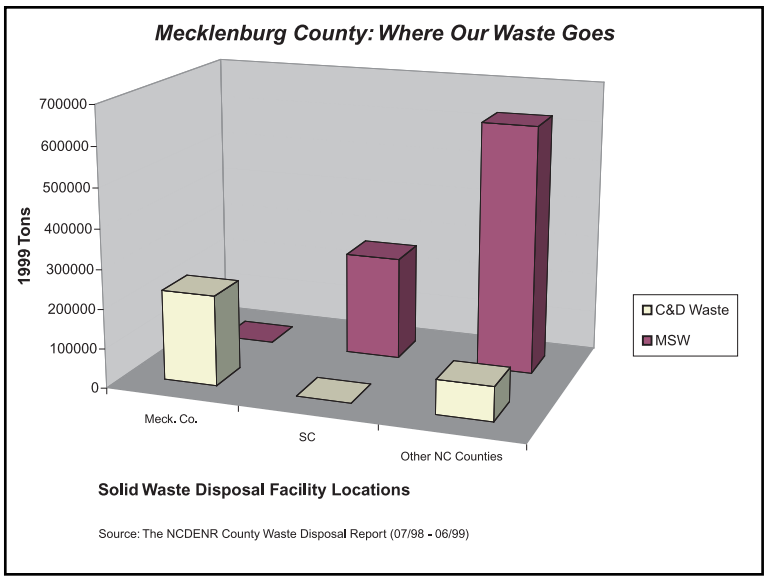
Most people are unaware that there are thirty active and more than forty closed solid waste management sites located in Mecklenburg County for the disposal, processing and transfer of the waste we discard. The active sites consist of a municipal solid waste landfill (1), a construction and demolition landfill (1), land clearing and inert debris landfills (13), a municipal transfer station (1), C&D material recovery facilities (2), an LCID material recovery (1), a medical waste incineration (1), composting facilities (2) and recycling centers (8). Of the closed facilities, forty-one were landfills, three were incinerators and there were countless open dumps. Roughly 29% of the County's measurable waste stream is disposed of or reclaimed for use within its borders; the rest is exported.

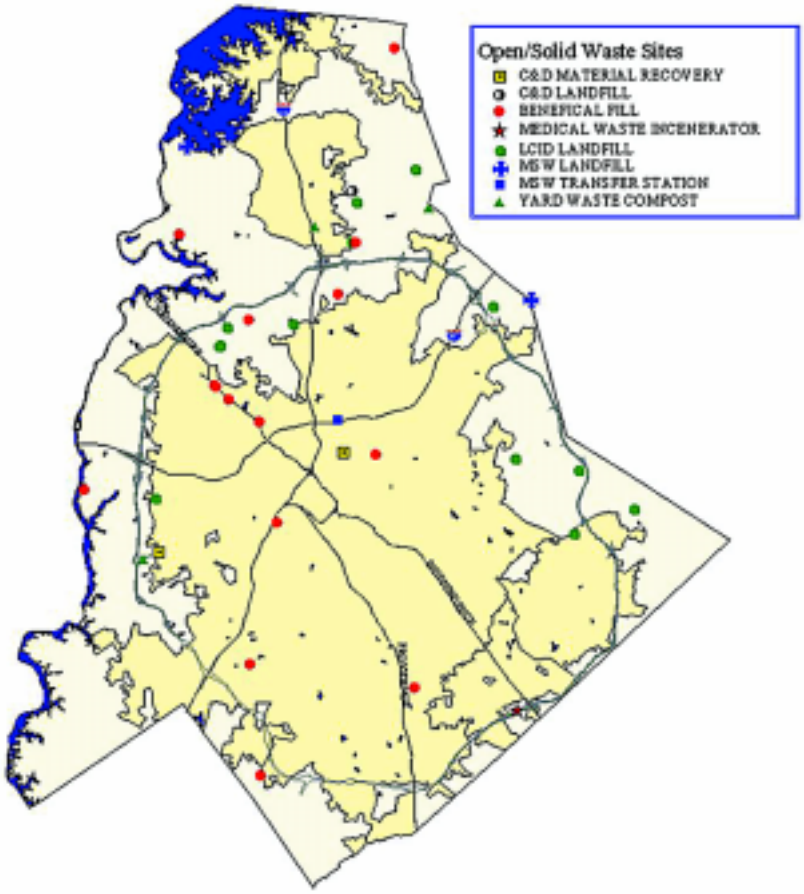
MSW is garbage, refuse and similar nonhazardous solid waste material generated by households and commercial establishments. In 1999, practically all of the MSW generated within Mecklenburg County (887,215 tons) was transported to locations outside the County for disposal. 625,260 tons were disposed of at the BFI/Charlotte Motor Speedway landfill in Cabarrus County, 259,599 tons were disposed of at the Lee County MSW landfill in Bishopville, South Carolina and the remaining 2356 tons were taken to other NC/SC landfills. Except for Duke Power Company's private lined landfill used for disposal of non-radioactive solid waste generated by the company, all MSW disposal since April 1994 has been at landfills outside of Mecklenburg County.

The County recycled 90,618 tons of material in its residential program during FY 98-99. Yard waste counted for 47,646 tons and curbside materials comprised the bulk of the remainder. The yard waste was composted at either the North Mecklenburg Recycling Center near Huntersville or the Compost Central Recycling Center near the airport. The curbside paper, plastic and metal materials were processed at the Metrolina Recycling Facility.

Construction and demolition (C&D) wastes are solid wastes resulting solely from construction, remodeling, pavement, building and other structures. Demolition contractors disposed of 228,934 tons of C&D Since 1997, there has been more local interest in C&D waste recycling. An undetermined amount of C&D waste sorting occurs at construction and demolition job sites by contractors to reduce their waste disposal costs and two fixed C&D material recovery facilities recently opened in the County. Phoenix Recycling Corporation, a sorting and processing operation located near the Charlotte-Douglas International Airport, processed 26,882 tons of C&D waste to reclaim usable materials in 1999. Additionally, Hawk Sanitation operating a material recovery facility located near uptown Charlotte, sorted 22,430 compacted cubic yards of C&D waste and diverted 1,950 cubic yards of metal and 1,860 cubic yards of paper stock to recycling facilities.

Land clearing and inert debris (LCID) wastes are those wastes generated during land clearing and demolition activities and include trees, stumps and





"When I see trash, I always pick it up unless it's extremely gross."

Jennifer Weih
Independence High School

other vegetative matter and virtually inert debris such as brick, concrete, concrete block, asphalt and uncontaminated soil, rock and gravel. Currently, the State does not require these wastes to be weighed prior to burial, therefore, the amount of LCID waste disposed of in Mecklenburg County LCID landfills is uncertain. An unmeasured amount of LCID and yard wastes were disposed of at thirteen (13) permitted LCID landfills in the County down from sixteen (16) permitted landfills in 1995.

Additionally 47,646 tons of yard waste was recycled by local government into compost, while an undetermined amount of tree waste was ground into mulch by private firms. Hensons' Inc., the County's largest private LCID material recovery facility, processed 208,000 cubic yards of tree waste into mulch and boiler fuel. Fourteen small (less than 2 acre) landfills for the on-site disposal of land clearing waste were recorded in 1998 and 1999.

Medical waste is any solid waste that is generated in the diagnosis, treatment or immunization of human being or animals, in related research, or in the testing of biologicals. Locally, BMWNC, Incorporated incinerated 1808 tons of medical waste generated by Mecklenburg County in 1999, while 4900 tons were treated by SafeWaste Corporation. An additional 375 tons was treated at the BFI medical waste incinerator in Haw River, North Carolina.

As demonstrated by the waste exportation numbers above, solid waste management in Mecklenburg County has become a regional issue. The convenience of local solid waste management facilities has diminished due to a variety of factors including the real and perceived risks associated with solid waste treatment facilities, the cost of designing and constructing state-of-the-art waste management facilities and the availability of affordable, suitable land. As Mecklenburg County becomes more urban, the challenges of solid waste management are to surely grow.

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Solid Waste Generation and Disposal Rates for Mecklenburg County

RADIOACTIVE WASTE

Radioactive waste is also generated and managed in Mecklenburg County. The majority of radioactive waste is spent nuclear fuel that comes from Duke Power's McGuire Nuclear Power Plant on Lake Norman. Spent fuel assemblies accounted for 160 tons of radioactive waste in 1999. The McGuire Nuclear Power Plant has a fuel assembly storage capacity of 2926 tons and at the end of 1999, there is approximately 16% storage volume remaining.

Low Level Waste (LLW) consists of industrial, research or medical wastes like paper, rags, gloves, protective clothing and packaging. The amount of LLW generated and stored in Mecklenburg County in 1999 was 8135 cubic feet.

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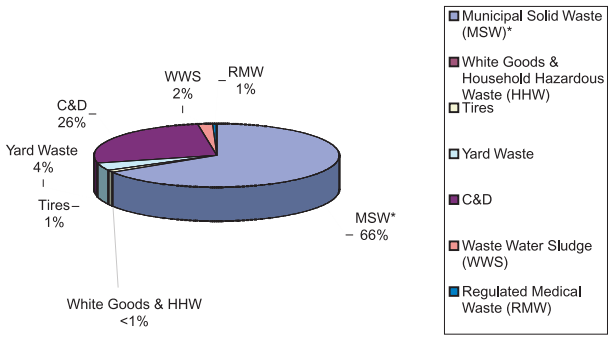
In 1998, North Carolina ranked 7th for municipal solid waste (MSW) generation in the United States - 12.6 million tons, being the 11th most populated state. With a 7% increase from 1997-98, the County's total solid waste tonnage for FY 98/99 was 1,266,233, where 1,144,736 tons were landfilled. 258,558 tons were produced by residents and 956,206 tons were generated by the commercially. Approximately 11% of the MSW waste for Mecklenburg County was recycled or composted and the rest was landfilled.

The national average for solid waste generated per capita per day is 4.4 pounds while North Carolina's average is 9 pounds, compared to a Mecklenburg County average of 7.5 pounds. By looking at the averages, it is evident that Mecklenburg County and North Carolina are well above the national average.

Goals for reducing the waste disposal rate are developed by the Waste Management Advisory Board (WMAB) and the Board of County Commissioners (BOCC). The WMAB and BOCC developed a 10-year plan in 1997 to reduce the amount of waste disposal by Mecklenburg County residents and businesses. This waste reduction plan was mandated by North Carolina House Bill 859 which set a 40% per capita waste disposal reduction for counties by 2006, measured from the FY 89/90 baseline. To meet this requirement, Mecklenburg County has committed to reduce household and commercial waste disposal by 12% for the year 2001 and 20% for 2006. We have also committed to reduce construction and demolition debris disposal 40% by 2006.

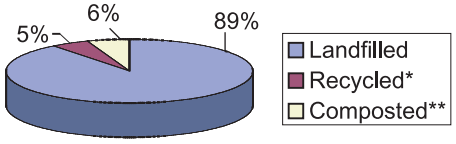
The 1999 residential and commercial MSW disposal

1999 Solid Waste Components for Mecklenburg County

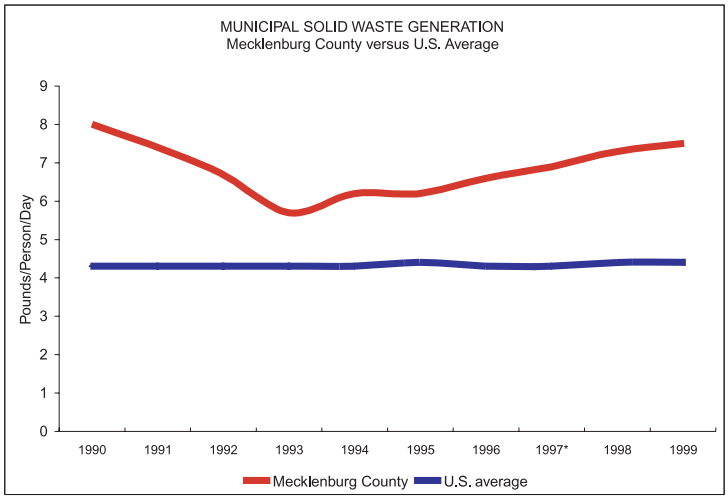


Source: Mecklenburg County Dept. of Engineering and Building Standards, NCDENR and Charlotte-Mecklenburg Utilities

1999 Municipal Solid Waste Management for Mecklenburg County



Source: Mecklenburg County Dept. of Engineering and Building Standards



Source: Mecklenburg County Dept. of Engineering and Building Standards, NCDENR and USEPA
*1997 waste generation was interpolated due to data inaccuracy.

Solid Waste Generation continued

rate is 1.12 tons/person/year which is 22% lower than the FY 89/90 baseline of 1.43 tons/person/year. The 1999 C&D waste disposal rate is 0.51 tons/person/year, while the FY 96/97 baseline is 0.56 tons/person/year.

Every citizen and business in the county generates waste. Waste generation in Mecklenburg County is a result of everyone's lifestyle in the community. Household and commercial garbage makes up the largest portion of our solid waste stream. Meeting our waste disposal reduction goals is contingent upon the cooperation of the citizens. It is essential that we are aware of what types of wastes we generate, where the waste goes and how we can reduce solid waste generation and landfilling.

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The Foxhole Landfill – New Waste Disposal Options

Mecklenburg County took a giant step in 1999 toward opening a municipal solid waste (MSW) landfill on US Highway 521 in southern Mecklenburg – a project that has been in the works since 1983. They completed construction on the first cell of the landfill, nicknamed the Foxhole for County Manager Gerald Fox, and prepared it for opening.

Workers install the plastic membrane of the landfill's composit liner system. The plastic covers three feet of clay and is itself covered by the leachate collection system and a top covering of dirt.

The County expects to receive the operating permit from the State and open the Foxhole by February 2000. When the Foxhole opens, southern Mecklenburg residents will have access to a full-service recycling center, swap shop and yard waste facility – the same waste reduction opportunities that exist in other areas of the County.

The Foxhole has been a long time coming.The land – 545 acres – was purchased in 1984, but final zoning approval wasn't obtained until 1993 (after several lawsuits and court decisions) with a favorable decision from the NC Supreme Court.

A site study was conducted from 1994 until 1996, and then the County hired consulting agency S & ME, Inc. to design the first cell. The State issued the permit to construct in July 1998, and the County awarded the construction contract to

Anson Contractors in August. That same month, local citizens known as GRACE filed an appeal to

The Fox Landfill

have the State revoke the County's construction permit.

The County spent the remainder of 1998 preparing the site by clearing and stripping the land and putting in erosion and settlement control. By the spring of 1999, they began the construction of the first cell, including the excavation, installation of the clay and synthetic liners and installation of the leachate collection and removal system. In addition, the County constructed the leachate storage and pretreatment tank system (pretreated leachate will be drained from the tank to McAlpine Treatment Plant for disposal) and built the entranceway, scales, fee collection building and infrastructure road system.

In June 1999, GRACE and the County reached an agreement which included the following conditions:

- Limit landfill elevation to 736 feet (10 feet below designlevel);
- Form an advisory committee from residents in Mecklenburg, Union and Lancaster counties to review landfill and operation plans;
- Construct the soccer fields and greenway portions of the final use plan within five years of the landfill opening;
- Limit the use of the landfill to acceptance of C&D debris and as a public convenience center for solid waste management until the end of the County's contract with BFI;
- Continue to work on a long term, cost-effective alternatives for MSW through the private sector after the termination of the BFI contract; and
- if an agreement is arranged, limit use of the landfill to acceptance of C&D and as a public convenience center for MSW

The recycling center, swap shop and yard waste operations will provide convenient waste reduction services to south Mecklenburg. Landfill final use plans include developing a park with playground areas, athletic fields, a wildflower exhibition area, walking paths and hiking trails – with the soccer fields and greenway opening within the next five years.

By owning their own landfill, the County gains flexibility, cost savings and control over their MSW. According to Cary Saul, Director of the County's solid waste management, "Our purpose in building the Foxhole is twofold. It represents both a cost savings to Mecklenburg users of the landfill and less risk in solid waste management. The Foxhole is a state-of-the-art facility, built with the latest technological and environmental controls. It will be operated in strict accordance with all local state and federal regulations. Landfill tip fees will be lower than other regional landfills, and the citizens of Mecklenburg will be in control of the disposal of their solid waste."

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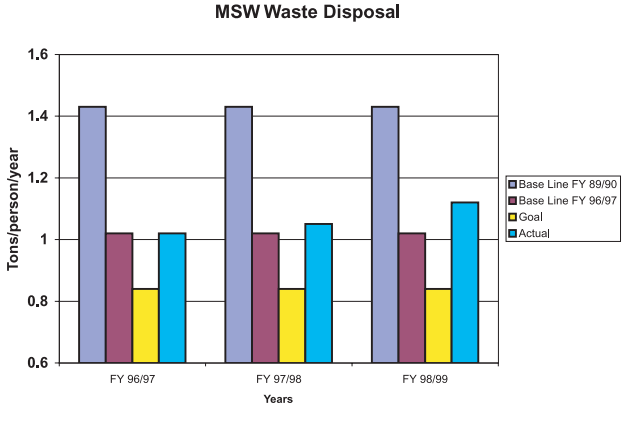
Recycling In Mecklenburg County

The management of the County's solid waste is determined by the Mecklenburg County Solid Waste Management 10-Year Plan, passed in 1997. The plan calls for a reduction in commercial, residential, and construction and demolition (C&D) waste through source reduction, recycling and composting efforts; and it sets reduction goals. For commercial and residential waste, the plan sets per capita waste reduction goals of 12% for the year 2001 and 20% for 2006, measured from the base year of FY96/97. For C&D, the per capita reduction goals are 30% by 2001 and 40% by 2006, measured from the base year of FY96/97.

Since the adoption of the plan, we have worked hard to achieve the goals — and in FY98/99 can say we've had both success and setbacks.

Residential recycling in the County has become almost as familiar as garbage pickup. What started in 1977 with one recycling drop center has grown into a comprehensive program. We have residential curbside collection in Charlotte and the surrounding towns, a network of eight recycling drop centers, a materials processing facility, a construction and demolition recycling facility and a composting operation.



Source: Mecklenburg County Dept. of Engineering and Building Standards

The County recycled 90,618 tons of material in its residential program during FY 98-99. Yard waste counted for 47,646 tons and curbside materials comprised the bulk of the remainder.

Charlotte and the surrounding towns each administer their own residential recycling collection programs and deliver the recyclable material to the County's Metrolina Recycling Facility for processing. Curbside programs accept newspaper, catalogs and magazines, #1 and #2 plastic bottles, glass bottles and jars, spiral paper cans and aluminum, steel and tin cans. Cardboard (flattened) is being added to Charlotte curbside collection and should be accepted everywhere by the end of 2000.

"I would like my generation to make more efficient ways of disposing trash, conserving water, energy and raw materials.

Katie Phillips
Independence High

The County operates eight recycling drop centers, three of which are staffed and offer additional recycling options, including swap shops and household hazardous waste. All centers accept the materials collected curbside, as well as junk mail, office paper and chipboard (e.g. cereal boxes, gift boxes, etc.). The three staffed centers also take white goods (used appliances), tires, batteries (household, car and Ni-Cd rechargeable), scrap aluminum and ferrous metal, motor oil, antifreeze, transmission fluid, used oil filters, oil and latex paints, eyeglasses and foam rubber.

ECOFLO, a Greensboro-based hazardous waste facility, is contracted to maintain storage and collection sites for household hazardous waste at the Hickory Grove and North Mecklenburg recycling centers.

Residential yard waste (e.g., leaves, plant trimmings, tree limbs and grass) is picked up curbside in Charlotte and the towns and taken to Compost Central, the municipal composting facility, or North Mecklenburg Yard Waste Facility. Residents can deposit yard waste for a fee at Hickory Grove, North Mecklenburg and Compost Central.

The County has expanded the residential backyard composting program to include comprehensive yard care workshops that emphasize conservation and environmentally friendly landscaping practices.They have introduced composting into the Charlotte-Mecklenburg school curriculum and every third grade classroom now has its own compost bin. The County will continue to expand residential recycling options, but staff efforts will concentrate on the more difficult task of educating residents to reduce their waste at the source through changing purchasing and consumption behaviors.

The Solid Waste Management Plan recognized the need for an aggressive commercial waste reduction program that called on businesses to remove from the waste stream cardboard, office paper and aluminum cans. While some commercial recycling had occurred, there wasn't any concentrated government effort to develop or monitor commercial reduction, even though com-

mercial waste accounts for 70% of the total waste stream – 952,960 tons in FY98/99 (including construction & demolition debris).

In response to opposition to the commercial program's funding mechanism (a $1 fee on every ton of landfilled commercial waste), the Board of County Commissioners (BOCC) approved the formation of a coalition of business and government to work on a voluntary commercial waste reduction program.

The Coalition for Voluntary Commercial Waste Reduction, composed of businesses, organizations and government, was formed to build a recycling infrastructure and educate businesses about waste reduction. They worked for two years with mixed success. They collaborated on an extensive outreach campaign, which resulted in an increased awareness of commercial recycling and waste reduction. Some new services such as the Wipe Out Waste Hotline and commercial recycling drop centers were launched, and former adversarial parties worked together. The County implemented a fiber recycling program in all the Charlotte-Mecklenburg schools and more than two-thirds of County buildings. But, the coalition was unsuccessful in significantly reducing the amount of landfilled waste. And even though their time was extended by the BOCC, they virtually ceased operating in 1999.

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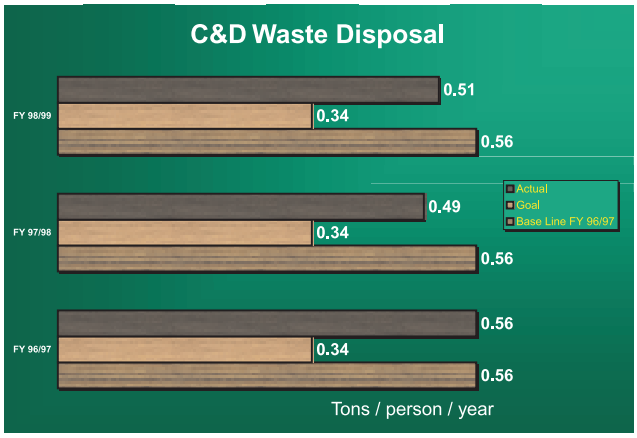

MECKLENBURG COUNTY SOLID WASTE RECYCLING FACILITIES

SELF-SERVICE RECYCLING CENTERS:

Park Road Park Recycling Center -
5300 Closeburn Rd., daily 7 a.m. - dusk
Uptown Recycling Center - 11th St.
Between Tryon and College St., open 24 hours
University City Resource Recovery Facility Recycling Center - Ken Hoffman Blvd. (off of Highway 29 (Tryon St.) at the Highway Patrol Station and Firestation 27), open 24 hours
McAlpine Creek Park Recycling Center -
8711 Monroe Rd., daily 7 a.m. - dusk
Rozzelles Ferry Road Recycling Center -
5800 Rozzelles Ferry Road, open 24 hours

Accepted Materials: newspapers & inserts, flattened cardboard, magazines & catalogs, telephone books, junk mail, mixed office paper, # 1 & #2 plastic jars & bottles, aluminum/tin/steel cans, spiral paper cans

FULL-SERVICE RECYCLING CENTERS:

- North Mecklenburg Recycling & Yard Waste Center - 12300 N. Statesville Rd., 875-3707, Tues. – Sat. 7 a.m. – 3 p.m
- Hickory Grove Recycling & Yard Waste Center - 8007 Pence Road, 535-3020, Tues. – Sat. 7 a.m. – 3 p.m.
- West Mecklenburg Recycling Center - 8440 Byrum Drive, 357-1473, Tues. – Sat. 7 a.m. – 3 p.m.

- Accepted Materials: (all of the above) and used appliances, scrap aluminum & ferrous metal, motor oil/antifreeze/transmission fluid & oil filters, tires, lead acid (car) batteries, Ni-Cd batteries, household batteries, oil & latex paint, eye glasses, foam rubber, used clothing in good condition, household hazardous waste, household garbage and yard waste (except West Mecklenburg; yard waste in that area goes to Compost Central).

Metrolina Recycling Facility – 1007 Amble Drive, 598-8595, Mon. – Fri. 7 a.m. – 4 p.m.; materials recovery facility with state-of-the-art theatre and education program. Call to book a free tour.

Compost Central Yard Waste Facility– 5631 West Boulevard, 588-9070, Mon. – Fri., 7 a.m. – 5 p.m., Sat. 7 a.m. – 3 p.m.

Metal and Tire Recovery Center – 5740 Rozzelles Ferry Road, 392-1063, Mon. – Fri. 7 a.m. – 3 p.m.

Phoenix Construction & Demolition Recycling – 5631 West Boulevard, 527-0039, Mon. – Fri., 7 a.m. – 5 p.m., Sat. 7 a.m. – 3 p.m.

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From Open Dump to Subtitle D - The Evolution of Solid Waste Regulation

Over the past century making changes to the way solid waste has been managed has been slow. It might be compared to turning a large ship heading for an iceberg in the fog at full speed ahead. Although the danger of the iceberg was always there and the ability to turn the ship was available, the realization that danger was imminent upon siting the iceberg at close range resulted in a response by all hands on board to steer the ship out of harms way. But, a ship does not turn on the dime. For many years we managed our waste simply by digging a hole and burying the waste out of site. Out of site was out of mind. Our solid waste ship steered an unchanging heading until contamination of groundwater and surface water by landfills became apparent. When wells and rivers around landfills began to show contamination from waste placed in the unlined landfills and it became apparent that landfill space may be approaching a crisis, the cry began to go out from the crows nest, iceberg dead ahead.

Significant events and recent changes to the regulations which dictate how solid waste is managed have changed the way we think about disposing of our trash. In order to see how much regulation has changed we need to take a look back to where we have been. Probably the earliest changes which affected how we managed solid waste began with the local health department.

Development of the Local Health Dept. and Local Regulations

Health concerns began to be addressed in Mecklenburg County before the turn of the 20th century. In the early 1880's, the County Commission and City Council created the positions of County Physician and City Physician respectively. By the summer of 1917, the Mecklenburg County Health Department was organized and located in rooms beneath the old City Auditorium located at the corner of North College and 5th streets. Major Benjamin Brown assisted by Dr. C. C. Hudson, one stenographer, one part-time milk inspector, one part-time clinician, one sanitary inspector and, two nurses began the task of standardizing the health of our community. However, this did not initially include solid waste management. It was 1954 before the first local solid waste regulations were enacted and the Health Department performed inspections to determine compliance. In July of 1960, the Health Department moved into a new facility at 1200 Blythe Boulevard on the grounds of Charlotte Memorial Hospital. By 1960, the Charlotte and Mecklenburg County Health Departments had been placed under the direction of one Health Director with a staff of 128 for the city tasks and 36 for the county. In 1975 the Mecklenburg County Department of Environmental Health was formed as a separate entity from the Health Department.

In September of 1981 the Mecklenburg County Commission voted to adopt the Mecklenburg County Solid Waste Management Regulations Governing the Storage, Collection, Transporting, and Disposal of Solid Waste in Mecklenburg County. In 1984, the North Carolina Department of Human Resources delegated authority to Mecklenburg County to perform a solid waste management program and the local Solid Waste Section was formed. The Department of Environmental Health was charged with the responsibility of administering the North Carolina Solid Waste Management Rules. In 1986, the Mecklenburg County Department of Environmental Protection ("MCDEP") diverged from Health Department and, with the exception of facilities operated by the County, continues to regulate solid waste in the County through the delegation of authority.

Development of the State and Federal Solid Waste Management Policy

The Federal Rivers and Harbors Act of 1899 forbade the discharge of "refuse matter" into navigable water without a permit. Although the intent of this act was to protect interstate commerce this clause is probably the first legislation to address solid waste management. Disposal of solid waste in North Carolina prior to 1935 was generally accomplished by one of three methods: by open dumping, feeding garbage to swine or incineration. Each method of disposal presented its own unique

From Open Dump to Subtitle D - The Evolution of Solid Waste Regulation

problems. Open dumps attracted rodents which spread disease and generated foul odors, and burning garbage often sparked forest fires. Feeding garbage to swine containing uncooked foods could lead to diseases like trichinosis. Inefficient incinerators of the day designed similar to crematoriums required expensive supplemental fuel to burn garbage and polluted the air.

Around 1935, a new form of disposal, sanitary landfilling, became an accepted alternative to these three methods. Sanitary landfilling was accomplished by digging a trench, filling it with the garbage brought to the landfill and covering it each day with soil to prevent rodent and mosquito access. Although sanitary landfilling became popular in the United States after World War II and many local governments in urban areas had converted to sanitary landfilling by 1960, open dumping and burning remained popular in rural states including North Carolina. During this era, North Carolina's solid waste program began.

The Division of Sanitary Engineering under the direction of the State Board of Health advised local governments on managing open dump sites to prevent rodent related health problems. The Division developed a bulletin in 1952 entitled Refuse Disposal by Sanitary Landfill intended to convince local governments to convert from the open dump disposal method. Few local governments converted. A model ordinance designed to enable local governments to better regulate the storage, collection transportation and disposal of garbage was developed by the Division in 1963, but the cost of the voluntary improvement in disposal method was seen as prohibitive in many North Carolina communities. When monies became available from the Federal Government via The Federal Solid Waste Disposal Act of 1965, the North Carolina General Assembly secured funds for three positions to complete a state solid waste survey and to develop a solid waste disposal plan. The survey revealed that only 23 of the 479 disposal sites being operated in North Carolina provided "reasonable protection to the public health and environment." The initial work completed led to the enactment of the Solid Waste Disposal Act of 1969 which resulted in the establishment of a statewide solid waste management program with the principal goal of assisting local governments develop and implement local disposal plans. In 1970 the Federal Resource Recovery Act emphasized the need to recycle, recover resources and convert waste to energy. A year later in 1971, the State Board of Health developed Rules and Regulations Providing Standards for Solid Waste Disposal. By 1974, the remaining 456 open dumps in North Carolina had been converted to 160 sanitary landfills. North Carolina Senate Bill 366 was passed into law in 1975 adding the tasks of recycling and resource recovery to the Department of Human Resources. In 1976, what would later be amended in 1986 to become the most significant piece of legislation to affect the way communities and private companies managed and disposed of solid waste, The Resource Conservation and Recovery Act ("RCRA") was enacted. Subtitle D of RCRA required that liners be installed at municipal solid waste landfills, financial responsibility accounts be established, hazardous waste be screened from entering landfills and the long term monitoring of groundwater beneath landfills.

After highly publicized incidents involving medical waste washing onto beaches and a New York garbage barge carrying 4,000 tons of garbage bound for disposal in North Carolina, the General Assembly considered legislature introduced as Senate Bill 111, later to be known as the Solid Waste Management Act of 1989. The bill was passed and a complete revision of solid waste management law in North Carolina was underway. The Act required the development of a comprehensive solid waste management plan, new medical waste and yard waste management rules and that 25% of solid waste would be recycled by 1993. In 1991, the act was amended by House Bill 1109 which changed the emphasis from recycling to waste reduction. The bill called for a 40% reduction in solid waste disposal by 2001. The Solid Waste Management Act was amended in 1995 after concerns by local governments about cost of the waste reduction requirements. The 1995 amendments would allow local governments to use their own strategies and initiatives to develop plans which demonstrated a "good faith effort" to meet the 40% reduction goal.

While everyone was busy trying to abide by the requirements of the Solid Waste Management Act, a larger pot was boiling. A small waste hauling company, C&A Carbone, Inc. sued the town of Clarkston, New York over the town's flow control ordinance. The ordinance required that all nonhazardous solid waste generated within the town or brought into the town be deposited at the local transfer station. On December 7, 1993, the Supreme Court of the United States heard arguments from both parties regarding the constitutionality of the local flow control ordinance. The same kind of flow control ordinance that many local governments including Mecklenburg County had adopted to meet waste reduction plans and generate revenue from solid waste in order to pay for facilities and comply with environmental regulations. Justice Kennedy in his delivery of the Court's opinion stated that "The avowed purpose of the ordinance is to retain the processing fees charged at the transfer station to amortize the cost of the facility. Because it attains this goal by depriving competitors, including out-of-state firms, of access to local market, we hold that the flow control ordinance violates the Commerce Clause".

The stringent requirements of Subtitle D in conjunction with the Supreme Court's "Carbone Decision" have significantly changed the way solid waste is managed and has affected counties abilities to meet the waste reduction requirements of the North Carolina Solid Waste Management Act. Expensive to operate waste to energy facilities closed as tipping fees were

higher than at competing landfills which could now receive the wastes without restriction. Transfer stations operated by private waste disposal companies opened in communities to capture a share of the waste and ship it to their own regional landfills. The entire waste management picture had changed.

The next big change that may dictate the direction of federal and state regulation of solid waste is the impending closure of super-sized landfills in the heavily populated northeast. The Fresh Kills Landfill in New York which receives 13,000 tons per day is closing in 2001. States to the west and south, including North Carolina, are beginning to get concerned that this waste will be visiting their states soon.

The future of direction of new solid waste management regulation is uncertain. Local Government will continue its efforts to reduce disposal and increase recycling. NCDENR is planning to review the effectiveness of the amended Solid Waste Management Act of 1995 by the end of this year before moving ahead with any new rules. SOER

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Solid Waste Complaints Increase Throughout the 90's!

In 1997, Mecklenburg County agencies responded to more than 366 incidents of open dumping including illegal landfilling and unlawful accumulations of solid waste. In 1999, the number of incidents increased to 563, a 35% increase from 1997.

In Mecklenburg County, three county agencies respond to open dumping complaints and incidents: City of Charlotte Solid Waste Services Community Improvement Division, Mecklenburg County Health Department Vector Control Section and Mecklenburg County Department of Environmental Protection. From 1987 -1991, the number of solid waste related incidents that either of the three agencies responded to was on average 256 per year. The average number of complaints received per year between 1993-1995 was 331.

The open dumping that occurred in Mecklenburg County in from 1987-1999 ranged from small quantities of household garbage, construction waste or in some cases, barrels of hazardous waste dumped on a roadside to larger multi-acre landfills of land clearing and inert debris and/or construction wastes. However, generally, there are few cases of illegal landfills involving the incorporation of municipal waste.

The North Carolina Solid Waste Management Rules define "disposal" as "the discharge, deposit, injection, dumping, spilling, leaking or placing of any solid waste into or on any land or water so that the solid waste or any constituent part of the solid waste may enter the environment or be emitted into the air or discharged into any waters, including groundwaters." The act of not properly disposing of waste in an approved facility is known as open dumping. This term can be used to describe trash that is deposited on a roadside, accumulated in a backyard or vacant lot or buried an illegal landfill.

Open dumping occurs generally for three reasons: the rising costs of disposal fees, lack of convenience and/or disregard or the lack of understanding of environmental regulations by some generators and transporters. Few of the open dumps in Mecklenburg County, including illegal landfills and unlawful accumulations of solid waste, meet the requirements that apply to permitted facilities. In addition, few of these sites exercise sound environmental practices which may potentially lead to soil, surface water and groundwater contamination.

The increase in the number of solid waste related incidents may be related back to the three factors mentioned earlier: cost, convenience and disregard. Heading into the year 2000, it will be necessary to combat these factors by educating the citizens of Mecklenburg County about the dangers of open dumping and the available solid waste disposal resources, and aggressively pursuing violators. SOER

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Brownfields in Charlotte – Opportunity Knocks

Camden Square - Design Center of the Carolinas, a $14 million brownfields redevelopment project located in the South End off South Boulevard.

Brownfields are idle properties, which were predominantly and historically industrial production sites whose redevelopment is greatly complicated by the presence of known or suspected contamination. In 1998, a UNC-Charlotte Department of Geography study revealed that Charlotte's urban area has over 1181 sites located on 5,606 acres, representing over $227 million in taxable value, where past land use may complicate future redevelopment efforts.

How did this occur in Charlotte? While Charlotte benefits from being the hub of an industrial Piedmont, the legacy of industrial use dating back to the nineteenth century has created environmental problems for us today. At manufacturing and service industry locations where lead, petroleum, metals and industrial solvents were not carefully handled, soil contamination often exists. The soil contamination degrades the groundwater and threatens plant, animal and human life. The presence of contamination and the need for safe cleanup complicates redevelopment; finding and cleaning the contamination is both expensive and time consuming.

Charlotte recognized that developers and business owners needed help in redeveloping these more complex brownfield sites. Many of these sites occurred in communities that had been overlooked for redevelopment and the City would see benefits from these building activities. The thought of new economic activity brought to these neighborhoods was very enticing. In 1996, Charlotte applied to the United States Environmental Protection Agency (EPA) for economic assistance and was awarded a $200,000 Brownfield Assessment Pilot Grant to support assessment of contaminated sites in the South End and Wilmore communities.

After extensive community input and involvement, seven sites were selected to receive assistance though the grant. Two of the projects (Camden Square's Design Center of the Carolinas and Thomas Construction) are now complete, representing over $14 million in new investment and over 400 new jobs. A third site has been cleaned up and redevelopment plans are underway. The fourth and fifth locations are completing their work with N. C. Department of Environment and Natural Resources to determine the right cleanup for safe redevelopment. The last two sites are owned by the Community Development Corporation's for housing and retail development and they have just begun their assessments.

These success stories have an important impact on the city. By demonstrating that these projects can be done and by blazing the trail through environmental engineers, attorneys and regulators, other developers have followed. Additional sites located on South Boulevard, Thrift Road and Tuckaseegee Road have been or are being redeveloped.

A broader program is needed to serve all Charlotte's similarly distressed areas. In 1999, the City was awarded a $500,000 EPA Brownfields Cleanup Revolving Loan Fund Grant to enable cleanup activities at sites scattered throughout Charlotte and $150,000 has been requested to fund assessments in our area. In 2000, the City hopes to offer both these programs, providing a comprehensive brownfield assistance program in Charlotte.

Brownfields represent important prospects for development of vacant lands in Charlotte. It is important to help underutilized sites reach their potential, eliminating hazards to health and creating amenities for neighborhoods. Through the EPA's programs and the City's coordination, developers and business people can receive the assistance they need to make redevelopment opportunities happen.

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HAZARDOUS WASTES IN MECKLENBURG COUNTY

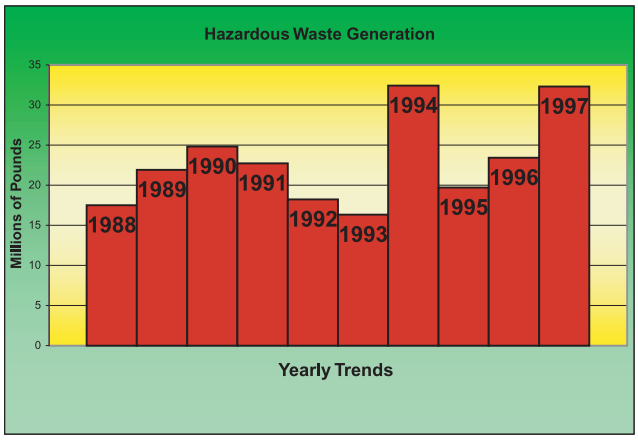
Mecklenburg County generates more hazardous wastes then any other county in North Carolina. Mecklenburg County has held this dubious distinction for more than 10 years now. In 1997 Mecklenburg County generated approximately 16,157 tons of hazardous wastes or 24.3% of the 66,501 tons of waste generated in North Carolina that same year. Additionally, a total of 44,927 tons of hazardous wastes were transported or stored thoughout Mecklenburg County in 1997.

Last year the Mecklenburg County Department of Environmental Protection Emergency Response Team responded to 11 accidents which had the potential to release hazardous wastes into the environment. Accidental spills and illegal dumping are the most publicized way in which hazardous wastes are released into the environment. However, hazardous wastes are also introduced into the environment unknowingly by the improper use or disposal of household hazardous wastes such as cleaning solvents, detergents, petroleum byproducts and acids.

Hazardous waste is a solid waste, or combinations of solid wastes, which because of its quantity, concentration or physical or chemical characteristics may potentially cause or contribute to an increase in death rates or serious illness rates. The hazard to human health or the environment caused by the substances can be felt immediately or over an extended period of exposure depending on the substance. Commonly, hazardous waste is thought of as any substance that displays one or more of the following characteristics: ignitability, corrosivity, reactivity or toxicity.

In 1978, the nation as a whole became aware of the threat of hazardous wastes when leaking drums of hazardous wastes were found buried throughout neighborhoods in the Love Canal housing development in Niagara, New York. Just two years prior to this discovery, the United States Congress had passed the first law regulating hazardous waste generation, management and disposal. Since that time, there have been numerous news specials about communities across the nation which have been contaminated by hazardous wastes. Many of these wastes have been found to cause cancer, birth defects and a variety of neurological disorders. Because of the seriousness of the threat posed by these chemicals, lawmakers have passed a variety of legislation in an attempt to prevent further contamination of the environment by hazardous wastes.

In 1965, the Unites States Congress passed the Solid Waste Disposal Act. Five years later, in 1970, Congress realized that there was great potential value to be found in materials which were commonly disposed of as municipal solid waste (MSW). This gave birth to the Resource Recovery Act which was passed that same year. In 1976, this act was amended and resulted in the Resource Conservation and Recovery Act (RCRA). This series of acts placed the government of the United States firmly in the arena of waste management and also gave the federal government the ability to regulate solid waste within the United States. Congress gave the United States



TYPICAL HAZARDOUS WASTE GENERATORS

General types of industries which are found to produce hazardous wastes during normal operations include among others:

- Chemical Manufacturers
- Vehicle Maintenance and Repair Shops
- Printing Companies
- Manufacturers of Leather Products
- Construction Industries
- Cleaning Agents and Cosmetics Manufacturers
- Manufacturers and Refinishers of Wood and Furniture Products
- Metal Manufacturing Companies

Environmental Protection Agency (USEPA) the authority and responsibly to act as the regulating agency for these acts.

For the purposes of the RCRA, household hazardous wastes and municipal solid wastes are excluded from this definition. The objective of this definition was to qualify hazardous waste as primarily a product of industry. Given the sampling of people who generate hazardous wastes, it becomes clear why the RCRA defined hazardous waste as a product primarily created by industry. Because of the RCRA focus on industry as the source of hazardous wastes, we have several categories of people who either generate, transport, store, dispose of, or handle hazardous wastes as part of their business enterprises. The generators whose production levels are tracked are large and small quantity generators and conditionally exempt small quantity generators.

Large quantity generators are those generators producing more than 1000kg (2200lbs.) of hazardous waste per month or 1kg of acutely hazardous waste per month. These generators may store their wastes on site for up to 90 days from when the accumulation began. Small quantity generators are generators whose production levels are regulated, but whose totals are not statistically tracked and are those generators producing less than 1000kg (2200lbs.) of hazardous waste per month. These generators may store their wastes on site for up to 180 days from when the accumulation began. Conditionally exempt generators are typically those generators that produce hazardous wastes sporadically or in very small amounts and are those generators producing less than100kg (220lbs.) of hazardous waste per month. These generators may store wastes on site for up to 270 days from when the accumulation began.

HAZARDOUS WASTE IN MECKLENBURG COUNTY

- Large Quantity Generators in Mecklenburg County: 53
- Small Quantity Generators in Mecklenburg County: 311
- Conditionally Exempt Generators in Mecklenburg County: 410
- Tons of Hazardous Waste Generated in Mecklenburg County: 16,157 tons
- Tons of Hazardous Waste Generated in North Carolina: 66,501 tons
- Percentage of Total Hazardous Waste in North Carolina Generated in Mecklenburg County: 24.3%
- Tons of Hazardous Waste handled by TSD's in Mecklenburg County: 44,926.52 tons

Any facility used for the storage, treatment and/or the ultimate disposal of hazardous wastes is a registered Treatment, Storage or Disposal Facility (TSD). There are four registered disposal facilities for hazardous wastes in Mecklenburg County, which are currently inactive. Hazardous wastes are stored or treated at five facilities in Mecklenburg County. In 1997 these facilities handled 44,926.52 tons of hazardous wastes.

Hazardous Waste Transporters are not regulated by the RCRA, but are regulated by the Hazardous Waste Transportation Act and by the Emergency Preparedness and Community Right to Know Act. There are no firm numbers on exactly how much hazardous waste material is transported throughout Mecklenburg County. There are three registered hazardous waste transporters in Mecklenburg County. Significant strides in reducing the amount of hazardous waste generated in Mecklenburg County were made early on. However, the overall generation of hazardous waste is not declining at this time.

CONTAMINATED SITES

The regulation of all handlers and generators of hazardous wastes becomes important when ensuring that these people show due care and caution while handling and dis-

CONTAMINATED SITES AND EMERGENCY RESPONSES

- Current NPL sites in Mecklenburg Co.: 1
- Current SPL sites in Mecklenburg Co.: 128
- Total NPL sites in North Carolina : 28 (w/23 currently being evaluated for addition)
- Total SPL sites in North Carolina : 1094 (w/700 currently being evaluated for addition)
- Total Emergency Responses in 1999: 11

posing of these wastes. There are guidelines and regulations that ensure that these wastes are properly transported, stored and handled. These regulations are in place to protect both the environment and the human population from being unnecessarily exposed to hazardous wastes. However, accidents happen and the environment becomes contaminated with hazardous wastes on occasion. When these accidents happened prior to the acts passed by Congress, the contamination was not always properly cleaned up. This led to the creation of many contaminated sites across the country, including sites throughout North Carolina and Mecklenburg County. These sites are regulated by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), which is commonly referred to as the "Superfund Act".

In 1987, the General Assembly of North Carolina passed legislation to create the Inactive Hazardous Sites Program to identify, correct and control properties within North Carolina which had been contaminated by hazardous materials. This act reflects many of the aspects of the Superfund Act and was designed to work within the same frame work. The USEPA and/or NCDENR assesses the sites which are potentially contaminated and prioritizes them for investigation. When these sites are investigated, the extent of contamination is determined. The investigating agency then decides whether or not the site requires clean up based on the presence of contamination and the potential human or environmental impact any contamination present may have. Sites in need of clean up, as deemed by the USEPA, are placed on the National Priority List (NPL). Sites in need of clean up, as determined by the NCDENR, are placed on the State Priority List (SPL). In either case, these sites are attended to as funds become available.

When a spill or accidental release of hazardous material occurs, emergency personnel respond to the scene as needed. Emergency responders include Police and Fire Department units, Mecklenburg County Department of Environmental Protection and elements from either NCDENR or USEPA.

Hazardous waste is a byproduct of modern society. It is incumbent upon industries and consumers to minimize the amounts of hazardous wastes they create. The proper management and reduction of hazardous materials and wastes can reduce the detrimental effects these materials have on the environment. SOER

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We Were Green, Have We Lost Our Color?

Thirty years ago, Charlotte had tree-lined streets, small and medium sized parks, undeveloped lots in residential areas and multiple acreage tracts that served as undesignated and informal green belts. We were a green city. We still have our parks, but development has just about eliminated our vacant lots and multiple acreage tracts. The once large, wooded tracts in the county are now residential developments or shopping centers. Charlotte still has tree-lined streets, but only in the older sections of the city. The new residential developments won't be tree-lined for another 25 years and the shopping centers will probably never develop a green image. Small towns are shoulder-to-shoulder with each other or with Charlotte.

Did we foresee economic development? - yes. Did we foresee economic development's affects on open space? - probably not. Did we go to sleep at the wheel? No, we adopted new strategies, new ideas and new leadership to maintain our green.

In 1978, a modest $19.7 million park bond package was passed which "jump started" the efforts to keep the County green. As demonstrated by bond passage in subsequent years, this initial attention to providing open space was and is a serious movement supported by the voters. Efforts to preserve open space ranged from the designation of nature preserves of more than 1000 acres to the development of local parks and greenways. The citizens continued their support in November 1999, passing a $52 million bond package. Where does this put us in relation to other similar areas? It is safe to say we are in the middle of the pack.

How is land identified for potential preservation, whether it is for a park or just for green space? There

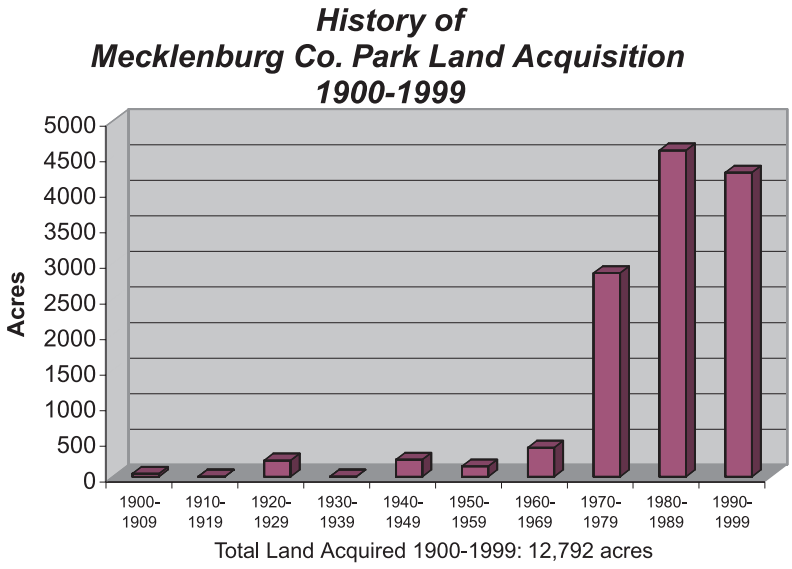
We Were Green, Have We Lost Our Color?

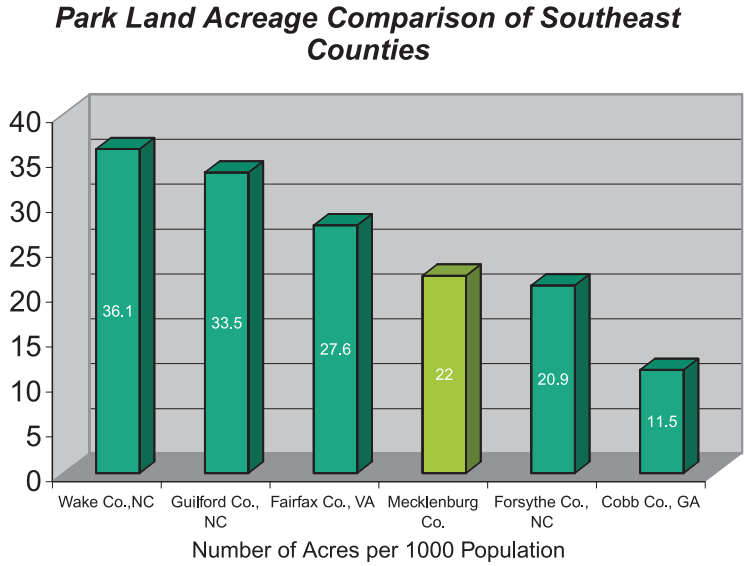
are many ways. Landowners will often want to preserve their land and make it available. Developers may need to preserve some green space as part of plans for development or they may want to combine green space as part of a contribution for a tax break. Some tracts come on the market, particularly as older owners divest themselves of property. Some sites are identified, through intensive investigations, as excellent examples of unique or special habits. Often these habitats were more common in the past, but are becoming rare due to continued economic growth and development. Efforts can then be made to focus limited resources on well defined targets. A summary of one such effort will show how green space can be identified and, using creative measures, be preserved.

From 1993 to 1996 an intensive natural heritage survey of Mecklenburg County was undertaken by a council working under the Mecklenburg County Park and Recreation Department. The objective of the survey was to identify the best remnant natural habitats in the county, document their characteristics and rank them by importance. During this investigation, 43 sites were examined and 27 were determined to be of significance at the County, State, Regional or National level. As a result of this natural heritage survey, six sites consisting of more than 400 acres have been preserved.

Their preservation came about in several ways. The Catawba Lands Conservancy (CLC), a nonprofit organization, purchased one site outright. The CLC received two sites from the State Department of Transportation as a mitigation for wetland impacts resulting from the I-485 outer belt construction project. Charlotte Mecklenburg Utilities bought one as a buffer for the water supply on Mt. Island Lake. The Park and Recreation Department acquired one site adjacent to the Latta Plantation Nature Preserve. Another area was donated to the CLC by an international business corporation. By combining identification, documentation, and public and private commitment with governmental leadership, almost 15,000 acres of land has been preserved.

The bond package passed by the citizens of Charlotte-Mecklenburg in November 1979 was a defining moment for preserving our open or green space. That action has resulted in the improvement of the quality of our life, more habitats for wildlife and better surface and ground water protection. Based on the land acquisition performance since 1978 and the present conservation commitment by the public and private sector, Mecklenburg County will not likely see nature become a distant neighbor.





Includes land acquired by Mecklenburg County and the City of Charlotte for parks, greenways and watershed protection. Source: Meck. Co. Parks and Recreation 1999 General Obligation Bond Referendum Information Handbook.

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How Mecklenburg County's Parks and Greenways System Helps Our Environment

Mecklenburg County is developing an expansive parks and greenways system. Funded primarily by voter approved bonds since 1978, ten separate referenda bonds totaling $192,315,000 have been passed to acquire land and to develop and rehabilitate recreation facilities. In addition to $52,000,000 for park bonds, in 1999 a very forward-looking item was on the ballot in Mecklenburg County. A $220,000,000 land purchase bond was successfully passed which will fund the County?s projected land acquisition needs over the next ten years. The bonds will buy land for multiple public purposes including parks, greenways, schools, libraries, watershed protection and other needs. The need for acquisition of so much land was identified in the County?s ten-year capital planning document called the capital needs assessment or CNA. The timing of such an aggressive approach to public land acquisition was triggered by the County?s rapid and continuing growth. Officials and staff agreed that if land were not purchased quickly for many of the needs envisioned in the CNA, those opportunities would be lost.

One can travel through any area within this County and see that growth and change are taking place at an astonishing rate. We see I-485 steadily wrapping around the heart of the County forming a necklace of sorts with ?beads? in the form of interchanges scattered along its length. Nearly every bead will generate a star-like pattern of development radiating in all four directions from intersections with the existing roadways. In addition, new subdivisions drive and then follow the extension of sewer and water lines into parts of the county where sparse development has languished for years. At the same time, urban planners and other smart growth

How Mecklenburg County's Parks & Greenways system helps our Environment

advocates are encouraging in-fill development, particularly along future rapid transit corridors. All in all, this place is booming! So, you may ask, how does our parks and greenways system help our environment?

Mecklenburg County is in the ongoing process of implementing ambitious master plans for parks and greenways. This planned, interrelated system currently encompasses over 13,500 acres. True, this is proportionately only a fraction of the County?s total geographic area, but it is where some of this acreage is located that makes the difference. Much of the acreage is found in two strategic types of places. First, a network of nature preserves includes much of the shoreline of Mountain Island Lake, which is the drinking water source for most of this County as well as portions of Gaston County. The nature preserve designation protects over 2,700 acres of land ranging from Latta Plantation Nature Preserve, encompassing a contiguous mass of 1,300 acres, to portions of flood plains along McDowell and Gar Creeks, the two major creeks flowing through the protected watershed into the lake.

This undeveloped land serves to help filter non-point source pollution from our drinking water supply source. Storm waters transport the pollution through the natural drainage conduits (creeks) to the lake. Non-point source pollution is generated from siltation occurring with new development, from pesticides and fertilizers used on residential lawns and commercial landscaped areas as well as run-off from impervious surfaces including petroleum product residues that accumulate on parking lots. Thus the presence of Mecklenburg?s acres of nature preserves on Mountain Island Lake reduces the cost of chemically treating our water before it is piped into our homes. The benefit of this cost saving will compound (like interest in a savings account) and become more significant over time.

The second strategic place where Mecklenburg County?s parks and greenways system enhances the environment is the acreage incorporated into preserved flood plains (or greenways) along more than 16 miles of creeks draining across the County. These protected acres essentially remain in a natural vegetated state except for (underground) utility lines and recreation trails. Several thousand more acres are preserved along our creeks within parks located on the creeks. These flood plains filter and enhance water quality in the same manner as the nature preserve system described above. Vegetation that thrives undisturbed along these creeks also filters some pollutants from the air. Yet another environmental benefit derived from the parks and greenways system is protected habitat that supports a variety of wildlife within our urban setting.

Mecklenburg?s citizens can be assured that their votes for park and land purchase bonds will do (at least) double duty by way of providing places for people to play and by helping to protect our waters, our air quality and natural habitat for plants and many small creatures. In the next few years citizens will see hundreds of acres acquired and protected for these purposes. This is one significant method of sustaining and improving the quality of life in this place we call home.

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LAND ENVIRONMENTAL INDICATORS - 1999

SOLID WASTE	
Municipal Solid Waste Generation (tons)	887,215
Municipal Solid Waste Generated Per Person Per Day (Pounds)	7.5
Solid Waste Management (tons)	
Exported to Cabarrus County (Municipal Solid Waste)	625,260
Exported to South Carolina (Municipal Solid Waste)	259,599
Composted - Yard Waste	49,957
Recycled - Curbside and Drop Centers	44,400
Recycled - Household Hazardous Waste	164
Disposed in Mecklenburg County C&D landfill	228,934
Recycled at C&D Waste Recycling Facility	19,839
Disposed in Cabarrus County C&D Landfill	73,687
Disposed in Lincoln County C&D Landfill	6,078
Disposed in South Carolina C&D Landfills	6,435
Tires Managed (disposed or recycled)	11,218
Solid Waste Disposal in Mecklenburg County (tons)	
Construction and Demolition (C&D) Landfills	228,934
Land Clearing/Inert Debris (LCID) Landfills	(No Data)*
Municipal Solid Waste	0
Construction Permits Issued (residential and commercial)	74,651
Violations by Source Category (Total)	11
Sanitary Landfills	0
MSW Transfer Stations	1
Construction and Demolition Landfills	0
Land Clearing/Inert Debris Landfills	6
Land Clearing Waste Recycling Centers	1
Compost Sites	0
Incinerators	0
C&D Waste Recycling Centers	3
HAZARDOUS WASTE	
Total Hazardous Waste Generated (tons)	16,157
Hazardous Waste Facilities (2000)	
Large Generators	53
Small Generators	311
Conditionally Exempt Generators	410
Treaters, Storers, Disposers (TSD's)	10
Transporters	15
Burners/Blender	12
Recyclers	0
RADIOACTIVE WASTE	
Low-level Waste Generation (cubic feet)	8,135
High-level Waste: Spent Fuel Assemblies	160
Radioactive Waste Management (high level)	
Fuel Assembly Capacity	2,926
Fuel Assemblies Stored	2,469
Percent Storage Capacity Remaining	15.6
Medical Waste Management	(estimate in tons)
Treated by permitted/approved facilities in Mecklenburg County	16,837
Generated by Facilities in Mecklenburg County	7,038
Shipped for Treatment Outside Mecklenburg County	375

* LCID Landfills are not required to track tonnages.

Look Both Ways Before You...

John M. Barry, Ph.D.
Director, Department of Environmental Protection

Now that the rush of Y2K and all of that hubbub is over, it would be nice to turn again to the subject at hand – that of the state of Mecklenburg County's environment. We have left behind a century, that has for the most part, been interesting to say the least. We have endured several military conflicts. We have seen the advent of flight at Kitty Hawk and man walking in space and on the moon. We have seen awareness of environment problems rise to become a worldwide concern. And we have also seen technology grow and produce goods and services that even a few years ago, very few persons could imagine.

But most importantly, we have seen our quality of life improve in just about every aspect. This is true in Mecklenburg County as it is in the remainder of our great country. Yet with all of this change, with all of the advances in technology, with all of the knowledge that we have relative to our quality of life and our environment, are we really better off? Let's take a look back and see what we can learn, before we leap ahead.

I recently found a copy of the front section of the Sunday, September 21, 1975, Charlotte Observer in a drawer in my office. (I'm sure it had some historical significance, because I wasn't even living in Charlotte until 1978.) The headlines covered topics about the CIA, Lee Harvey Oswald, Howard Hunt and the upcoming City of Charlotte City Council elections.

But then, down in the right corner of the front page was the headline "Charlotte 59th in Life Quality Study." 59th? Come on now, can that be right? Yes, native Charlotteans, that's what the article said! Charlotte ranked 59th of the country's 83 cities of similar size in a study measuring "quality of life" standards ranging from swimming pools to smog to sexual discrimination. Eugene, Oregon, topped the 200,000 to 500,000 population category and Mobile, Alabama, was ranked the worst in the government-funded study. The rankings were based on economic, environmental, political, social and health and education components. From a regional environmental perspective, Raleigh, Greenville (SC) and Charleston ranked "adequate," while Charlotte and Columbia were graded "substandard." Fayetteville topped the Carolinas with a grade of "good."

However, it would also seems apparent from this article that in 1974, the citizens of Charlotte-Mecklenburg were thinking about the future. Community goals had already been proposed and adopted; and they were very similar to those being considered now, albeit not as technically detailed. Let's examine a few of these 1974 goals and compare them to the current situation.

Insist upon the countywide enforcement of antipollution and antilitter laws.

Charlotte-Mecklenburg now has federally recognized certified air pollution program, various antilitter ordinances and authority to enforce many State laws and regulations pertaining to illegal solid waste disposal, and a Memorandum of Agreement with the State to enforce water pollution laws and regulations.

continued

Encourage the development of solid waste recycling to minimize need for landfills.

Charlotte-Mecklenburg now has one of the premier voluntary recycling programs in the nation. Our effective overall solid waste management integrates source reduction, reuse, recycling, composting, waste to energy (incineration) in addition to landfilling.

Promote a positive public attitude on mass transit as a desirable alternative to private automobile use. [and] Resolve the problem of pedestrian and vehicular movement in the core city through development of parking facilities, convenient interchange facilities, and a circulation system integrating all forms of movement and traffic.

Charlotte-Mecklenburg and the region are now considering purchasing rights of way for light rail corridors, more extensive express bus patterns and a more complete and integrated bus system to reduce dependence on cars. Plans are being made to accommodate interconnecting greenways, bike lanes and pedestrian friendly areas. Planned communities incorporating residential, retail and business opportunities are being designed and built.

However, from today's perspective, the omission of surface water quality concerns is a major factor. Twenty-five years after this document, we are concerned about our drinking water source, not from a quantity standpoint, but from threats to its quality. In response to this relatively recent concern, Mecklenburg County has instituted the Surface Water Improvements and Management program, affectionately known as SWIM, and are studying and implementing buffer requirements for streams and the Catawba River system.

Yes, a lot has occurred in twenty-five years — much of it good. We have growth in the Metrolina area which has created thousands of jobs and increased our economic base, and due to technology, we are able to determine the effects of pollution on our health and our environment.

On the other hand, not everything that has happened has been for the good. We have continued growth and its accompanying sprawl; increasing air pollution problems from automobiles and industries; wetlands loss; solid waste production considerably higher than the national average; and because of the ever increasing amount of impervious surfaces, problems with the quality and movement of stormwater.

Should we forget the past and move on with the future? No way! It's time we look both at the future and the past, realize that we still have many of the same goals and the same or greater problems that we had some 25 years ago, and buckle down and make some tough political decisions that will guide us into the next century. And most importantly, we need to continue to move ahead – rapidly. We won't kill free-market enterprise or personal choice if we manage growth to lesson dependence on cars, preserve open space or create greenways. What we will do is create more options, preserve our quality of life and protect our health at the same time. Can we accomplish this? Probably so, but it will take political buy-in from regional elected officials and convincing our community of the importance of these efforts.

Still need time to think about it? Maybe you should do your thinking in your car during a high ozone day in August when the interstates are at a standstill.

Making the Vision Real

Bob Freedman and Lisa Renstrom
Co-Chairs, Voices & Choices

There's an old saying that goes "many hands make light work." During the past two years, hundreds of hands have been at work in a process called Voices & Choices, trying to find ways to balance our region's need vibrant economy with the need to protect our environment. Has the work been light? Well, just ask all the volunteers from anywhere in 14 counties around Mecklenburg, and they'll probably say, "Light work? No. Worth it? Yes!"

Voices & Choices began after the November 1998 Regional Environmental Summit in Rock Hill, SC. At that Summit, over 550 people gathered to learn about how the tremendous growth was putting pressure on the environment around us. At the end of the day, they decided that there were six areas around which a Plan should be formed for action, including: Land Use, Transportation, Air Quality, Water Quality, Open Space and Resource Recovery/Recycling. Since May of 1999, volunteers from across the region have been meeting to put together a plan entitled "Make the Vision Real" which lists goals and action steps in each of those areas. We'll talk more about that shortly.

During the process, a very important link was made between economics in our region and the environment. Our beautiful natural heritage has attracted re-locating businesses and industries, new talent and resources from across the country and the world. The Charlotte region had a secret that was out: it's a great place to live! But that quality of life won't last if we don't protect our environment. So, our environment is actually a crucial economic asset.

Voices & Choices Action teams have been meeting for months to come up with specific ideas to protect that asset. Some of their most important ideas include a Regional Land use and Transportation Plan, a Strategic Regional Plan for Open Space, and regional management of the three watersheds in the region. The teams are also calling for recycling programs throughout the region, even in rural areas, and adoption of more stringent air quality controls.

In years past, the business community and environmentalists have many times been on opposite sides of many issues, each mis-trusting the other, and each convinced that the other was unable to see another perspective. As co-chairs of Voices & Choices since the summer of '98, we represented those interests, but we recognized that in truth, we had a common goal: to find a balance that would both protect our environment and further strengthen our economy.

Throughout the process of creating "Make the Vision Real," developers and environmentalists, farmers and urbanites, met to share ideas. Imagine having the Catawba River Keeper and one of Duke Energy's head engineers together for weeks of discussion! No, it wasn't always pretty, but in the end, cooperation, sharing and establishing common ground has worked to produce a plan which we believe will affect significant positive change in the region.

It's not hard to imagine that having clean air and water, parks nearby, convenient transportation and fewer landfills adds to your everyday happiness. But these things don't just happen without careful planning, resources and a commitment to a long range view of how the choices we make today impacts our children and grandchildren. In the end, making the Summit vision of a clean, sustainable region a reality long into the future comes down to individual choices. Choices about how we use energy, how we support different types of housing patterns, and ways to get around.

In the end, solutions don't come from plans and books, they come from you, your neighbor, your friends and colleagues. Although the "Make the Vision Real" phase of Voices & Choices is complete, we're far from done, and it's never too late to get involved. We invite you, on behalf of the hundreds of citizens just like you who created this plan, to participate in continuing to craft new ways to meet the challenges facing our region. Throughout 2000, Voices & Choices will be traveling to solicit feedback and input on "Make the Vision Real," setting priorities for local action in town meetings, electronic forums and old-fashioned sit-downs.

In 2001, we'll convene a second Regional Environmental Summit. Somewhere in the region, hundreds of people will gather to discuss the progress we have made, report on the challenges we still face, and affirm a shared, common vision. What will we have to say to each other? Will we have begun leading the nation in innovative planning and cooperative progress? Can our region remain just as great a place to live as it is now, or even get better? We are optimists about the future, and we'd like to add your voice to Voices & Choices.

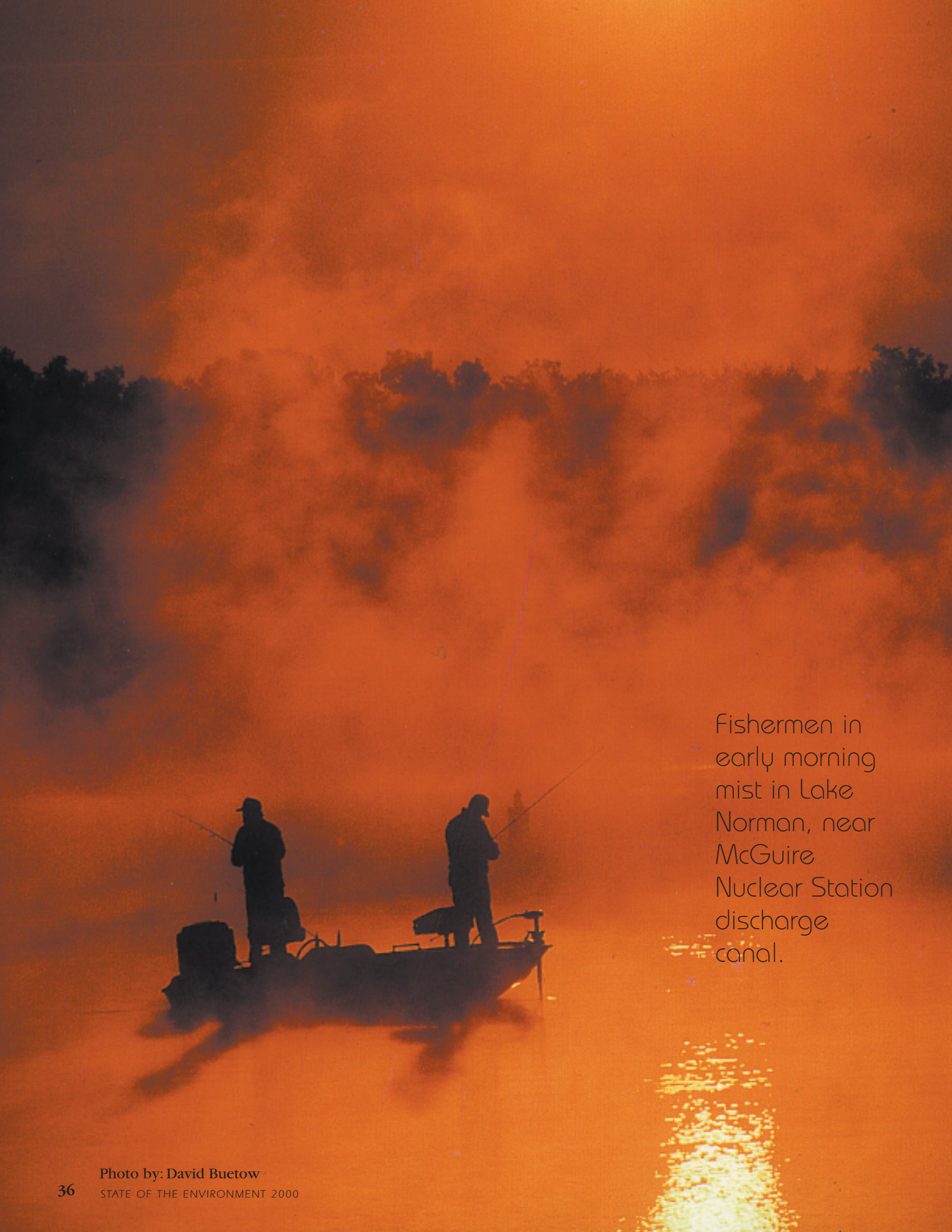
Reflections from a longtime Mecklenburg County Resident

I'm going to tell you about "my creek" in more detail than you care to hear. I'm 75 years old and was born and raised in Charlotte. I have lived in the Plaza Midwood neighborhood since 1928. When I was little, I played in a creek that ran between Nassau Boulevard and Tippah Avenue and finally flows into Briar Creek. The people in the neighborhood called it the Van Landingham Creek because it originated on their property and was thought to come from a spring there that fed their fishpond.

The creek was abundant with aquatic life, bullfrogs, crawfish, snails and various water bugs. On hot summer days, my little friends and I would play in it and if thirsty, drink the water by scooping it up in our hands. Amazingly, no one ever was sick from this and it tasted so good. Nearby, were other things like "hoppy" toads and turtles, which we captured and brought home, much to our Mother's consternation. We would dam up portions of the creek with a few rocks and sand and make a little pool. This was great fun because it made something like a little swimming pool except it was only about 6" or 8" deep. This was in the 1930's and early 40's. There were hardly any homes backing up to the creek. I can remember lying in my bed on Kenwood Avenue and hearing the bullfrogs "cheroom cheroom" at night. I went into the Navy in 1941 and did not return until 1958. By that time I heard no bullfrogs. I visited the creek several times after that and saw none of the creatures I have mentioned. Toads were present around our house up into the 1960's, but I don't think I have seen one since that time. Although I don't remember seeing any fish in our Van Landingham Creek, I did see them in a branch of Briar Creek. This is the branch that runs under Belvedere Avenue. There was a fairly sized pool just downstream from Belvedere that was deep enough and wide enough for some of us to "swim" in. We also fished there and caught a small fish that some said were Perch. Of course they are long gone.

Most people my age, did not think about the environment until we were long grown and some do not even now. When I realized what had transpired in our little neighborhood in my lifetime, I became alarmed. People in younger generations and beyond are going to be deprived of a lot of joys of nature.

Charles "Chuck" Paty, Jr.
Charlotte, NC



Fishermen in early morning mist in Lake Norman, near McGuire Nuclear Station discharge canal.

Photo by: David Buetow

Those Delightsome Rivulets

A young Englishman by the name of John Lawson was the earliest explorer to venture into the interior of North Carolina. His travels carried him across the lower edge of Mecklenburg County in 1700. In his journal, Mr. Lawson noted concerning Mecklenburg County that it was "abounding in many and delightsome rivulets." As a matter of fact, Mecklenburg County has over 2000 miles of "delightsome rivulets" or streams which lace across its rolling landscape. Mecklenburg County sits on the drainage divide between the Catawba and Yadkin River Basins with two-thirds of its streams draining west toward the Catawba and the remaining one-third draining east to the Yadkin. The western edge of the County is formed by 190 miles of shoreline along portions of three of the eleven lakes which comprise the Catawba River system including Lake Norman, Mountain Island Lake and Lake Wylie. It is a foregone fact that Mecklenburg County is a "water rich" community and that these abundant surface waters played a major role in its early settlement. Pioneers, many of them of Scotch-Irish descent, flocked to the banks of Mecklenburg County's streams beginning in the mid 1700's. Many of these early settlers were accomplished millwrights and it wasn't long until water mills sprang up along nearly every stream having year round flow, grinding grain into flour and powering sawmills for producing lumber. Communities developed around these mills and streams quickly became the life's blood of this area playing a vital role in the development of Mecklenburg.

The Catawba River also contributed tremendously to the early development of Mecklenburg County. It served as a highway for early settlers moving into the region and was also used as a major shipping route for goods bound to Charleston for export. Beginning in the 1700's, fisheries sprang up along the banks of the river providing a food source for early settlers. Ferries were constructed along major transportation routes crossing the river followed by bridges. Another little known fact concerning the Catawba River is that it served as a barrier preventing federal forces from invading and laying waste to Charlotte during the Civil War. During the spring of 1865, federal calvary moved east toward Charlotte from the direction of Lincolnton. Confederate forces under the command of General R. D. Johnston of Lincoln County established a defensive position on the east bank of the Catawba River in Mecklenburg County adjacent to the bridge at the Rozzelle's Ferry in the area where Brookshire Freeway crosses Mountain Island Lake today. Federal forces reached the west bank of the river and fired upon the Confederate position but were unable to effect a river crossing and were thereby prevented from advancing east to Charlotte.

History of Surface Water Uses in Mecklenburg County

The streams and rivers of Mecklenburg County have been vitally important as a major source of raw drinking water since the 1800's. Charlotte's first municipal drinking water intake was located on Sugar Creek in 1881. In 1904, the water intake was moved to Irwin Creek primarily due to declining water quality conditions in Sugar Creek brought about by sewage discharges from inadequate and often nonexistent collection and disposal systems. In 1911, the Irwin Creek intake failed to provide Charlotte with the water it desperately needed during a water shortage brought on by an extreme drought and water had to be brought into town by train from the Catawba River. This near catastrophe awakened Charlotte to the growing needs of the community for abundant, clean drinking water and in 1912 the City began withdrawing its water from the Catawba River close to the current intake along Mountain Island Lake at the end of Pump Station Road in western Mecklenburg County.

By 1900, the population of Mecklenburg County had grown to 55,268. The Catawba River and the many streams in the County continued to be vitally important to area residents. At that time, Mecklenburg County was very rural in nature and the quality and useability of these waters had continued to be very good with only small, isolated pockets of pollution centered primarily in downtown Charlotte. Little Sugar and Sugar Creeks were the most polluted waters in the County due primarily to inadequate sewage disposal facilities. In the early 1900s, some areas of Charlotte were served by septic tanks but most of the town completely lacked any type of sewage treatment system and thousands of gallons of raw sewage were dumped straight to creeks until the City constructed its first modern sewage treatment plant along the banks of Sugar Creek in 1923. In the rural areas of the County, creeks remained free of pollutants and were widely used for recreation. Most residents had a favorite fishing or swimming hole near their home and in a time with limited recreational activities, these waters provided much needed relief for area residents. In 1910, a public recreational area called Camp Latta was developed along the banks of Long Creek in western Mecklenburg County and included a swimming hole formed by damming the creek.

A public swimming area on long creek at Camp Latta – circa 1910.

Beginning in 1948 during the post World War II boom, suburbs began to spring up in a ring around Charlotte. A brief lull in growth was experienced in the early fifties followed by increasingly steady growth into the 1960's. The quality and useability of Mecklenburg County's streams suffered as a result of this growth primarily due to dumping by businesses and inadequate collection and disposal systems for the community's increasing volume of sewage. These water quality problems came to head in the late 1960's. A series of articles in the Charlotte News in September 1969 brought these problems to the attention of Mecklenburg County residents which lead to a call to action resulting in the established of one of the country's first local water quality programs in 1970. Subtitles in this series of articles included "A Tip: Don't Go Near The Water" and "Catch Any Fish In Sugar? You Can Forget About It" as well as "The Creek Is Simply A Sewer." The articles featured a six week long investigation by a News reporter documenting severe pollution problems in Little Sugar Creek. The News enlisted the help of Dr. Edward F. Menhinick, an assistant professor of biology at the University of North Carolina at Charlotte, to document the impacts of this severe pollution on aquatic life in the stream. Dr. Menhinick selected three intercity locations in Little Sugar Creek for his research including Cordelia Park, Piedmont Courts and Freedom Park. After hours of seining the creek for life, Dr. Menhinick found one dead frog, one live earthworm, two beer cans and several hundred cigarette butts, but not one fish. Bacteria counts measured in the stream were 260 times the State standard. The creek was void of life and the extremely high bacteria counts made them completely unsuitable for human contact. Public outcry in response to these appalling conditions lead to the funding by the Mecklenburg County Board of Commissioners of the County's Water Quality Program at a cost of $90,604 annually effective January 1, 1970.

Orange blossom deodorant dripping to mask odor of creek.

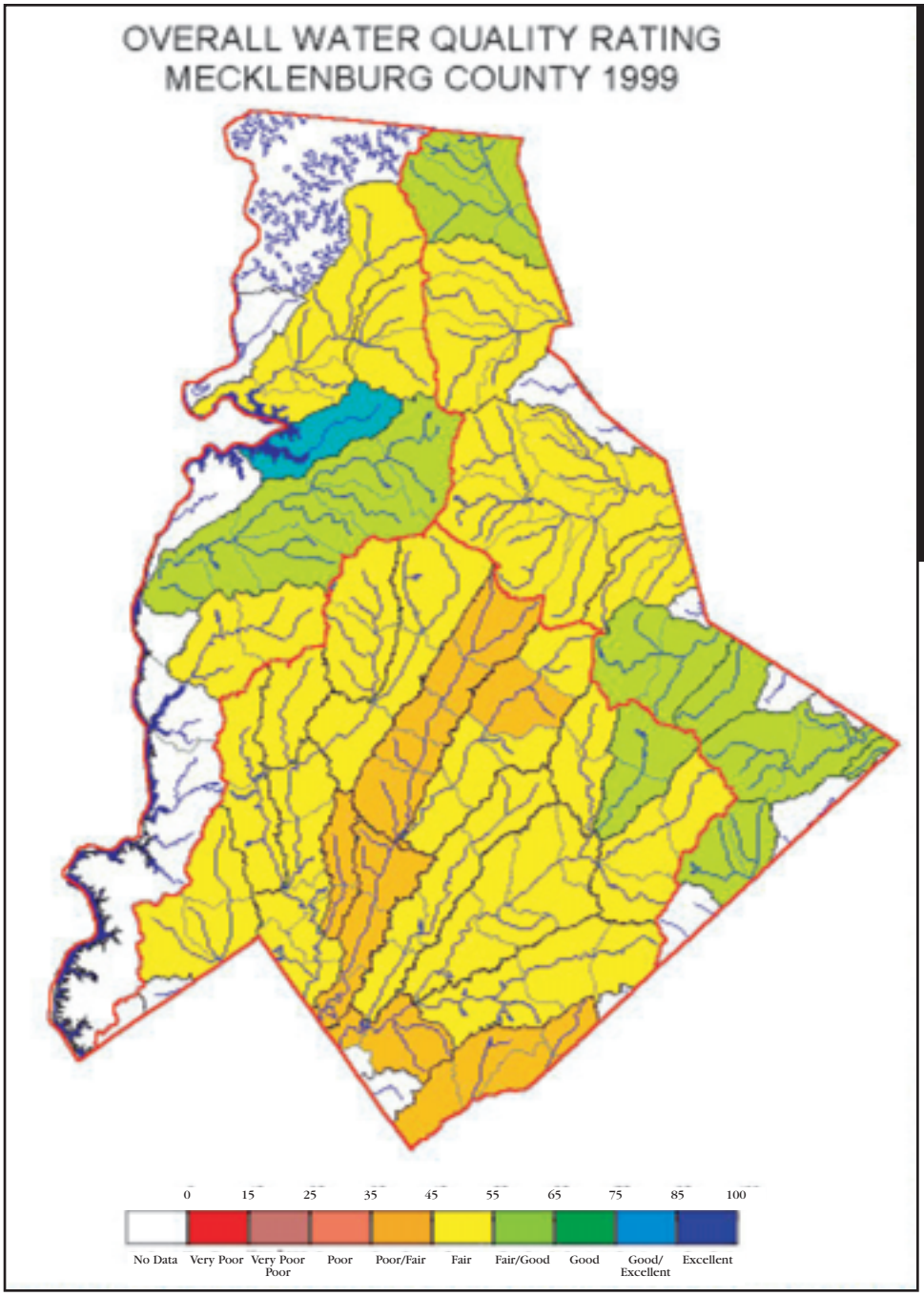
Changing Waters

A lot has changed with regards to water quality conditions in Mecklenburg County over the past thirty years, for both the better and worse. Improvements in water quality have been documented in the inner city streams draining areas of "Old Charlotte" such as Little Sugar Creek in the area that Dr. Menhinick surveyed 30 years ago. The illegal dumping by businesses and the discharges from inadequate sewer collection and treatment systems have been significantly reduced. This is largely due to improved regulations such as the enactment of the Federal Clean Water Act in 1977 as well as enhancements to the municipal sewer system by Charlotte-Mecklenburg Utilities. Mecklenburg County's Water Quality Program has also contributed significantly toward this improvement in water quality conditions. From January through September 1970, the newly formed Water Quality Program, operating under the Division of Environmental Health of the Health Department, had identified and eliminated over 300 pollution sources through their successfully completion of a preliminary survey of the County's streams. This effort continued for years until most of the chronic dumping into Mecklenburg County streams had been brought under control. On June 16, 1998, the County's Water Quality Program which is now part of the Mecklenburg County Department of Environmental Protection performed a fish survey in the same section of Little Sugar Creek studied by Dr. Menhinick 30 years earlier. This time fish were detected in healthy numbers, a total of 796 to be exact. Unfortunately bacteria counts measured in these streams continued to be high and the waters remained unsuitable for prolonged human body contact. Today, the average bacteria count in the County's urban streams is one-third what it was 30 years ago but continues to exceed the State standard. Compared to 1969, the score has improved in favor of cleaner waters but County residents are still the losers as the streams remain unsuitable for wading or swimming.

The story for the outlying areas of the County is somewhat different. As this community has urbanized, the waters of the streams in these once rural outlying areas have become increasingly polluted. Streams that were once suitable for swimming only a few years ago are experiencing significant water quality degradation to the point where they are no longer safe for human contact. McDowell Creek in northern Mecklenburg County is a good example. This once rural area of the County has increased in population by over 300% since 1980 putting it among the fastest growing areas in North Carolina. During the 10 year period from 1988 through 1998, there were 138 exceedances of the State's water quality standards in McDowell Creek which has been degraded to the point that it is no longer suitable for prolonged human contact. Of particular concern is that McDowell Creek lies upstream of Mecklenburg's drinking water intake in Mountain Island Lake. The water quality in McDowell Creek Cove where the creek flows to the lake is among the poorest in the County. This problem must be checked before negative water quality impacts are experienced at Mecklenburg's water intake. A special initiative launched in 1999 by the Mecklenburg County Department of Environmental Protection referred to as Water Improvements Now (WIN) seeks to involve the community in efforts to reverse the negative water quality trends in McDowell Creek and restore its quality and useability.

Current Conditions

Based on 1999 water quality data, the poorest water quality conditions in Mecklenburg County continue to be found in Little Sugar and Sugar Creeks draining the most urbanized areas of the County. Water quality conditions in streams improve slightly toward the outlying areas of the County but overall only 15% of Mecklenburg's streams are considered suitable for human contact. All the waters in the County are supportive of aquatic life to varying degrees. The lakes on the County's western border typically exhibit good water quality conditions and are suitable for swimming and supportive of aquatic life. Overall Lake Norman has the best water quality conditions followed closely by



"The lakes are our drinking water supply and we can spend millions now to preserve land and protect our waters or we can allow them to be polluted and spend billions in the future to ?try? and clean them up. Our lakes are important, economically and for our quality of life, as nature preserves and recreation areas for all of us, not just those who happen to live there."

Mary McDaniel
Mountain Island Lake Resident

Mountain Island Lake. Of the three lakes, Lake Wylie has seen the most significant water quality degradation in the past 20 years but overall its water quality is considered good. Currently, the most prevalent pollutants in Mecklenburg County's surface waters are bacteria, sediment and a variety of contaminants carried in storm water run off. Elevated bacteria levels originate primarily from failing sewer systems. Construction site runoff is the most common source of sediment in the County's surface waters.

The source of pollutants in storm water runoff is much more difficult to pinpoint and is therefore the most difficult to control. As the number of parking lots, roads, roof tops and other impervious surfaces increases due to urbanization, less precipitation is allowed to filter naturally through the soil and the volume of runoff increases. This storm water runoff flows directly to the County's surface waters carrying with it pollutants deposited on the impervious surfaces such as oil dripped from automobiles as well as iron, zinc, copper, chromium, lead and a variety of other toxic metals from automobile wear and a variety of other sources. These are called nonpoint source pollutants and are estimated to account for half of the pollution problems found in streams nationwide. Control of these nonpoint source pollutants was nonexistent until 1987 amendments to the Clean Water Act required that measures be taken to control the most severely contaminated storm water discharges. These control measures were required for all cities in the country with populations greater than 100,000, which included Charlotte. In November 1993, Charlotte launched its Storm Water Pollution Prevention Plan, a comprehensive and proactive approach toward reducing the discharge of pollutants in storm water runoff. After seven years of implementation tremendous strides have been made toward identifying the sources of these pollutants and initiating actions necessary to restore water quality conditions. Since 1995, storm water data reveals a 50% average reduction in total suspended solid (TSS) concentrations in Mallard Creek. The most sig-

nificant improvement has been observed in McAlpine Creek which has experienced a 90% average reduction in TSS levels. Positive trends have also been recorded in Sugar, Little Sugar and Long Creeks which have experienced 37, 61 and 50 percent reductions respectively in TSS levels measured in storm water data since 1995.

S.W.I.M.

Another significant step toward improving the quality and useabiltiy of Mecklenburg's surface water resources was taken by the Mecklenburg County Board of Commissioners (Board) on October 15, 1996 with the adoption of the County's first "Creek Use Policy." The Board recognized the continuing degradation of the quality and useability of the County's surface waters in the face of increased growth and the spread of urbanization. They unanimously agreed that having only 15% of the County's surface waters suitable for prolonged human contact was unacceptable and decreed in a bold and progressive policy statement that "....all Mecklenburg waters shall be suitable for prolonged human contact, and recreational opportunities and shall be suitable to support varied species of aquatic vegetation and aquatic life." In effect, the Board acted to turn back the hands of time and restore the quality and useability of Mecklenburg's most precious and abundant natural resource, its surface waters. Staff was directed to develop for the Board a "list of alternatives and potential costs" for fulfilling this policy statement. Recognizing the daunting nature of this task, staff requested that the Board appoint a citizen's stakeholder group to assist them in this endeavor. The group comprised of thirteen Mecklenburg County citizens and seven City and County staff met for the first time in February 1997. The initiative soon became known as Surface Water Improvement and Management or S.W.I.M. and the group of stakeholders and staff as the S.W.I.M. Panel. The S.W.I.M. Panel was a very diverse group including an even split between "environmentalists" and "developers." The Panel met on seventeen occasions from February 1997 through April 1998 and successfully formulated a plan they called S.W.I.M. Phase I, which was a nine part strategy aimed at controlling the worst pollution problems in the County, sediment and bacteria, and initiating the steps necessary to protect the communities drinking water supply and move forward toward fulfilling the Board's Creek Use Policy. The Board unanimously approved S.W.I.M. Phase I and provided the necessary funding for implementation effective July 1, 1998.

A key component of S.W.I.M. Phase I was the establishment of stream buffers county wide. The S.W.I.M. Panel had emphasized that these buffers were perhaps the best tool in protecting the County's surface waters. The Board assigned the development of a buffer plan to the S.W.I.M. Panel and meetings continued. In April 1998 after 23 meetings, 3 workshops and 4 public hearings, the Panel came to consensus on a S.W.I.M. Stream Buffer Plan which was unanimously approved by the Board. The Buffer Plan was developed into an ordinance and subsequently unanimously adopted by Charlotte and Mecklenburg County effective November 1999.

The Future?

The development and implementation of S.W.I.M. Phase I continues with significant and measurable success. Both sediment and bacteria levels in Mecklenburg County streams are on the decline, some by as much as 90%, but a tremendous amount of work remains before Mecklenburg County can herald the fulfillment of the Board's Creek Use Policy. Future phases of S.W.I.M. will be required aimed at addressing increased pollution from new developments and implementing measures to address pollutants from existing development. Recent amendments to the Clean Water Act require the County and all six of Mecklenburg's towns to implement a storm water pollution prevention program similar to Charlotte's by March 2003. Despite the tremendous amount of change in water quality requirements to date, even more significant changes lie in Mecklenburg's future.

Everyday those "delightsome rivulets" of Mecklenburg are crossed by thousands of citizens hurrying to fulfill their appointed tasks with little or no thought being given to the tremendous role these flowing streams have played in the development of the place they call home. Even less thought is given to the steps necessary to protect these waters from destruction and total loss of useability. But maybe, after having read this article, you will find cause to reflect on the past and contemplate the future of our precious water resources and take the actions necessary to prevent their demise. SOER

www.

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PUZZLE PIECES OF WATER QUALITY

When putting together a puzzle, each puzzle piece adds to the puzzle's picture. Alone, each piece of the puzzle does not look like much more than a blob of color. The more pieces added to the puzzle, the clearer the picture becomes. Like putting together a puzzle, Mecklenburg County Department of Environmental Protection (MCDEP) uses a number of different water quality puzzle pieces to develop a picture of the overall water quality conditions of the County's lakes and streams. Like the pieces of a puzzle, each water quality puzzle piece alone does not provide enough information to assess the overall water quality conditions of the County's surface waters. The water quality puzzle pieces can be referred to as indicators of water quality.

MCDEP uses four different physical, chemical, and biological indicators of water quality. They include the Water Quality Index (WQI), the Lake Water Quality Index (LWQI), Biosurveys of Benthic Macroinvertebrates and Fish, and the Overall Water Quality Rating Index (WQR), a combined physical, chemical and biological index. These water quality indicators enable MCDEP to communicate a more complete picture of the water quality conditions of the County's lakes and streams, to identify and eliminate sources of pollution, to determine lake and stream water quality trends over time and to evaluate the success of efforts to improve lake and stream water quality.

Water Quality Classification	Water Quality Indices			
	Lake & Stream WQI	EPT Taxa Richness	NCIBI	Overall WQR
Excellent	85 - 100	< 27	57 - 60	85 - 100
Good/Excellent	75 - 84	26 - 27	53 - 56	75 - 84
Good	65 - 74	22 - 25	47 - 52	65 - 74
Fair/Good	55 - 64	18 - 21	45 - 46	55 - 64
Fair (Average)	45 - 54	14 - 17	39 - 44	45 - 54
Poor/Fair	35 - 44	10 - 13	35 - 38	35 - 44
Poor	25 - 34	6 - 9	27 - 34	25 - 34
Very Poor/Poor	15 - 24	3 - 5	23 - 26	15 - 24
Very Poor	0 - 14	0 - 2	0 - 22	0 - 14

Physical and Chemical Indicators of Water Quality

The first water quality puzzle piece, the WQI, was developed by NSF International (formerly the National Sanitation Foundation). The WQI is a water quality indicator that measures physical and chemical water quality parameters of streams. Each of the parameters measured reflect different types of possible pollutants in a stream. Parameters measured for the WQI include pH, Biochemical Oxygen Demand (BOD), Nitrate, Total Phosphorus, Turbidity, Total Solids, Fecal Coliform Bacteria, percent saturation of Dissolved Oxygen (DO), and change in Temperature from upstream to downstream. The LWQI, a lake water quality puzzle piece, is an adaptation of the WQI developed by William Fusilier where several of the parameters used to determine stream water quality have been replaced by those more indicative of water quality conditions in lakes. Parameters measured for the LWQI include pH, Nitrate, Total Phosphorus, percent saturation of DO, Temperature, Conductivity, Secchi Disk Depth, Alkalinity, and Chlorophyll-a. Any significant change in the parameters measured may indicate that a pollution problem exists. For example, a low DO and high BOD and nutrients concentrations may indicate organic pollution, and if accompanied by a high fecal coliform count may indicate a sewer discharge to a stream. Both indexes provide an indication of how safe it is for people to be in a lake or stream.

Biological Indicators of Water Quality

The third water quality puzzle piece, biological surveys of the Benthic Macroinvertebrate (bottom dwelling aquatic organisms such as insects, crayfish

Water Chemistry Parameter	Description
pH	A measure of the Hydrogen ion concentration in water. Changes in pH can increase the toxicity of certain pollutants in water.
Biochemical Oxygen Demand	A measure of the amount of oxygen required for the breakdown of organic materials and the oxidation of inorganic materials as ferrous iron and sulfides. The higher the BOD, the greater the presence of organic pollution.
Nutrients: Nitrate and Total Phosphorus	Concentrations of nitrogen and phosphorus compounds are measurements of nutrient enrichment and serve as indicators of problems such as leaking sewer lines and septic fields, discharges from wastewater treatment plants, and pollutants in storm water such as lawn fertilizers and sediment from construction sites.
Chlorophyll a	A measure of the algae community in a lake or stream. Higher levels indicate greater algal populations, suggesting possible nutrient enrichment.
Turbidity	A measure of the clarity of water. Turbidity is caused by suspended matter such as clay, silt, fine particles of organic and inorganic compounds and indicate nutrient enrichment, erosion or sedimentation problems.
Total Solids	A measure of the concentration of matter suspended and dissolved in water.
Secchi Disk Depth	A measure of the clarity of water in lakes. The Secchi Disk Depth decreases as the concentrations of inorganic (sediment) and organic (algae) solids increases.
Dissolved Oxygen	A measure of the amount of oxygen available to aquatic organisms such as fish. Concentrations below 5.0 parts per million are stressful or deadly to most fish and other aquatic organisms.
Temperature	Temperature directly or indirectly impacts many physical, chemical and biological components of water. Dissolved oxygen is inversely related to temperature. High temperatures indicate thermal discharges.
Conductivity	A measure of the ability of water to conduct an electric current which is dependent on the concentration dissolved ions. As the pollutant load increases, the concentration of dissolved ions increases causing the conductivity to increase. Conductivity is used as an indicator of industrial pollution.
Alkalinity	A measure of the buffering capacity of surface water which is important to water quality as pH has a direct effect on freshwater organisms and on the toxicity of various pollutants in water.
Fecal Coliform Bacteria	Bacteria belonging to the Family Enterobacteriaceae that are generally associated with human and/or animal fecal wastes and are used to indicate the possible presence of fecal discharges and sewage in surface waters.

and clams) and Fish communities, serve as excellent indicators of water quality that complement the WQI and LWQI indicators. Changes in the composition of benthic macroinvertebrate or fish communities can reflect changes in water quality caused by pollution problems or alterations in the aquatic habitat due to streambank erosion and sedimentation from construction sites. Each fish species has a unique tolerance to pollution and to specific pollutants. For example, darter species are sensitive to excessive sedimentation and temperature changes and are not found in urban streams that have experienced severe streambank erosion and have been largely exposed to sunlight. The same can be said for benthic macroinvertebrates as tolerance to various pollutants varies greatly from species to species. Benthic macroinvertebrates are ideal water quality indicators because they are sensitive to changes in water quality, found in all types of aquatic habitats, less mobile than fish and large enough to be easily collected. While chemical

and physical parameter sampling may miss occasional pollutant discharges, benthic macroinvertebrates are exposed to everything that enters the streams and lakes. Using benthic macroinvertebrates, the stream water quality classification is determined by EPT Taxa Richness (total number of different species) of three pollution sensitive aquatic insect orders, Mayflies (Ephemeroptera), Stoneflies (Plecoptera), and Caddisflies (Trichoptera). The greater the taxa richness the better the stream water quality. Using fishes, the stream water quality classification is determined by using the North Carolina Index of Biotic Integrity (NCIBI) which incorporates 12 different community composition descriptors. The higher the NCIBI, the better the stream water quality.

Combined Physical, Chemical and Biological Indicator of Water Quality

The most accurate water quality puzzle piece that summarizes the stream water quality conditions in Mecklenburg County is the WQR indicator that combines the chemical, physical and biological parameters that have been measured. This rating is obtained by averaging the annual WQI with the EPT Taxa Richness value. The WQR gives a better view of the water quality conditions of the County's streams since the limitations of the chemical sampling are minimized by the EPT Taxa Richness values. The benthic macroinvertebrate community present in a stream is a reflection of the total combined effects of all pollutants, and therefore the resulting WQR more accurately reflects the true water quality conditions in those streams. The better the water quality, the better the stream will be able to support increasingly sensitive uses such as propagation of wildlife, wading and swimming.

Unlike a puzzle whose picture never changes, the water quality conditions of Mecklenburg County's lakes and streams change daily. New development, accidental spills, and storm water runoff combine to add a wide variety of pollutants to the surface waters of the County. Continued monitoring of the water quality conditions of the lakes and streams will give new data to keep the water quality puzzle pieces current, and reflect an accurate overall picture of the water quality conditions in Mecklenburg County. SOER

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Overall Water Quality Rating: Acceptable Water Uses

	Water Conveyance	Minimum Diversity of Aquatic Life	Average Diversity of Aquatic Life	Wide Diversity of Aquatic Life	Wading/Infrequent Body Contact	Swimming/Frequent Body Contact	Drinking Water Supply	Pristine
Very Poor	X							
Very Poor/Poor	X	✔						
Poor	X	X						
Poor/Fair	X		✔					
Fair	X		X					
Fair/Good	X			✔	✔			
Good	X			X	X			
Good/Excellent	X			X	X	X	X	
Excellent	X			X	X	X	X	X

X = Fully Supportive ✔ = Supportive But Threatened

Water Quality on the World Wide Web

Have you ever wondered about the water quality of your neighborhood creek? Have you ever wondered if the three lakes that border Mecklenburg county are suitable for fishing or swimming? Well, you can find out about the latest water quality conditions in Mecklenburg County, using the County's Geographic Information System (GIS), and the World Wide Web.

Mecklenburg County Department of Environmental Protection has developed a web site dedicated to displaying the most recent results of our routine water quality sampling and long term water quality trends, and lots of other useful information *(http://www.co.mecklenburg.nc.us/coenv/Water/trends/test.html)*. These pages are generally updated quarterly, but due to increased activity on our lakes during the summer, the information about the lakes is updated monthly between May and September. In addition to the Water Quality Indices for all of the major stream basins, there is plenty of other information for the curious. For example, information about the primary pollutant in each basin and the results of aquatic insect sampling from Mecklenburg County streams is located on the site.

For those wanting more site specific information about the general water quality in their area, they can visit *http://engbs.co.mecklenburg.nc.us/html/epa/epa.htm*

This page allows the user to enter any street address or a tax parcel id number and get information about the water quality in that watershed. It also allows the user to see floodplains, greenways and the regulated buffer widths for all Mecklenburg County streams.

So the next time you are surfing the web, check out the waters in your own backyard. You might be surprised. SOER

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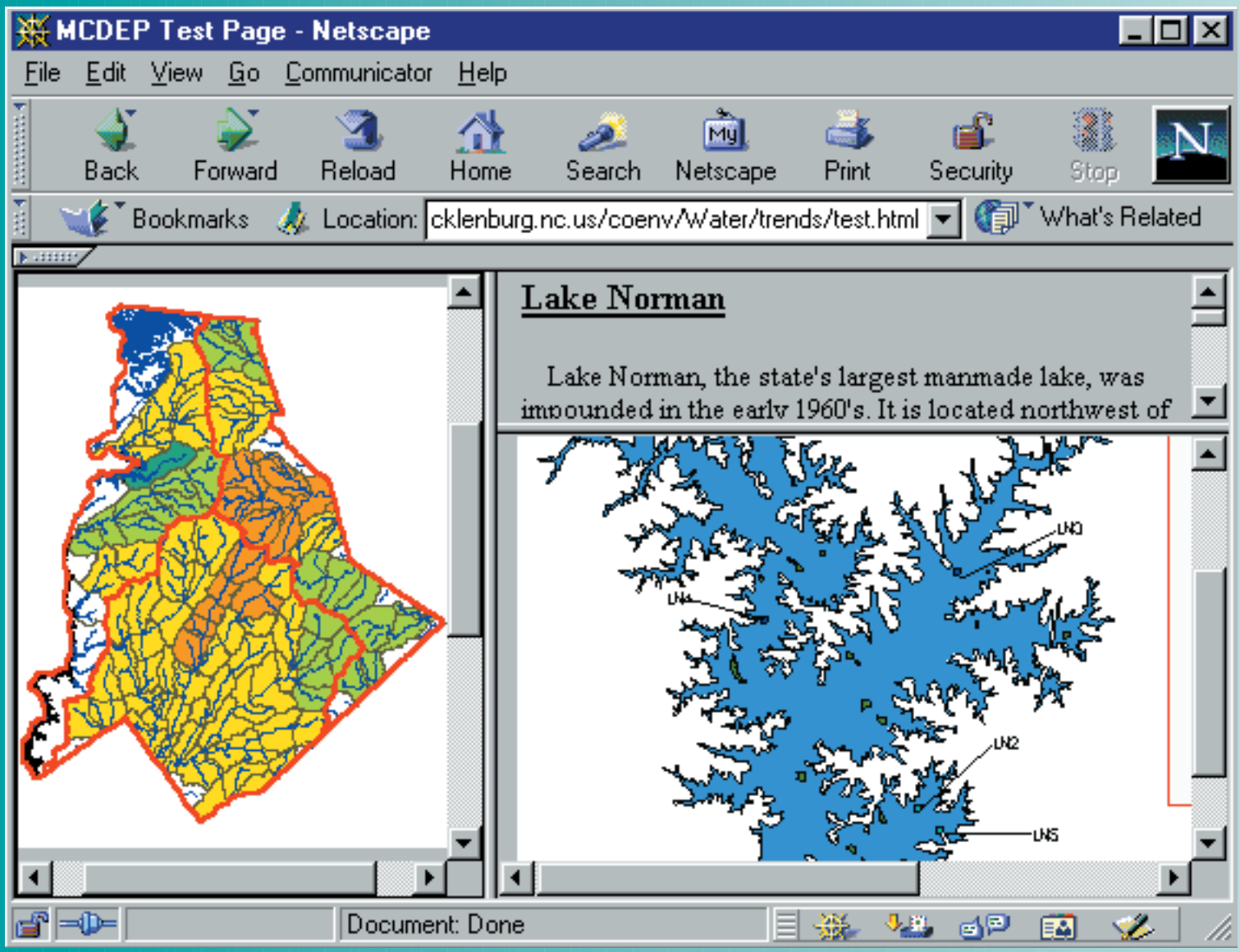


The Catawba Lakes, a Shared Resource

Growth and development along the shores of Lake Norman has provided recreational opportunities for many but has also let to congestion and water quality problems.

Flanking the western edge of Mecklenburg County, Lake Norman, Mountain Island Lake and Lake Wylie form a natural boundary with Lincoln, Gaston and York counties. These three reservoirs form the midsection of the Catawba River which flows 225 miles from the mountains near Mt. Mitchell to the Lake Wateree Dam in South Carolina where it becomes the Wateree River. Remarkably, due to its irregular shape there are about 190 miles of lake shoreline in Mecklenburg County which, if stretched out, would almost equal the entire length of the Catawba River.

The three reservoirs serve multiple uses. While formed primarily for electric power generation and flood control, they also serve as the source of our drinking water and are used extensively for recreation, boating and fishing. For example, there are currently over 57,000 registered boat owners in the six counties surrounding Lake Norman, Mountain Island Lake and Lake Wylie, 19,000 in Mecklenburg County alone. Naturally, the preservation of the water quality of these precious resources is important to the residents of Mecklenburg County and the entire region.

The Lakes are Formed

Most residents living in the area probably cannot remember a time when Mecklenburg County was not bordered by three reservoirs. The first dam on the Catawba River was built by the Southern Company, the forerunner of Duke Power Company, at the site of the present Lake Wylie Dam in 1904. It was rebuilt in 1925 to the present shoreline. Lake Wylie was named in 1950 for Dr. W. Gil Wylie, a man instrumental in the hydroelectric development of the Catawba River. Prior to 1950 this water body was called Catawba Lake, a name which can still be seen on old topographic maps. In 1923, the dam which formed Mountain Island Lake was completed. The Catawba River was unchanged for over 30 years when Duke Power Company built its last and largest dam on the Catawba River, Cowans Ford Dam. This created Lake Norman, the largest lake in North Carolina. Lake Norman was named for Norman Atwater Cocke, president of Duke Power Company from 1953 to 1958. After Lake Norman was filled to full pond in 1963, the shoreline of the reservoirs bordering Mecklenburg County became what they are today.

While formed primarily for electric power generation and flood control, they also serve as the source of our drinking water and are used extensively for recreation, boating and fishing.

Lakes as Dynamic, Living Systems

Water levels or quantity in our three reservoirs, as in all the eleven reservoirs along the Catawba River, are carefully managed by Duke Power Company. But what about water quality? How does one go about measuring water quality in a reservoir? There is not a simple answer to this question. So, let us start with a few words on lakes and reservoirs in general.

Boaters and water skiers skimming along the surface of the lake on a hot, summer day may not be aware of all the things that happen beneath the surface of the water. A whole ecosystem is at work within lakes from bacteria and planktonic algae which form the bottom of the food chain through tiny animals called zooplankton to small fish and finally the large predator fish at the top of the food chain. Physical and chemical processes interact with these biological communities and all of these can vary tremendously in different parts of the same lake. In particular, the water quality in coves or near the shore may be different than that out in the main part of the lake. This is especially true where a tributary may enter a cove delivering various pollutants to the lake.

Water quality at the same location in a lake can vary dramatically over time. Lakes are dynamic entities that respond to seasonal changes in temperature and sunlight, warming up in the summer and cooling off in the winter. This change in temperature alone can have profound effects on the lake, influencing its mixing regime, chemistry and aquatic life. Most lakes stratify in the summer which means that as the surface water warms and become less dense, it tends to lie as a separate layer on top of the cooler bottom waters. Swimmers notice this when they dive down from the warm water on the surface to feel the cooler water at deeper depths. As the temperature cools in the fall, the lake will "turn over", meaning the water layers mix, and the water temperature will again become relatively uniform from top to bottom. Sometimes when this happens, material which had been on the bottom during the summer months gets resuspended and comes to the surface. This can sometimes be mistaken for pollution of some type.

Plume of sediment from Dutchmans Creek entering upper Lake Wylie after a storm event shows the influence of tributaries on the water quality of the main stem of the Catawba.

Water Quality Issues

So, how healthy are our lakes? What do we see when we do a lake sampling run or "check up" on the health of these water bodies? Usually, the major concerns about lake water quality relate either to public health issues or the ecological health of the lake (i.e., can fish and other aquatic organisms live in the water?).

Public Health Concerns

One major public health question asked by lake users is whether or not it is safe to swim. In order to answer this question, the Mecklenburg County Department of Environmental Protection (MCDEP) and other agencies routinely sample for fecal coliform bacteria. Fecal coliforms are found in the digestive track of warm blooded animals, including humans. They are an indicator of possible contamination from sewage and the possible presence of pathogenic bacteria. In the summer when swimming and recreational use increases on the lakes, additional fecal coliform samples are taken by MCDEP at selected sites. Lakes are generally quite clean in terms of fecal bacteria contamination although problems are sometimes found in coves or near the shoreline. Potential sources of fecal contamination around our lakes are leaking septic systems, sewer overflows, poorly performing wastewater treatment plants and storm event runoff from yards and various land uses. Wastewater treatment plants are generally not a source of fecal contamination when operating properly.

One question of concern to fisherman is whether the fish they catch in these reservoirs are safe to eat. There are currently no advisories on game fish consumption for the Catawba River Basin. Sores occasionally observed on fish may not necessarily be due to water pollution, but may be a sign of natural disease or stress.

MCDEP's lake sampling program involves taking field measurements and water samples for laboratory analysis monthly during summer and every other month during winter at all three reservoirs. Field measurements of temperature, dissolved oxygen, pH and conductivity are taken by lowering sensors into the water column. Water samples

David Rimer measures water clarity in Lake Wylie using a Secchi disk during a regular lake run in November.

are also routinely collected for various parameters including chlorophyll, nutrients, alkalinity, suspended solids and turbidity. In addition to routine sample analysis, other parameters such as metals, pesticides and volatile organic compound are periodically measured.

Environmental Health Concerns

Dissolved oxygen is always of particular interest for determining the ecological health of a lake, as fish and other aquatic life rely on it to "breathe." This factor alone can determine the amount of fish habitat in a reservoir.

Sediment, a widespread pollutant affecting surface waters, also impacts the ecological health of lakes. The same sediment coming from pollution sources in the watershed eventually makes its way into the reservoirs or "receiving waters" for the streams. There, the sediment can be a problem by carrying other pollutants such as metals from the watershed into the lakes, interfering with biological communities, and gradually filling in the reservoir thus decreasing its storage capacity. Sources of sediment include poor erosion control practices around construction sites, agriculture and shoreline erosion from wave action. Sediment in reservoirs is measured in several different ways. One way, perhaps the simplest type of field measurement taken during lake sampling, is the Secchi depth. This involves lowering a black and white disk into the water and recording the depth where it disappears. It is a quick and easy measure of water clarity and is used frequently by volunteer water quality monitoring groups. Turbidity and suspended solids are more exact measurements of the amount of suspended material in the water.

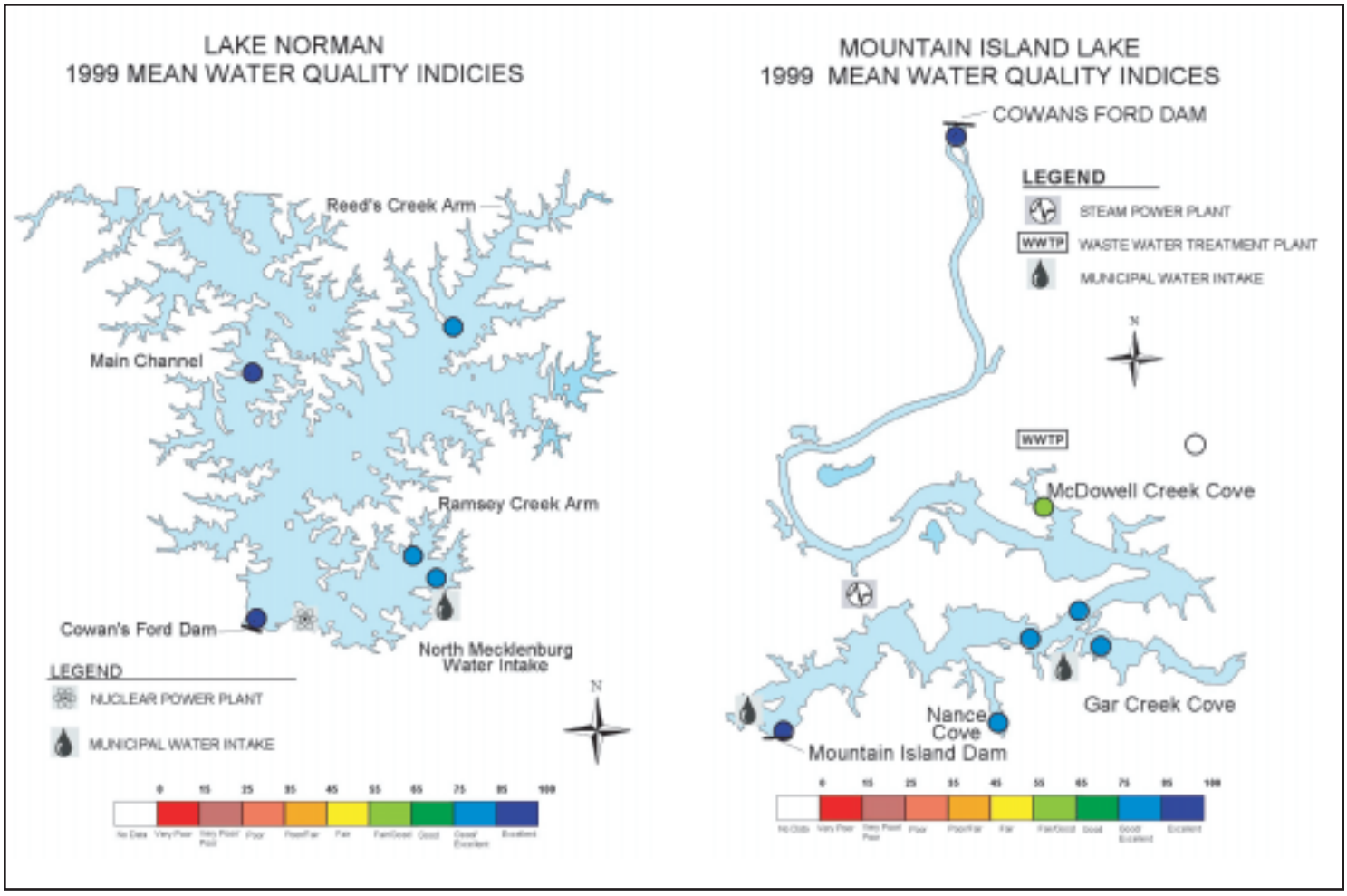
Plant nutrients, especially nitrogen and phosphorus, are carefully watched in lakes and reservoirs as too much of them can lead to algae blooms and other water quality problems. Just as adding fertilizer to your lawn can make your grass grow, excess nutrients in lakes makes the "grass" of reservoirs, tiny microscopic algae called phytoplankton, grow. While some algae growth is good for fish production in lakes, too much can result in fish kills from oxygen depletion. Algae can also form nuisance surface scums and create taste and odor problems for water treatment systems. Chlorophyll, the green photosynthetic pigment in plants, is monitored in order to measure the level of algae in the lake.

Lake Water Quality Index

As you can see, monitoring programs end up with a bewildering array of data on the lakes. In order to simplify this data into a more understandable form, MCDEP uses a lake index. This index, developed by Fusilier in 1982 takes nine of the most critical parameters (temperature, dissolved oxygen, pH, conductivity, total phosphorus, nitrates, alkalinity, chlorophyll and Secchi disk depth), rates them for water quality (from very poor to excellent) and combines them into a single number from 1 to 100. The ratings are then color coded and placed on a map. Like any other index it has its limitations. For example, not all parameters are included and it is a "snapshot" of water quality conditions at the time of sampling. However, in the absence of a nationally accepted water quality index, Fusilier's Water Quality Index is a useful indicator of overall water quality conditions. MCDEP has been using this index for over 10 years to communicate general water quality information about our reservoirs to the public. So what are the current water quality conditions of the lakes on our western border? Water quality ratings for sampling locations in the Catawba lakes bordering Mecklenburg County for 1999 are shown on the diagrams.

Lake Norman

Let us begin with Lake Norman, the "inland sea", with a surface area of 32,150 acres and a maximum depth of 120 feet. About 90 miles of Lake Norman's shoreline is within Mecklenburg County. Water stays in Lake Norman longer than any other Catawba reservoir, 239 days. This fact, also referred to as the retention time, is good for water quality. The long retention time allows for sediment coming into the upper end of the reservoir to settle out, and incoming nutrients to be

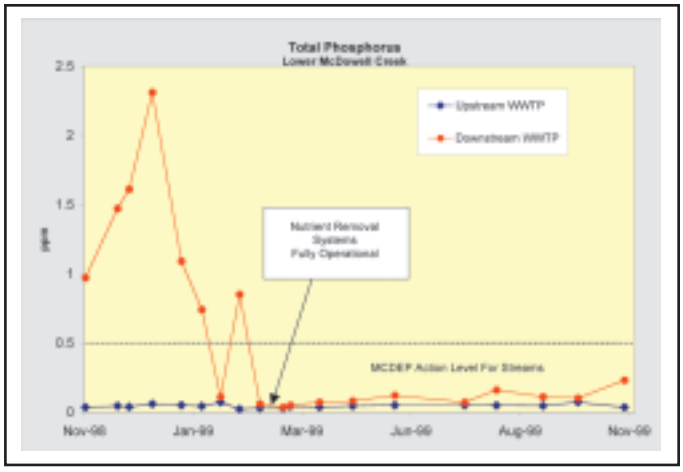


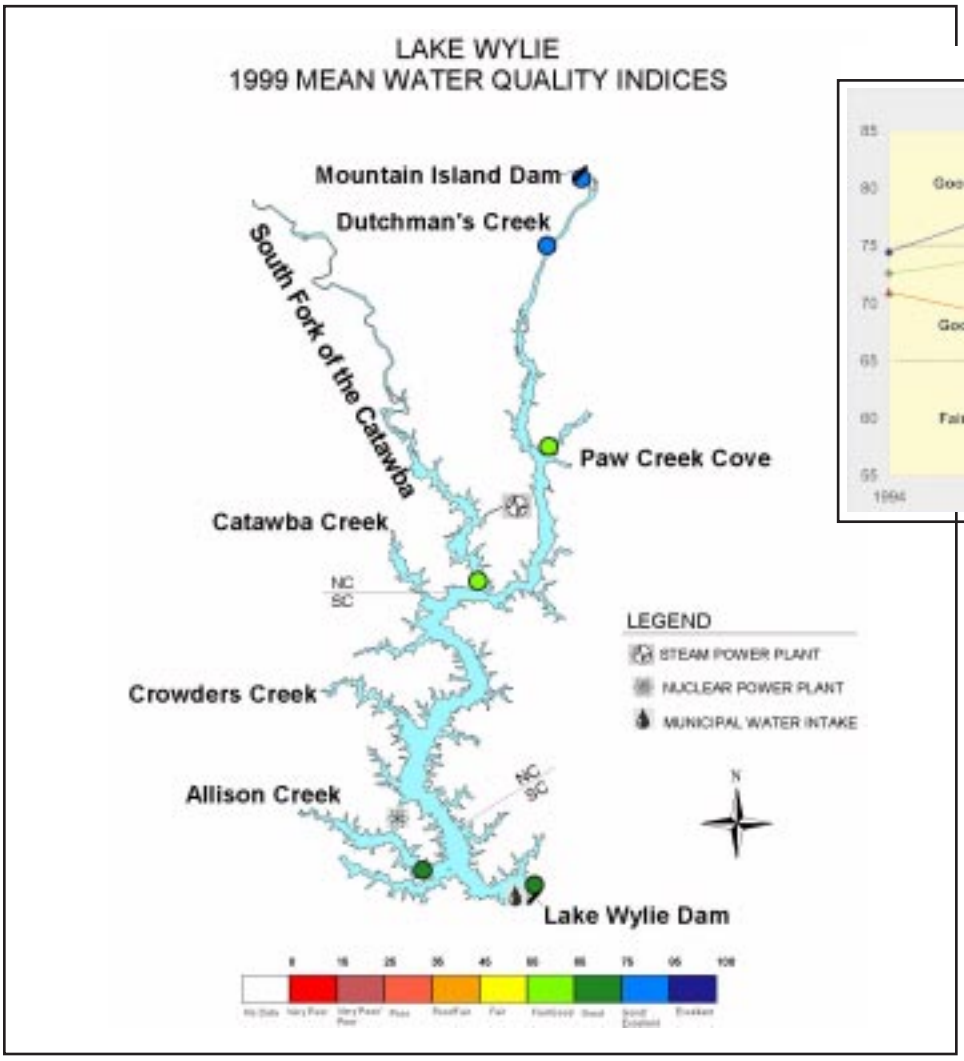
used up by algae populations in the upper lake. As a result, the water in lower Lake Norman, the part near Mecklenburg County, is typically of good quality: fairly clear with low nutrient levels. Water quality index values for 1999 were consistently in the good to excellent range. No exceedances of water quality standards were seen at any location sampled in Lake Norman during 1999.

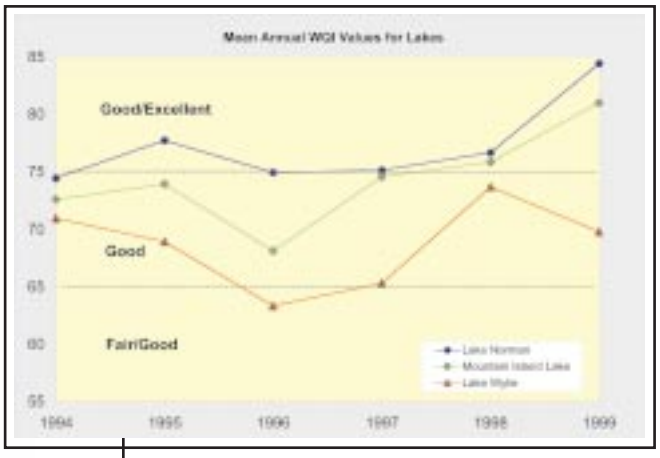
Mountain Island Lake

Next in line is Mountain Island Lake. Unseen from the lake surface in Lake Norman, about 100 yards upstream of Cowans Ford Dam, is an underwater dam or wier. This weir functions to trap the cool bottom waters of Lake Norman for cooling at the power plants. The weir also serves the function of allowing only the oxygenated surface waters of Lake Norman to enter Mountain Island Lake below. The relatively clean oxygenated surface water from lower Lake Norman funnels through this small, narrow reservoir connecting Lake Norman and Lake Wylie. The surface area of Mountain Island Lake (3235 acres) is about one tenth that of Lake Norman and its maximum depth is 30 feet. Because of its smaller size, residence time is very short, only about 12 days. The Mecklenburg County side of the lake has about 37 miles of shoreline. There are three creeks within Mecklenburg County which drain into Mountain Island Lake: McDowell, Torrence and Gar Creeks. This lake serves as the primary drinking water supply for the City of Charlotte and is classified by the state of North Carolina as WS-IV. This classsification places tighter development restrictions on the lake and its watershed in order to protect water quality.

Water quality indices from Mountain Island Lake in 1999 ranged from fair to excellent. Poorer ratings







were seen in McDowell Creek Cove due primarily to higher nutrient levels and algae growth in the cove. Water quality in McDowell Creek Cove has frequently been rated of poorer quality than the rest of Mountain Island Lake, due to point source inputs of nutrients from the McDowell Creek Wastewater Treatment Plant (WWTP) located on the lower end of McDowell Creek. These nutrient inputs have recently been reduced, however. During the WWTP's recent expansion, the state of North Carolina placed limits on the amount of phosphorus and nitrogen that can be discharged by the plant. Construction on the expansion at the WWTP was begun in 1996 and the nutrient removal systems were in place and fully operational by March 1999. Since then total phosphorus levels in McDowell Creek downstream of the WWTP discharge have decreased dramatically. While the water quality rating at the sampling location in McDowell Creek Cove improved slightly this year, it still ranks below other locations on the lake. It may be several years before the full effect of this reduction is seen due to stored nutrients in the sediments of the cove and nonpoint inputs from the McDowell Creek Watershed. One exceedance of the turbidity standard for lakes, indicating high sediment concentration, and one exceedance of fecal coliform levels were observed in Mountain Island Lake in 1999, both in McDowell Creek Cove. Both of these findings were most likely due to nonpoint pollution from the watershed.

Lake Wylie

After Mountain Island Lake, water from the Catawba River enters Lake Wylie, the third largest lake on the Catawba River. Lake Wylie, with a surface area of 12,450 acres, is about one third the size of Lake Norman and has the largest individual watershed of all the Catawba reservoirs. About 67 miles of shoreline are within Mecklenburg County. The water residence time for Lake Wylie is about 39 days. In contrast to Lake Norman, many large tributaries enter Lake Wylie which influence its water quality, most of which are not in Mecklenburg County. Foremost among these is the South Fork of the Catawba River which contributes 30% of the water volume to Lake Wylie. Water quality in the South Fork of the Catawba River has historically been poorer in quality than the main stem. The South Fork and other tributaries of Wylie, such as Crowders Creek, deliver nutrients from their respective watershed into Lake Wylie, resulting in increased algae growth. This is reflected in the lower water quality index values for 1999 which ranged from poor/fair in mid-lake locations to excellent in the upper reaches of the reservoir below Mountain Island Lake. Two exceedances of the NC water quality standard for chlorophyll (40 ug/l) were observed in 1999, both in May at mid-lake locations (52 and 73 ug/l). Six exceedances of fecal coliform action levels were observed in Lake Wylie during 1999.

Water Quality Trends

In what direction has the overall water quality in our three reservoirs been headed? The results look mixed but encouraging. Lake Water Quality Indices for the warmer months (May

through September) were averaged by year for the last five years. The warmer months were chosen since that is when we typically see more water quality problems such as algae blooms and when more people are using the lakes. The annual average water quality indices for both Lake Norman and Mountain Island Lake in 1999 were up compared with 1998 and appeared to show a slight improving trend for the past five years. The annual average water quality index for Lake Wylie declined in 1999 over 1998 and did not appear to show any distinct trend over the past five years.

The three reservoirs bordering Mecklenburg County have been developed and utilized in a way perhaps unimagined by those with the early vision to electrify the Catawba River. They have become a regional resource and treasure shared by our surrounding counties.

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Mecklenburg County Department of Environmental Protection collecting field measurements and water samples in Paw Creek on Lake Wylie.

Governing the Lakes

As the sun sets over Lake Norman, water skiers take advantage of the calmer waters that earlier were choppy and busy with boaters, jet skiers, and fishermen. On Mountain Island Lake, bird watchers quietly observe as a great blue heron searches for a meal. Lake Norman, Lake Wylie, and Mountain Island Lake provide an abundance of recreational opportunities for Mecklenburg County citizens. Whether you're a fisherman, a water skier, or a bird watcher, these lakes have something for everyone.

Of course, these lakes know no political boundaries and are shared by several counties and towns. In fact, Lake Wylie is the only Catawba River Lake that is shared by two states, North Carolina and South Carolina. As you may imagine, with individual interests involving a shared resource, conflicts may arise. These conflicts come in the form of safety, environmental, and lake use issues. The marine commissions of Lake Norman, Lake Wylie, and Mountain Island Lake were formed in order to facilitate various issues regarding the lakes. The marine commissions are units of local government, and were created through legislative acts by the General Assembly and joint resolutions from the various counties that border each lake. Each county, through the various boards of county commissioners, appoints each marine commissioner, which provides equal representation across the lakes. The three marine commissions hold public meetings once every month. The commission meetings provide a public forum in which lake users can share their concerns and interests with the board. The marine commissions partner with various law enforcement, regulatory, and volunteer groups to address lake issues.

During 1999, the marine commissions were involved in several environmental issues, which helped to strengthen environmental protection along our lakes. Some of these issues include:

- The restoration of 2 _ acres of wetlands in Lake Wylie that were destroyed by development activities;
- The implementation of sewage pump out station regulations at marinas;
- Providing comments to various regulatory agencies regarding shoreline management guidelines, new developments plans, and water quality plans; and
- Providing citizens and neighborhood groups with information on environmental protection, regulations, and appropriate contacts.

In addition to environmental issues, the marine commissions also addressed several safety issues such as: age restrictions and safety class requirements for jet ski operators; no wake zones; and maintenance of shallow water and channel markers. In response to citizen complaints, the marine commissions have also encouraged increased law enforcement coverage on the lakes.

With the rapidly increasing population and use of our lakes, environmental and safety issues will be on the rise. The marine commissions provide a governing body, representing all jurisdictions to ensure safe and healthy lakes for the region. Additional information may be obtained about the Lake Wylie and Mountain Island Lake Marine Commissions from Michael McLaurin at (704) 372-2416. Information about the Lake Norman Marine Commission may be obtained from Ron Smith at 1-800-464-7512.

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PROTECTING OUR PRECIOUS WATER SUPPLY

Did you ever take a moment to wonder where your drinking water comes from? The tap....pipes....The City....?

Drinking water is a resource which is often taken for granted by the general public. A lot of folks really don't know where their drinking water originates, only that it flows from the tap when the faucet is open. In the Mecklenburg County area, water can easily be taken for granted because it is so plentiful and relatively inexpensive. It is often the things that are most common in our lives which go unnoticed and unappreciated.

The truth of the matter is that our water supply is the lifeline of the community. Mecklenburg County is blessed with abundant water resources which led to the settlement of this area by Europeans in the 1700's. Prior to this, Native Americans prospered from the wealth of the waters of this region. In more recent history, these water resources have supported the incredible population and economic growth Mecklenburg County has experienced and it is apparent that we are ever more dependent on our precious water supply. Evidence of this growth trend can be illustrated as easily by water usage trends as by population figures. For example, Charlotte-Mecklenburg Utilities (CMU) reports that average daily water usage over the past decade has increased from 61 million gallons per day in 1989 to 100 million gallons per day in 1999.

Unfortunately, the rapid growth, extensive development, and changing land uses seen throughout this region often come at the expense of environmental degradation. Mecklenburg County's water supply reservoirs are particularly susceptible to the detrimental impacts of an expanding community in that we desire to live and recreate on or near these water bodies. As we move into the future, great emphasis must be placed on protecting our water supply so that we may maintain the resources which have made our community a leader and trend setter, both regionally and abroad.

The Catawba River - A Journey From the Blue Ridge Mountains to the Tap

High on the eastern slopes of the Blue Ridge Mountains in Avery, Burke, Caldwell, and McDowell counties, thousands of tiny springs and seemingly insignificant tributaries act as conduits for rainwater and groundwater. These small conduits converge as they flow down the mountain slopes and create larger streams which in turn converge into rushing rivers such as the Catawba River and the scenic Linville River. These rivers enter Lake James, which is the first of eleven manmade impoundments along the Catawba which were created to harness her impressive power.

As the Catawba River emerges on the other side of the dam at Lake James it continues it's southeastern trek flowing through three more manmade impoundments including Lake Rhodhiss, Lake Hickory, and Lookout Shoals. The free flowing segments of the Catawba meander through undisturbed forests, cow pastures, corn fields, residential, and industrial areas through both urban and rural communities. All along the way, water is being added to the system through natural hydrologic processes such as stream flow, rainfall, overland runoff and through human activities such as treated wastewater discharges. Conversely, water is also being extracted from the river and it's impoundments for agricultural uses, treatment for human consumption, industrial processes, and through evaporation.

Some of the headwaters of the Catawba River flows over Catawba Falls near Old Fort, N.C.

Like any other traveler, the Catawba River acquires mementos along the way which represent the places it has been. For example, the river may pick up sediment from stormwater runoff over disturbed land, nutrients from agricultural activities and wastewater discharges, oil and grease, hydrocarbons, and other chemicals from parking lot runoff, and bacteria from human activity and wildlife.

The Catawba River enters Mecklenburg County under the name of Lake Norman which is the largest man-

made lake in North Carolina. Here, the water is detained for more than 200 days until it flows through the dam and enters the much smaller Mountain Island Lake. The sheer size and volume of Lake Norman along with the detention time in some ways acts as a natural water treatment process for a portion of the contaminants which were picked up along the rivers journey. As the water velocity is slowed, sediment and suspended solids settle to the lake bottom and nutrients and other organic substances are utilized by aquatic organisms.

Lake Norman and Mountain Island Lake serve as the drinking water supply reservoirs for Mecklenburg County. Though Lake Norman is approximately 95 percent larger than Mountain Island from a volume standpoint, Mountain Island serves as Mecklenburg County's primary water supply reservoir. Two water intakes pump raw water from these lakes and distribute it to three water treatment facilities operated by Charlotte-Mecklenburg Utilities. CMU is capable of treating 183 million gallons of water each day and provides drinking water to approximately 70 percent of Mecklenburg County's estimated 661,091 people. On the average, each person uses nearly 147 gallons of water per day at a cost of approximately $.0014 per gallon including treatment and distribution. The treated water is distributed to customers through a network of 2,965 miles of water main and 174,800 service connections. Industries within the County are dependent on this source of water to maintain industrial processes. In addition, 8,846 fire hydrants offer fire protection to individuals and industries within the service area.

Managing the Threats to Our Water Supply

Considering that our water supply reservoirs are such an important aspect of the foundation of our community, the obvious question arises, "What is being done to protect these essential resources?"

The answer to this question is somewhat complex in that it often conflicts with the community development agenda, crosses political lines, and often requires personal sacrifice. You may have heard the phrase, "We all live downstream". This concept holds the key to drinking water reservoir protection. The successful protection of these resources must actually be implemented on the regional as well as the local watershed scale. A watershed would include all land area which drains to our water supply reservoirs. In other words, the protection of our water supply begins at it's point of origin in the Blue Ridge Mountains, along the meandering 112 mile journey to Mecklenburg County, and yes, even in our own backyards. The total watershed area from the headwaters of the Catawba River to the Mountain Island Lake Dam encompasses approximately 1,859 square miles.

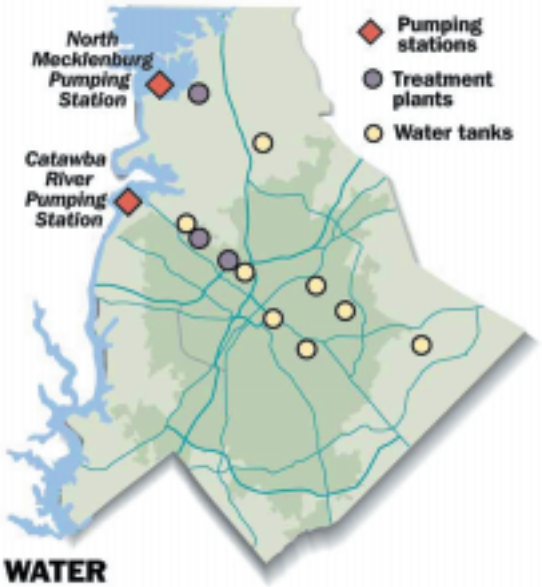
Considering that our water supply reservoirs are such an important aspect of the foundation of our community, the obvious question arises, "What is being done to protect these essential resources?"

Pollution which threatens our water supply reservoirs and streams can be divided into the two general categories of point source and non-point source pollution. Point sources of pollution can be defined as discharges from pipes such as treated industrial and domestic wastewaters. These dis-

Have you ever wondered where Charlotte-Mecklenburg's water supply comes from and what happens to it on its way to our homes? Here's a look at the process that brings water to our taps.

How we get our water

Mountain Island Lake



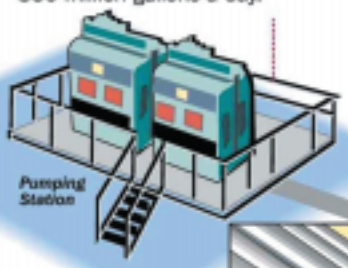
GETTING THE WATER

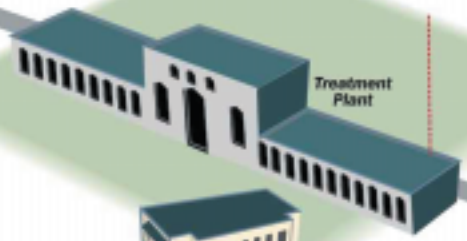
1 Most of the system's water comes through the Catawba River Pumping Station on Mountain Island Lake. The station has a pumping capacity of about 142 million gallons of water a day. When the current expansion is complete, its capacity will increase to 350 million gallons a day.

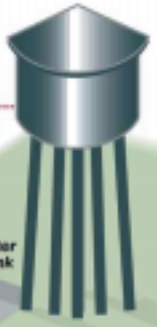
2 Four pipes measuring 30, 36, 54 and 60 inches, connect the station to the Franklin Water Treatment Plant on Brookshire Boulevard. A 120-inch pipe is under construction in the Oakdale community in northwest Mecklenburg County.

TREATING THE WATER

3 Most of Charlotte's water is held at the Franklin Treatment Plant in three reservoirs, with a total capacity of 350 million gallons. It has a treatment capacity of 141 million gallons per day. Some untreated water is sent to the West Treatment Plant on on Beatties Ford Road. The North Mecklenburg Treatment Plant gets most of its untreated water from a pumping station on Lake Norman. Sediment is removed and chlorine added to kill bacteria. Once the water is treated, it is stored in large tanks called clearwells before being pumped into the system.







6 Each month, the water that comes into our homes is recorded by 34 water system employees who must read 174,800 water meters.

CONSUMING THE WATER

5 Although the Charlotte-Mecklenburg system serves mostly residential customers, the 10 largest users (including UNC Charlotte and Frito-Lay, Inc.) account for about 5 percent of usage. During the peak-use months, April through September, watering lawns, washing cars and filling swimming pools increases consumption.

DISTRIBUTING THE WATER

4 The distribution system is a network of nearly 3,000 miles of underground pipes throughout the county. Eight elevated storage tanks help maintain pressure. Pumps fill the tanks during the night and gravity moves the water into the system during the day. It normally moves 3 to 6 feet per second, through pipes of different sizes, the largest of which is a 54-inch main along Providence Road. Hydrants have a minimum pipe size of 6 inches and typical lines that carry water into homes are $^{3}/_{4}$-inch.

GEORGE BREISACHER/Staff
Charlotte Observer

charges are regulated and monitored by the National Pollution Discharge Elimination System (NPDES) permitting program. NPDES permits specify the maximum pollutant load of individual characteristics a facility is allowed to discharge to surface waters.

Non-point sources on the other hand, would include those discharges associated with rainfall runoff and snowmelt. The quality and rate of runoff of non-point source pollution is dependent on the type of land cover and land use from which the rainfall runoff flows. For example, rainfall runoff from undisturbed forested land will generally contain much less pollution and run off more slowly than runoff from urban and industrial land uses with large amounts of impervious cover, such as paved parking lots, roof tops, and roadways.

Non-point source pollution is widely considered to have the greatest negative impact on water quality in the Catawba River because it is widespread, difficult to study and quantify, and because it is even more difficult to control. Due to changing land uses in the watershed, sediment is one of the main pollutants contributed by non-point sources. While some sediment is expected to enter our waters through natural streambank erosion, excessive sediment is contributed by rainfall runoff over disturbed or graded land. Sediment is known to disrupt aquatic ecosystems and many other contaminants such as bacteria, nutrients, and both mineral and toxic metals "cling" to sediment and enter our waterways.

Erosion controls at construction sites, undisturbed riparian (streamside) buffers and structural stormwater best management practices (BMPs) are proven to be effective means of controlling non-point source pollution. Proper erosion controls such as silt fences and sediment basins capture silt and sediment and prevent them from leaving the construction site and entering streams and lakes. Riparian buffers allow runoff to sheet flow across natural wooded or vegetated areas prior to entering surface water bodies. A wide variety of structural stormwater BMPs such as retention basins and constructed wetlands also decrease non-point source pollution. Buffers and BMPs function similarly by decreasing the velocity of stormwater runoff, thereby allowing solids to settle out and by allowing nutrients and other contaminants to filter into the ground. Further, all of these methods are effective means of flood control in that they slow runoff velocities and reduce the runoff volume.

Who is Protecting Our Water Supply?

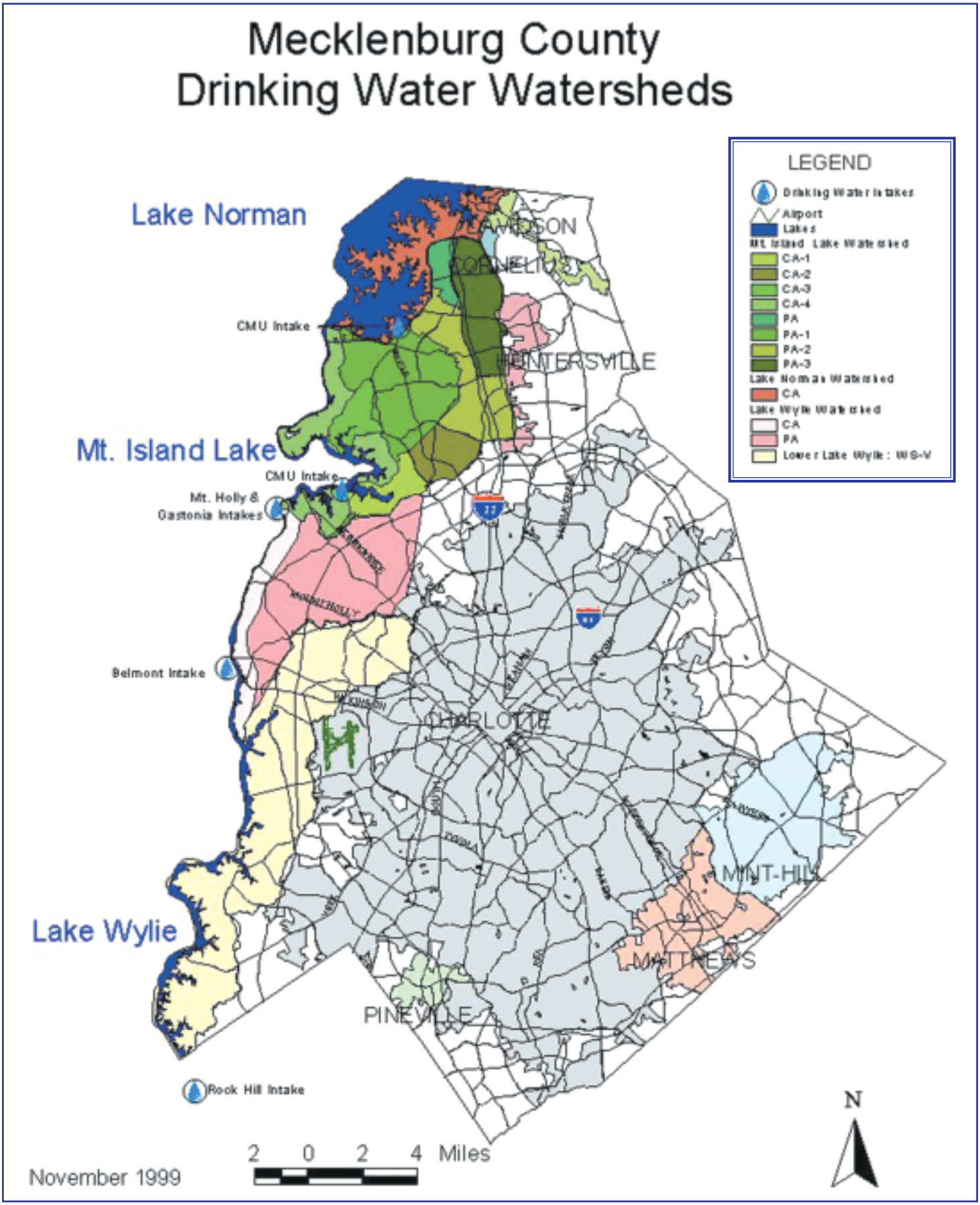
Federal regulations require that state governments have measures in place to protect water supply sources. In North Carolina, this is accomplished by designating the use of all or parts of certain streams, rivers and lakes as water supply sources (WS) or technically WS-I, WS-II, WS-III, WS-IV or WS-V waters. These water supply classifications require varying degrees of protection to ensure that the waters meet their designated use. The degree of protection and restriction is also based upon the environmental sensitivity of the surface water. To ensure that the desired use of these waters is maintained, the State regulates minimum ambient water quality standards and wastewater discharge limitations within a water supply watershed.

In June of 1989, the N.C. Water Supply Watershed Protection Act (NCGS 143-214.5) was passed. This Act instituted a cooperative program of watershed management and protection to be administered by local governments. Through this Act, local governments had the option of developing, implementing, and enforcing their own watershed management policies as long as they met minimum state requirements. If local governments chose not to develop a watershed management plan, the State would administer and enforce minimum statewide requirements. This Act had a large impact on Mecklenburg County since its entire western boundary is defined by the Catawba River which is designated as a WS-IV water supply, with the exception of lower Lake Wylie which is a WS-V water supply. Mecklenburg County has three major watershed protection areas which are regulated under this Act: Lake Norman, Mountain Island Lake, and upper Lake Wylie. Although Lake Wylie is currently not a drinking water reservoir for Mecklenburg County, the Town of Belmont in Gaston County, and the Towns of Rock Hill and Fort Mill, South Carolina are dependent on this source. These three protected areas encompass roughly one fourth of the land area of Mecklenburg County.

> "The Mountain Island Lake vicinity is providing important community objectives...recreation, wildlife conservation and drinking water supply. These objective have been met through a deliberate and concerted effort."
>
> ***Roy Alexander***
> ***Mecklenburg County***
> ***Parks and Recreation***

Governments in Mecklenburg County which have jurisdiction within the protected areas have adopted watershed protection regulations as required by NCGS 143-214.5. These regulations provide limits, requirements and restrictions for development within the protected areas. Included as part of these regulations are undisturbed vegetated buffers along perennial streams and lakes. The required buffer widths vary from 30 feet to 100 feet depending on the location of the development and proximity to the drinking water intakes. All local watershed regulations must meet the minimum State standards. Mecklenburg County has excerised a proactive approach to protecting our drinking water supplies by creating regulations which exceed State minimum standards. These local watershed regulations are administered under County, City, and Town zoning and subdivision ordinances.

While regulations serve as an essential tool for watershed protection, another extremely important aspect of the preservation of our water supply


Mecklenburg County
Drinking Water Watersheds
LEGEND
Drinking Water Intakes
Airport
Lakes
Mt. Island Lake Watershed
CA-1
CA-2
CA-3
CA-4
PA
PA-1
PA-2
PA-3
Lake Norman Watershed
CA
Lake Wylie Watershed
CA
PA
Lower Lake Wylie : WS-V
Lake Norman
CMU Intake
Mt. Island Lake
CMU Intake
Mt. Holly &
Gastonia Intakes
Belmont Intake
Lake Wylie
Rock Hill Intake
DAVIDSON
CORNELIUS
HUNTERSVILLE
CHARLOTTE
MINT-HILL
MATTHEWS
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November 1999
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and natural resources has come in the form of private organizations which are not only active in Mecklenburg County but all along the Catawba River. Groups such as the Catawba Lands Conservancy, Catawba River Foundation, Trust for Public Lands, the RiverKeeper/CoveKeeper Program, and Adopt-A-Stream groups are instrumental to the protection of our water resources. Some of the major accomplishments of these organizations include the preservation of several hundred acres of land on Mountain Island Lake, development of water quality monitoring programs, patrolling hundreds of miles of Catawba shoreline to identify illegal discharges and buffer violations, adoption of several stream and shoreline miles resulting in the removal of hundreds of pounds of trash from our surface waters, and providing funding for land acquisition projects in Mecklenburg and surrounding counties to name a few.

Mecklenburg County and Charlotte-Mecklenburg Utilities have also made great strides in preserving the water supply watersheds, particularly around Mountain Island Lake. In 1970, the County passed a $20-million bond package to create parks and greenways, primarily on the east side of Mountain Island. In that same decade, CMU also launched a land acquisition program in the watershed. Each year $50,000 from the utility's capital improvement budget goes to protection of land in the watershed, particularly on the eastern lakeshore where the CMU intake is located. This land, managed by Mecklenburg County Parks and Recreation, now totals 2,700 acres. Regulations permit only low-impact recreation, such as canoeing, fishing, and hiking in these areas.

Looking Ahead

The future of Mecklenburg County's water supply will find itself threatened by population growth and extensive development as urbanization continues both locally and upstream in the more rural counties. As development forces land values to rise, major landowners will feel increasing pressure to sell watershed land for housing, shopping centers, and industrial development. To ensure high quality water supplies and natural resources for future generations, water supply watershed protection must continue through a balance of watershed regulation enforcement, intensified efforts to preserve land and riparian buffers along our streams, lakes and rivers, and through community involvement and education.

State Senator Fountain Odom, whose district encompasses the eastern side of Mountain Island Lake and who has been working to protect it for 30 years, once said in describing Mountain Island Lake, "There's tremendous diversity of wildlife—white-tailed deer, red-tailed hawks, as well as rare and endangered flowers. The lake is the crown jewel of the area. It is to us as Central Park is to Manhattan, only more so—it's not only our recreational oasis, but also the source of our drinking water." SOER

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The Initiative for Mountain Island Lake

For more than seventy-five years, Mountain Island Lake has remained a quiet, peaceful reservoir with abundant wildlife and natural scenery. This pristine lake remains untouched and unheard-of by most Mecklenburg County residents. Being primarily undeveloped and located downstream of the state's largest manmade impoundment (Lake Norman), Mountain Island Lake is an ideal spot for a raw drinking water intake. Since Lake Norman is so large, pollutants and sediment have ample time to settle out of the water before it enters Mountain Island Lake. In fact, Charlotte's intake has been located on Mountain Island Lake since the early 1900's. The Cities of Gastonia and Mt. Holly also have intakes on the lake. It is estimated that Gastonia has saved over $250,000 annually in drinking water treatment costs since they moved their intake to Mountain Island.

Within the past decade, sprawling development from Charlotte has encroached upon Mountain Island Lake, bringing several subdivisions, two schools, and many new residents to the watershed. The new growth and development in the area has sparked an enormous interest in protecting the lake from degradation. Although land conservation efforts were started in the 1970's, the majority of land in the watershed remains unprotected. In 1997, a partnership between the Catawba Lands Conservancy, the Community Foundation of Gaston County, the Foundation for the Carolinas, and the Trust for Public Land formed the Initiative for Mountain Island Lake. In 1998 this collaboration worked with Gaston and Lincoln counties on a $6.15 million grant from the NC Clean Water Management Trust Fund for the acquisition of a 1,231 acre tract with six miles of shoreline on the western shore of the lake. In March 1999, the first ever governmental summit was held in Mecklenburg County concerning water quality. At the initial meeting, the Carolinas Lands Conservation Network presented a Geographic Information System (GIS) based model of the Mountain Island Lake Watershed, prioritizing nearly 125 miles of tributaries needing protection. The results of a three-county poll were also unveiled showing that residents of the region ranked water quality protection among the top of their concerns, and were willing to pay to keep their drinking water safe and clean. During this meeting, staff and elected officials agreed to protect at least 80% of the undeveloped shoreline and high priority stream segments in the next two years.

Since that summit, the City of Gastonia is purchasing a 425 acre tract located near their drinking water intake, and Mecklenburg County voters passed a $220 million land purchase bond providing $15 million for the land acquisition within the Mountain Island Lake Watershed. Currently, approximately 56% of the shoreline is protected and conservation efforts are at an all- time high. Both the Catawba Lands Conservancy and Mecklenburg County Parks and Recreation are active partners in the identification and purchase of land and conservation easements.

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Bridgett Thompson - The Trust for Public Land

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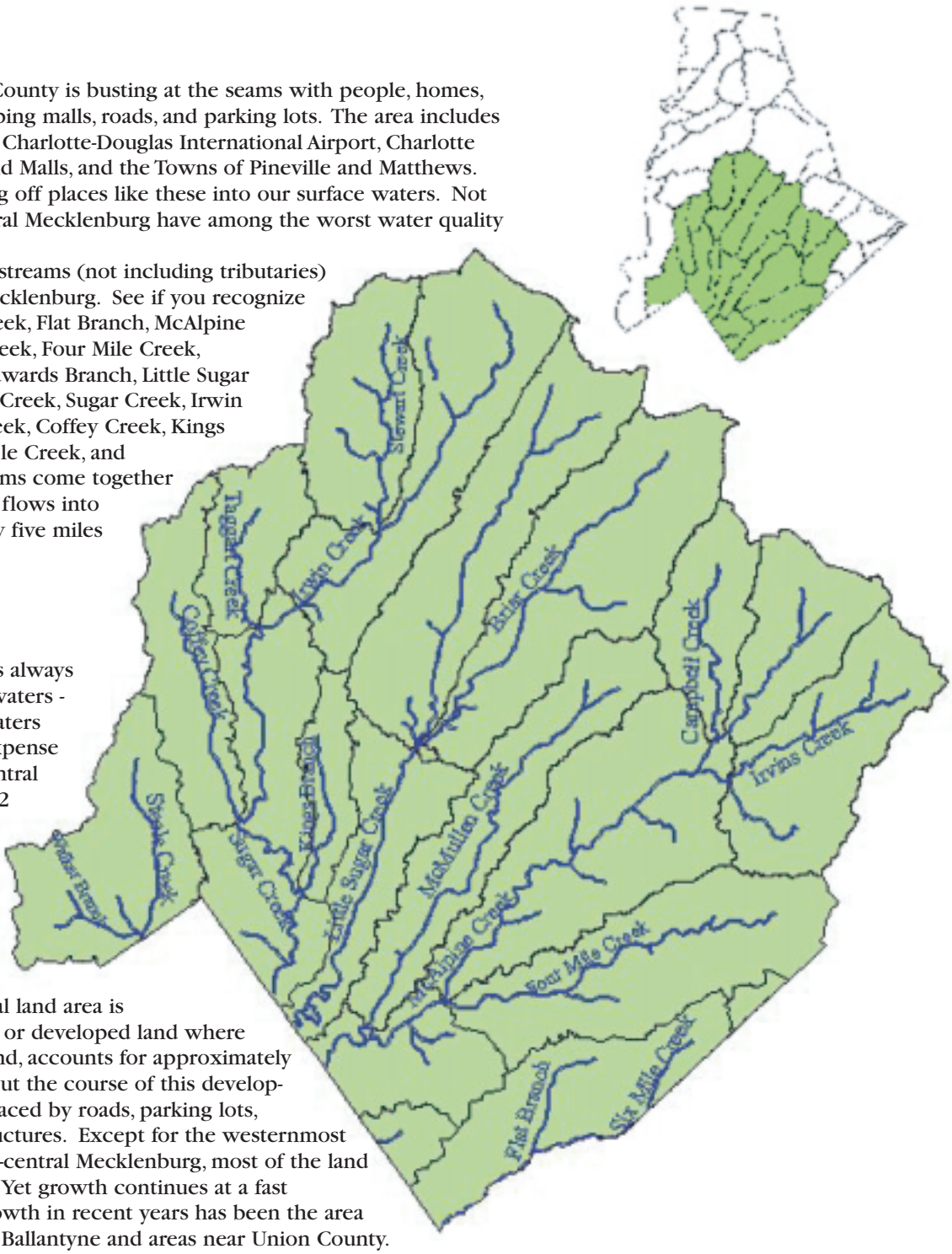
The cleaner the water entering the treatment plant, the less it will cost to treat it. Therefore, preserving land within the Mountain Island Lake Watershed will be the most cost effective and lasting method of keeping our drinking water safe and of high quality. SOER

South-Central Streams Suffer Impacts of Urbanism

South-central Mecklenburg County is busting at the seams with people, homes, office buildings, industries, shopping malls, roads, and parking lots. The area includes places like downtown Charlotte, Charlotte-Douglas International Airport, Charlotte Coliseum, South Park and Eastland Malls, and the Towns of Pineville and Matthews. Think of all the pollution running off places like these into our surface waters. Not surprising, streams in south-central Mecklenburg have among the worst water quality in the county.

Approximately 163 miles of streams (not including tributaries) run throughout south-central Mecklenburg. See if you recognize any of the following: Six Mile Creek, Flat Branch, McAlpine Creek, Campbell Creek, Irvins Creek, Four Mile Creek, McMullen Creek, Briar Creek, Edwards Branch, Little Sugar Creek, Dairy Branch, Little Hope Creek, Sugar Creek, Irwin Creek, Stewart Creek, Taggart Creek, Coffey Creek, Kings Branch, McCullough Branch, Steele Creek, and Walker Branch. All of these streams come together as Sugar Creek which eventually flows into the Catawba River approximately five miles southeast of Fort Mill, SC.



Surface Water Quality Reflects Land Use

The way we use the land has always impacted the quality of surface waters - and not for the better. Surface waters have generally perished at the expense of growth, especially in south-central Mecklenburg. Areas with 1/4 to 2 acre residential lots account for 40% of the area while commercial/industrial land use accounts for another 14%. Another 16% is greater than 2 acre residential and open space (includes farms, open fields, parks, etc.). Only 28% of the total land area is woods/brush. Impervious cover, or developed land where water cannot soak into the ground, accounts for approximately 10% of total land area. Throughout the course of this development, many trees have been replaced by roads, parking lots, homes, strip malls, and other structures. Except for the westernmost and southernmost areas of south-central Mecklenburg, most of the land is almost completely developed. Yet growth continues at a fast pace. Experiencing the most growth in recent years has been the area south of I-485, especially around Ballantyne and areas near Union County.

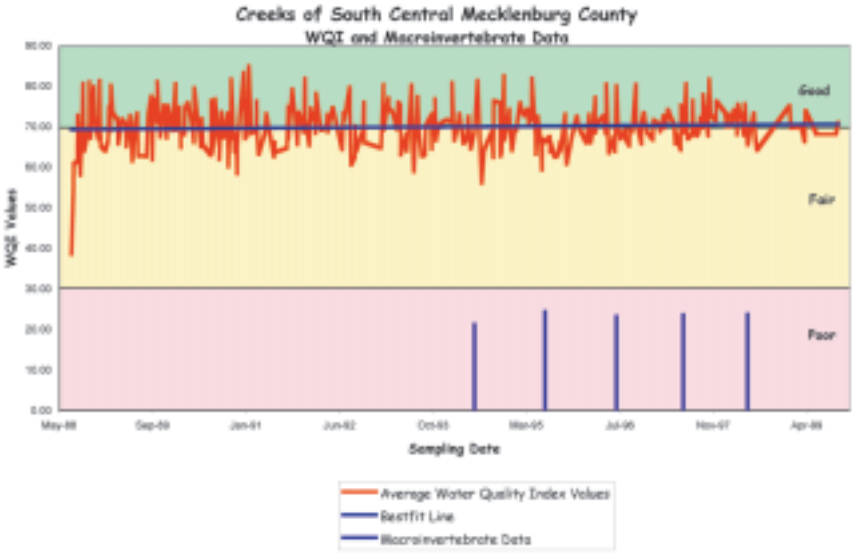
South-Central Streams Suffer Impacts of Urbanism

This area of the Little Sugar Creek watershed (N.Tryon and Sugar Creek Rd.) Has among the highest percentage of impervious cover in the county.

The result has been consistent fair to poor-fair water quality ratings in Four Mile and Six Mile Creeks over the past five years.

Two major forces expected to drive future development will be I-485 and the proposed transit corridors. New roads create new places to build. You can see it already at existing interchanges along I-485. Except for a stretch through the Steele Creek basin and an interchange at Weddington Rd., I-485 through south-central Mecklenburg is complete. Proposed land use at the interchanges will be a mixture of commercial, office, industrial, and residential zoning. A shining star in terms of its implications for managed growth and environmental protection is the development of transit corridors through south-central Mecklenburg. Light rail is recommended to run on the existing line that parallels South Boulevard. A busway, already partially constructed, is recommended for the Independence corridor. Land use plans recommend that density be established along these corridors to increase ridership opportunities near home and work and to minimize growth in other areas of the county. Such planning is part of the Smart Growth initiative which received attention in 1999. Smart Growth is a way of balancing growth with environmental responsibility. It involves measures such as controlling sprawl, rural and open space protection, and transportation alternatives.

Water Quality Index (WQI) values, based on a scale of 0 to 100, express the overall water quality at a given stream site and are based on chemical, physical, and biological data. Graphed WQI data was obtained from 28 monitoring sites in south-central Mecklenburg. Average WQI values have remained in the fair-good range for south-central Mecklenburg streams since 1988. The graph also shows that, since 1996, extreme "dips" into the fair range have not occurred, but despite what the graph shows, many of these streams are still unsuitable for prolonged human contact and fishing due to specific elevated pollutants and fluctuating conditions. This is not the whole story. Macroinvertebrates, small critters that attach to objects in streams and lakes, also help indicate water quality conditions. In fact, they are considered better indicators because they live in the water and, therefore, are exposed to pollutants daily. Typical pollutant sampling is only performed on a monthly or quarterly basis and, henceforth, provides only a "snapshot" of water quality conditions. Data results based on macroinvertebrate species composition surveys have consistently averaged in the poor range. Combining the WQI and macroinvertebrate data, average water quality for south-central Mecklenburg streams has consistently been in the lower to mid-fair range.



The high concentration of people and impervious cover coupled with a low concentration of forested and open space contribute to the degraded conditions. Little Sugar Creek, Mecklenburg County's "poster-child" for degraded urban streams, has consistently had the poorest water quality. Not surprising, its basin contains many

old sewer lines, a large amount of impervious cover, many industrial sites, and large residential developments. Improvement projects have been conducted and are currently underway to improve conditions within Little Sugar Creek. Trends indicate that this work has helped to improve conditions slightly over the past few years. More exciting restoration projects are planned for the future in Little Sugar and other streams.

The Arch-Enemies: Bacteria, Nutrients, and Sediment

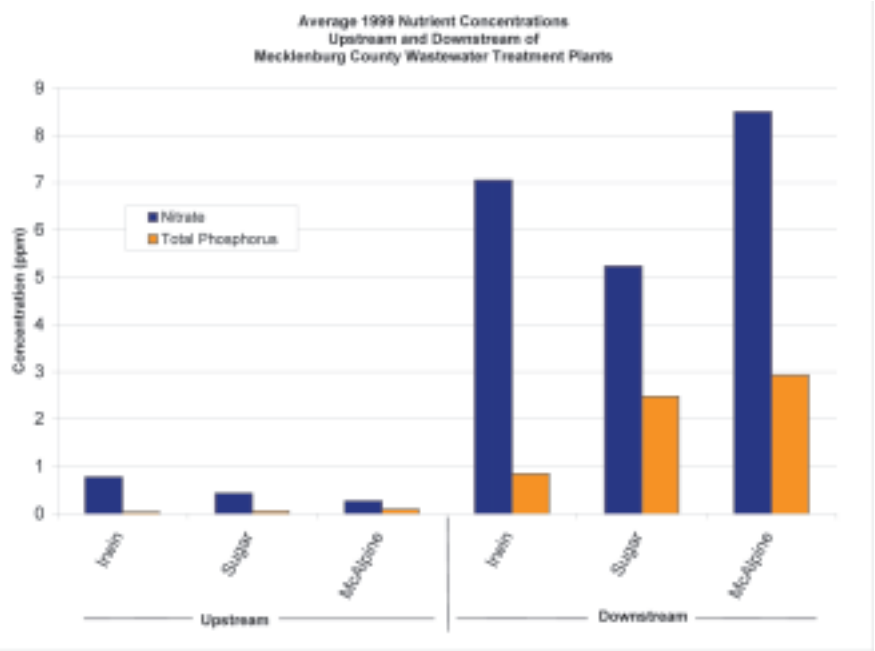
While dense development and population are two of the over-arching causes of degraded water quality conditions in this area, there are also pollutant-specific causes for the degradation. The most widespread culprit in south-central Mecklenburg streams is fecal coliform bacteria. Fecal coliforms are a family of bacteria present in the intestines of humans and other warm-blooded animals. They are not harmful themselves, but indicate the potential presence of other bacteria and viruses that cause disease. Because of the risk to human health, fecal coliform affect the useability of our streams more than any other pollution parameter.

Significant sources of fecal coliform bacteria in the south-central area of Mecklenburg County are leaking and overflowing sanitary sewer lines, pet and wildlife waste, illegal dumping, and illicit connections of sanitary wastewater. 274 discharges from municipal sanitary sewer lines were reported in south-central basins in 1999. Sewage overflows are common in many municipalities with old sewer systems. The problem is exacerbated in Mecklenburg County due to the increasing number of people and businesses connecting to the system. Also, many people create blockages by putting items into the system such as grease and paper towels. To address the severity and widespread nature of the problem, a new state law was passed in 1999. Charlotte-Mecklenburg Utilities (CMU) has taken the reigns on complying with the new rules, including notifying the public of sewage overflows and increasing response time to reported overflows. They have also implemented an aggressive sewer line cleaning, repair, and rehabilitation program and an educational campaign about proper grease disposal.

The NC state baseflow fecal coliform standard for the class of streams located in south-central Mecklenburg is a geometric mean of 400 colonies/100 ml of sample water. Average fecal coliform levels exceeded the standard in many streams in 1999, including Briar, Little Sugar, Stewart, Taggart, Irwin, Steele, McAlpine, McMullen, Irvins, Six Mile, and Kings Branch. Briar Creek had the highest average at 3391 colonies/100 ml, followed by Taggart with 2275, Stewart with 2318, and Little Sugar with 992. Incidentally, these basins had among the highest reported numbers of sewer overflows per land area in 1999. Briar, Little Sugar, and McAlpine Creeks are on North Carolina's list of impaired waters for chronic exceedances of the fecal coliform standard. All states are required by the EPA to develop a list of waters, called the 303(d) list, not meeting water quality standards or not supporting designated uses. States are then required, on a priority basis, to develop Total Maximum Daily Loads (TMDLs) or management strategies for 303(d) listed waters to address impairment. A TMDL is the total daily amount of a pollutant that a water body can assimilate without jeopardizing water quality standards or designated uses. Pollutant sources are allocated a certain portion of this load and are only allowed to discharge up to their allotted pollutant load.

The Mecklenburg County Department of Environmental Protection (MCDEP) is currently working with the North Carolina Division of Water Quality and a local stakeholder team on the development of the fecal coliform TMDLs. MCDEP staff has also increased sampling and source tracking efforts in these streams. This has and will continue to help reduce fecal coliform levels and provide much needed data for developing the TMDLs.

Nutrients are another significant form of pollution in south-central Mecklenburg streams. Nutrients are elemental forms of phosphorus, nitrogen, and carbon that are essential for growth and ecosystem health. In excessive amounts (especially phosphorus), nutrients can impair surface waters by causing excessive algae growth, reduced transparency, and undesirable shifts in fish populations. Excessive algae growth sometimes causes dissolved oxygen to drop below levels necessary to sustain fish and other aquatic life. Excess nutrients are not nearly as detrimental to stream systems as they are to lakes. For this reason, North Carolina does not impose



nutrient limits on direct dischargers to streams except for a small percentage of cases. Nutrients may enter water resources dissolved in surface or groundwater or attached to sediment. The main sources of nutrients in south-central Mecklenburg are wastewater treatment plant (WWTP) discharges, chemical fertilizers, leaking and overflowing sewer lines, pet and wildlife waste, sediment runoff, decaying organic material, and atmospheric deposition.

Data in 1999 and in previous years show that, during ambient stream conditions (no rain in past 72 hours), wastewater treatment plants are a large source of nutrient loading to streams. 1999 averages for total phosphorus and nitrate-nitrogen levels upstream and downstream of the three major wastewater treatment plants in south-central Mecklenburg show that wastewater effluent contributes heavily to instream nutrient concentrations. CMU operates the three major treatment facilities, Sugar Creek WWTP (discharges to Little Sugar), Irwin Creek WWTP, and McAlpine WWTP. The combined average discharge for the three plants in 1999 was 63.41 million gallons per day. Due to possible impacts on South Carolina lakes, some local and regional stakeholders argue that regulations should be imposed which mandate that CMU install nutrient reduction systems at their facilities. However, such measures would be extremely costly to them and, ultimately, taxpayers. In 1999, CMU began working with local stakeholders on voluntary measures to reduce nutrient discharges, including working with industries to reduce their nutrient inputs to the system and efforts toward creating opportunities for the reuse of treated wastewater (called graywater).

Another pollutant having a large impact on streams in south-central Mecklenburg is sediment. Sedimentation, or the movement of sediment from its source into surface waters, is extremely detrimental to surface waters. It buries aquatic life habitat and fish eggs, clogs fish gills, reduces water clarity, increases flooding potential, and carries attached pollutants, not to mention has a variety of economic consequences.

This straight section of Little Sugar Creek near E. 36th Street is typical of past engineering designs to control streambank erosion and flooding.

Development is almost exclusively the root cause of sedimentation in south-central Mecklenburg. First, higher stormwater flows resulting from increased impervious cover coupled with tree removal near streams causes severe erosion of streambanks during storm conditions. Second, rain washes sediment from construction sites where sediment control structures are not properly applied or maintained. Turbidity, a measurement of water clarity, is a surrogate measure of sedimentation in surface waters. The higher the amount of sedimentation, the higher the turbidity. 1999 quarterly stream sampling produced one turbidity standard exceedance at four sites: Four Mile Creek, Six Mile Creek, McAlpine Creek below McAlpine WWTP, and Campbell Creek. As mentioned, rapid development is occurring in the Four Mile and Six Mile Creek basins which likely accounts for the exceedances in those two creeks.

MCDEP took major steps toward reducing sedimentation in Mecklenburg County in 1999. Staff began a single-family residence erosion control program. Between July 1, 1999 and January 10, 2000, over 2900 single-lot site visits were conducted in south-central Mecklenburg County. Many of these resulted in Notices of Violation (NOVs) being issued to builders, some of whom were later assessed fines for not complying by dates stated in the NOVs. The other major stride toward reducing sedimentation was the passing of streamside buffer regulations in the City of Charlotte and Mecklenburg County. Buffers are naturally vegetated areas along streams that help to filter pollutants, store flood waters, reduce bank erosion, shade streams, and protect the natural meandering of steams. Buffer ordinances are currently being drafted by Matthews and Pineville and should be in place by summer 2000.

Life Beneath the Water's Surface

Perhaps as a kid you used to splash around in streams, look for critters, or even catch fish. Maybe you still get a kick out of it with your kids or by yourself. People mostly care about

streams because of what lives in them. Let's face it, without the dash of a bluegill or dart of a crayfish, streams would not be nearly as fun or interesting. As mentioned, MCDEP monitors the waters of south-central Mecklenburg for macroinvertebrates, and for fish species. Fish surveys since 1995 varied from a low of two species found on upper Little Sugar Creek to a high of 18 species on Rocky Branch. As a general rule, the higher the species diversity, the better the water quality and habitat conditions. On a good note, compared to a fish survey conducted in 1976, significant increases in the number of fish species occurred in both the Little Sugar (from 10 to 20) and Irwin/Sugar basins (from 13 to 24). Improvements are mostly attributable to major reductions in point source discharges and local efforts by government, civic groups, and citizens.

Our Streams' Fate

South-central Mecklenburg streams have suffered at the expense of our modern, industrial existence. The more urban streams, such as Little Sugar and Irwin, are undoubtedly better off than they were in the 1960s. However, years of abuse and current discharges of nonpoint source pollution render them far less than pristine. The dilemma remains, how much time and effort should we as a community spend to improve these streams in the face of a myriad of other social, economic, and environmental problems? Many factors will have to be weighed, including what direct and indirect benefits we'll receive by improving them, and what direct and indirect losses we'll suffer by not doing anything or, worse yet, degrading them further. One thing is for certain. A lot of mistakes have been made where these streams are concerned, but hopefully we've learned from our mistakes. With the interest and energy circulating among our citizens in addition to the exciting restoration projects currently underway, the future certainly looks brighter for the streams of south-central Mecklenburg County.

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Restoring Edwards Branch

As part of Mecklenburg County's Surface Water Improvement and Management (SWIM) Initiative, MCDEP is undertaking a comprehensive restoration project in the Edwards Branch watershed. The goal is to restore waters in Edwards Branch, and ultimately the entire County, to a "fishable and swimmable" condition. The majority of the funding for the project has been provided by a grant from the Clean Water Management Trust Fund. This water quality project is coordinated closely with an ongoing City of Charlotte Storm Water services (CSWS) flood control project, demonstrating that flood control and water quality improvement can be achieved simultaneously.

The Edwards Branch Watershed is one square mile in size and is an area encompassed by Independence Boulevard, Albemarle Rd., Sharon Amity Rd., Central Avenue and Norland Rd. The watershed is a "built out" highly urbanized watershed including single and multi family residential, commercial and industrial land uses along with a public park, a cemetery, schools and churches. The watershed contains one major waterway, Edwards Branch, with its three tributaries as well as two ponds. Its waters have been impaired by non-point source runoff from adjacent land uses. Non-point source pollution refers to the pollutants such as fecal coliform bacteria, sediment, nutrients and metals that are washed off the land surface during rain events.

The Edwards Branch demonstration project will evaluate the feasibility and cost effectiveness of restoring degraded waters in an urban setting using established Best Management Practices (BMPs). BMPs are structural and non-structural methods that are used to control storm water quality and quantity. Most structural BMPs work by providing a temporary storage of storm water runoff, allowing pollutants to settle out or be consumed by physical and biological processes. An example of a non-structural BMP would include public initiatives such as storm drain stenciling and fertilizer/pesticide education application programs. The proposed basin-wide BMP plan includes the design and implementation of wet ponds, multiple pond/marsh systems, bioretention areas, riparian buffers, level spreaders, stream bank stabilization, stream channel restoration, constructed wetlands and targeted public education programs. In addition to water quality improvement goals, the project also hopes to improve aquatic habitat through the construction of riffles and pools along the tributaries of Edwards Branch.

A storm water quality monitoring station has been installed at the outlet of the watershed which will be used to conduct baseline, construction and post construction monitoring. In addition, stream habitat assessment, fish and macroinvertebrate studies and channel cross section monitoring have been and will continue to be used to collect data to justify implementation of successful BMPs throughout the County. It is anticipated that the Edwards Branch restoration project will pave the way for future similar projects in an effort to restore and protect the waters of Mecklenburg County.

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Streams of Western Mecklenburg County...

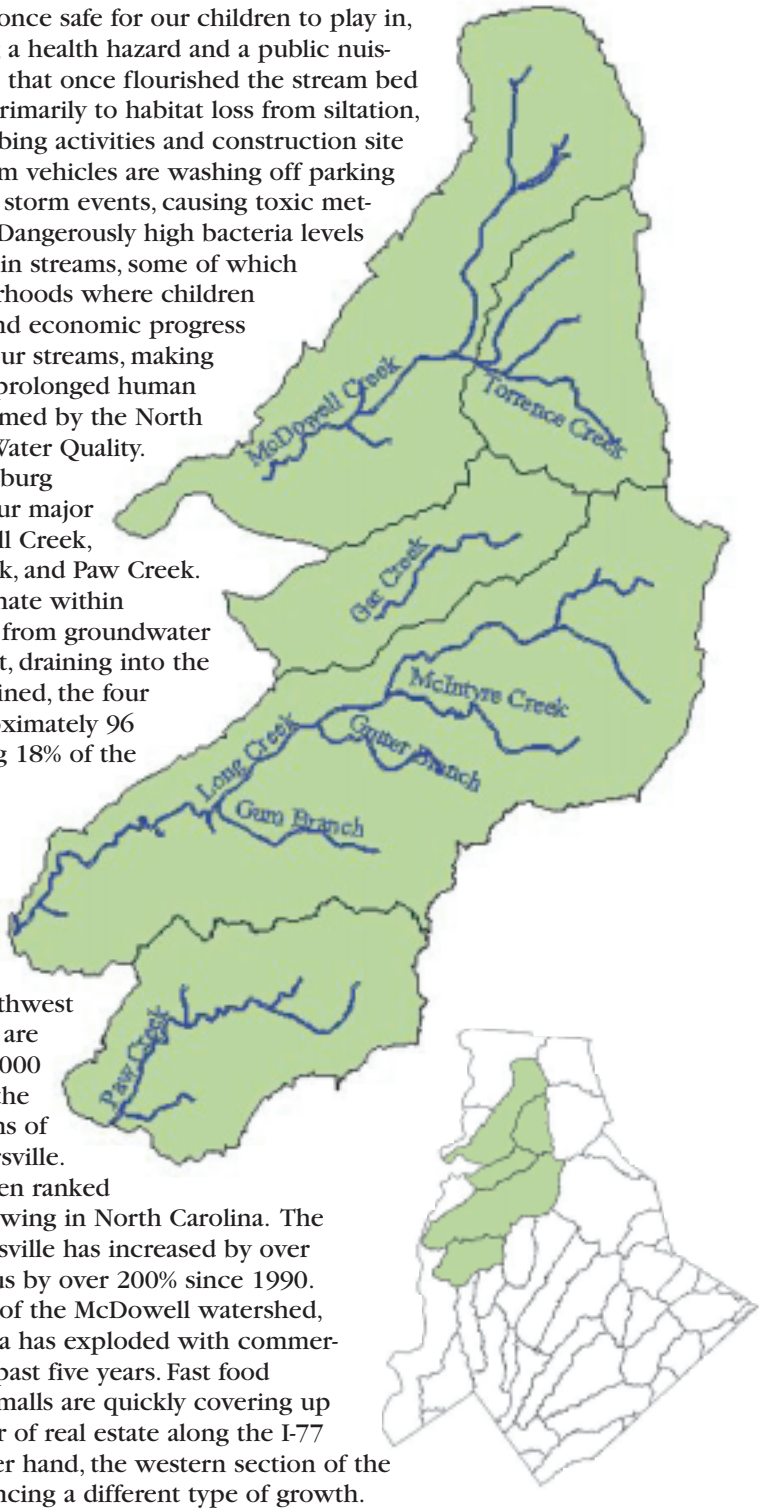
A THREATENED RESOURCE

The year was 1910 and Charlotte had grown to nearly 18,000 people. Children swing from ropes, tied high in river birch trees, landing in the cool waters of Long Creek in western Mecklenburg County. Although streams in the inner city were polluted by poorly operating sewage treatment plants, the western Mecklenburg County streams remained primarily untouched and untarnished. These streams were often used for fishing and swimming. In fact, a private park called Camp Latta was located along NC Hwy. 27, which boasted a deep pool swimming area which was created by damming up a section of Long Creek. Rural western Mecklenburg had seen little to no growth and residents often enjoyed the private, natural settings that the Long and McDowell Creek bottoms provided. On hot days, these streams provided a cool, wet place to relax and play. Children were drawn to these creeks primarily by curiosity, often fishing, swimming, wading, catching crawdads, and exploring.

Today the year is 2000 and children are still drawn to the same streams, for much the same reasons. The only problem is that these streams, which were once safe for our children to play in, are quickly becoming a health hazard and a public nuisance. The aquatic life that once flourished the stream bed is disappearing due primarily to habitat loss from siltation, caused by land disturbing activities and construction site runoff. Pollutants from vehicles are washing off parking lots and roads during storm events, causing toxic metals to enter streams. Dangerously high bacteria levels are sometimes found in streams, some of which run through neighborhoods where children play. Development and economic progress has taken its toll on our streams, making them "unsuitable for prolonged human body contact", as deemed by the North Carolina Division of Water Quality.

> "Creeks should be somewhere that people can go to enjoy nature, rather than polluted drainage ditches."
>
> **Kevin McMahon**
> Independence High School

Western Mecklenburg County is home to four major watersheds, McDowell Creek, Gar Creek, Long Creek, and Paw Creek. All four streams originate within Mecklenburg County from groundwater springs and flow west, draining into the Catawba River. Combined, the four watersheds are approximately 96 square miles, covering 18% of the County.



McDowell and Gar Creek Watersheds

The McDowell and Gar watersheds, located in the far northwest corner of the County are inhabited by over 30,000 people and includes the quickly growing towns of Cornelius and Huntersville. These towns have been ranked among the fastest growing in North Carolina. The population of Huntersville has increased by over 400%, and in Cornelius by over 200% since 1990. Near the headwaters of the McDowell watershed, the interstate I-77 area has exploded with commercial growth over the past five years. Fast food restaurants and strip malls are quickly covering up every available corner of real estate along the I-77 corridor. On the other hand, the western section of the watershed is experiencing a different type of growth.

Acres of woods and pastures that were once only useful to cattle farmers and hunters are being replaced by large sprawling residential subdivisions with community pools and tenniscourts. Increasing property values have persuaded many land owners to sell large plots of family land to developers. Although the pressure of development is evident, the watershed still remains primarily undeveloped on the western side.

McDowell Creek originates in the Town of Cornelius and flows south, joined by Caldwell Station Creek, then by Torrence Creek from the east. McDowell then turns towards the west, eventually discharging into Mountain Island Lake which serves as the primary drinking water reservoir for Mecklenburg County. As McDowell Creek gets closer to the lake, it's not unusual to see the stream standing still, or sometimes actually flowing backwards due to its confluence with Mountain Island Lake.

Protecting Our Drinking Water Supply

Gar Creek, located south of McDowell originates near Mt. Holly Huntersville Road and Alexanderana Road, and discharges into Mountain Island just upstream of the Charlotte Mecklenburg drinking water intake. The Gar watershed measures only eight square miles, compared to the 30 square miles of the McDowell watershed. The McDowell and Gar watersheds have the most restrictive development standards in the County, due to their proximity to the County's raw drinking water supply. These regulations limit the amount of impervious surfaces within a development and require undisturbed buffers along streams. Numerous studies have shown that storm water runoff from impervious cover, such as pavement and roof tops results in negative water quality impacts to nearby streams. Watershed protection regulations help to reduce impervious cover, which allows for more open space where rainfall can soak into the ground and recharge streams.

A muddy McDowell Creek flows past Beatties Ford Rd., heading into Mountain Island Lake.

Sediment and Bacteria Among the Primary Pollutants in McDowell

The Mecklenburg County Department of Environmental Protection has four monitoring sites in the McDowell watershed and one site in the Gar watershed. Samples have been routinely collected and tested for various chemical parameters since the late 1970's. A water quality index is used to consolidate various data for a given water body. These data are useful for determining the chemical components of the stream, such as nutrient, oxygen, sediment, and bacteria levels. Biological data such as macroinvertibrate and fish diversity have also been collected over the years. These data are helpful in determining stream health by defining the aquatic life diversity, since certain species are very pollution tolerant, while others are not.

Chemical water quality data for the McDowell watershed have shown little fluctuation over the past ten years. Water quality index values have generally remained in the average to good ranges. The primary pollutants in the watershed are fecal coliform bacteria and sediment. Although these pollutant levels are low when compared to streams such as Little Sugar in more urbanized areas, it is likely the levels will become higher as more development, impervious areas and other pollution sources increase. Fecal coliform levels have sometimes been traced back to overflowing and leaking sewer lines. Dairy and cattle farms are also a source of bacteria in some streams in the McDowell watershed. This will likely not be a source in years to come, due to the rapidly decreasing number and size of farms in the watershed. Chemical water quality data collected during storm events in McDowell Creek have consistently shown high levels of mineral and toxic metals. This data is not unusual when compared to storm water data collected in other watersheds across the County.

Sediment comes from the erosion of bare soils and the eroding stream banks, while bacteria can be traced to many natural animal sources as well as some human sources. Some metals, such as iron are found naturally in the soils, while zinc and copper are likely wearing off automobile tires and brakes, then washing off impervious areas into nearby streams. The data show a correlation between the amount of impervious cover, sediment and metals, with watersheds with more impervious cover appearing to have higher amounts of sediment and met-

als. This would indicate that the increasing development within the McDowell and Gar watersheds will cause increased levels of sediment and metals believed to be related to non-point sources, meaning they are washing off various land uses during rain events, as opposed to being discharged by a particular source.

There are very few point source pollution contributors in the McDowell and Gar watersheds. The McDowell Creek Wastewater Treatment plant, one of five Charlotte-Mecklenburg municipal wastewater treatment plants, is the largest point source contributor. The plant serves the entire northern Mecklenburg area and has a permitted average annual discharge of 6.0 million gallons of treated wastewater per day (MGD), although the current discharge from the plant is around 4.0 MGD. As you may imagine, this discharge has historically elevated the level of nutrients in McDowell Creek and has been one of the contributing factors in the algal abundance in McDowell Creek cove on Mtn. Island Lake. Recently the plant added a nutrient removal system, which caused a dramatic improvement in the water quality of McDowell Creek below the plant's discharge.

Macroinvertibrate data tend to show a slight decrease in species richness in lower and mid McDowell Creek, likely due to habitat alterations caused by siltation. The State of North Carolina Division of Water Quality has recently added McDowell Creek to a list of impaired streams within North Carolina, not because of a particular pollutant, but because of its poor biological diversity.

The water quality in Gar Creek remains among the best in the County. This little watershed continues to dodge development and remains primarily undisturbed. Gar Creek is home to a wide diversity of biological life and often serves as a model for other streams in the County.

In 1998, the Carolinas Land Conservation Network and the Centralia Council of Governments guided a scientific steering committee to identify priority lands for protection of Mountain Island Lake. Several stream segments in the McDowell and Gar watersheds were identified as high priority streams. The Mecklenburg County Department of Environmental Protection has also initiated an effort in the McDowell watershed called Water Improvement Now (WIN). This initiative is geared towards involving the public in protecting the natural resources within their own watershed. The McDowell watershed was targeted for this pilot project due to its importance in protecting Mecklenburg's drinking water supply, and the increasing threats that development is having on water quality in the area.

The Paw Creek watershed is home to eight major petroleum distribution companies.

Long and Paw Creek Watersheds

The Long and Paw Creek watersheds are located just south of the McDowell watershed. Like most areas in Mecklenburg County, they have not been overlooked by development, but have a relatively low population density when compared with other areas of the County. The predominant land use is residential.

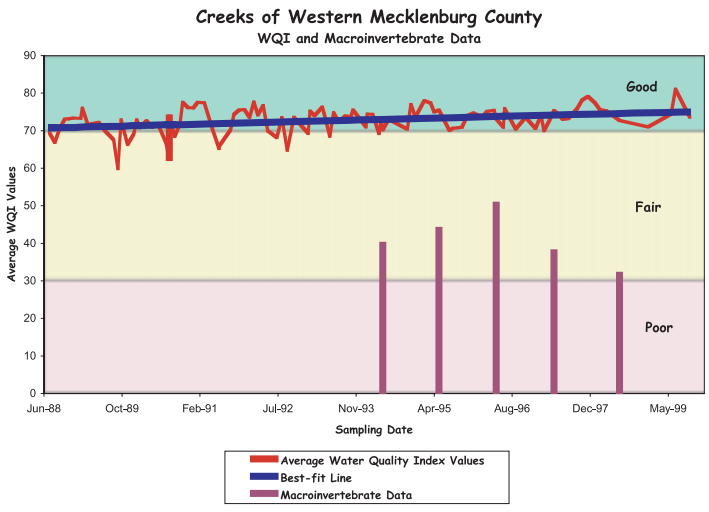
Like the McDowell watershed, Long Creek is experiencing significant growth in the form of single family residential subdivisions. Long Creek originates just east of I-77 near W.T. Harris Blvd. and flows west, eventually discharging into the upper portion of Lake Wylie. It is the largest among the western watersheds, stretching across 36 square miles, with major tributaries being Long Creek, McIntyre Creek and Gum Branch. The lower portion of Long Creek falls within the Lake Wylie drinking water supply watershed regulations, which provide additional protection to the Town of Belmont's drinking water intake located along the shoreline of Lake Wylie.

The Paw Creek watershed is located just south of Long Creek and originates north of Freedom Drive, just west of I-85. Paw Creek meanders towards the west, draining into Lake Wylie just below the Town of Belmont. The watershed encompasses about 20 square miles and is partly residential, but with a significant amount of industrial and commercial land uses. The upper portion of the Paw Creek watershed, known by many Mecklenburg residents as "Tank Town," is a major petroleum distribution hub for eight petroleum distribution companies.

A child explores the banks along McDowell Creek.

Long Creek Threatened by New Highway Development

Three monitoring sites are located in the Long Creek watershed and one site in the Paw Creek watershed. Water quality index values for the Long and Paw Creek watersheds have remained fairly consistent over the past ten years, generally staying in the average to good ranges. The primary pollutants are sediment and fecal coliform bacteria. Samples collected in Long and Paw Creeks during storm events are high in sediment, bacteria, and metals. Although there are several point source dischargers in the watersheds, the pollutants are believed to be non-point source related. Long Creek has also been added to North Carolina's list of impaired waters due to sediment problems. The expansion of interstate I-485 will cut through the upper portion of the watershed, crossing portions of Long Creek and it's tributaries six times, and run parallel to the main branch of Long Creek for approximately eight miles. This close proximity to the stream will result in increased velocities and water temperatures during rain events. Higher velocities could result in more bank erosion and sediment, while higher temperatures could promote algae growth, leading to oxygen depletion. Biological diversity in Long and Paw Creeks are currently in the fair to good range and have shown little fluctuation over the years.



What Does the Future Hold?

Although Camp Latta no longer exists, children still play in western Mecklenburg streams, just as they did in 1910. They look for frogs and crawdads, and explore some of the same areas. The only difference is that urban growth and development has surrounded many of the streams, making them vulnerable to many pollution sources. While some Mecklenburg citizens describe this growth as "progress," others describe it as "destruction." When all western Mecklenburg stream data is combined and illustrated over a 12 year period, the chemical water quality parameters appear to show a very slight improvement, but the declining macroinvertibrate data clearly illustrates the results of cumulative pollution and aquatic habitat alteration over the years. In a county such as Mecklenburg, is it possible to balance economic growth with the protection of our environment? Some say yes, and cite environmental protection initiatives, such as new County wide stream buffer regulations designed to preserve floodplains as open space and parks, while providing areas for children to play and explore natural resources. There are also aggressive, innovative initiatives underway such as educating citizens about protecting streams in their own backyard. The threat to the water quality in our western streams is real, but these resources can be protected through wise planning and the support of citizens and property owners.

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"WIN" Water Improvements Now Initiative for the McDowell Creek Watershed

Located in northwestern Mecklenburg County, McDowell Creek winds behind neighborhoods and businesses, under roads and through agricultural fields of Huntersville and Cornelius. A canopy of oaks, hickories and poplars shade the waters of McDowell Creek, form a forested buffer, and stabilize it's stream banks. However, McDowell Creek, for the most part, goes unnoticed. Perhaps only the occasional fisherman or resident has noticed the muddy red waters of the creek during a rain storm or how the stream banks quickly erode when the forested creek buffer is cleared.

The McDowell Creek Watershed is defined as McDowell, Caldwell Station, and Torrence Creeks and all the lands these creeks drain. At the southern end of the watershed, McDowell Creek flows into McDowell Creek Cove and eventually into Mountain Island Lake. Portions of the watershed's stream banks remain forested, but sediment and silt have already covered most of the watershed's stream beds, destroying aquatic life and habitat.

In May of 1999, Mecklenburg County Department of Environmental Protection's (MCDEP) Water Quality Section targeted the McDowell Creek Watershed for a pilot project, the Water Improvements Now Initiative (WIN). This particular watershed was chosen for three reasons. McDowell Creek has recently been added to North Carolina's list of "impaired" waters. It is located in one of the fastest growing areas of Mecklenburg County, and McDowell Creek drains into Mountain Island Lake just north of Charlotte's drinking water intake. In addition to the reasons mentioned above, biological data collected over the last five (5) years has illustrated a steady decline in the populations and diversity of aquatic life found in McDowell Creek. Sediment, the primary pollutant in this watershed is not only detrimental to aquatic life, it also fills up the stream beds which decreases the storm water storage capacity of the stream and increases the risk of flooding.

The WIN Initiative has been designed to organize a group of enthusiastic watershed residents (WINners) to focus on environmental issues impacting their community including creek buffers, storm water, development, and open space preservation. MCDEP staff are excited about this pilot project and are committed to providing support and resources to this special group of environmental advocates. It is hoped that the WINners group will encourage local government to support "smart growth" and initiate exciting "hands-on" projects such as a volunteer stream monitoring program, stream bank restoration and stream buffer enhancement projects.

During the Fall of 1999, staff used a combination of tools to reach potential WINners: public presentations, news releases, feature articles, and a promotional poster and brochure. The WINners group will consist of residents, students, businesses and community leaders who live and/or work in the McDowell Creek Watershed. Together these individuals will be able to combine resources and work towards sustainable solutions for protecting water resources, the overall environment, and the quality of life in their community. A kickoff celebration is planned for Spring 2000. Ultimately, the McDowell Creek Watershed WINners group will establish a firm foundation upon which future WIN groups in other critical watersheds can build. Clean water is not only a critical local issue, it is one of the top regional, national and global issues of the future! SOER

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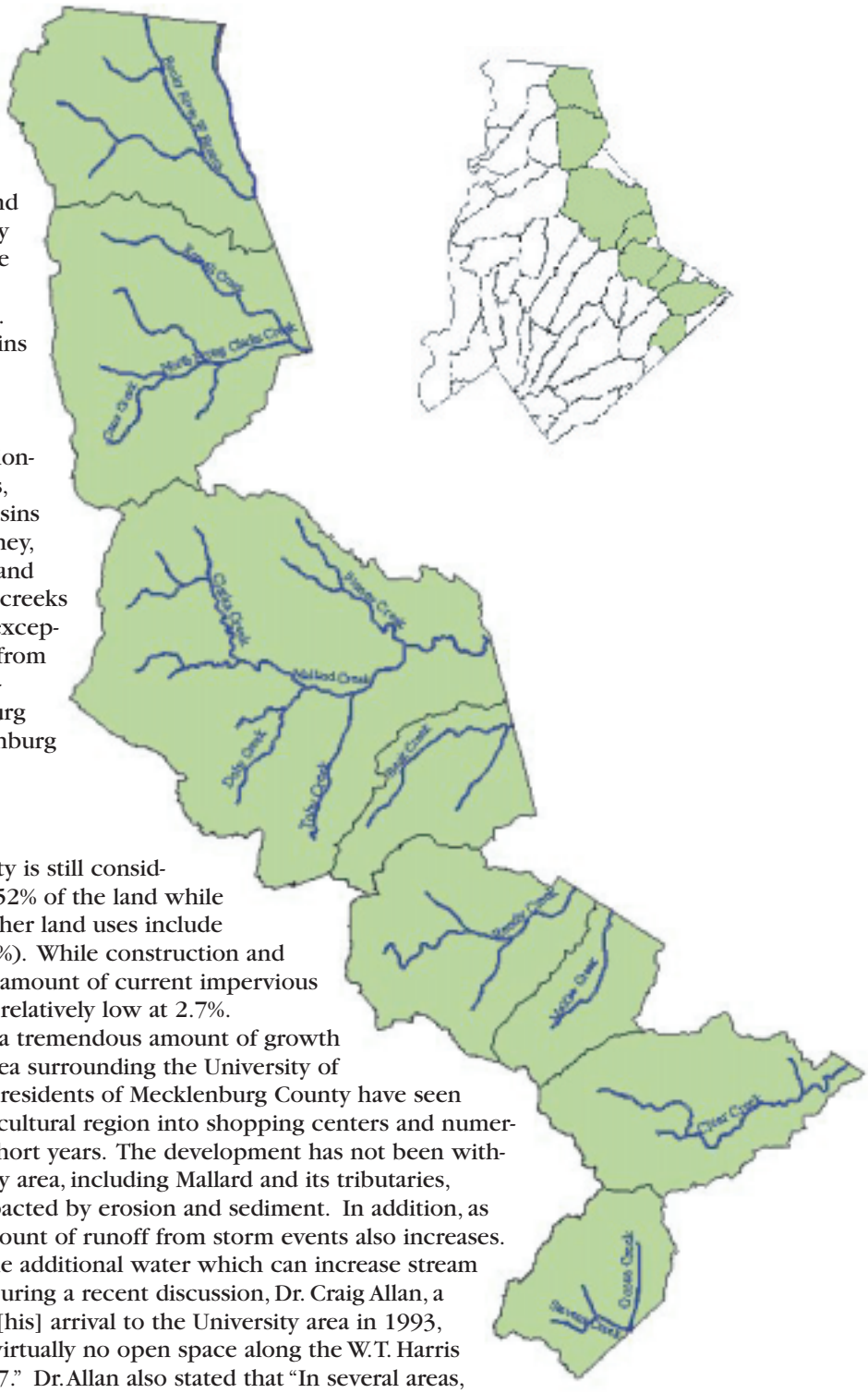
> Never doubt that a small group of thoughtful, committed people can change the world, indeed it is the only thing that ever has.
> **-Margaret Mead**

The Other Basin - The Yadkin River Basin

When most people think of a river basin in Mecklenburg County, the Catwba is the first thing that enters their mind, but there is one other important drainage basin located in the County. Along the central and northern borders of eastern Mecklenburg County flow the streams that drain to the Yadkin-Pee Dee River Basin. This network of streams comprises approximately one third of the County's streams. The Yadkin-Pee Dee Basin contains eight sub-basins that, collectively, have a drainage area of 1328 square miles. The primary function of these streams is to provide habitat for fish and other wildlife and, secondly, to provide various recreational uses for citizens. There are 14 primary creeks, stretching some 88 miles, that drain these sub-basins including Clear, McKee, Reedy, Back, Mallard, Stoney, Clarke, Doby, Toby, Cane, Ramah, Goose, Stevens and the West Branch of the Rocky River. All of these creeks originate within Mecklenburg County, with the exception of the Rocky River which flows southward from Iredell County and then along the Mecklenburg - Cabarrus County line before entering Mecklenburg County. The creeks flow southeast from Mecklenburg County before entering the Yadkin River.



From Farmlands to Freeways

The eastern most side of Mecklenburg county is still considered somewhat rural. Open space accounts for 52% of the land while 42% of the land is utilized for residential use. Other land uses include commercial (1.3%) and also some industrial (1.6%). While construction and development within the basin is on the rise, the amount of current impervious cover such as roads, parking lots and rooftops is relatively low at 2.7%.

During the last several years there has been a tremendous amount of growth within the basin. This is especially true in the area surrounding the University of North Carolina at Charlotte (UNCC). Long term residents of Mecklenburg County have seen this area transform from a rural farming and agricultural region into shopping centers and numerous residential developments within just a few short years. The development has not been without a price as the creeks that drain the University area, including Mallard and its tributaries, Stoney, Toby and Doby, have been negatively impacted by erosion and sediment. In addition, as the amount of impervious areas increase, the amount of runoff from storm events also increases. The result is that the streams are forced to handle additional water which can increase stream bank erosion and can raise flooding potential. During a recent discussion, Dr. Craig Allan, a hydrology professor at UNCC, stated that "Since [his] arrival to the University area in 1993, the amount of development in the area has left virtually no open space along the W.T. Harris Boulevard corridor between Highway 49 and I-77." Dr. Allan also stated that "In several areas, Doby Creek has developed unstable stream banks that are slumping and the channel depth has deepened due to scour from increased flows during storm events."

Other areas within the basin are also under pressure from construction. The construction of the new I-485 beltway will impact many of the sub-basins in the area. I-485 will travel along the entire eastern border of Mecklenburg County and, by the time construction is finished, will go through every sub-basin that drains to the Yadkin River. The forests and open land within the basin will continue to give way to growth and development. Therefore, the quality of the natural resources of the area, including our creeks and streams, may progressively decline. Not only will the creeks be impacted by the construction of the road itself, but they will also be affected by the future growth that will be a result of the 12 planned interchange locations that will be constructed within the basin.

While the land around some of the proposed I-485 interchanges has already been developed, there are many areas that have yet to be fully developed. The proposed land use at seven of the I-485 interchanges is for residential (single family and/or multi-family). These seven interchanges will be located at Highway 49, Rocky River Rd., Harrisburg Rd., Blair Rd., Fairview Rd., Lawyers Rd., and Idlewild Rd. Office and industrial land uses have been recommended for areas around three of the interchanges in northeastern Mecklenburg County at Mallard Creek Rd., I-85 North and North Tryon St. The recommended land use for the area surrounding the Albemarle Rd. interchange is office and/or industrial. The proposed land use at the remaining interchange at Prosperity Church Rd. is for a village/town center. The face of these rural, countryside communities, as we now know them, will be forever changed by the construction of these interchanges.

Development of I-485 will transform many rural areas into urban corridors.

"Muddy trashy creeks makes me feel terrible. I want to clean it up...start a club, a campaign!"

Alberta Watkins
Independence High School

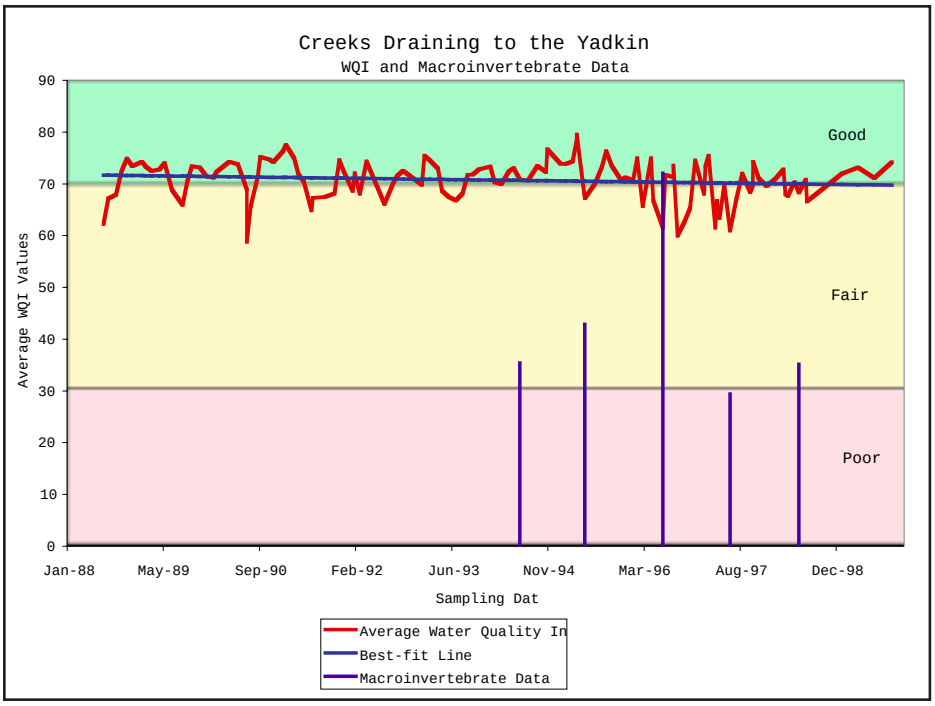
More Pavement Means More Pollution

In an effort to document changing water quality conditions within the basin, monitoring has been conducted by the Mecklenburg County Department of Environmental Protection (MCDEP) at numerous sites within the basin since the late 1970s. Water samples are tested for fecal coliform bacteria, physical and chemical parameters, as well as metals. The data indicates that, historically, the primary pollutants within the basins have been turbidity from suspended sediments and fecal coliform bacteria. Turbidity is a measure of the amount of suspended solids in a water sample. Most of the turbidity in streams is caused by sediment loss from construction sites and from eroding streambanks. Fecal coliform bacteria is found in the intestine of warm blooded animals, including humans. Fecal coliform bacteria can indicate the presence of sewage as well as harmful pathogenic bacteria.

Currently there are ten water quality monitoring sites located within the eight sub-basins that are monitored quarterly. The creeks that are monitored include Clarke, Mallard (two sites), Back, Stevens, Goose, Clear, McKee, Reedy and Rocky River. Monitoring conducted during 1999 indicates that the primary pollutants throughout the basin continue to be turbidity from suspended sediments and fecal coliform.

Sediment is harmful to overall water quality as it can cover stream beds thus destroying aquatic habitat and covering fish eggs. If enough sediment accumulates in the stream bed, the water conveyance capacity of the stream can be reduced resulting in increased flooding potential. When streams have excessive amounts of suspended sediment the aesthetic value of the stream is also diminished. In addition, suspended sediments can increase the amount of fecal coliform in streams as fecal coliform bacteria attaches to suspended sediment thereby increasing harmful bacteria counts. High fecal coliform counts in creeks can also increase health risks to humans during contact. This can be especially true when children come in contact with waters that have high fecal coliform bacteria concentrations and inadvertently ingest some of the water while playing.

In addition to physical and chemical water quality monitoring, MCDEP also conducts biological monitoring at all of the aforementioned sampling locations as well as two additional locations on Toby Creek. Biological monitoring determines the number of different species, or taxa richness, of aquatic macroinvertebrates such as stoneflies, mayflies and caddisflies that are present in the stream. The presence or absence of these pollution sensitive aquatic insects help to determine the overall health of the stream. Aquatic



macroinvertebrates are ideal water quality indicators because they are sensitive to changes in water quality and are found in all types of aquatic habitats. They are also less mobile than other aquatic dwellers, such as fish, and are unable to relocate if water quality conditions worsen.

MCDEP uses the physical and chemical water quality data to compute a water quality index (WQI) value for each specific sub-basin. The WQI values are expressed numerically from 0 to 100. The WQI numbers correlate to a ranking ranging from Very Poor (0-15) to Excellent (85-100). While the surface water quality in the Yadkin basin is better than average compared to other streams in the County, the WQI "best fit line" for the creeks in the basin shows a downward trend in water quality.

The WQI value for waters in the Rocky River sub-basin have decreased from "Good" in 1995 to "Fair/Good" in 1999. Waters in the Clarke Creek sub-basin have dropped from a "Fair/Good" WQI rating in 1995 compared to a "Fair" rating in 1999, while the Back Creek sub-basin has seen its WQI rating drop from "Good" to "Fair" over the same period. The Reedy Creek and McKee sub-basin WQI ratings have remained constant at "Fair/Good" over the last five years, Clear and Goose Creeks have seen their ratings drop from "Good" in 1995 to "Fair/Good" in 1999. The North Carolina State Division of Water Quality (DWQ) has recently added McKee, Clear and Goose Creeks to a list of impaired streams within the State due to high sediment and fecal coliform concentrations. Sections of Goose Creek in Mecklenburg County were once the home of an endangered species of mussel, the Carolina Heel Splitter. It is not difficult to see that recent development has taken its toll on the waters of the Yadkin basin.

Mallard Creek has some of the poorest water quality in the entire basin with WQI values in the "Fair" range. The primary pollutants found on the lower reaches of Mallard Creek are nutrients such as nitrogen and phosphorus. These pollutants are especially prevalent at the monitoring site located downstream of the Mallard Creek Wastewater Treatment Plant (WWTP). Excessive nutrients in surface waters can lead to algae blooms which can deplete the water of precious oxygen that aquatic organisms need. The primary source for these nutrients is the Mallard Creek WWTP which can process 8 million gallons of sewage per day (MGD). Due to increased recent development in the area, there are plans to expand the facility's capacity to 12 MGD. Secondary sources of nutrients include yard fertilizers and waste from wild and domestic animals.

The headwaters of Mallard Creek flow adjacent to a new development.

The Fate of the Yadkin Basin is in Our Hands

Is it too late to save the waters of the Yadkin River basin? With new development and construction continuing at a record pace, it will be a difficult challenge to preserve these precious natural resources. Mecklenburg County has initiated programs that will help to preserve and protect surface waters. One such program is increased erosion control inspections, especially on single family lots, which will help to ensure that sediment loss from these sites is kept to a minimum by installing and maintaining effective erosion control devices. An intensive monitoring program has been initiated in the Yadkin Basin that will identify stream sections with high fecal coliform concentrations and then locate and eliminate sources such as sewer overflows and illicit sewage connections. Additionally, implementation of the Stream Buffer Ordinance, which will require buffers along all undeveloped streams in the County, will help to ensure protection of our surface waters. Together, with the help of concerned citizens, these measures and other innovative strategies will protect and preserve the water quality resources of the Yadkin basin and all of Mecklenburg County.

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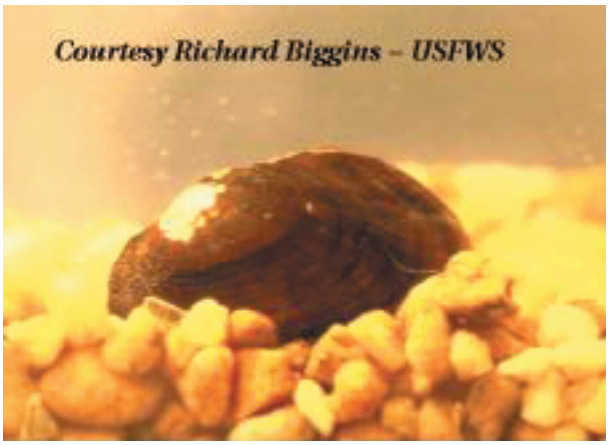
PROTECTING THE ENDANGERED CAROLINA HEELSPLITTER IN GOOSE CREEK



Goose Creek is home to the endangered Carolina Heelsplitter (Lasmiogona decorata).

The Carolina heelsplitter (Lasmigona decorata), a small yellowish brown mollusk related to clams, oysters and scallops, is native only to the Carolinas. The mussel is historically known to exist within the Catawba River and Pee-Dee River systems in North Carolina and the Saluda and Pee-Dee River systems in South Carolina. It is presently thought that only three populations are still surviving—Waxhaw Creek and Goose Creek in Union County, N.C., and a short reach of the Lynches River and Flat Creek, a tributary to the Lynches River, in S.C. During the late 1980s, the U.S. Fish & Wildlife Service conducted status surveys of the remaining populations of the mussel. The survey determined that the heelsplitter has been eliminated from most of these original sites. Because of its decline, the Carolina heelsplitter was added to the federal endangered species list in June 1993.

Years of habitat alteration and water quality degradation are believed to be the main reasons for the species extirpation from its historic range. Increased suburban residential development and incorrect agricultural operations near the headwaters of Goose and Stevens Creeks in southeast Mecklenburg County provides sources of pollutants found in stormwater runoff. Stormwater pollution, also know as nonpoint source pollution, originates from diffuse sources of everyday activities. The pollutants are carried down stream in Goose Creek into Union County, severely degrading the aquatic environment. "The mussels are like living rocks," explains Kate Pipkin, a conservation biologist with the N.C. Wildlife Resources Commission. "Because they filter water and are relatively stable in their stream bed, the mussels cannot escape pollutants from upstream. Their numbers decline when the water is not right." Consequently, the mussels are good indicators of water quality. "They require streams with well oxygenated clean water with stable streambanks of large trees providing shading and woody debris," says Pipkin.

The N.C. Wildlife Resources Commission, a division of the State's Department of Environment & Natural Resources, and the Mecklenburg County Department of Environmental Protection recently began conservation efforts to drastically improve water quality in the Stevens and Goose Creeks watershed. Planned construction of miniature stormwater wetlands in an urban neighborhood in Mint Hill and the recent promulgation of county stream buffers, part of Mecklenburg County's Surface Water Improvement & Management initiative, will help provide water quality protection by filtering pollutants and providing storage of flood waters flowing downstream into heelsplitter habitats. Also, community education and involvement in the protection of the watershed headwaters will be encouraged to help reduce pollutants from the misuse of household and lawn chemicals. Four water quality related educational presentations are planned to be held in Mint Hill in 2000 and will hopefully generate interest and long term stewardship in the sustained recovery of the heelsplitter. Mecklenburg County currently monitors many chemical, physical and biological parameters and will continue to do so in order to assess the improvements in water quality flowing down stream from the watershed.

"The overall success of the heelsplitter recovery depends upon the conservation efforts of the people that are connected to the species by their work, their land, and their actions" —NC Wildlife Resources Commission.

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Staying Above Water: Floodplain Initiatives in 1999

Flood waters threaten a house along Little Sugar Creek.

According to the Federal Emergency Management Agency (FEMA), 1999's Hurricane Floyd alone was responsible for 13 hurricane-related disaster declarations, the most authorized for any single disaster. The 1993 Mid-west floods held the previous record with nine declarations. Nearly $514 million has been poured into Hurricane Floyd recoveries, including more than $277 million for North Carolina, the hardest hit of the Floyd-damaged states. Although Mecklenburg County was spared Hurricane Floyd's wrath, Charlotte-Mecklenburg has a history with flooding:

- Over $50 million in insured and uninsured losses resulted from local storms in 1995 and 1997;
- $13 millin in insured losses have been paid since the mid-70's;
- 1530 flood insurance policies in force;
- 2000+ structures in the floodplain (approximately 1400 residential and 600 commercial properties). Floods are natural processes. They are part of dynamic and complex systems that provide many environmental benefits. Throughout time, floods have shaped the landscape, carved out habitat for wildlife and sowed the lands with rich, fertile soils.

Unfortunately, the most lasting impression left by floods has been one of destruction. Floods have become our nation's greatest natural disaster, disrupting lives and often causing significant economic impact. Flood events also impact the environment by carrying pollutants from impervious areas into streams and by scouring away streambanks.

In 1999, Mecklenburg County completed several aggressive initiatives

As Mecklenburg County has grown, the new buildings, roads and parking lots we have constructed have changed the natural system. When the land draining to the creek (termed "watershed") was more natural, the rainwater soaked into the ground, flowed slowly across the land and had its pollutants filtered by soils and plants. In these undeveloped lands, floodwaters only swelled so high and basically nothing stood in the path of the flood. However, with development, not only is there more rainwater skidding across roads and parking lots, but it is making a speedier plunge. Therefore, the rainwater does not soak into the ground as much and travels over the land faster, which reduces the quality of water in streams and lakes. Also, the levels of the floodwaters get higher and people find themselves and their structures in the path of a flood.

In 1999, Mecklenburg County completed several aggressive initiatives centered on the following objectives:

- to prevent or reduce the loss of life, disruption of vital services, and damage caused by floods
- to preserve and restore the natural and beneficial functions of the floodplains.

These objectives are the backbone of the Mecklenburg County Floodplain Guidance Document, which clearly outlines how meeting the above objectives also takes into consideration other goals. It recognizes that protecting water quality in creeks and keeping structures and people out of harm's way also can have a positive impact on the physical and economic health of a community. The creeks and surrounding lands can be used to support community values, such as improved water quality, open space, greenways, ball fields and wetland areas. The following four initiatives supporting multiple goals were completed in 1999:

- adopted Hazard Mitigation Plans
- secured $12.2 million in Hazard Mitigation Grant Funds (Hurricane Fran) to purchase 116 structures in the floodplains of Little Sugar and Irwin Creeks
- secured $940,000 in North Carolina Clean Water Management Trust Fund (CWMTF) to construct wetlands in the floodplain
- adopted new floodplain regulations that set aside more land for the passage of floodwaters.

Hazard Mitigation Plans

In April 1999, the Mecklenburg County Board of Commissioners adopted Hazard Mitigation Plans (Plans) for the four watersheds with the highest number of structures at risk of flooding and the poorest water quality. These include upper Little Sugar, Briar, McMullen, and Irwin Creeks.

The Plans' recommended alternatives include removing buildings from the floodplain, elevating buildings in place, floodproofing buildings, constructing levees or floodwalls, and constructing storm drainage improvements. The Plans are a result of detailed analyses of flooding problems along major creeks in each watershed. Development of the Plans also took into account the potential location of future greenways and possible water quality improvements.

Public meetings for each watershed were held in July and August of 1998 to gather input on the flood problems and potential solutions. Information from these meetings was incorporated into the Plans and public comment summaries are included as an appendix in each Plan. The draft Plans, including color maps, were posted on Storm Water Services web page to solicit additional comment. The adopted Plans may be viewed by accessing http://www.co.mecklenburg.nc.us/coeng/Storm.

In 2000, after the completion of new floodplain maps, hazard mitigation plans will be developed for the surrounding watersheds. The focus of these plans will be to identify not only the structures that currently flood, but also those prone to flooding in the future as the watershed is fully developed.

While carrying out the recommendations outlined in the Plans hinges on funding, the Plans enable the County to respond to potential Federal and State funding opportunities more quickly and in a more reliable manner, as was the case with Hazard Mitigation Grant Program (HMGP) Hurricane Fran Disaster funds.

$12.2 million Hazard Mitigation Grant Funds (Hurricane Fran)

Although Mecklenburg County did not receive any damages as a result of Hurricane Fran, the County was able to secure $12.2 million in state, federal and local funding for the acquisition of 116 residential structures built in the floodplain in the 50's and 60's - prior to the current Floodplain Regulations. These funds were made available through the HMGP administered by Federal Emergency Management Agency (FEMA). Through the planning process mentioned above, as well as the automation of benefit-cost programming using Geographic Information Systems (GIS), Mecklenburg County was capable of quickly developing grant applications to secure remaining Hurricane Fran funds just prior to the project close-out.

The eligible properties were in six neighborhoods, three of which are in the Little Sugar Creek watershed, which has a history of poor water quality. The other three neighborhoods are in the Irwin Creek watershed, which has fair water quality.

Acquisition of these structures is anticipated to begin in March of 2000 and should take approximately two years to complete. This is a voluntary program and the participation by flood-prone property owners will ultimately dictate the timing of the project and use of the acquired land.

The properties acquired through the HMGP mentioned above will be deeded to Mecklenburg County after acquisition. With these 116 structures removed from the floodplain, there is the potential for over 56 acres of floodplain property to be restored, allowing it to provide its "natural and beneficial functions" to the community – including open space, greenways, stream buffers, wetlands, or a combination thereof.

$940,000 from CWMTF

Mecklenburg County, in coordination with the City of Charlotte, submitted a grant application to the Clean Water Management Trust Fund (CWMTF) for the creation of wetlands in each of the six neighborhoods identified in the HMGP buy-out project areas. The grant was awarded in the amount of $940,000. The highest priority wetland site is along Wellingford Road. This is an area in the Hidden Valley neighborhood located in the upper portions of Little Sugar Creek.

The objectives of the wetlands project is to reduce pollutant loading in Little Sugar Creek by 70% for phosphorous, 80% for suspended solids, and 60% for fecal coliform counts. Acquisition of the structures is anticipated in March of 2000 and construction of the wetland areas is projected for December of 2000.

The above three initiatives address the planning and restoration of the environment where development has already occurred. The fourth initiative, completed in 1999, focuses on preventing flooding as well as enhancing the beneficial uses of the floodplain in areas where properties have yet to be developed.

Little Sugar Creek spills over its banks into a south Charlotte neighborhood.

New Floodplain Regulations

Numerous communities across the United States have to deal with outdated FEMA floodplain maps. Floodplain maps are used to determine flood insurance rates and to educate the public on potential flood risks. The existing floodplain maps are more than 10 years old for over 50% of the communities that participate in the National Flood Insurance Program (NFIP). Mecklenburg County is experiencing significant development and the accuracy of the FEMA floodplain maps have been a concern for some time. With the continued increase in building activity and flooding in certain areas not depicted on the FEMA maps, the County has recognized the critical need for accurate floodplain maps. In addition, there has been a realization that new development in and around floodplains must be protected from "future" flooding and degradation of water quality that is expected from increased development upstream.

Based on a pilot study of Mallard and McAlpine Creek watersheds, flood elevations on the old FEMA maps are too low and greatly underestimate the actual risk of flooding. In fact, the 100-year flood elevations may be as much as three to four feet too low. Therefore, Mecklenburg County, the City of Charlotte, and the surrounding Towns adopted an interim policy that requires buildings to be 5.7 feet higher than the FEMA 100-year flood elevations. Previously, the requirement was to build only a foot above the FEMA flood elevations. The interim policy will be in effect until the new maps are adopted in the summer of 2000. The BOCC also adopted an amendment to the Floodplain Regulations which stipulates that new floodplain maps will be developed based on ultimate development capacity in the watershed.

During 1999, Mecklenburg County not only wrestled with how high structures in the floodplain should be elevated, but actually where they can be built. This area in the floodplain reserved for building is termed the "fringe." Old FEMA maps were drawn to maximize the amount of land available for development. This resulted in a minimum amount of area set aside for floodwaters – termed "floodway" area (no-build zone). The old FEMA maps allocated 50% of the floodplain to fringe areas and 50% to floodway areas. The new maps will be drawn such that essentially only 25% of the floodplain will be available for development (fringe areas) and 75% of the floodplain reserved for floodwaters (floodway). This change was brought about by an increasing interest to protect against future flood losses, coupled with a greater effort to protect our environmental resources.

These more restrictive regulations were developed in conjunction with the SWIM Stream Buffers initiative. To offset restrictions that these regulations place on development, incentives and mitigation allowances were included in the Zoning Ordinance. With the Floodplain Regulations and the SWIM Buffer Regulations working together, there will be larger areas set aside than before for the floodplain to perform its natural and beneficial functions, which include conveyance of flood water, filtering of pollutants, allowing channels to meander naturally, and preservation of wildlife habitat.

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STREAM FISH HABITATS ARE BEING RESTORED

The fish in Mecklenburg County streams are making a come back. In 1999, the Mecklenburg County Department of Environmental Protection (MCDEP) fisheries biologist was amazed at the number and variety of fish found in a sample taken from Little Sugar Creek. Fourteen different species of fish were found in the stream. This was a vast improvement over the fish sampling results reported in a September 1969

Charlotte News article in which Dr. Edward Menhinick, a University of North Carolina at Charlotte fisheries biologist, reported finding no fish in Little Sugar Creek after several hours of searching.

n the late 1960s and early 1970s, Mecklenburg County's streams were severely polluted. The primary pollutants in the streams at that time included the discharge of partially treated wastewater from small, poorly operated wastewater treatment plants, failing septic systems, illegal connections to the storm drain system, pollutants in stormwater runoff, sedimentation from construction sites and streambank erosion. The majority of these problems now have been addressed by Charlotte-Mecklenburg Utilities, the Mecklenburg County Health Department, Mecklenburg County Storm Water Services (MCSWS) and MCDEP. The combined action of these agencies has resulted in substantial improvements in the water quality of the County's streams. The better water quality has enabled many of the more pollution tolerant fish species, such as the redbreast sunfish, to return to the streams.

Sediment Covering up Aquatic Habitat

Unfortunately, all is not well. Some of the pollution sensitive fish, like the darters, the eastern silvery minnow and the greenhead shiner, which historically had been present in urban streams like Little Sugar Creek, have not returned. These fish require fairly cool, clear water streams with rocky bottoms for reproduction. The stream bottoms of most of the County's urban streams have become covered with silt, sand and sediment from construction sites and streambank erosion, clogging the small spaces among the rocks and gravel where aquatic insects (fish food organisms) and small fish live. Fish spawning areas have become covered with sand and sediment preventing the successful reproduction of a number of different types of fish. Also, the majority of the urban streams have long stretches exposed to full sunlight resulting in warm streams choked with algae. Summer stream temperatures often exceed 80oF which may be lethal to some species of fish. Overall the lack of suitable fish habitats is preventing these fish from returning to the urban streams.

Every time it rains, the water level in Mecklenburg County's streams rises rapidly. This is most noticeable in the highly developed watersheds within the City of Charlotte. The owners of land adjacent to a stream can testify to the damage that rapidly rising stormwater has on streambanks. Each year some streambanks may lose as much as a foot or more of soil, especially in the erosion sensitive stream bends and turns. Such extreme erosion is threatening backyards, trees, fences, parking lots, outdoor storage buildings and even some homes.

Traditionally, hard engineering practices, such as the lining of streambanks with rip-rap rocks, have been used to stabilize eroding streambanks. These techniques were often accompanied by stream channelization, or the straightening of the stream, which required the removal of the protective streambank vegetation. One of the primary objectives of the traditional streambank stabilization approach, other than

Mecklenburg County Storm Water Services Little Sugar Creek streambank stabilization project combined hard engineering techniques (rip-rap) and soil bioengineering to stabilize the streambank.

stopping the streambank erosion, was to move stormwater downstream as quickly as possible, and little or no attention was given to the fish and other aquatic organisms that lived in the streams. The resulting stream channels often lacked habitat diversity as the natural stream characteristics (meanderings, pools, riffles and shading tree canopy) were removed resulting in a difficult environment for fishes and aquatic insects to survive in.

New Techniques for Fish Habitat Restoration

MCSWS is currently testing new techniques to stabilize eroding streambanks. New techniques include more environmentally friendly approaches to streambank stabilization such as soil bioengineering and aquatic habitat restoration.

Soil bioengineering is the specialized use of plants and plant material to stabilize the streambank by combining engineering principals with plant science. The use of plants on streambanks can be very beneficial to the environment because they provide habitat for wildlife, can filter pollutants from the water, provide shade to the stream, and their roots simply hold the soil in place.

Aquatic habitat restoration techniques used by MCSWS are designed to increase the diversity of stream velocities, simulate natural stream meanderings, and provide cover for fish and macroinvertebrates. Some of the structures that are being installed to restore aquatic habitats include current deflectors, boulder clusters, fish lunkers (which simulate undercut banks), plunge pool/drop structures and artificial riffles. The restoration of the natural diversity of habitats and canopy covering impacted by streambank stabilization activities will result in greater abundance and diversity of fish and aquatic macroinvertebrates.

Structures such as current deflectors, arranged in an alternating pattern, will simulate natural stream meandering. Deeper pools will develop at the ends of the deflectors and slow moving areas behind the deflectors will serve as refuge and shelter for young fish. Artificial riffles, constructed of boulders and rocks placed in a band across the width of the stream, will stimulate the production of aquatic insects and

2 years after construction, the vegetation has stabilized Little Sugar Creek's streambank in Huntingtowne Farms Park.

create shelter for young fish. Stream temperature problems will be reduced with the replacement of the stream's protective canopy cover through selective plantings.

One of the first soil bio-engineering streambank stabilization projects by MCSWS is located on Little Sugar Creek in the Huntingtowne Farms Park and was completed in 1997. The section of the stream at Huntingtowne Farms Park was eroding rapidly. Within just a one year time period prior to construction, storms caused up to 20 feet of the bank to erode. The project combined soil bioengineering and rip-rap to stabilize the channel. In two years, the plantings along the bank have grown considerably and are beginning to provide shade to the stream. Fish enhancement structures introduced into the stream channel included current deflectors and boulder clusters and fish lunkers (stabilized undercut bank structures). The current deflectors are beginning to create a meandering flow pattern in the stream channel. Fish sampling has shown that an abundance of fish and a good variety of different fish are residing in this segment of Little Sugar Creek.

A number of plunge pool/drop structures are also being installed in the County's streams. The first structures have been installed in Briar, Little Sugar, Long and McAlpine Creeks. These structures are constructed by placing rocks along the entire width of the stream. Some structures have been built to narrow the stream and increase the stream's velocity. The purpose of these structures is to provide cover for the fish and aquatic insects and to create deep pools in the stream where larger fish can find refuge. A preliminary sampling of the fish in the vicinity of these structures has shown a large number of fish are attracted to the structures. Also, down stream of these structures, deep pools are beginning to form.

Fish lunkers, or constructed bank overhangs, installed in Briar Creek provide cover and refuge for fish.

Hope for the Future

Long ago, fishing the streams of Mecklenburg County was an important recreational pastime for it's citizens. Thirty years ago, the streams were not a sanitary place to go. Very few people were fishing the streams for recreation. If changes in the approach to stabilizing eroding streambanks are successful, fishing will again become a popular pastime. The restoration of the vegetation along the streambank will support wildlife, such as birds, making a visit to the stream a pleasant experience. The increased diversity of habitats in the County's streams will, one day, encourage the return of the darter, the eastern silvery minnow, and the greenhead shiner to the urban streams, as well as stimulate a good bass and sunfish fishery. SOER

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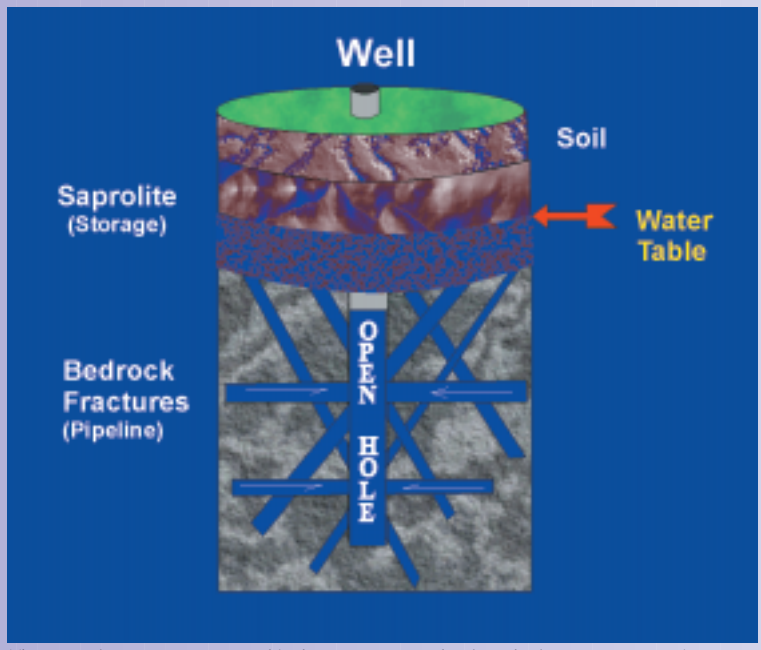
If you are a resident of Mecklenburg County and your home is not connected to the Charlotte Mecklenburg Utility system, the water you drink is most likely groundwater. The protection of your water supply is one of the most important things you can do for your health and well being. Twenty-nine percent of the Mecklenburg county residents are dependent on groundwater for their drinking water as compared to fifty-three percent of the population statewide. Groundwater is generally a safe source of drinking water, however, it is susceptible to pollution. If groundwater is not being used as drinking water is its protection an issue?

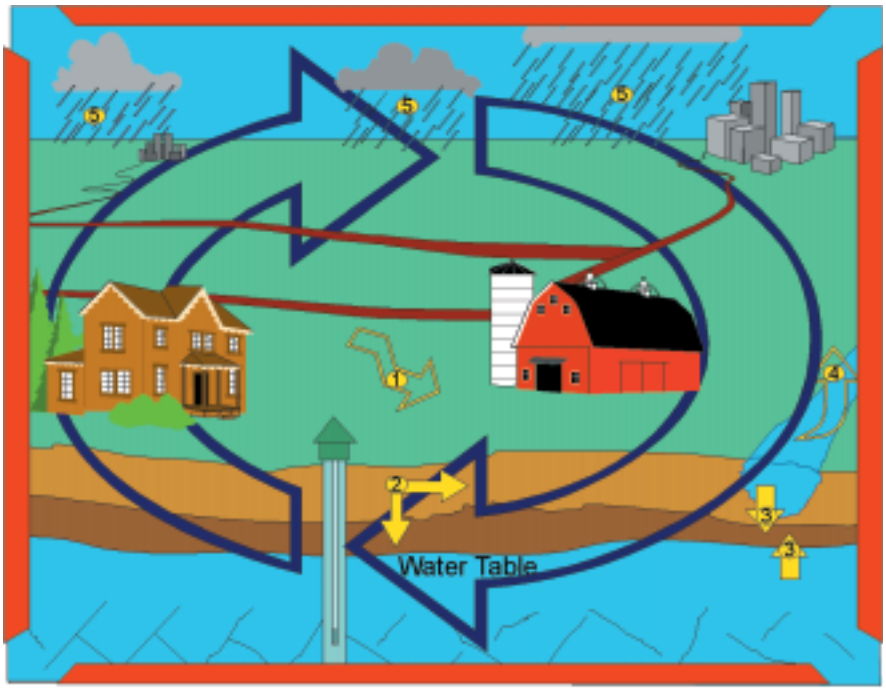
Mecklenburg County is located in the Piedmont of North Carolina. Bedrock in Mecklenburg County is a complex series of metamorphic (sedimentary and volcanic rocks that have been altered by heat and pressure) and igneous rocks (rocks that crystalize from magma). Soils in the area are residual, the result of weathering and decomposition of the bedrock. Residual soils which have the texture of soil but retain the appearance and structure of the bedrock are termed "saprolite." The saprolite contains water within the pore spaces of unconsolidated material and acts as a "reservoir" or storage area for the groundwater. Think of groundwater as water that fills the spaces between rocks and soil particles underground, in much the same way as water fills a sponge. This underground water system is called an aquifer. There are no geologic barriers in Mecklenburg County that protect the aquifer from spills and leaks that occur at the ground surface. The bedrock does not contain any significant pore space. It contains fractures within the bedrock which function like a "pipeline", transmitting water from one area to another. The flow through the pipeline is dependent on the ability of the water to move through the system (hydraulic conductivity) and the thickness of the aquifer.



The groundwater system in Mecklenburg County can be described as a storage pipeline system.

The "pipeline" is replenished from the "reservoir." Mecklenburg County's water table is found at various depths in the county, typically ranging from fifteen to fifty feet, and is generally located within the saprolite or "reservoir." Most of the drinking water wells in Mecklenburg County are located in the bedrock or "pipeline" portion of the aquifer.

Pollutants that contaminate groundwater may be some of the same pollutants that contaminate surface water. Surface water and groundwater are commonly connected hydraulically, but the interactions are difficult to observe and measure. Historically, in the Piedmont the interaction between the two systems has been ignored. Streams interact with groundwater in three basic ways; streams gain water through the stream bed from groundwater (gaining stream), streams lose water to groundwater by out flow through the stream bed (losing stream) or the stream can lose in some reaches of the stream and gain in other reaches. Because of this interaction, compounds found in surface water can move through the soil and end up in the groundwater. And compounds found in the groundwater may feed into streams,



The hydrologic cycle: (1) Surface water runoff; (2) water absorbed into the ground; (3) gaining and losing streams; (4) evaporation; (5) precipitation.

lakes and springs. For example, in at least two locations, Briar Creek has been contaminated with heating oil from leaking underground storage tanks. In both cases the releases were first identified when a petroleum sheen was observed seeping into the creek. Another example occurred along Little Sugar Creek where the four main components of gasoline (benzene, toluene, ethylbenzene and zylene) and an additive of gasoline (MTBE) were found in a storm water outfall. In this example it is believed that contaminated groundwater seeped into the storm drain which eventually discharged into the Creek.

The primary reason for protecting the groundwater in Mecklenburg County is to insure that residents of Mecklenburg County are not at a risk of drinking contaminated groundwater. This should always be the primary reason for protecting the groundwater, however the groundwater system is not an isolated system. Because surface water and groundwater are integrated portions of the hydrologic cycle it is pointless to clean up one resource and ignore the other. SOER

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Potential Sources of Groundwater Pollution

At this time there are a total of 1157 confirmed incidents of UST leakage within Mecklenburg County. Of the confirmed incidents of leakage, 331 of the sites have been cleaned-up and closed. An additional 134 have been determined to not have caused contamination and are closed. There are 581 sites which are open and currently being evaluated for cleanup and another 111 sites which are open and have been determined contaminated the soil, but not the groundwater in the area. These 111 sites are still being monitored.

Surface spills that are not promptly cleaned up may contaminate the groundwater.

In the last decade, the problem of contaminated groundwater has become more widely recognized with the passage of the Clean Water Act in 1987 and the Safe Drinking Water Act of 1991. These laws, combined with the overall increase in environmental awareness by the population at large and an increased demand on the available groundwater have helped to give importance to the issue of contaminated groundwater. In Mecklenburg County, the primary sources of groundwater pollution include accidental spills, underground storage tanks, above ground storage tanks, septic tanks and landfills. The primary pollutants associated with these sources are petroleum products (e.g., gasoline and heating oil) and chlorinated solvents (e.g., solvents and de-greasers). These types of pollutants act differently once they reach groundwater. For example, chlorinated solvents move more quickly and deeply than petroleum products.

Accidental Spills

Accidental spills occur when any potential contaminant is spilled onto the surface of the ground. If the contaminant is not promptly and effectively recovered it will often saturate the surface soil. Once the soil is saturated, the contaminant moves downward through the soil and partially weathered rock below the surface, until it reaches the water table, which causes contamination of groundwater.

How and where do these accidental spills occur? There are several ways in which pollutants are accidentally spilled. The most readily recognized spills are those that occur during an accident involving motorized vehicles where chemicals are spilled onto the roadway. Other accidents involving household items such as gasoline, heating oil, cleaners, motor oils and detergents, contribute to the amount of pollution in this category. Accidents like these occur when chemicals are spilled onto a lawn, a driveway, at an industrial facility, at a neighborhood business or when sewage systems back up causing them to overflow. In 1999, there were 79 accidental spills requiring emergency response and 331 incidents of sewage overflows requiring responses.

Underground Storage Tanks

Underground storage tanks (USTs) are a major source of groundwater pollution. In Mecklenburg County there are 6133 registered USTs of 1100 gallons in size or larger. Of these USTs, only 1923 are currently in use. Of the remaining, 3957 are closed or have been removed, and 253 are temporarily closed while under going cleanup work or while they are being upgraded. USTs can cause contamination to groundwater when they leak. The number of USTs of less than100 gallon capacity used in either residential or farm applications are unknown. Originally, USTs were constructed of steel. After years underground, these tanks would rust and holes would form. The holes would form in the tank itself, or in the pipes which carried the liquid from the tanks to dispenser. Most often, USTs were used for gasoline storage or for the storage of chemicals used in manufacturing.

In the early 1980's the subject of UST contamination and design was was addressed by the United States Environmental Protection Agency (USEPA), and the United States Congress. The result was a law that had requirements for all existing tanks to be upgraded with leak detection, corrosion protection, spill and overflow prevention. These upgrades could only be avoided by replacement of old USTs with new tanks meeting the higher standards. The owners that upgraded or replaced their USTs had to show that no previous groundwater contamination had occurred; however, if they had caused contamination of the groundwater they were required to remediate the site. All tank owners were required to show that they had the financial resources to cleanup any future spills should

Steel underground storage tanks corrode with time.

they occur. These upgrade requirements were to be completed by 1998 and apply to only those tanks that hold petroleum products. These new tanks should help prevent future groundwater contamination from UST leakage.

Common chemicals found in sites which have been contaminated by petroleum products include gasoline and heating oil components. Petroleum pollutants are found at approximately 88% of all the contaminated sites. These sites have a variety of chemicals and additives present in the groundwater. Once these products are in the groundwater they tend to separate because each different chemical has a different rate of movement. Gasoline is the most common contaminant present, and is found at approximately 70% of all sites in Mecklenburg County. Methyl tertiary-butyl ether (MTBE) is a gasoline additive that improves combustion in engines resulting in lower emissions and lower amounts of air pollution. MTBE has recently shown up in polluted groundwater.

Above Ground Storage Tanks

Above ground storage tanks (ASTs) are not regulated by the county or state, therefore accurate information on the total number of ASTs present, or the total amount of contamination caused by ASTs is not available. These tanks frequently contain heating oil, propane, commercial solvents, gasoline and assorted other industrial chemicals. It is common to find ASTs in older residential neighborhoods, industrial areas and rural areas. When a leak occurs in an AST it is frequently easier to detect it. Easier detection typically allows for more effective leak stoppage, which lowers pollution potential. However, if an AST leak it is not halted promptly, the resulting pollution potential is similar to the accidental spills discussed above and groundwater contamination can occur.

Septic Tanks

Septic Tanks are a form of under ground storage tank (UST). Currently there are over thirty thousand recorded septic tanks in Mecklenburg County, although there are no firm numbers on how many of these tanks are currently active. These tanks are the type of UST that most people are familiar with and they have the potential to contaminate groundwater with fecal coliform bacteria if the are not properly maintained. Further problems may arise when household chemicals are introduced into these tanks when inadvertently flushed down the toilet or poured down sink drains. Once these chemicals get into the septic system they tend to migrate rapidly into the surrounding ground. This may cause increased problems if the septic tank is positioned near a well. There are currently no mechanisms in place to determine the extent of contamination caused by septic tanks, other than by extensive on-site evaluations.

Landfills

Landfills have followed humans where ever they have traveled. Throughout history humans have discarded one form of refuse or another. Typically they have thrown their refuse in a hole and buried it. Today we have more sophisticated ways of burying our refuse, but the final reult still the same. We bury our trash.

Current federal regulations require that we use a lined landfill to dispose of our municipal solid wastes (MSW). This type of landfill has a lower barrier that is impermeable to help prevent the leakage of landfill liquids, thus preventing them from reaching the groundwater below. Most MSW landfill's in the past were unlined and must be monitored to ensure they are not contaminating the groundwater in areas where they are located. Mecklenburg County has a total of six unlined MSW landfills which were formerly permitted to operate but are now closed.

In addition to MSW landfills, there are several other types of unlined landfills permitted to operate within Mecklenburg County, which are not allowed to accept MSW or hazardous wastes. They are inspected on a monthly basis as required by their permits for operation within Mecklenburg County. They include fourteen Land Clearing and Inert Debris landfills(LCID's) and one Construction and Demolition Debris Landfill (C&D). LCID Landills of less than one acre in size do not

A landfill operation in Mecklenburg County.

Open Landfills in Mecklenburg County
Permitted Landfills in Mecklenburg County;
Construction and Demolition 1
Land Clearing & Inert Debris 14
Sanitary MSW 2

recieve a permit, but must have their locations recorded on the land deeds for the property. Tonnages for these non-MSW type landfills (LCID's and C&D's) are not currently available.

Though many waste professionals claim that the newer landfills should not be a problem because of their liner, no one disputes the fact that unlined landfills are a significant threat to groundwater quality over time. According to the State of North Carolina Department of Environment and Natural Resources, approximately 90% of closed unlined MSW landfills have had an impact on groundwater quality. Closed landfills which were previously permitted are not of as great of a concern as closed illegal and unpermitted landfills, since their true contents are unknown. For this reason, illegal or unpermitted landfills may require monitoring after closure.

Landfills of newer design which operate under proper permits, are not considered to have as much potential for contaminating groundwater. Not only are they inspected more thoroughly and more often, they are also designed to be a more secure containment system. As with USTs requirements for safeguards and early detection devices exist as an operational requirement. These precautions are required to provide warning of any problem before it seriously impacts the environment. SOER

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Closed Landfills in Mecklenburg County
Permitted Landfills in Mecklenburg County;
Ash Monofill 1
Construction and Demolition 1
Land Clearing & Inert Debris 33
Sanitary MSW 6

Non-Permitted Landfills in Mecklenburg County:
Land Clearing & Inert Debris 12
Stump Holes 2071
Sanitary MSW 9
Open Dumps 17

Underground Home Heating Oil Tanks - a Citizens Guide

There are two basic types of home heating oil tanks, above ground storage tanks (AST) and underground storage tanks (UST). ASTs are visible and when a leak or spill occurs it is apparent. This is not always true with USTs. Typically, these tanks are constructed of steel and can range in size from 50 gallons to several thousand gallons. One of the greatest misconceptions is that residential heating oil UST's are regulated the same way gasoline station tanks are regulated. Actually, USTs that are home heating oil tanks are exempt from technical requirements. This means that UST home heating oil tanks do not have to install a leak detection device, corrosion protection or spill and overfill prevention. Owners of underground home heating oil tanks are not required to sample the soil when the system is closed out. In fact, unless there is a spill or release from the home heating oil UST there are no reporting requirements.

What should you do with a home heating oil tank that is no longer in use? Home heating oil tanks are exempt from the state regulatory closure requirements. Even though a home owner is not required to close a UST, a tank owner is advised to remove any product from the tank once it is no longer in use in order to limit the chances of a leak or spill. It is also recommended that the tank is removed from the ground or that it is abandoned in place. If you select to abandon the UST in place, filling the UST with inert material such as sand, cement or foam will bind any petroleum sludge in the bottom of the tank. This also will weight the tank system down so it will not float to the surface of the ground. You do not need to contact the Mooresville regional office unless you discover signs of a leak, spill or soil contamination. However, if there is a release or spill from the tank then you must report the spill to the North Carolina Department of Environment and Natural Resources (NCDENR) (704) 663-1699. Typical signs of a leak or spill include stains on the soil, strong petroleum odors, puddles of oil and dead vegetation.

Why should you bother with the cost and hassle of properly abandoning a home heating oil UST system after it is no longer needed? The answers to this question are numerous, but the bottom line is the cost of preventing soil and groundwater contamination are small compared to the cost of cleaning up a leak or spill from a UST. Also, lending institutions may not be willing to loan money with the property as collateral if the home heating oil UST system is not closed out properly. Lastly, real estate transactions become problematic when an old improperly abandoned UST is found on site.

Why do UST's leak? Typically it is a result of the steel tank or piping corroding with time. Once the steel has been corroded the break in the system allows product to exit. Another common problem occurs when the fill pipe has been broken off. Many times this happens after it has been run over by a lawn mower or other yard equipment; other times the cap to the fill pipe has been simply removed. When the fill pipe is broken or left open, rain water can enter the UST system causing the heating oil to float on the water and eventually flow out of the fill pipe to the surface of the ground. Remember that it is the homeowner's responsibility to report the spill to NCDENR.

If a leak occurs, who is responsible for cleaning up the contamination around the UST? If the UST has been used on or after November 8,1984 then the current property owner is the tank owner. If the UST was taken out of use before November 8,1984 then the last person to use the UST is considered the tank owner. There is financial assistance for the tank owner through the Noncommercial Leaking Petroleum UST Cleanup Fund that will pay up to one million dollars for reasonable and necessary costs directly related to the cleanup of a petroleum release from your UST, but the fund will not pay for attorney fees, tank removal costs or excessive or unnecessary work. It is important to work closely with the NCDENR regional office in Mooresville to ensure that the work is within the cleanup fund guidelines. Unfortunately leaks or spills from aboveground storage tanks are not covered by the Noncommercial leaking UST cleanup fund.

If you are responsible for cleaning up a leak or spill from a home heating oil UST, what should you do after you report the contamination? First, soil samples need to be taken to determine how much contamination is present. Typically, these samples need to be analyzed for total petroleum hydrocarbon concentration. Groundwater samples may also need to be taken if the water table is close to the contaminated soil. These samples must be analyzed by a certified laboratory to ensure that the sampling is completed according to NCDENR guidelines it is recommended that a professional consultant is retained. Depending on the concentration and on the extent of contamination, further assessment of the site may be necessary. The NCDENR Regional office in Mooresville will be helpful in determining what further steps are needed. If further action is required, you will likely have to hire a professional to assess the site and clean up the contamination.

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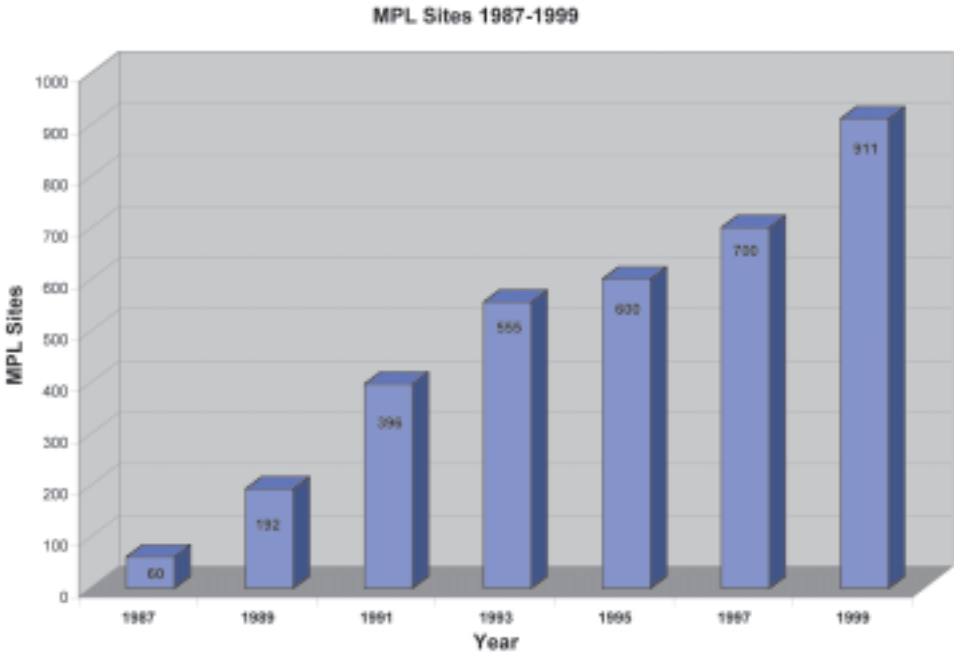
Groundwater Contamination in Mecklenburg County

There are currently 911 sites where pollution release incidents have occurred in Mecklenburg County. Some of the sites have minor soil contamination and other sites have contamination that has extended into the groundwater. So far, 479 pollution release incident sites have been evaluated resulting in the identification of 186 contaminated wells located near 42 of the release sites.

In 1989, the Mecklenburg Priority List (MPL) was established in response to the need for a more aggressive program to protect to citizens from drinking contaminated groundwater. The MPL program is the only program of its kind in the region that actively investigates contaminated sites to insure that residents are not drinking or at a risk of drinking contaminated groundwater. The program does not duplicate the State's efforts in addressing the clean up of contaminated sites.

A site is added to the MPL when information is provided that reports contamination of soil or groundwater. The MPL is a compilation of the federal National Priority List (NPL or Superfund), the State Priority List, the State Priority Pending List, the NCDENR Incident List and the Non-discharge Permits for Mecklenburg County. Sites may be added on a case-by-case basis if the land use activity and the potential to impact the groundwater is considered significant. In 1999 landfills were added as MPL sites. The MPL's are subdivided into active, inactive and unknown sites. Active sites have wells within 1500 feet of the site, inactive sites do not have wells within 1500 feet of the site and unknown sites have not been investigated. To date, 85% of the sites on the list are active or unknown sites.

In 1999, the Mecklenburg County Department of Environmental Protection investigated 90 MPL sites. Sixty-eight were active sites where a total of 956 wells were identified within 1500 feet. Currently, over 2850 peo-



MPL Sources of Information on Groundwater and Soil Contamination

North Carolina Department of Environment and Natural Resources (NCDENR) Mooresville Regional Office

North Carolina Department of Environment and Natural Resources (NCDENR) Superfund Section Mecklenburg County Department of Environmental Protection (MCDEP)

US Environmental Protection Agency (EPA) Federal Superfund List

Non-discharge permits for Mecklenburg County

ple are using groundwater as a drinking water source around these sites. In 1999, sampling was performed on 211 wells. Fortunately only two of the wells showed contamination above the EPA drinking water standards. In both cases, the contaminant was tetrachloroethylene.

The MPL program is unique because the focus is to aggressively search for contaminated drinking water wells. When contamination is identified in a drinking water well, there is direct contact with the resident or home owner to insure that they are aware of the contamination. It is the goal of the program to work with the residents and with local, state and federal agencies to ensure that all citizens have a safe permanent drinking water source. If the responsible party for the contamination can not be identified and the contamination is not at a level for state or federal involvement, the owner becomes responsible for obtaining an alternative source of drinking water. Filtering the groundwater may be the only option if Charlotte-Mecklenburg Utilities water or some other water supply is not available; however, filtering groundwater to remove contamination can be very costly and often cost prohibitive for a typical homeowner.

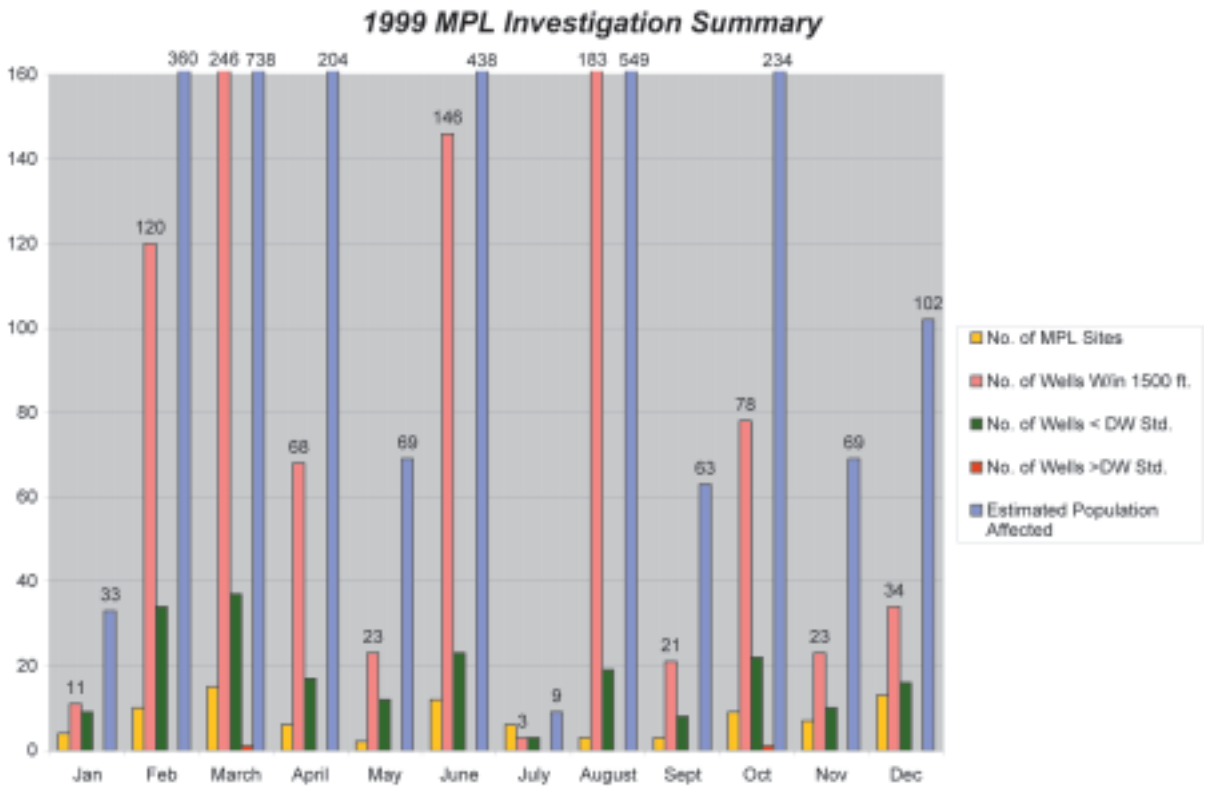
Zip codes 28208, 28205 and 28206, located in the central and western portions Mecklenburg County, have more than 70 MPL sites each. In 1997, only

Tetrachloroethylene (PCE)

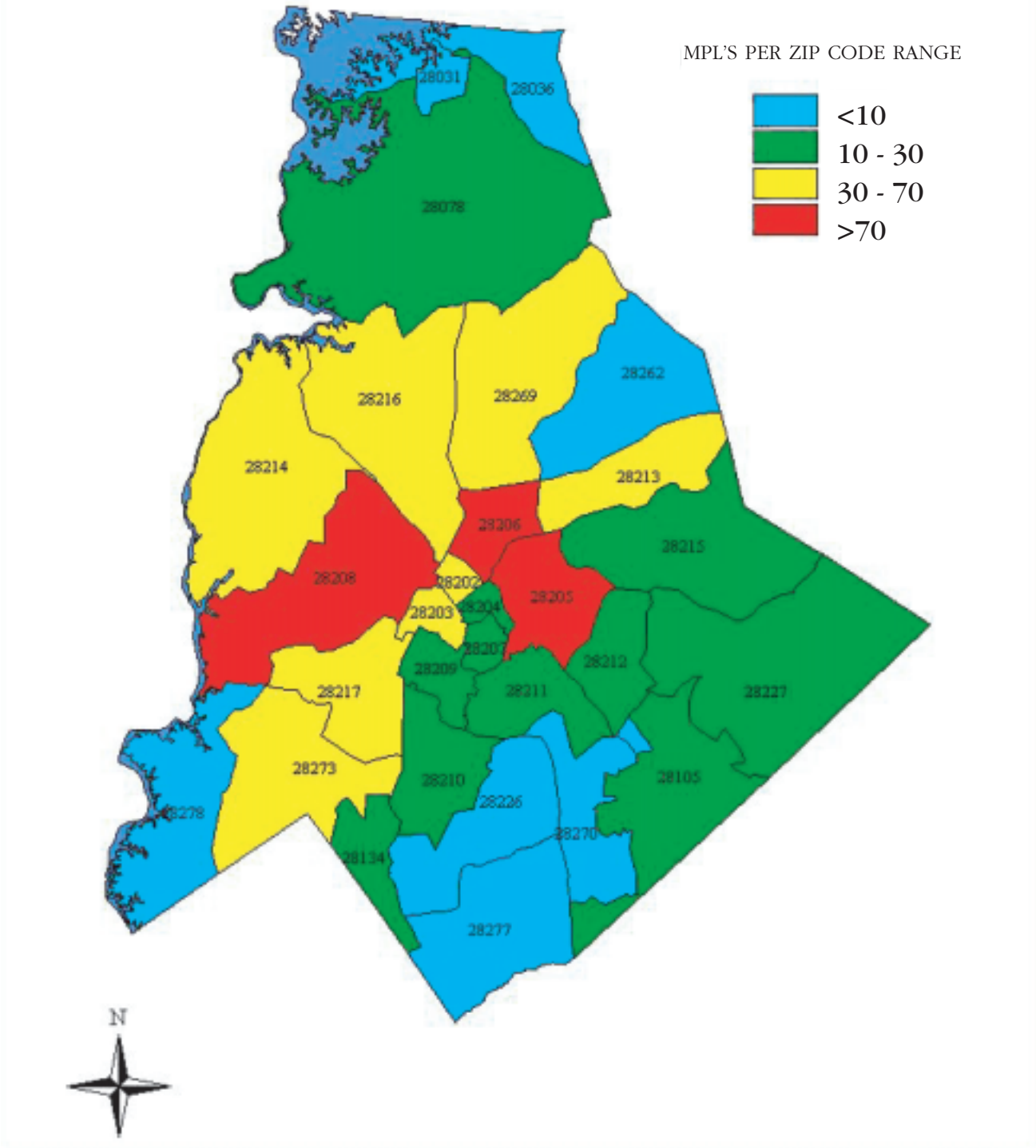
Tetrachloroethylene (PCE) is a colorless organic liquid with a mild chloroform-like odor. Its greatest use is in the textile industry, and as a component of aerosol dry-cleaning products. The maximum contaminant level (MCL) allowed in drinking water for tetrachloroethylene is 5 parts per billion (ppb). Some people who drink water containing tetrachloroethylene in excess of the MPL over many years could have problems with their livers and may have an increased risk of getting cancer.

In 1986, 405 million pounds of PCE were produced. Major releases of tetrachloroethylene to air and water are from dry cleaning and industrial metal cleaning or finishing. From 1987 to 1993, according to EPA's Toxic Chemical Release Inventory, tetrachloroethylene releases to land and water totaled over 1 million lbs. These releases were primarily from alkali and chlorine industries which use it to make other chemicals. The largest releases occurred in Louisiana and South Carolina.

PCE released to soil will readily evaporate or may leach slowly to the groundwater. The break down by soil microbes is slow. PCE released to water will primarily evaporate and has little potential for accumulating in aquatic life.



Mecklenburg County Priority List Sites (MPL's)



zip code 28208 had more than 70 sites. There were also increases in the number of MPL sites in zip codes 28216, 28269 and 28213 where each area had 30-70 MPL sites. The southern portion of the county and the northern portion of the county have the fewest MPL sites. All of these areas have people that rely on groundwater as a source of drinking water.

EPA Team investigating the extent of contamination at a drycleaning facility.

Case History

How does a site become an MPL site? What exactly happens from that point? To answer these question lets look at one local MPL site. On the eastern border of Mecklenburg county there was a dry cleaning facility that operated from 1977 through 1993 until the owners filed bankruptcy. Groundwater is the only source of drinking water in this area, and it is estimated that 120 people live within 1500 feet of this facility. The facility used various chlorinated solvents (Tetrachloroethlyene, Trichloroethylene and 1,2 Dichloroethene) and mineral spirits in the cleaning process. The chemicals were stored in 55 gallon drums as well as above ground storage tanks behind the building. Chemicals used in the cleaning process were put into a metal dumpster on site and were also stored in 55 gallon drums. These used chemicals were periodically removed by a regulated company for proper disposal. The building also has a septic tank and septic drain field which were used during this same time.

An inspection of the facility by MCDEP in April 1991 revealed 49 unsealed, unmarked drums of hazardous waste on a loading dock on the west side of the building and an illegal boiler blowoff discharge draining toward surface water. The site was reported to the North Carolina Department of Environment and Natural Resources Groundwater and Hazardous Waste Sections. The Hazardous Waste Section became the lead agency and issued a Notice of Violation in July of 1991 and an administrative penalty in 1992. Upon investigation, it was determined that the property was contaminated and the site became an MPL site. Drinking water wells and one spring (used as aother drinking water source) adjacent to the property were sampled. The analyses showed the well on the facility site, the spring and two additional private drinking water wells had contaminants above the drinking water standards. The residents and the owner of the facility were advised not to use the water for drinking or cooking and to limit their shower times.

The Charlotte-Mecklenburg Utilities water system was located three miles away, so the residents were dependent on groundwater as a drinking water source. Bottle water was provided by the company causing the contamination for a short period of time and then by the NCDENR. Through the MPL Program, six of the most affected wells were tested eight times between 1991 and 1994 for the purpose of monitoring the concentration of the contaminants in the wells. Additional wells in the area were tested with less frequency. The EPA was contacted when the levels in one of the wells exceeded the EPA Emergency Action Level. At that point, the EPA became the lead agency and through an emergency response fund, installed carbon filters on three private wells that exceeded the drinking water standard. MCDEP has continued to monitor off-site wells near this facility in addition to the wells equipped with carbon filters to verify the filters' contaminant removal efficiency through a cooperative agreement with EPA and NCDENR.

EPA is currently determining the extent of contamination at the facility and will determine what actions need to be taken to clean up the facility. Until the site is cleaned up adjacent wells that have not been contaminated or wells that have an EPA treatment system will be sampled periodically. SOER

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A REGIONAL PERSPECTIVE ON GROUNDWATER

The Mooresville Region is one of seven subdivisions for the North Carolina Department of Environment and Natural Resources (NCDENR), and includes Mecklenburg and the 10 surrounding counties. The department through its Groundwater Section is responsible for protection of the groundwater throughout the 11-county region. Approximately 55 percent of the people in the region use groundwater and wells for their water supply, although the percentage is lower for Mecklenburg County due to the extensive network of municipal water lines throughout the county. The same number of people in Mecklenburg and the surrounding counties who get their water from groundwater is roughly the same as the number of people who get their water from Mountain Island Lake. Many of the wells in the county and the region are private wells serving a single-family dwelling, while others are community wells serving 15 or more households. Regardless of the type of well, water quality and quantity are important issues for these 600,000 groundwater users.

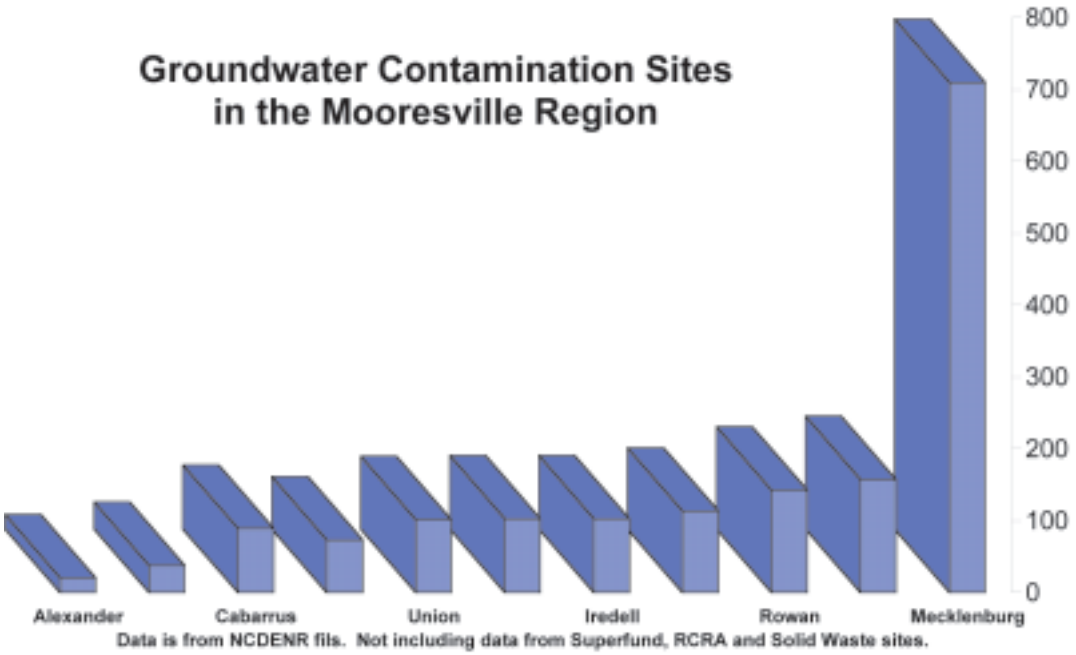
Groundwater Quality

In the 1970s and 1980s, the State Groundwater Section routinely checked the groundwater and found it to be of good quality. In general, the naturally occurring groundwater in the Mecklenburg area is not hard or saline and does not contain an unusually high metal content such as iron in the water. Mecklenburg County has continued with a program to check the quality of groundwater and has confirmed the earlier findings for groundwater throughout the county.

In the 11 counties that make up the Mooresville Region, nearly 4,000 contamination sites have been reported. At about half of these sites, only the soil is known or reported to be contaminated. At the other nearly 2,000 sites, soil and groundwater have been contaminated. The majority of the contamination has resulted from leaking underground petroleum storage tanks.

Type of Facility	County	Source	Contaminant	Impact
Manufacturing Plant	Mecklenburg	Illegal dumping behind plant	Solvents (industrial cleaners and degreasers)	On site and subdivision backup well across interstate contaminated
Textile Parts Manufacturer	Gaston	Chemicals piped to open field behind shop	Solvents from machine shop	On site well for workers and adjacent well highly contaminated
Above Ground Storage Tanks at Small Distributor	Rowan	Leaking tanks and lines	Petroleum	Vapors from gasoline collected in sewer line in street causing an explosion hazard
Fertilizer Packing Plant	Iredell	Damaged packages of fertilizer dumped in pond behind plant	Nitrates	Subdivision well on backside of plant contaminated; children with "blue baby" syndrome
Residential Subdivision	Union	Coating stripped off wire by dipping into drums; drums pushed over when chemicals spent	Solvents and metals	Nearly all wells in subdivision contaminated when old farm developed
Screen Printer for Clothing	Stanly	Waste chemicals piped to underground "septic" tank and allowed to overflow	Solvents	On site wells contaminated and works exposed

The Number of Groundwater Contamiantion Sites in the Mooresville Region



"Other sources" of contamination include a wide variety of facilities and activities. Although these "other sources" make up a smaller percentage of the total number of contamination sites in the region, they are often the sites of greater concern. The contaminants at some of these sites are industrial solvents and cleaners, which are heavier than petroleum, and tend to sink into the subsurface. As a result, the sites with solvents as the contaminant have groundwater contamination that spreads farther and travels deeper. Nearly 70 percent of the contaminated water supply wells in the region are contaminated by the "other sources" in comparison to petroleum leaks from the underground storage tanks. At half the sites where groundwater has been contaminated, water supply wells are not in use and are not threatened by the contamination. On the other hand, that can be restated that close to half the time water supply wells are threatened or impacted by the contamination. These sites are high priority sites for groundwater cleanups for the regional office staff.

A review of the NCDENR groundwater and underground storage tank pollution databases shows that counties with more industry and commercial enterprises, such as Gaston and Mecklenburg, have the highest number of pollution sites. Although Mecklenburg County has the highest number of pollution sites over all, Rowan and Gaston counties surpass it with the number of high priority sites where water supply wells have been contaminated. Mecklenburg has 24 sites with contaminated wells while Rowan has 29 and Gaston has 32.

Groundwater Quantity

The Mooresville Region contains one-fifth of North Carolina's population, and Mecklenburg County is one of the faster growing areas in the state. New subdivisions are sometimes located in areas, such as around Lake Norman, that are beyond the reach of the nearest municipal water lines. In an effort to supply water, developers look to the groundwater and the use of private or community water supply wells. Two problems seem to be arising more often in recent years. The first is that the wells do not produce enough water to supply the households in the subdivision. The second is that better producing wells go dry after a number years because of over pumping the supply in the aquifer. In either case, the result can be quite alarming for those dependent on a good supply.

As the issue of groundwater quantity becomes more critical with growth in the Mecklenburg area, the need for more information to determine beneficial well locations, appropriate lot sizes, choice of waste disposal systems and the amount of open area needed around the well will also grow. Studies similar to the one conducted recently in Guilford County by the U.S. Geological Survey will become a necessity. This study includes two examples of groundwater management planning, which is a new concept in water supply and demand in the Piedmont. The first example is a single-family dwelling with a private well and septic system and the second is a community well system for a cluster of houses in a subdivision setting, both typical of the type of developments in the Mecklenburg area. Without some data gathering of this sort on the amount of groundwater being recharged and stored, developers and groundwater users can expect to continue with the panic that comes from suddenly learning that the well is dry.

Another component of the Guilford County project was a study of the contribution of groundwater to stream flow. Depending on the location in the county, groundwater contributes anywhere from 30 to 60 percent of the water in streams. If the groundwater is over pumped and the wastewater disposal system does not allow much of the used water to be returned to the aquifer, the stream flow can be notice-

ably reduced. This is a groundwater quantity issue that does not receive enough attention in land use and development plans.

Well Construction

In addition to having good quality and a sufficient quantity of groundwater available, the well itself needs to be up to the task. Proper well construction plays an important role here. Only three counties in the Mooresville Region have inspection programs for private water supply wells—Gaston, Rowan and Catawba counties. The Mooresville office responds to complaints about muddy water, bacteria in the water or other problems resulting from well construction violations for the other eight counties. These state inspections are handled on a complaint-only basis and typically begin after the family has moved into their new home and are coping however they can with water problems. With less than one full-time position devoted to the eight counties, the correction of the violations can take months.

The well construction violations listed for Gaston, Catawba and Rowan counties represent those found prior to the start of the county well inspection program. Since county health and environmental health departments inspect the wells prior to and during completion, violations being reported to Mooresville in these counties have stopped. Gaston County reports that about 45 drillers operated in that county prior to the local inspection program. Now only about 12 drillers install wells in the county.

In the luckier situations, a well construction violation will result only in a nuisance problem. If muddy water is entering a well, clothing, ceramics and glassware show red-brown stains. In the more serious situations, coliform bacteria enter the well causing health problems for the well users. In one household in Union County, the mother developed gastro-intestinal problems after moving into the family's newly built home. After a series of medical tests, some of which were quite invasive, the family doctor thought to suggest that the well water be tested. The results showed fecal coliform bacteria from nearby septic tanks to be present in the well water. Once the well construction violations were corrected, the health problems disappeared.

Just about every facet of a home building project is required to be completed by a licensed or certified worker and a third party inspects that work. Well water and well construction for private wells have never received this type of scrutiny in North Carolina until recently. Beginning January 1, 2000, all wells in North Carolina must be constructed by a certified well driller. Some drillers were "grandfathered in" at the start of the program. Other drillers and all future drillers will be required to pass a competency exam to become certified. One safeguard that is still missing in well construction, however, is the inspection of the driller's work. This is where counties have played a helpful role in protection of public health for private well users. The Groundwater Section strongly encourages counties to be more involved in well construction inspections, especially if the county has a high number of violations. The challenge before us all is to balance the growth and the environmental impact such that when groundwater is needed as the water supply, the pump in the well will produce clean, plentiful water.

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Barbara Christian, Mooresville Regional Office, NC Department of Environment and Natural Resources.

Contributors: C. Daniel, D. Harned, R. Forsythe, M. Heller

PUBLIC WATER SUPPLY SYSTEMS:

WHAT THEY ARE AND WHERE THEY ARE

Drinking water is supplied to the majority of the population in Mecklenburg County by public water supply systems. These sources of water are withdrawn from both surface water (the Catawba River) and from groundwater wells. Naturally, depending on number of people served, these systems can vary in size and complexity.

First of all, a little background. A public water system is defined as a system for the provision of piped water for human consumption if the system serves 15 or more service connections or which regularly serves 25 or more individuals. And, to make it even more confusing, they are categorized into three classifications which include Community, Nontransient Noncommunity (NTNC) and Transient Noncommunity (TNC) public water systems. Each of these classifications can include both surface and well water supplies.

The largest and only community surface water supply system in Mecklenburg County is Charlotte-Mecklenburg Utilities (CMU). CMU provides water to the majority of people in Mecklenburg County through its vast interconnected system of distribution and treatment plants which include the Franklin Water Treatment Plant in northwest Charlotte and the Vest Water Treatment Plant in central Charlotte. Each of these receives water from Mountain Island Lake, whereas the North Mecklenburg Water Treatment Plant receives its water from Lake Norman. The entire system has a total treatment capacity of 183 million gallons per day.

The "Rules Governing Public Water Systems" in North Carolina requires CMU to monitor its water for approximately 150 different contaminants. Fortunately, there have been no exceedances of the maximum contaminant levels.

Mecklenburg County has approximately 40 community well supplies which get their water predominantly from fractured bedrock. Since the quality of water in different parts of the county varies with location, the community well system must also monitor for approximately 150 contaminants. In Mecklenburg County, the largest community well water systems are operated by private water utility companies such as Carolina Water Services, Heater Utilities, Rayco Utilities and Water Resources. These systems are usually found in rural areas not served by CMU.

Only 13 NTNC public water supply systems are operated in Mecklenburg County. Most of these systems obtain water from groundwater and most have wells constructed in fractured bedrock. Most of this classification consists of schools, day cares and a few businesses. NTNC systems also monitor the safety of the groundwater by analyzing for 150 contaminants. These systems are most often found in the more rural parts of the county where municipal water is not available.

Public Water Supply Systems continued

The final group are the TNC public water systems. There are approximately 75 TNC systems in Mecklenburg County which withdraw water from both fractured bedrock and watertable aquifer wells. These systems typically serve churches, restaurants, parks, quick stops, etc. in the more rural areas of the county where CMU water lines are not available. The monitoring requirements for TNC systems are limited. They include testing for bacteriological contaminants, nitrates and nitrites.

For more information about public water supplies, you can call the Mooresville Regional Office of the Division of Environmental Health, NC Department of Environment and Natural Resources.

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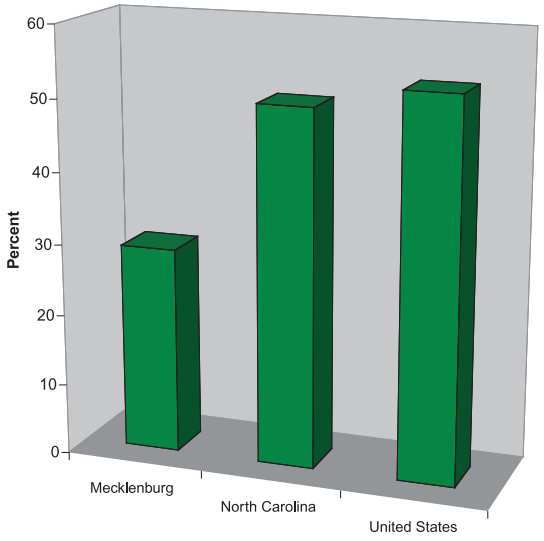
Britt L. Setzer, Mooresville Regional Office, NC Department of Environment and Natural Resources

Groundwater Guardian Protects a **Precious Resource**

Population Using Groundwater as a Drinking Water Source



A little over half of the United State's population (53%) and almost 30% of Mecklenburg County's citizens use groundwater as their primary drinking water source. With so many people depending on groundwater, protection of this vital resource is just as important here as throughout the country.

The Groundwater Foundation of Nebraska created a national program known as Groundwater Guardian to protect and improve groundwater through the involvement of interested citizens. The purpose of Groundwater Guardian is to empower and educate communities to protect groundwater through increased awareness and publicity, to improve groundwater through voluntary actions of citizens and to support and encourage the formation and maintenance of citizen lead groundwater programs. Groundwater Guardian educates businesses, the public, schoolteachers and students on important environmental issues that affect the quality of groundwater. Educational outreach is crucial to reducing pollution and creating more environmentally conscious citizens. Groundwater Guardian teams can also help reduce pollutants by educating polluters as to the effects of their careless actions and thus protecting Mecklenburg's groundwater.

Presently there are three Groundwater Guardian teams in Mecklenburg County one each in the Mint Hill, Lake Norman East and Steele Creek communities. A team can be formed by any interested citizen as long as there is at least one representative from each of the following sectors: civic group and/or citizen, government, educator, business and/or agriculture. Once the four representatives have been named, the team can then meet to learn and plan their goals for the coming year. Learn, plan, act, designate and maintain - these are the five steps for organizing and maintaining a Groundwater Guardian team. With registration and a plan of action, the team is ready to educate their community about groundwater. A national conference is held every

Mint Hill area students learn about protecting groundwater

fall to officially designate the team locales as Groundwater Guardian Communities and update members on the special achievements of the Groundwater Foundation and educate members on current events in groundwater research.

The Mecklenburg County teams have all been established within the last year. The Mint Hill Neighborhood has been a groundwater guardian community since January of 1999; while, Lake Norman East and Steele Creek were formed in late 1999. Mint Hill was recognized nationally at the 1999 Groundwater Foundation conference where the official designation as a Groundwater Guardian Community was received. The other two communities are hoping to receive their designation at the Foundation's year 2000 convention. Mint Hill's activities in 1999 included a "Water Festival" for students and parents and educational outreach in the Mint Hill schools. The Lake Norman East community, which encompasses parts of Mecklenburg and Iredell Counties, has already set up an educational display in the Statesville Mall and conducted seminars at the local middle schools. The Steele Creek Neighborhood Team is just forming.

In addition to the three groundwater teams in the county, there are still many other communities within Mecklenburg that would benefit from the Groundwater Guardian program. All it takes are four interested and concerned citizens to form a team. MCDEP is an official Groundwater Guardian Affiliate: a role that promotes the startup of teams in interested parts of the county. If you are interested in starting a Groundwater Guardian team in your neighborhood, please contact MCDEP at 704-336-5500.

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Mint Hill Groundwater Guardian Team and Independence High School – Educational Teamwork

International Baccalaureate Students from Independence High School designed "Problem in Bain Village," an activity where the students find the source of the groundwater contamination.

The Mint Hill Groundwater Guardian Team was formed in January 1999 in a collaborative effort to educate local citizens about ways to conserve and protect drinking water and to deal with the increased risks to the local groundwater due to the growth in the area and the expansion of I-485. With more than 50% of the Mint Hill population dependent upon private wells for drinking water, protection of this resource was a priority. Members of the team include students/teacher from the Biology III International Baccalaureate (IB) classes at Independence High School, staff from Bain Elementary in Mint Hill, a representative from the Mint Hill Business Association, a hydrogeologist from the Meckenburg County Department of Environmental Protection, and the Mint Hill Town Manager. The IB diploma program requires the students to complete 150 hours of community service, so the students were excited about combining their academic classes with community service. The first year goal of the team was to host an educational event for local elementary students and their parents. The IB students from Independence were responsible for planning designing, implementing, and evaluating the Water Festival itself. Other members of the team were there to assist with fund-raising, and to provide technical information. The high school students spent 10 hours in field research on a environmental problem in a local water source, and were very interested in educating other about problems with groundwater.

The First Annual Water Festival was held at Independence High School on Saturday May 24, 1999 with

fifty elementary students and their parents as participants. Participants were introduced to Willy the Wacky Water Molecule, who served as their host for the day. The participants took a pre-test to measure their basic water knowledge, and then were placed in small teams with a "Water Guide." These groups rotated through ten hands-on stations where they learned the parts of a well, conducted chemical tests to determine if substances will be soluble or insoluble in water, carried out procedures to purify "foul water", posed as government officials in a small town with "Trash Troubles" and manipulated models of aquifers. A favorite activity was making an "Edible Aquifer" to illustrate how common substances such as oil, paint, fertilizer seep into bedrock to contaminate well water. The average scores on the pre-tests were 45% correct, and on the post test the participants scored an average of 80%.

During the five month collaboration between schools, business, local government and the Mecklenburg County Department of Environmental Protection, the students and team members were actively involved in researching local environmental issues, fund-raising, planning, and implementing the water festival. Many of the high school seniors from this team are now in college, and are considering environmental careers because of this positive experience. This type of "grass roots" collaboration is fundamental to increasing community awareness of environmental issues, and to begin working towards solutions to our problems. The Mint Hill Groundwater Guardian Team was designated as a 1999 Groundwater Guardian Community and received a plaque from the Groundwater Foundation for their work on the Water Festival. The team plans to host the Water Festival again this spring and hope it will become an annual event for the students in the Mint Hill area.

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Cindy Moss, Independence High school Faculty

Water Environmental Indicators, 1999

Point Source Pollution Management	
Number of Point Source Discharges	425
Wastewater Treated (millions of gallons per day)	71
Wastewater Generated Per Capita (gallons per person per day)	121
Exceedance of Daily Permit Limits for Groups of Known Sources	347
Average Water Quality Index Values	
Lakes	80 (Good/Excellent)
Streams	71 (Good)
Countywide (lakes & stream combined)	75 (Good/Excellent)
Exceedance of Surface Water Quality Action Levels Creeks (Total)	110
Fecal Coliform Bacteria	27
Conductivity	2
Total Phosphorus	27
pH	2
Biochemical Oxygen Demand	2
Turbidity	5
Ammonia	4
Dissolved Oxygen	2
Total Kjeldahl Nitrogen	7
Nitrate Nitrogen	32
Exceedance of Surface Water Quality Action Levels Lakes (Total)	43
Fecal Coliform Bacteria	3
pH	3
Chlorophyll-a	2
Secchi Disk Depth	10
Total Phosphorus	21
Turbidity	2
Nitrate Nitrogen	2
Water Supply	
Drinking Water Supplied by CMU (Millions Gallons/Day)	101
Population Using CMU Drinking Water	476,166
Selected Sources of Potential Groundwater Contamination	
Septic Tank Systems Permitted	300
Septic Tank Systems Repaired	82
Estimated Number of Septic Tank Systems	30,000
Sanitary Landfill Sites	2
Land Clearing Inert Debris Landfills	13
Construction and Demolition	1
Groundwater Usage	
Existing Community Wells	40
Private Wells (Calculated)	63,695
Non-Community Wells	88
Citizens Dependent on Groundwater for Drinking Source (Calculated)	184,925
MPL Sites	
Number of sites Evaluated	479
Contaminated Drinking Water Wells	186

Strategies to Coordinate Environmental Policies

Pat McCrory, Mayor
Charlotte, NC

As the Mayor of Charlotte, North Carolina, and a person truly concerned about our current and future environment, I have come to realize that current U.S. Environmental Protection Agency (EPA) programs are fragmented, making it difficult to implement holistic solutions. I believe EPA policies do not support good land use or smart growth practices. Consider the following examples:

- Smaller wastewater treatment plants have less stringent requirements than larger ones, which of course encourages construction of more small plants, resulting in inefficiency and sprawl.
- Brownfield initiatives encourage redevelopment of old inner city industrial sites while air policies may punish cities for this same redevelopment.

In order to deal with environmental concerns in the Charlotte-Mecklenburg area for the next fifty years, I am recommending that we follow a plan of action that will help us to better coordinate environmental policies. We must first develop a strategy to protect our environment that will ensure our air, water and land policies complement each other. One example of an area in which this strategy could effectively be employed is air pollution. Current air pollution regulations encourage industry and residents to locate away from nonattainment areas. This, in turn, prevents the preservation of farmland and greenfields, and also encourages more highway construction. We should as an alternative expand and encourage infill development to reduce air pollution and to preserve much-needed farmland.

Other specific programs and policies that could be jointly enacted by Charlotte and Mecklenburg County to improve and preserve our environmental quality include:

- Increasing recycling from commercial sectors
- Recycling landscaping materials such as rocks, dirt, and trees
- Developing markets for recycled materials and for community acceptance of these materials (e.g. paper, wood, plastics)
- Promoting the use of white roofs on buildings for deflecting heat, thus saving cooling energy
- Working with developers to increase tree preservation, recycling, and setback requirements
- Providing incentives for targeted development such as infill, "smart growth," and transit- oriented development
- Building upon previous vision statements for our community such as those from as Voices and Choices, and the 2015 City/County vision

The second strategy we should pursue is government reorganization. The environmental efforts of government entities do not always complement each other's work because of existing organizational structures. For example, the Metropolitan Planning Organization is composed of representatives from Union and Mecklenburg counties. Our air quality ozone attainment area as designated under the 1990 Clean Air Act is made up of Mecklenburg and Gaston county residents only. State

Highway Division consists of a region that stretches from Mecklenburg County to Pinehurst. None of these organizational boundaries complement each other, and as a result, some of our most crucial customers are not involved in efforts to preserve air, land and water.

We need only look at neighboring sections of Cabarrus County to illustrate this problem. Here we find an area exhibiting rapid growth and yet the Concord Mills Mall road system is not part of a common regional highway plan. It is obvious that we need to organize our efforts so that all regulatory entities work together to address common issues of transportation, air and water quality, and land use in an effort to encourage "smart growth" development and transit hubs. On a more regional scale, the South Carolina jurisdictions of York, Chester and Lancaster Counties must also be included. Political buy-in from regional elected officials is critical to keep our region competitive and to attract economic growth.

Thirdly, since there are regulations, standards and permits outside of our local control that affect environmental quality, governmental units including the state and federal governments must work as a team to deal with the environment across political boundaries. A coordinated approach to growth, land use and zoning is necessary to protect our environment yet provide infrastructure elements such as schools for our growing population. If this is done properly, we can reduce the effects of growth that lead to air and water pollution and brownfields. Possible approaches to pursue include:

- Administration and governance using a "holistic" approach (this may necessitate State and/or Federal assistance)
- Transfer of applicable regulatory authority from State/Federal to local level
- Transfer more authority from EPA to local governments for brownfields redevelopment
- Integrated permitting for air, water, stormwater, brownfields, etc.
- Resolve conflicts in regulations among federal agencies (EPA, USDOT, FEMA, Corps of Engineers, Fish and Wildlife) which affect population growth, economic development and a sustainable environment
- Establish air quality regulations that complement land-use planning regulations
- Create a combined air, transportation, watershed management and land use planning region (multi-county, interstate)

In all of these actions community support is key. It is imperative that we do a better job of communicating our long-term environmental goals in an effort to demonstrate the connection between population growth, infrastructure, industrial development and redevelopment of brownfields. If we are successful in our efforts, the results can be cleaner air, creeks suitable for swimming and fishing, less solid waste, good jobs and schools as well as low crime rates.

It is also imperative that we understand what the environmental impacts will be fifty years from now as a result of the policies and decisions made today. Our goal should be to enact environmentally friendly land-use practices, which augment a total transportation system including HOV lanes wherever possible. It is this type of long-term thinking that must be utilized to create sound and comprehensive environmental policies for our region for the next fifty years.

"The most pressing environmental problem is air pollution, everyone has to breathe the air"

Jennifer Wilkinson
Independence High School

THE HEALTH EFFECTS OF OZONE: A PHYSICIAN'S PERSPECTIVE

As a physician, I have seen how poor air quality has impacted the respiratory health of my patients.

While the growth of our community has afforded us many opportunities, it has created a number of growing pains. The significant decrease in air quality is something that we need to be aware of and strive to improve. In this article, I would like to first discuss air pollution and its impact on respiratory health and then comment on its impact on our community.

By way of introduction, my formal training in medicine was 4 years in Internal Medicine at Wayne State University in Detroit, Michigan and 2 years of training in Asthma, Allergy and Immunology at the National Jewish Respiratory Center and at the University of Colorado Health Science Center in Denver, Colorado. For fifteen years, I have been in private practice at the Allergy and Asthma Center in Charlotte. As part of a group of respiratory specialists, we have been able to perform a large number of clinical research studies in our office.

The Impact Of Air Pollution On Respiratory Health

The role of air pollution - the atmospheric accumulation of substances injurious to humans has a distinct impact on our ability to breathe, though the exact nature as to how it affects us is unknown. The world has seen a significant increase in asthma, allergic nasal disorders and respiratory illnesses over the past 25 years. At least part of this increase has been attributed to poor air quality in industrialized nations.

While air pollution consists of a large number of various chemicals and substances, several of them are of such quantity and reactivity that they should be considered more significant as a cause of respiratory illness. The most common pollutant in this group is ozone, which is generated through the interaction of hydrocarbons and nitrogen oxides under the influence of sunlight. Ozone concentrations commonly exceed safe levels in many cities of the world. Sulfur dioxide, produced by heat and power plants that burn coal or oil, is another common substance harmful to humans. Likewise, particulate matter, in the form of smoke products and products of burning fuel, can have an impact on health. These respirable particles are measured and noted by their size, either as particulate matter of 10 microns or less, PM10, or as particulate matter of 2.5 microns or less, PM2.5.

Studies to evaluate the exact impact of these substances have not been easy. Diesel exhaust particles (PM10) can enhance the production of allergy and inflammatory factors in humans, creating greater susceptibility to allergic disease and have been implicated in the worldwide increased prevalence of allergic asthmatic disease (1). Of even greater concern is the effect of pollution on non-smokers (smokers have their own personal pollution to worry about) and non-asthmatics. A study by Abbey et al. published in 1998 (2) tried to answer what happens to anyone exposed to general pollutants. Individuals were questioned as to their symptoms and had lung function tests over a 25 year period. Air quality was also studied over that same period of time. Exposure to particulate matter correlated with a 7.3% diminished percent of lung function in non-smoking men and a greater fluctuation in lung function in women and men. A rise of 23 parts per billion (ppb) ozone as an 8-hour average was correlated with a 6.3 % decrease in lung function

Dr. Errington examines a patient.

The world has seen a significant increase in asthma, allergic nasal disorders and respiratory illnesses over the past 25 years.

in men whose parents had asthma, bronchitis, emphysema or hay fever. A study by Romieu and et. al.(3) done on children with mild asthma in Mexico City found a strong correlation between respiratory symptoms and the increased levels of ozone and PM10. Measuring different parameters of lung function showed that each pollutant worked independently of each other to lower lung function.

These studies give further support for current efforts to limit suspended particulate matter exposure and ozone exposure in the urban environment.

Sulfur dioxide, ozone, and oxides of nitrogen are known to increase bronchial reactivity under experimental conditions with concentrations at or only slightly greater than peak levels recorded at times in industrialized urban areas (4). Ozone not only increases our immediate risk of respiratory difficulties, but in asthmatics, it increases our general responsiveness to airborne allergy factors (indoors and outdoors). Asthmatics are then more likely to become sensitive to an even greater degree to airborne allergy factors (5). Increased bronchial reactivity from one aeropollutant may also induce vulnerablility in asthmatic patients to another aeropollutant (6), to aeroallergens(7), infective agents and meteorologic changes (8), and vice versa. Ozone during exercise at 0.12 parts per million (ppm)[i.e. the National Ambient Air Quality Standard (NAAQS)]—a level exceeded at least 4 days annually in most metropolitan United States cities—may or may not produce bronchospasm in asthmatic subjects (9). Ozone at greater than or equal to 0.2 ppm—Southern California Stage 1 Smog Alert— during intermittent exercise causes decreases in lung function on testing and increases symptoms in persons with asthma (5). Delfino et. al. (10) evaluated children aged 9 to 16 with mild asthma as to the effect of ozone and allergy factors on respiratory symptoms. The children kept symptom scores and levels of ozone were monitored in the ambient air and they also wore a Harvard passive sampler on themselves for 12 hrs. per day. They found that symptoms increased with ozone exposure and with fungal exposure, but independent of each other. They also found that symptom severity correlated very well with their personal exposure to ozone (as measured by their personal packs) vs. the ambient ozone levels measured in the atmosphere. They concluded that the persons own exposure to ozone was critical in aggravating their asthma and that asthma worsened with more long term exposure to ozone vs. necessarily the highest levels of ozone in a given area. Frequently the asthmatic patient recognizes a correlation of intensity of their symptoms and aeropollution exposure; while difficult to quantify, the patient and the physician can presume a relationship exists and can consider it clinically relevant. Sulfur dioxide at a concentration of 0.5 ppm, in the upper range experienced in photochemical smog, incites bronchoconstriction in asthmatic subjects(11), especially during exercise (12).

"Poor air quality affects me, my friends and family, and everyone in the county. Air and water are non-negotiable. Without clean air and water, the quality of our lives and our health are at risk."

Hugh McColl, Jr.
Chairman and Chief Executive Officer Bank of America

The Impact Of Air Pollution On The Community

This brings us to the Mecklenburg County experience. Data on air pollutants collected by the Mecklenburg County Department of Environmental Protection has identified significantly elevated aeropollutant levels throughout the county at different times, with higher ambient levels and peak levels occurring in the warmer months. There are elevated levels of ozone, particulate matter (measured as PM10 and PM 2.5) and carbon monoxide.

Because the prevalence of lower respiratory disease in the population at any time is approximately 5-10% and the prevalence of upper respiratory tract disease at any one time approximates 20% of the population, the impact of poor air quality on the quality of life in any community is significant. Illness not only creates a cost burden in health care —hospital visits, doctor visits and medication expense —it also results in lost work hours, decreased productivity at work and lost quality time at home.

Those most at risk of adverse health effects from exposure to pollutants are the very young, the elderly, smokers, workers whose jobs expose them to toxic materials and persons with heart and lung disease. My own medical practice is primarily caring for patients with allergic and respiratory disease and there is a measurable increase in respiratory complaints during the warmer months. While some of this is attributable to allergy exposure and occasional infections, there are significant problems among the nonallergic patients as well. Complaints include increased cough, shortness of breath, especially on exertion, and chest tightness. There are also significant upper respiratory complaints, such as nasal burning, congestion, drainage and throat and eye irritation. Patients often relate this to periods of time spent outdoors. While many patients can relate their onset of trouble to specific days, there are a large number of patients whose symptoms simply deteriorate over time. Indeed it is more common to see patients presenting not with acute respiratory failure, but with a slow deterioration of lung function and progressively worsening symptoms over time. The process can be so slow that people do not sense the worsening of symptoms until they are having marked difficulty breathing. Certainly those individuals who have severe chronic respiratory disease already are

more sensitive to the deleterious effects of poor air quality and get into real respiratory trouble more quickly even with less exposure. It is an important part of a physician's task to assess a person's breathing status such that the person can be advised as to their likelihood of trouble, and to give that person reasonable expectations of acceptable exposure to the outdoor envirnoment. The physician can create a plan with the patient to help the patient assess their own status at home and to have at their disposal a treatment plan for self-help should symptoms deteriorate. People who can respond early to symptoms and seek treatment early seem to have a shorter course of illness. It is difficult to assess the loss in work and productivity related to these problems triggered by air pollution in our community, but I feel it must be sizable.

I am one physician among many who care for patients experiencing significant respiratory problems. Their ability to breathe is adversely affected by environmental factors, both allergic and irritant. As presented above, some of these irritant factors, generated by man, can have profound effects on our quality of life. Exposure needs to be as limited as possible. SOER

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OZONE - SUNLIGHT, CHEMISTRY AND OUR REACTION

Charlotte skyline on good and bad ozone days.

Every year as things begin to warm up, talk turns to one of Charlotte's most ubiquitous pollutants - OZONE. Most of us have heard something about its adverse effects and have experienced its brown haze signature on the summer sky. But does anyone actually realize what ozone is? Pull up a chair and get comfortable. It is a fascinating story.

Ozone - Where Is It Found?

Ozone, or O_3, is an oxygen molecule made up of three oxygen atoms. It is a photochemical oxidant, meaning that it is a molecule formed as a result of some complex atmospheric chemical reactions that will be discussed later in this article. One of the most interesting things about ozone is that it can be either beneficial or harmful, depending on where it is. Beneficial ozone is found in one of the upper layers of Earth's atmosphere called the stratosphere, therefore, it is commonly known as stratospheric ozone. The stratosphere is the layer of the atmosphere extending from seven to thirty miles above the surface of the Earth. The ozone layer is relatively thin (about a mile) compared to the stratosphere. It is found at a height of about 22 miles, a little more than half-way into the stratosphere. Stratospheric ozone is regarded as beneficial because it shields the Earth from the damaging ultraviolet radiation of the sun. A different type of ozone is found in the lowest level of the Earth's atmosphere, the troposphere. The troposphere extends from the Earth to a height of seven miles above the surface. Simply put, the troposphere is the layer of the atmosphere that sustains life for us due to presence of the oxygen that we breathe. Unfortunately, the tropospheric ozone, usually referred to as ground level ozone, is harmful.

The Harmful Effects Of Ozone

There are several harmful effects associated with ground level ozone, which is a major component of photochemical smog. Smog is a generic term for that pervasive brown haze that forms around Charlotte and many other cities during the summer season. Ozone, in high concentrations, has been associated with respiratory problems in small children, the elderly, asthmatics, individuals with emphysema or other similar disorders. In very high concentrations, even healthy adults experience a reduction in lung capacity when exposed for long periods or during heavy outdoor exercise. High ozone levels also affect crop production. Some fruits and vegetables, particularly tobacco, grapes, soybeans and citrus fruits are highly sensitive to ozone. The United States Environmental Protection Agency (EPA) estimates that annual crop damage caused by ozone amounts to $3 billion nationwide.

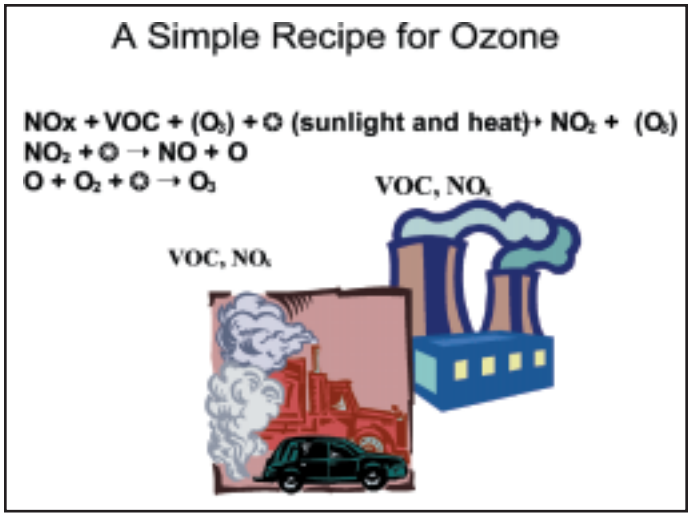
The EPA estimates that annual crop damage caused by ozone amounts to $3 billion nationwide.

Other harmful effects are manifested on materials. Ozone destroys natural rubber very quickly. That is why articles like windshield wipers and weather stripping are now made with synthetic materials in an effort to thwart one of its more destructive capabilities. It can also affect textile dyes in the same manner as does ultraviolet radiation. Either directly or indirectly, the harmful effects of ground level ozone have one thing in common, they all cost us money for the havoc they wreak.

The Not So Secret Formula For Atmospheric Ozone Formation

Well, now we know what ozone is and why we do not want it to be around us. Let's briefly discuss how it is formed in the atmosphere. To form ground level ozone, we need ozone precursors, sunlight, and heat. The ozone precursors are volatile organic compounds (VOCs) and nitrogen oxides (NOx). VOCs can be either biogenic (naturally occurring) or anthropogenic (man made). Biogenic sources include the natural respiration of trees and the natural decomposition of organic matter. Anthropogenic sources range from the combustion of fossil fuels to the use of solvents. Nitrogen oxides are anthropogenic generated emissions which are almost exclusively formed by the combustion of fossil fuels in gasoline powered vehicles and coal fired power plants.

The chemistry behind ozone formation may be described as a photochemical cycle. The major photochemical oxidants are ozone and nitrogen dioxide (NO_2). Although the chemistry of the atmospheric reactions taking place is very complex, the general mechanism for ozone formation can be described as follows: Nitrogen oxides and VOCs react in the atmosphere in the presence of sunlight. Atmospheric conditions play an important role in ozone formation. The air needs to be relatively stagnant and the temperature needs to be warm. The products of the atmospheric reactions are called photochemical oxidants. Simply stated, VOCs and nitrogen oxides react to form ozone and NO2. NO2 reacts with the ultraviolet radiation in sunlight to form nitrogen oxide and an oxygen radical. The oxygen radical combines with atmospheric oxygen in the presence of VOCs to form more ozone. This cycle continues as long as there are precursors, sunlight, and heat. This is why ozone formation occurs in the summer, when the sunlight energy is more intense and the relative temperature is high. If precursor levels are unchanged or are increased, then a long hot summer will result in the formation of high concentrations of ozone.



Did all of that register? If it did, go to the head of the class. Fortunately, no quiz will be given.

Driving Destinations Help Determine Ozone's Destiny

How does this affect the Mecklenburg County area? The day to day operation of numerous mobile sources contributes significant quantities of nitrogen oxides to the atmosphere which eventually will increase the likelihood of additional ground level ozone. The more cars there are on the road, the more potential there is for ozone to be in the air. The public shares joint responsibility with industry in being obligated to try and find effective means by which to reduce and control ozone formation by decreasing the prevalence of precursor emissions. Industrial emissions of ozone precursors are governed by the EPA, state and local air quality programs. The public, and private industry, can reduce emissions by following the Ozone Action Tips published by MCDEP.

From 1990 through 1997, the Charlotte area did not violate the federal standard for ozone concentrations in the ambient air. Until 1997, the federal standard was 0.12 ppm over one hour. The new standard is 0.08 ppm averaged over eight hours. However, current monitoring data shows that the ambient ozone levels are on the increase. Mecklenburg County had exceedences of the federal eight-hour standard thirty-four times in 1999.

It should be noted that ozone is a regional problem. Ozone formation does not start and stop at the county line. Ozone precursors from automobiles traveling to and from surrounding counties contribute to our local ozone problem. Pollutants from nearby power plants are transported by the wind, only to join with other locally produced precursors to form ozone. Ozone itself, once formed, will migrate to adjacent locales. As the summers get hotter and the number of automobiles on the road increases, the ozone problem in Charlotte will become more and more serious. The summer of 1999 ozone season was a good example of this phenomenon because several hot days led to repeated instances of high concentrations of ozone. We cannot control the weather, but we can control ourselves. The collective actions that are taken will make a positive difference in preventing the development of ozone and deterring its detrimental impact on the quality of our air. SOER

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AS OZONE STANDARDS FLUCTUATE, WHERE DO WE STAND?

Mecklenburg County just withstood a steamy, hot summer in 1999 and weathered yet another challenging ozone season. As is characteristic of the North Carolina Piedmont, the summer months brought us elevated ozone levels. From April through October 1999, the Mecklenburg County Department of Environmental Protection (MCDEP) monitored the local ambient air ozone levels for comparison to the National Ambient Air Quality Standard (NAAQS) to determine our degree of compliance with the applicable ambient standards. The measured ozone levels, associated health advisories, controversy and litigation over the new federal ozone standard kept ozone under the scrutiny of the public's critical eye for most of the year.

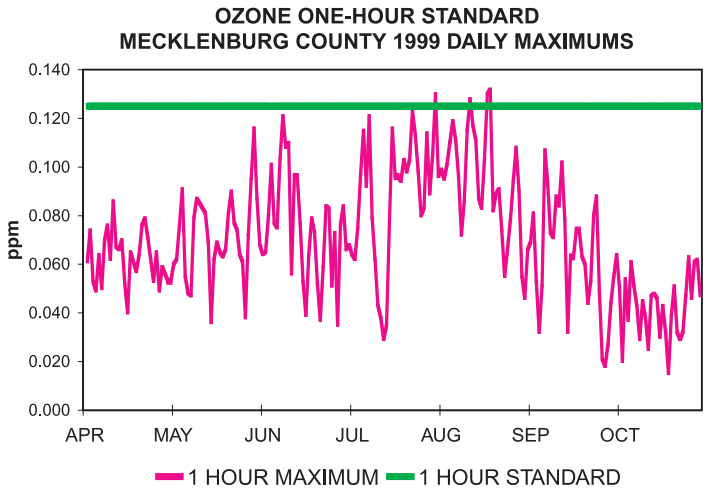
One-Hour and Eight-Hour Standards

A discussion of the ozone levels measured in 1999 would not be complete without a discussion of the changes in the federal standard over the past few years. The original federal ozone standard of 0.12 parts per million (ppm) based on one-hour concentrations of ozone was promulgated by the United States Environmental Protection Agency (EPA) in the 1970's. Regulations allow for an average of one exceedance of the standard per year over a 3-year period per monitoring site in each air quality region. Therefore, four exceedance days at any one of the monitoring sites in Mecklenburg County over three years would constitute a violation of this standard. A statistical number called the "design value" is used as an indicator to measure the degree of violation, and is the fourth highest one hour value over three years. It is the single number representing the ozone level for three years and is used to determine an area's nonattainment status category. Due to the 1990 Clean Air Act (CAA) amendments, Mecklenburg and Gaston Counties were designated as a moderate nonattainment area; however, in 1995, as a result of three successive years of no violations being recorded, both were officially redesignated as an attainment area for the one-hour ozone standard.

In July 1997, EPA promulgated a new eight-hour ozone standard. The new standard of 0.08 ppm averaged over an eight-hour period was the result of a lengthy scientific review process on the effects of ozone on the public health and the environment. A violation occurs when the design value for any monitor in an area exceeds the standard. The "design value" for the eight-hour standard is a three-year average of the fourth highest ozone concentrations recorded during a given year. With the passage of the new standard, the EPA revoked the old one-hour standard in many areas that met the old standard, including Mecklenburg County.

Do We Have A Standard?

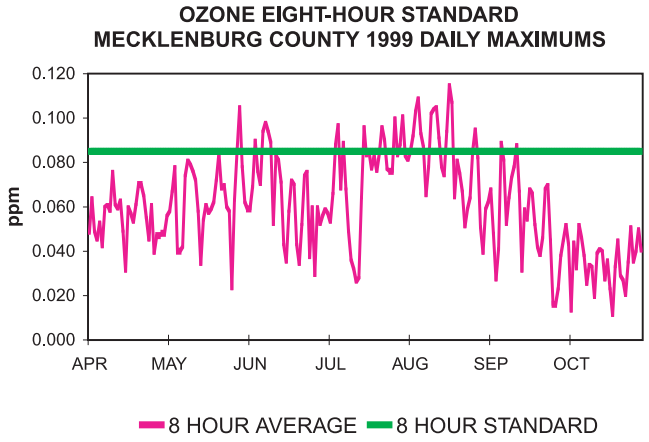
In response to challenges to the new eight-hour standard filed by industry and others, a three-judge panel of the United States Court of Appeals issued a decision on May 14, 1999. Among other items, the panel (1) remanded the eight-hour standard for further consideration, (2) concluded the Clean Air Act (CAA) as it was being applied effects an unconstitutional delegation of legislative power, and (3) concluded that the EPA lacks authority to implement the new standard. This left Mecklenburg County and about 3,000 other counties nationwide without any enforceable federal public

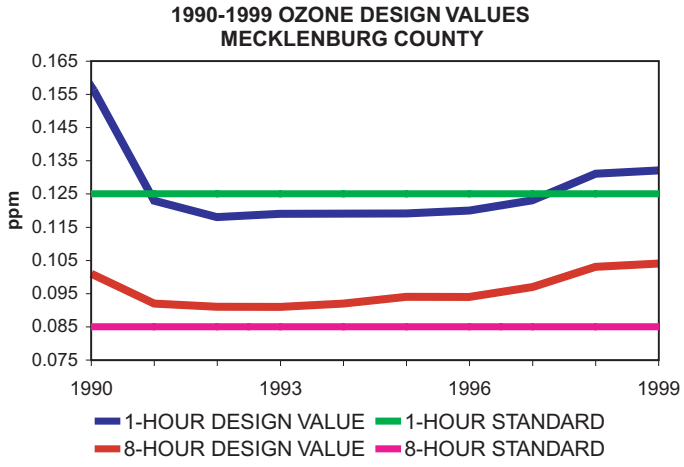


health standard for ozone. On June 28, 1999, the EPA filed a rehearing request but on October 29, 1999, the court denied the request.

As a result of the court's decisions of May 14, 1999 and October 29, 1999, the new standard was allowed to remain in place, but the EPA cannot enforce it. As the fate of the new standard teeters precariously in the scales of justice due to ongoing litigation, the EPA proposed a rule on October 20, 1999, to reinstate the old one-hour standard. The public comment period for this proposal ended on January 3, 2000. Even through all of this, the appeal process for the eight-hour standard continues.

On April 1, 1999, the State of North Carolina adopted the eight-hour standard and on November 16, 1999, Mecklenburg County adopted the State standard by reference. Therefore, the eight-hour standard is enforceable on both the State and County level, but there is no enforceable standard on the federal level.





1990-1999 Ozone Data

During 1999, MCDEP recorded four days of one-hour ozone standard exceedances and 34 days of eight-hour ozone standard exceedances. In summary, the ozone levels measured in Mecklenburg County have been increasing over the past few years and have exceeded both the one-hour and eight-hour standards.

If the one-hour ozone standard is reinstated, EPA will not redesignate Mecklenburg and Gaston Counties as being a nonattainment area in the near future because we have an air quality "maintenance plan" to follow. All affected agencies will have to work very closely together to determine the appropriate course of action to follow while considering what additional air pollution control measures to employ to hasten the reduction of ozone concentrations and demonstrate attainment with the one-hour standard. The CAA requires EPA to collect data and designate the attainment/nonattainment status within three years of a new standard promulgation. The eight-hour ozone standard attainment/nonattainment status designations should be declared by July, 2000. Unfortunately, despite all of the plans and discussions, the future of Mecklenburg County's ozone standard and compliance status remains as unclear as the sky on a steamy, hot day in mid-July.

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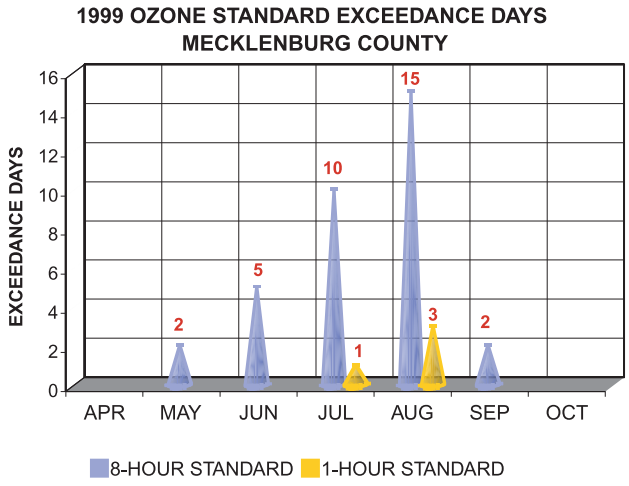


A SIMPLE MEASURE OF QUALITY OF LIFE: THE AIR QUALITY INDEX

Deprived of breathing air we can only live a few short minutes. The air we breathe is a precious resource which we are dependent upon for our entire lifetime. One simple measure of our quality of life in Mecklenburg County is the quality of our air.

Locally, the Mecklenburg County Department of Environmental Protection (MCDEP) is responsible for compiling and reporting this information in the form of the Air Quality Index (AQI). How do we measure the quality of the air we breathe? The AQI is calculated daily for each monitored pollutant and the pollutant with the highest AQI value is determined to be the critical pollutant for that particular day. The index provides information on pollutant concentrations for ground-level ozone, particulate matter, carbon monoxide, sulfur dioxide, and nitrogen dioxide. In simple terms, values equal to or less than 100 on the index scale are considered "good" to "moderate" air quality; values greater than 100 are considered unhealthy. It is equally important to have specific information regarding the health effects of the various pollutants that are reported in the index. For the Charlotte area, during summer months, ozone is usually the critical pollutant, but during the remainder of the year, particulate matter and carbon monoxide are the critical pollutants in our area.

"Sadly, my first reaction to a high ozone warning is to go outside less, which is illustrative of the problem we all face if we do not take the steps to protect our environment. These warnings, however, also motivate me to work harder than ever with my teammates and my community to create environmental solutions that will protect the future for all of us."

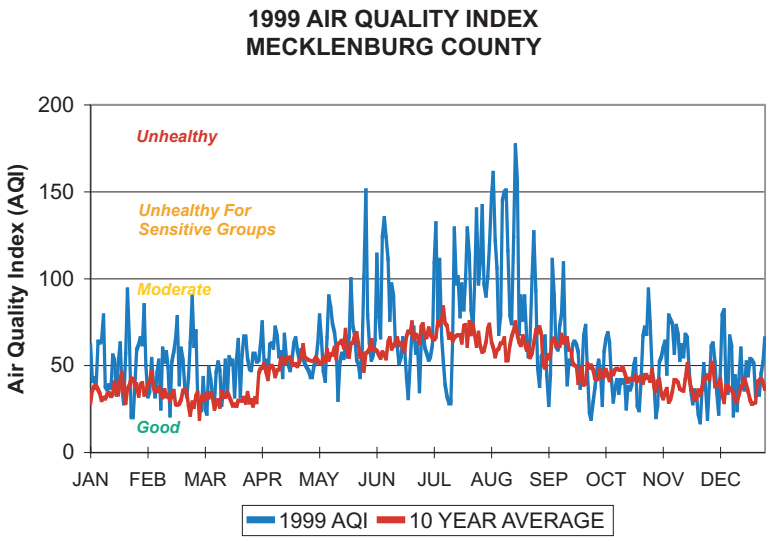
Hugh McColl, Jr.
Chairman and Chief Executive Officer
Bank of America

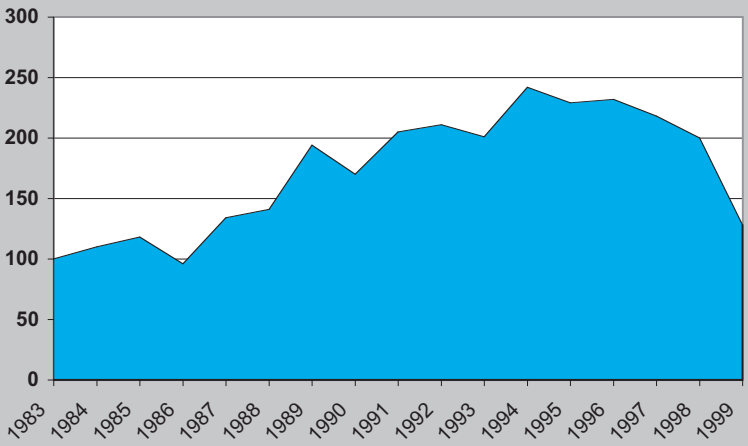
Air Quality Index
Category Index Values, Descriptors, and Colors

Index Values	Descriptor	Color
0 - 50	Good	Green
51 - 100	Moderate	Yellow
101 - 150	Unhealthy for Sensitive Groups	Orange
151 - 200	Unhealthy	Red
201 - 300	Very Unhealthy	Purple
301 - 500	Hazardous	Maroon

Pollutant Specific Health Effects Statements for the Air Quality Index (AQI)

AQI Category		Good	Moderate	Unhealthy for Sensitive Groups	Unhealthy	Very Unhealthy	Hazardous
Ozone (ppm)	8-hour	None	Unusually sensitive individuals, may experience respiratory symptoms.	Increasing likelihood of respiratory symptoms and breathing discomfort in active children and adults and people with respiratory disease, such as asthma.	Greater likelihood of respiratory symptoms and breathing difficulty in active children and adults, and people with respiratory disease such as asthma; possible respiratory effects in general population	Increasingly severe symptoms and impaired breathing likely in active children and adults, and people with respiratory disease such as asthma; increasing likelihood of respiratory effects in general population	Severe respiratory effects and impaired breathing likely in active children and adults and people with respiratory disease such as asthma; increasingly severe respiratory effects likely in general population.
	1-hour	None					
Particulate Matter ($\mu g/m^3$)	PM-2.5 24-hour	None	None	Increasing likelihood of respiratory symptoms in sensitive individuals, aggravation of heart or lung disease, and premature mortality in persons with cardiopulmonary disease and the elderly	Increased aggravation of heart or lung disease, and premature mortality in persons with cardiopulmonary disease and the elderly; increased respiratory effects in general population.	Significant aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly; significant increase in respiratory effects in general population	Serious aggravation of heart or lung disease, and premature mortality in persons with cardiopulmonary disease and the elderly; serious risk of respiratory effects in general population.
	PM-10 24-hour	None	None	Increasing likelihood of respiratory symptoms, and aggravation of lung disease such as asthma.	Increased respiratory symptoms and aggravation of lung disease such as asthma; possible respiratory effects in general population.	Significant increase in respiratory symptoms and aggravation of lung disease, such as asthma; increasing likelihood of respiratory effects in general population	Serious risk of respiratory symptoms and aggravation of lung disease such as asthma; respiratory effects likely in general population.
Carbon Monoxide (ppm)	1-hour	None	None	Increasing likelihood of reduced exercise tolerance due to increased cardiovascular symptoms, such as chest pain, in people with cardiovascular disease.	Reduced exercise tolerance due to increased cardiovascular symptoms such as chest pains in people with cardiovascular disease.	Significant aggravation of cardiovascular symptoms, such as chest pain, in people with cardiovascular disease	Serious aggravation of cardiovascular symptoms such as chest pains in people with cardiovascular disease; impairment of strenuous activities in general population.
	8-hour	None	None				
Sulfur Dioxide (ppm)	24-hour	None	None	Increasing likelihood of respiratory symptoms, such as chest tightness and breathing discomfort, in people with asthma.	Increased respiratory symptoms such as chest tightness and wheezing in people with asthma; possible aggravation of heart or lung disease.	Significant increase in respiratory symptoms, such as wheezing and shortness of breath, in people with asthma; aggravation of heart or lung disease	Severe respiratory symptoms such as wheezing and shortness of breath in people with asthma; increased aggravation of heart or lung disease; possible respiratory effects in general population.
Nitrogen Dioxide (ppm)	1-hour	None	None	None	None	Increasing likelihood of respiratory symptoms and breathing discomfort in children and people with respiratory disease such as asthma.	Greater likelihood of respiratory symptoms and breathing difficulty in children and people with respiratory disease such as asthma.





The Revised AQI

In August 1999, the index reporting system was revised to incorporate two new standards as required by EPA regulations promulgated in July 1997. The previous ozone standard was 0.12 ppm averaged over a one (1) hour period, however, the revised ozone standard is 0.08 ppm averaged over an eight (8) hour period. Fine particulate matter less than or equal to an aerodynamic diameter of 2.5 microns (PM2.5), was added to the required parameters. To complement specific information regarding the health effects of the various pollutants, the revised AQI went a step further and identified sensitive groups for each pollutant:

Ozone-	People and children with asthma.
Particulate Matter 2.5-	People with respiratory or heart disease, the elderly and children.
Particulate Matter 10-	People with respiratory disease.
Carbon Monoxide-	People with heart disease.
Sulfur Dioxide-	People with asthma.

Colors have been assigned to each index level which correlate to a specific descriptor and were added to allow regional mapping of air quality data for public access by electronic media. This data is also available at http://www.epa.gov/airnow/ during the summer months.

Air Quality Data and Trends

The public can dial (704) 333-SMOG (7664) to access a computerized message that is updated hourly, which provides the current AQI for Mecklenburg County. The AQI for the preceding day is published daily in The Charlotte Observer weather section. If you want to learn more about how differing pollutant concentrations are used to determine the breakpoints for the AQI category designations, you can go to the appendix at the end of the report. Being aware of the condition of our air is a simple way to work toward keeping AQI values as low as possible.

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"WHERE IS THAT NEW ROAD GOING TO GO?

"ASK MUMPO, THEY WILL KNOW

Just as individuals and companies keep a close watch on their financial budgets, as an air quality maintenance area, Mecklenburg County has its own air pollution budget to oversee. And this budget has to be maintained, even as we build new roads. Once Mecklenburg County demonstrated compliance with national air quality standards, a maintenance budget was established to ensure compliance was sustained. The air emissions budget became a reality through the cooperation and coordination of work efforts by EPA, North Carolina Department of Transportation, Charlotte Department of Transportation, and others. The budget was established for the three pollutants of concern -carbon monoxide (CO), nitrogen oxide(NOx), and volatile organic compounds (VOC). NOx and VOC emissions were included because they react together in the presence of sunlight to form ozone. Air emission budgets were established for four distinct categories - stationary sources, area sources, off-road sources and mobile sources. The budgets were determined using the Urban Airshed Model, which is a Gaussian dispersion model.

Conformity: Matching Air Quality Plans with Transportation Plans

Transportation Conformity requires that as new roads are built, the resulting mobile source emissions stay within the alloted air emission budget in actual tons per day emitted for CO, NOx and VOCs. Mecklenburg County underwent a transportation conformity demonstration for mobile sources in April 1999. Specific data about vehicles (i.e. roadway speeds, miles traveled, and age of the fleet) were compiled. The data were used in a Mobile-5B model to obtain CO, NOx, and VOC emissions, which were compared with the respective mobile source budgets for CO, NOx, and VOCs in 1990 (i.e. the year budget conformity began), 1999 and 2005. Budget conformity was confirmed since the actual/estimated emissions were less than the budgeted emission tonnage. Additional future conformity was confirmed when the analyses of the mobile source emissions for the years 2015 and 2020 were performed and compared to those of 2005, the last budget year in the air quality plan.

In a joint effort to remain in "conformity," many government agencies have decided to work together for the common good to a degree that is rarely observed among municipalities, politicians, etc. This was initiated by the federal government's mandate for the establishment of Metropolitan Planning Organizations (MPOs). The MPO for Mecklenburg County is also known as the Mecklenburg-Union Metropolitan Planning Organization (MUMPO). It is supported by and comprised of responsible, local officials from 13 separate organizations who ultimately decide where roadway funds are to be spent. These officials do not pretend to have the necessary engineering, environmental, planning, or other technical knowledge needed for road project design and construction. Because of this, they have established a Technical Coordinating Committee (TCC) to evaluate technical issues and make informed recommendations to the MUMPO. The TCC is comprised of the various member towns, usually represented by their planning/zoning staffs.

Life After Nonconformity

If the actual/estimated emissions from mobile sources exceeded the budget, the Mecklenburg County area would be designated as being "out of conformity." This undesirable designation would have potentially devastating ramifications and repurcussions on the finances of local governments. Federal funds from the United States Department of Transportation (USDOT), which includes both the Federal Highway Administration and Federal Aviation Administration, would not be allowed to come to Mecklenburg County or the State of North Carolina for use in Mecklenburg County. Funding for projects underway would stop as well. Both figuratively and literally, "the bucks would stop here."

Funding for certain projects that by design would decrease air pollution could continue even if Mecklenburg County should be designated as being "out of conformity." One example of such a project would be better coordination of traffic timing signals so as to minimize the occurrence of traffic congestion. Another example would be that portions of the Charlotte International Airport's planned expansion still would be allowed to be constructed, since the improved design would result in a reduction of the amount of time an aircraft remains idling on the ground, and thereby would lessen the generation of excess emissions from the engine.

Despite the careful, meticulous planning of groups such as the TCC and MUMPO, the conformity budgets do not always work as planned. Even though Mecklenburg County has not yet exceeded our budgeted amounts for NOx or VOCs, we have violated both the new (8-hour) and old (1-hour) ozone standards in 1999. Both the conformity budget and the general public may be "seeing red" if this pattern continues.

WWW.

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'HEY BUDDY, *CAN YOU* "SPARE THE AIR"?

The Air Quality Coalition is looking dejected, disheveled and disoriented as they shuffle slowly down the street, tightly clutching a small tin cup, eagerly awaiting anybody who would consider making an ozone action contribution. Finally, a few kind hearted, concerned individuals give what they can from their frugal resources, while the masses hurriedly drive the other way. It is going to be another very lonely night on Atmosphere Alley. Get the picture? We have the solution and so do you whether you realize it or not.

What Is "Spare The Air"?

Mecklenburg County and the surrounding region just completed its fourth "Spare the Air" campaign in 1999. This community education outreach program is designed to help make businesses, schools, and the general public more aware of the effects of ground level ozone on their day-to-day lives, as well as how ozone can be prevented. "Spare the Air" emanated from a voluntary group of approximately 100 businesses over an 8 county region known as the Regional Air Quality Coalition. This group has concerns about the status of our region's air quality and they have joined together to do something about it. They have committed both time and resources toward educating their employees about how they can personally reduce their contributions to the total ozone problem. The Mecklenburg County Department of Environmental Protection (MCDEP) has lead this campaign in cooperation with the North Carolina Division of Air Quality (NCDAQ) since its inception.

"Spare the Air" is necessary in our county and region for many reasons.The primary pollutant that is a precursor to the formation of ozone is nitrogen oxides (NO_X). It is discharged from fossil fueled combustion sources such as car engines, gas fired yard equipment, generators, etc.. Since Mecklenburg County does not have a major industry releasing NO_X into the atmosphere, it would seem logical that there should be no ozone problems here. However, there is one pervasive source that releases NO_X in such quantities that ground level ozone continues to increase . . . automobiles. Our use of automobiles is not limited as a source of air pollution, so "Spare the Air" is geared toward helping educate the public on how they as individuals can help reduce ozone pollution.

During the ozone season, which begins in April and ends in October, NCDAQ meteorologists predict when the conditions are conducive to the formation of ozone. Generally, these conditions occur on hot, sunny days when there is very little wind present. When high ozone days are predicted (Code Orange or Code Red), a variety of announcements are made to heighten the level of public awareness and to present the public with opportunities to help lessen or prevent ozone formation. The ozone action alerts are announced via the television, newspaper, recorded phone messages and through employers involved in the Regional Air Quality Coalition.

In 1999, a creative, new emphasis was placed on educating the children attending public school in the Charlotte-Mecklenburg School System about ozone. An ozone booklet, developed through grant monies received by MCDEP, was distributed to fifth graders in each of the Charlotte-Mecklenburg schools. It included a host of educational activities, including a board game and poster, to help inform the students and their parents about the ozone problem and assorted ozone actions. The outreach also provided a special incentive for children to have their parents participate in ozone actions that could help make a difference. The parents signed a special form stating that they and their child(ren) performed certain actions to help reduce ozone. Those children correctly completing the challenge were eligible for a drawing for a bicycle that was to be given away at each school. In 1999, 45 bicycles were awarded to deserving students. The ozone educational booklet will be distributed again for use during the spring of the 2000 school year.

1999 Ozone Forecast Accuracy

Code	PPB	AQI	Forecast	# Correct	%Correct
Green	0 - 64	0 - 50	47	36	76.6%
Yellow	65 - 84	51- 100	64	33	51.6%
Orange	85 - 10	101 - 150	36	18	50.0%
Red	105 - 124	151 - 200	6	1	16.7%

During the ozone season, which begins in April and ends in October, NCDAQ meteorologists predict when the conditions are conducive to the formation of ozone.

Ozone Forecasting

A vital role in the overall ozone prevention efforts undertaken in the community is the forecasting of ozone action days. Various levels of ozone are categorized into groups and assigned a corresponding color. In 1999, the EPA revised its Air Quality Index (AQI) scale for determining what type of ozone day would be forecasted. A code green indicates the likelihood of a potentially "good" day with little ozone being present. The public should both figuratively and literally see red on a code red day which indicates that there will be an unhealthy level of ozone present in the air, having the potential to create conditions detrimental to our health. The highest category in the AQI for ozone code declarations is maroon. A code maroon represents the likely presence of hazardous ozone conditions. Fortunately, our ozone dilemma has not yet deteriorated to that level. We still have time to make a difference in projected and realized ozone levels in Mecklenburg County.

It is important that the forecasting be as accurate as possible so that the public does not feel as if the regulatory agency is "crying wolf" with every CODE ORANGE day that is predicted. The 1998 forecasting data indicated that the accuracy slightly decreased in 1999. During 1999, there were a total of 65 days when the forecasted ozone code was not achieved. Of those, 36 days were projected to be worse than they actually were and 29 were projected to be less severe than they were. Undoubtedly, the ozone actions taken by businesses and the public helped to adjust the outcome of the ozone levels that were ultimately realized.

Make A Difference, Not An Excuse

Mecklenburg County and the surrounding region are growing by leaps and bounds. The ozone issue will not be resolved without the voluntary participation of businesses, schools and individuals helping make a difference in the daily ozone levels. Prevention is the key. Here are some simple things one can do to help "Spare the Air":

- car pool, take your lunch/walk to lunch
- refuel vehicles after 6 PM
- conserve electricity
- drive smart, combine errands to minimize excess trips

No amount of wishful thinking is going to make the local ozone problem go away anytime soon. Until the ozone problem is rectified, the "Spare the Air" campaign will continue in its endeavors to educate the public about ground level ozone and the effects it has on health. If you would like to contribute to eliminating the cause, obtain additional information, or are interested in becoming involved in the coalition, please call the Spare the Air Hotline at 704-336-6859. The hotline is available between May and September each year.

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A TALE OF THREE CITIES

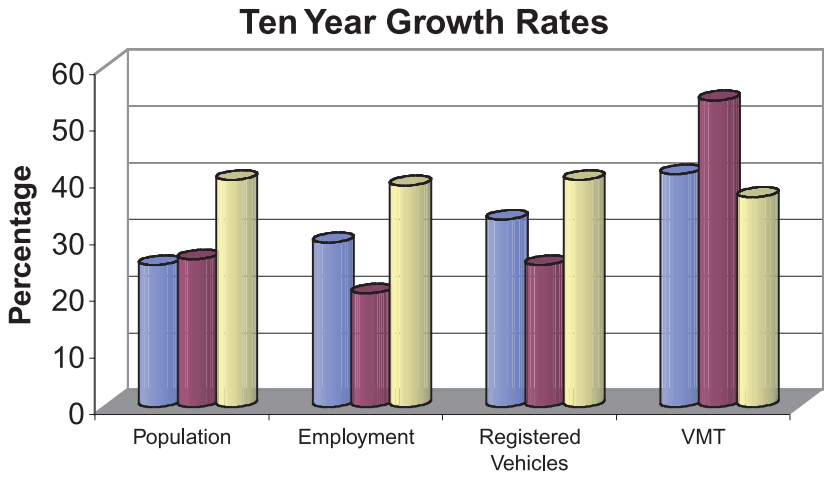
When it comes to the realm of air pollution, Charlotte is not the only city in the region contending with problems. Nashville, Birmingham, Atlanta, Columbia, and Raleigh, to name a few, are also struggling with their air pollution. Interestingly enough, each one seems to have a problem with one pollutant in particular - ozone. Just because we are dealing with the same pollutant, does not necessarily mean we each toil to the same degree. Let's take a closer look by narrowing down the scope of cities to just Charlotte, Atlanta, and Raleigh. Atlanta and Raleigh are good cities to compare to Charlotte. All three are experiencing high growth rates in terms of population, employment, the number of cars on the road, and the vehicle miles traveled (VMT), which are all factors directly contributing to the ozone problems. So, how does Charlotte fare in this side by side comparison of three leading southern cities? The answer just might surprise you.

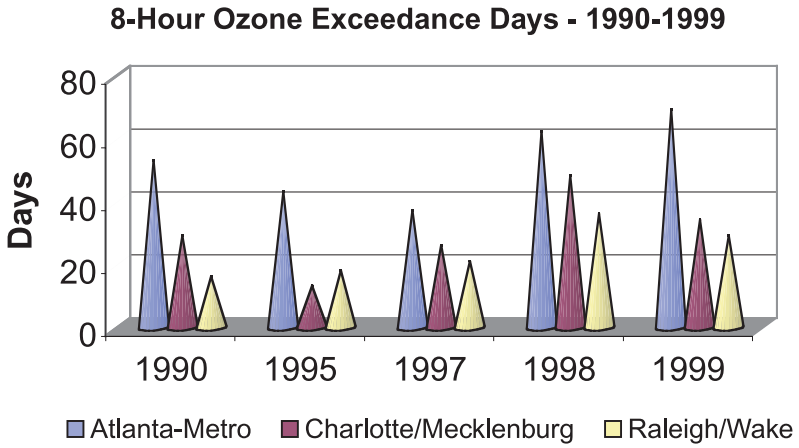

Charlotte, NC


Atlanta, Georgia


Raleigh, NC

A Tale of Three Cities





Growth and Ozone

For Atlanta, Charlotte and Raleigh it has been the best of times with all experiencing high growth and prosperity. Since 1990, growth in population, employment, registered vehicles and vehicle miles traveled has increased for all. Atlanta and Charlotte have grown at around 20%-30 % while Raleigh's growth has been more dramatic with rates hovering around 40%. The one ominous exception is VMT where Charlotte has experienced a 54% increase in 10 years. Vehicles are a major source of nitrogen oxide (NOx) emissions, one of the two ozone precursors; and the more we travel the more nitrogen oxide is exhausted into the air. This is not a category which Charlotte wants to lead.

While growth and prosperity have been high for all three cities, it has been the worst of times for ozone levels and the number of ozone exceedance days. In general, all the cities experienced high levels in the early 90s, moderation in the mid 90s and dramatic increases in the late 90s. Raleigh, with the largest change in growth factors, has seen the greatest increase in ozone exceedance days, with 18 in 1995 and 29 in 1999 - up 61%. In addition, Raleigh's ambient ozone levels have also steadily risen. In 1999, Atlanta had 69 days when it exceeded the eight hour ozone standard, over two-thirds of the summer. This was a 60% increase over 43 days experienced in 1995. Ozone levels have also steadily climbed in Atlanta, with the fourth highest maximum value reaching an eight hour high of 0.132 ppm in 1999. Charlotte's number of ozone exceedance days has more than doubled since 1995 from 13 to 34 days. In contrast to the other cities however, Charlotte's fourth highest eight hour ozone level for 1999 was lower than the previous two summers.

Ozone Control Strategies

According to "Georgia's State Implementation Plan for the Atlanta Ozone Non-Attainment Area, October 28, 1999." Atlanta is considered a "serious" non-attainment area. Its extensive menu of control strategies to reduce unhealthful ozone levels stretch from a minimum 13 county area to an entire region encompassing 45 counties, depending on the particular strategy. The strategies include: GA low sulfur gasoline; NOx reductions for large electric utility steam generators; Smog Free GA - voluntary partnerships; reductions from large NOx units in 13 counties; 0.15 lb/mmBtu NOx emission limit for five coal-fired power plants; changes in vehicle enhanced inspection and maintenance in 13 counties; expanded permitting requirements for new industry; expanded RACT rules for existing industry; new air quality rules for new boilers/fuel burning equipment/stationary engines/gas turbines; national Low Emission Vehicle program; and new standards for locomotive engines, consumer/commercial products, marine engines, and nonroad diesel engines.

What is in the air for Charlotte and Raleigh? Although, neither is yet in Atlanta's league for population and number of ozone exceedance days, the number of unhealthful summer days are high and on the rise. A draft of "Governor Hunt's Clean Air Plan for North Carolina - A Strategy for Reducing Ground Level Ozone by the Year 2007" calls for 20 % NOx reductions from industry and an 8% NOx reduction from the public's cars and trucks by 2007. Industrial reductions target the largest coal-fired electric utility boilers, while mobile source reductions rely mainly upon low sulfur fuels and an expanded vehicle enhanced inspection and maintenance program.

One has to wonder if North Carolina's plan is timely and if it is far reaching enough after looking at the Georgia plan. No one can predict Charlotte's future growth. But if we continue to emulate our past role model - Atlanta, will we not end up in the same place? It would be a far, far better thing to do than we've ever done before to do more than is required and prevent our summer days from being plagued by unhealthful air.

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Big plans and Big bucks for cleaner air

The boom in population growth and its effect on traffic have contributed to the increase in ozone levels in the Charlotte area over the past decade and it is expected to continue.

The City of Charlotte continues to reach milestones in its effort to improve our local air quality, particularly as it relates to transit. The passage of the one-half cent sales tax, the purchase of new, low emission buses, the beginning of the county-wide transit plan, and the continuation of the mass transit corridor studies are all part of its overall plan for improving Charlotte-Mecklenburg's air quality, especially ozone.

The boom in population growth and its effect on traffic have contributed to the increase in ozone levels in the Charlotte area over the past decade and it is expected to continue. During the next 26 years, the population in the Charlotte-Mecklenburg area is estimated to grow by 345,000 people, which is an astounding 57 percent increase. Use of innovative transit initiatives will improve air quality, as well as the quality of life for all Mecklenburg County residents.

New and Improved Buses

Certain improvements to the Charlotte Transit fleet are already in place with the addition of 51 new buses in early 1999, with another 46 expected to arrive by the end of 2000. The new buses are 74% more fuel-efficient and they emit 40% ess exhaust emissions. Remarkably, even the dark, sooty exhaust most people associate with the operation of diesel buses (i.e. particulates), has been reduced by 85%. This dramatic decrease is plainly visible in the following pictures.

Another innovation for Charlotte Transit is the addition of bicycle carrying racks to its fleet of buses. The 46 buses on order will have factory installed bike racks placed on the outside front end of the bus just ahead of the driver with the remainder of the bus fleet to be similarly equipped over the next year. From this vantage point, the driver will be able to safely watch as the passenger loads/unloads their bicycle from the bike rack. This is an important step in extending the range of potential transit riders and maximizing alternative modes of travel. Transportation planners have recommended that bike racks and lockers be provided at major transit connections and they are included in the concept designs for future rapid transit stations and hubs.

"There are alternatives to driving an automobile."

Andy Christy
Independence High School

Countywide and 2025 Integrated Transit/Land Use Plans

The half-cent sales tax provides a big portion of the funds needed to initiate many air quality improvements. Although passed by voters in November 1998, actual collection of the sales tax for transit began in April 1999. Between then and September 1999, $21 million has been collected and projections indicate that the tax will generate approximately $50 million per year. Combined with other continued funding from the City, Mecklenburg County and other neighboring towns, the new Metropolitan Transit Commission will oversee an

Outdated diesel bus

New, fuel efficient bus

Proposed transit oriented development at Remount Road, Charlotte, North Carolina. (Photo curtesy: LDR International, Columbia, MD)

annual budget of $90 million. These funds are designated to implement plans already on the drawing board and fund additional proposed services over the next 25 years. One initiative funded by the transit tax is a new Countywide Transit Plan. This plan addresses short term needs and will make countywide transit service a reality over the next five years. It will accomplish this through the addition of new express routes, local routes, carpool and vanpool initiatives, special innovative forms of transit service and by extending service to the surrounding towns in Mecklenburg County.

The success of the Countywide Transit Plan is very important development toward the implementation of the 2025 Integrated Transit/Land Use Plan. The countywide plan will result in the availability of increased transportation choices, as well as additional riders. In the short term, this plan may help check the trend of soaring growth in vehicle miles traveled.

The ultimate goal of the 2025 Integrated Transit/Land Use Plan is the completion of the five rapid transit corridors. The South Corridor continues to progress toward becoming a reality. Key public meetings and analysis have already been completed. The locally preferred mode of mass transit is expected to be approved in early 2000 and the major investment study is almost complete. Staff's recommendation for this corridor calls for the use of light rail transit, which is significantly more environmentally friendly than the current predominant modes of transportation. Following approval of the locally preferred mode of mass transit for the South Corridor, work can move forward on the environmental analysis and facility design, as well as studies for the North, University, Independence, and Airport rapid transit corridors.

A Telling Future For Rapid Transit And Land Use

Future completion of the rapid transit corridors is expected to provide an attractive alternative to the single occupant vehicle and to significantly increase transit patrons over current levels. In itself, this will provide an air quality benefit; however, Charlotte Transit's most significant contribution toward achieving cleaner air may be altering its impact on land use.

The promotion of mixed-use, pedestrian friendly transit oriented developments along the transit corridors and around rapid transit stations will have a dramatic effect on the reduction of vehicle miles traveled. This type of land use not only reduces the number of vehicle trips by encouraging transit, bicycle and pedestrian travel, it also reduces the length of the remaining trips that must still rely on the auto. The combination of all these factors will play a key role in improving air quality within the Charlotte-Mecklenburg Metro Area. SOER

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OZONE AND THE FUTURE FOR MECKLENBURG COUNTY

The three ozone monitors in Mecklenburg County have each recorded violations of the United States Environmental Protection Agency's (EPA's) new 8-hour ozone standard. To maintain compliance with the 8-hour average (standard), the recorded ozone concentrations cannot exceed 0.08 parts per million (ppm). Unfortunately, the ozone monitor located at the Mecklenburg County line, has the dubious distinction of registering the highest 3-year average in North Carolina (0.104 ppm). Mecklenburg County is only one of two areas in the state, with Raleigh being the other, that has recently violated the previous 1-hour ozone standard (1-hour standard is 0.12 ppm). This represents the first 1-hour violation since 1991.

Expected EPA Actions

The Washington DC Federal Circuit Court ruled in May 1999 that the EPA had not defined the intelligible principle for the setting of the new 8-hour standard the agency established in July 1997. The court instructed EPA that the 8-hour standard could not be enforced until such an intelligible principle had been defined in court. EPA then requested a rehearing before the entire panel since only three members of an eleven judge panel had ruled on the original decision. The full panel denied the rehearing request. EPA is now expected to appeal the decision to the U.S. Supreme Court. The future of the 8-hour standard is very uncertain because it could be delayed from being reinstated for several years while awaiting the outcome of the Supreme Court decision. The Washington DC Federal Circuit Court instructed EPA to move forward on designations for the 8-hour standard since they are required to do so under the provisions of the Clean Air Act. Therefore, EPA is expected to finalize the designations in July 2000. The Governor of North Carolina will be asked to make a recommendation in early 2000. The EPA has issued guidance that suggests the minimum nonattainment area should be the full metropolitan statistical area (MSA), which includes the following counties: Mecklenburg, Gaston, Union, Rowan, Cabarrus, and Lincoln in North Carolina, and York of South Carolina.

In December 1999, the EPA proposed reinstating the 1-hour standard for areas of the country where the standard had been revoked following the adoption of the 8-hour ozone standard, but had recently observed violations of the 1-hour standard. EPA proposed this action since it will take so long to resolve the 8-hour legal issues, and many areas around the country did not have a health standard in effect for ozone. EPA is expected to finalize this action in February 2000.This action will require an evaluation of necessary control measures to be implemented that will result in improved air quality and attainment of the 1-hour standard in Charlotte.

> "We must reduce power plant and other fixed emissions and reduce the number and level of motor vehicle emissions."
>
> Ron Bryant
> Catawba Lands Conservancy

Pollution Control Measures Needed To Meet The Federal Ozone Requirements

The North Carolina General Assembly passed the Clean Air Bill in July 1999 to address necessary mobile source control strategies to help attain the 8-hour standard. These control measures include a cleaner low sulfur gasoline to be sold throughout the state and a technologically changed/geographically expanded vehicle inspection and maintenance program (i.e. oxides of nitrogen will now be included in the emissions test that will be conducted in 48 of the 100 counties in the state). Additionally, there will be goals promoting the expanded use of alternative fuel vehicles, emphasizing methods to employ to reduce the growth rate of vehicle miles traveled (VMT), and advocating telecommuting (i.e. working at home via computer terminal). The state Environmental Management Commission is currently considering additional controls on utility emissions. A modeling analysis is under way to assess what other controls might be warranted for industrial facilities, cars and trucks. Public meetings will be held in late 2000 to gather input on recommendations for further controls.

The North Carolina Department of Environment and Natural Resources (NCDENR) currently believes the controls in the Clean Air Bill and the utility regulations under consideration will solve the 1-hour nonattainment problem. However, solving the 8-hour problem may prove to be much tougher.

A declaration of Mecklenburg County being designated as a nonattainment area of the 8-hour standard will result in local citizens paying more for the improved vehicle inspection and maintenance program in 2002 and cleaner gasoline in 2004. Federal transportation dollars could conceivably be withheld from Mecklenburg County. In order to avoid the tightening of the Federal purse strings, the state must positively impact the local air quality by developing an air quality plan for the 8-hour standard and implementing an appropriate ozone reduction control measure scheme . In nonattainment counties, a loss of potential new industrial growth is likely to occur. However, to close on a more positive note, all of us, especially our children, will be able to breathe easier and rest assured knowing that we have done our part to help clean the air for this and future generations.

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North Carolina
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Quality

CONTEMPLATING CRITERIA POLLUTANTS

For most of us, breathing comes about as easy as "falling off of a log". If and when one falls off of that log, whether it be figurative or literal, the obstacle that impaired our progress may not have been seen. Immediately afterwards, one wonders what just happened. Similarly, when one takes a deep breath, the ambient air pollutants that are present in the air breathed cannot be seen, but it does give one reason to pause and ponder what was just inhaled. It always pays to be fully aware of the quality of air that is being breathed.

NAAQS Facts

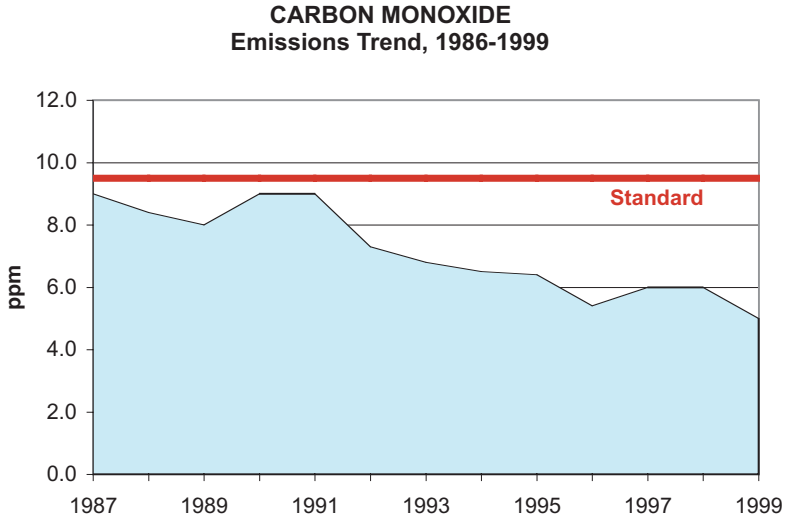
Major ambient air pollutants ("criteria pollutants") were first regulated by the federal government in 1970 with the establishment of National Ambient Air Quality Standards (NAAQS). These new regulations included both primary standards, which are designed to protect the public health and secondary standards, which are established to protect the public welfare. The specific criteria pollutants of concern were carbon monoxide (CO), sulfur dioxide (SO_2), total suspended particulate matter (TSP), nitrogen dioxide (NO_2), ozone (O_3), and lead (Pb). Hereafter, the use of the term "standards" refers to all of the emission levels estab-

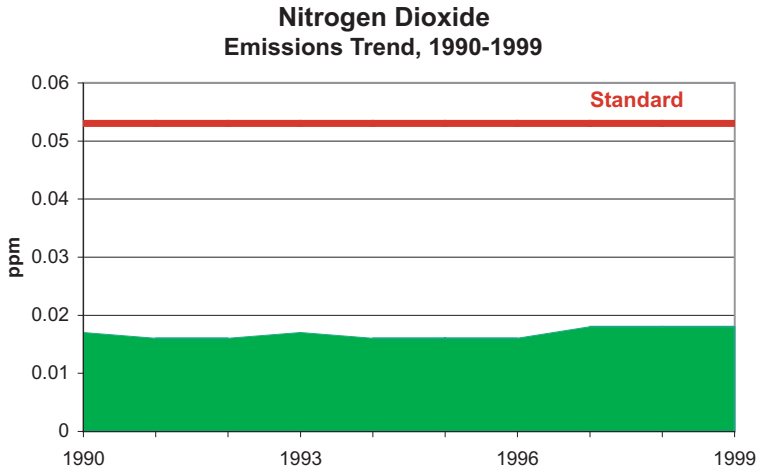
lished for a given criteria pollutant. On July 1, 1987, PM10 (particulate matter with an aerodynamic diameter of 10 microns or less) standards were promulgated and in 1997, PM2.5 (particulate matter with an aerodynamic diameter of 2.5 microns or less) standards were also promulgated. Particulate matter in general is an all inclusive term referring to total suspended particulates, PM10 and PM2.5. These pollutants are closely monitored via the Mecklenburg County Department of Environmental Protection ambient air monitoring network and the information that is gathered is used to help determine the status of our local air quality.

Carbon Monoxide (CO)

Carbon monoxide (CO) is produced by the incomplete combustion (i.e. the fuel is not completely burned during the combustion process) of fossil fuels in engines, boilers, furnaces, etc. It is a colorless, odorless gas that can pose a danger to people from localized concentrations found on traffic congested city streets. When inhaled, CO enters the bloodstream and reduces the body's ability to deliver oxygen to vital organs and tissues. At low concentrations, CO causes fatigue and impairs mental functions. The ill effects of excess CO exposure are especially serious for those who suffer from cardiovascular disease. In higher concentrations, CO intoxication may actually result in death of the exposed individual(s).

Local year round monitoring of CO began in 1976. A violation would be recorded if there was more than one exceedance of the CO standard in a calendar year. A violation of the carbon monoxide standard has not occurred since 1986 or even an exceedance of the standard since 1990 despite a steady growth in automobile registrations and number of vehicle-miles-traveled (VMT). Less polluting engines found in newer vehicles is the main factor accounting for the reduction in CO concentrations in our air quality. Mecklenburg County was officially designated as a carbon monoxide attainment area in 1995.



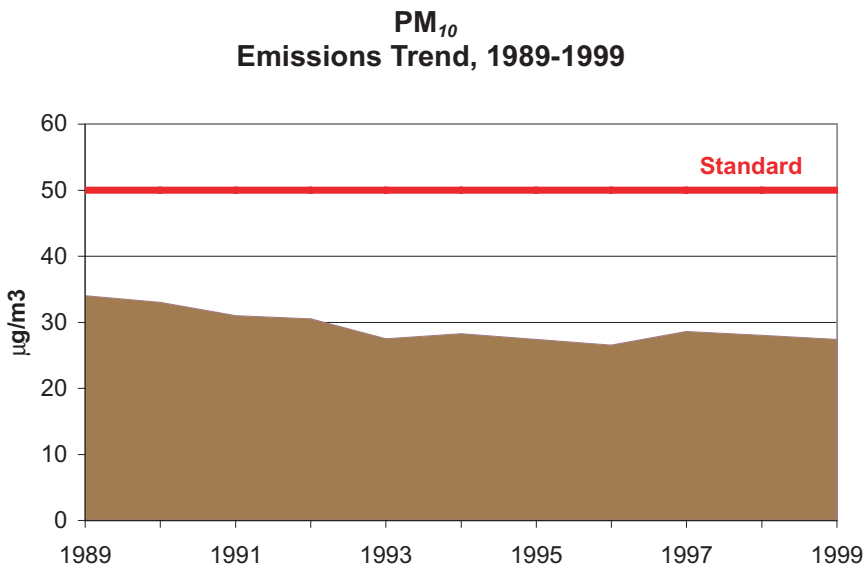


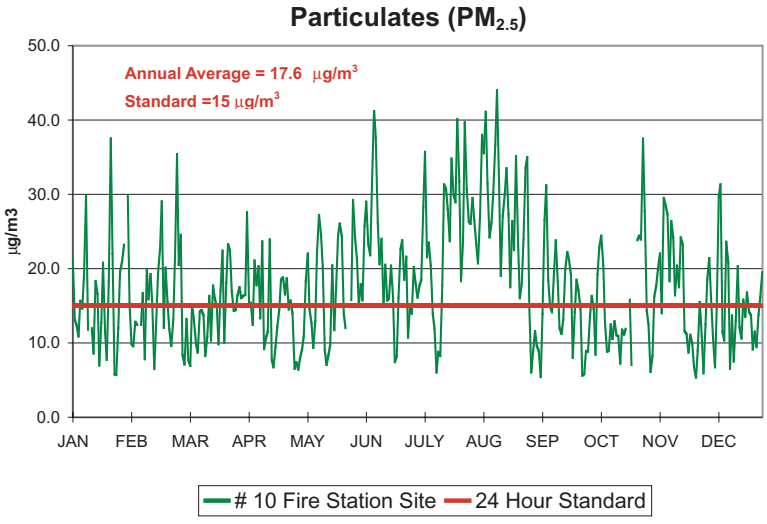
Sulfur Dioxide (SO_2)

Sulfur dioxide (SO_2) can adversely affect public health primarily as a respiratory irritant, the environment by damaging crops and forming acid rain, and visibility reduction through the presence of suspended sulfate particulates in the atmosphere. Monitoring for sulfur dioxide in Mecklenburg County began in the mid-1960s, but was discontinued in 1984 when ambient air concentrations were deemed to be at very low levels. Monitoring resumed in 1994 and has continually demonstrated compliance with the annual, 3-hour, and 24-hour standards for sulfur dioxide levels.

Nitrogen Dioxide (NO_2)

Nitrogen dioxide (NO_2) is primarily formed as a waste gas exhausted from incomplete fuel combustion and, like sulfur dioxide, can lead to crop damage and acid rain formation. In a concentration as low as 0.5 ppm, nitrogen dioxide can begin to affect the respiratory system of children and asthmatics. Monitoring for nitrogen dioxide began in the mid-1960s, but was discontinued in 1986 due to the presence of very low concentrations. Monitoring was resumed in 1989 due to recent studies emphasizing the role of nitrogen dioxide in the formation of ozone. Nitrogen dioxide levels have remained steady and are not likely to exceed the NAAQS; however,





new control strategies for limiting ozone formation will likely involve reducing nitrogen dioxide emissions from both industrial and mobile sources.

PM10

As we breathe, extremely small particulate matter (PM10) can easily be inhaled and penetrate deeply into the innermost recesses of our lungs. Health effects from PM10 exposure depend on the type, amount, and duration of particles inhaled and vary widely from respiratory aggravation to the development of cancer. PM10 monitoring results for Mecklenburg County indicate concentration levels consistently below the NAAQS.

PM2.5

In an attempt to better protect the public's health, the EPA determined that a more restrictive particulate matter standard was needed. The PM2.5 standard (15 micrograms of PM2.5 particulate matter/cubic meter of air)] was adopted in 1997. Mecklenburg County started monitoring for PM2.5 in 1999. The standard requires three (3) years worth of data to determine the area's compliance status. Compliance with the annual PM2.5 standard will be demonstrated when the three year average of the spatially averaged annual means is less than or equal to 15 micrograms per cubic meter. As a result, Mecklenburg County's PM2.5 compliance status is currently unknown.

Lead (Pb)

The NAAQS for lead was adopted in 1978. Presently, it is set at 1.5 micrograms per cubic meter, maximum arithmetic mean over a calendar quarter. Lead (Pb) can be present in the air as either a particle or gas. Nationally in 1985, 73% of airborne lead originated from motor vehicle combustion of gasoline containing antiknock agents such as tetraethyl lead. Essentially, there are no industrial sources of lead emissions in this area, virtually all local atmospheric lead emissions come from transportation sources. In 1985, EPA mandates began reducing the lead content of gasoline. The standard for lead content in gasoline was 0.1 grams Pb/gal on January 1, 1986, but the complete prohibition of Pb from gasoline did not become effective until January 1, 1996. Currently, Mecklenburg County is not conducting any ambient air lead sampling.

Although the ambient air levels of CO, SO_2, NO_2, PM10, and Lead are all considerably below the federal standards throughout Mecklenburg County and are expected to continue to be for the forseeable future, the curent regimen of air quality monitoring for the pollutants of concern will continue. Breathing may indeed be as simple as falling off of a log, but it is reassuring, while one is taking those deep breaths, to know more about the criteria pollutants present in the complex gaseous mixture called ambient air that is being breathed by one and all.

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MONITORING THE AIRWAYS

As in school settings years ago when strategically placed hallway monitors reported errant students, the Mecklenburg County Department of Environmental Protection's (MCDEP) ambient air monitoring laboratory reports information about air pollution occurring in our airways. The data is collected to determine compliance with the National Ambient Air Quality Standards (NAAQS). The NAAQS were established by the United States Environmental Protection Agency (EPA) to protect public health and welfare. High quality air pollution monitoring data is collected for the benefit of the citizens of Mecklenburg County.

Growth Of The Ambient Air Monitoring Network

Mecklenburg County has been measuring air pollution concentrations since the 1960's. Periodic measurements of ozone (O_3), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), particulate matter (TSP), and lead (Pb) were conducted during the 1970s. The air monitoring network (network) developed into its current design around 1980 and has since undergone several adaptive revisions. Today the network consists of ten (10) separate sites. Atmospheric concentrations of the following pollutants are routinely recorded: ozone, sulfur dioxide, nitrogen dioxide, carbon monoxide, particulate matter (TSP, PM10, and PM2.5), reactive oxides of nitrogen (NOy and NOx), and volatile organic compounds (VOC).

Ozone Monitoring

There are three ozone monitoring stations in operation all of which are located along a SW to NE line, our primary summer wind direction. These locations were chosen to measure expected maximum concentrations and evaluate population exposure. Ozone is a primary ingredient in summertime smog in our county.

PM2.5 Monitoring

The latest additions to the network are samplers measuring fine particulate matter (PM2.5), the most recent particulate regulated by EPA. PM2.5 is particulate matter less than or equal to an aerodynamic diameter of 2.5 microns or approximately 1/30 the size of a human hair. It would literally take several thousand particles of this size to fit on the period at the end of this sentence. The minute particles easily penetrate to the deepest parts of the lungs. Three sampling sites are situated in areas of Mecklenburg County that are expected to provide data on maximum pollutant exposures to the highest population density.

Typical PM2.5 particulate monitor.

TSP/PM10 Monitoring

Monitoring is also performed for coarse particulate matter in the form of PM10 and total suspended particulate (TSP). PM10 is particulate that has an aerodynamic diameter of 10 microns or less. When these particles are inhaled, they may cause adverse health effects because of their ability to reach the lower regions of the respiratory tract. TSP is particulate matter with an aerodynamic diameter of approximately 40 microns or less. MCDEP operates five PM10 sites and two TSP sites.

CO Monitoring

Carbon monoxide (CO) concentrations are recorded at three locations. The CO sampling site at the Discovery Place science museum has an inlet located above the sidewalk near the entrance. This is a high traffic street canyon site located in the central business district with potential for elevated CO levels to be present. There are two additional CO sampling sites located in neighborhood settings in order to check population exposure on a larger scale.

Carbon monoxide monitoring site in Charlotte. The sampling probe is located directly beneath the letter "E" in the word "PLACE"

SO_2, NO_2 And VOC Monitoring

Other parameters measured in the network include SO_2 and NO_2 , each with their own location. Oxides of nitrogen (NOy and NOx) and volatile organic compounds (VOC) data are collected in two areas in conjunction with the ozone network.

Access To Monitored Emissions Data

The data collected in the ambient air monitoring network is reported to the United States Environmental Protection Agency. The public can access historical data on the EPA website at *http://www.epa.gov/airsweb*. For more timely MCDEP operates the SMOG-LINE, which is a recorded message that is updated hourly regarding the status of Mecklenburg County's air quality. The SMOG-LINE may be accessed by telephone at 704-333-SMOG (7664).

MCDEP's ambient air monitoring network is the gauge used to measure public exposure to the pollutants listed in this article. Reliable, accurate, and representative data collected in this network provide the information necessary to evaluate Mecklenburg's compliance with NAAQS.

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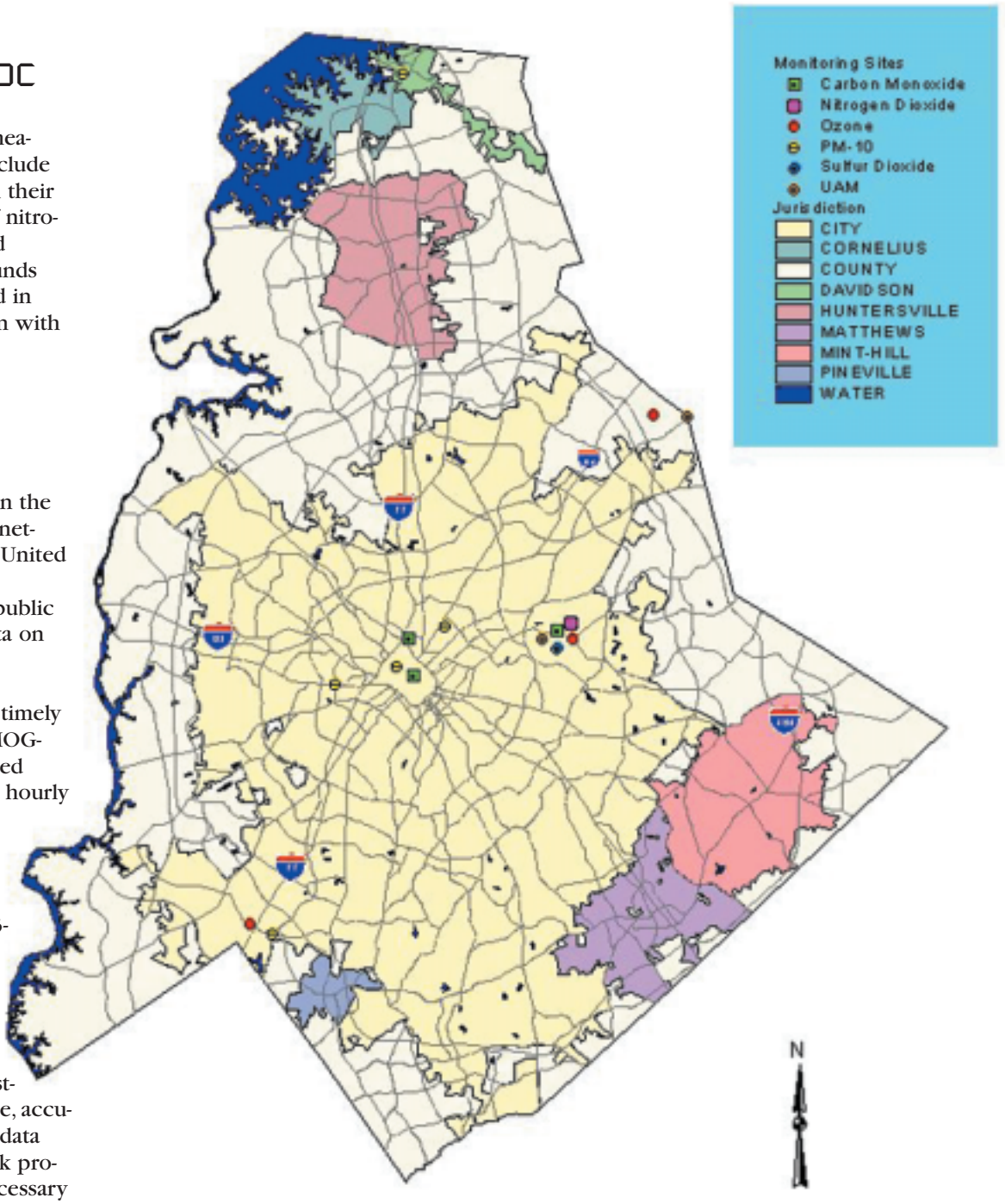

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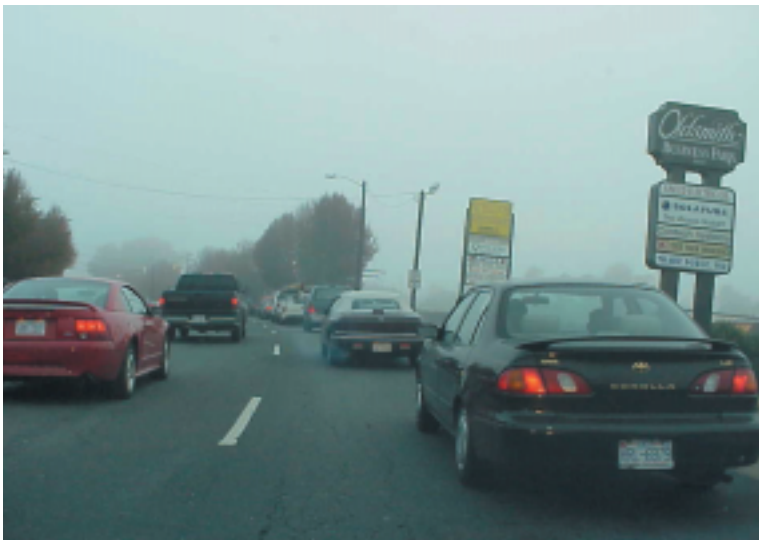
ONLY SUPER SPIES ARE ALLOWED TO SMOKE UP THE SKIES



White smoke emitted from the exhaust pipe of a vehicle in traffic.

Agent Ozone is being hotly pursued by enemy agents and is in desperate need of an evasive maneuver. With a flip of a switch on the sleek dashboard, a wall of white smoke belches out from under the vehicle. Agent Ozone will make it home in time for dinner.

Smoke And Mirrors

One's imagination does tend to wander while waiting at stoplights, rail crossings, etc., but we all suddenly are awakened and brought back to reality, especially if a nearby vehicle is fumigating the area with thick smoke as if it were a mosquito control vehicle making its rounds. As with all mechanical systems, motor vehicles need to be maintained. Unlike Agent Ozone, most of us do not want our vehicle to smoke like a chimney on a moment?s notice. One indication that the engine needs maintenance is if smoke comes from the tailpipe. A smoking tailpipe can be as simple to fix as getting an engine tune-up, or as complicated as needing to replace the entire engine.

The smoking tailpipe indicates that unnecessary pollutants are being emitted to the atmosphere. Black smoke primarily is soot (ash or particulates) and unburned fuel (organics or VOCs). Blue smoke/haze usually indicates the presence of organics (VOCs) in the exhaust gases. Both black and blue smoke indicate excess carbon dioxide (CO_2). A rotten egg odor, which may not be associated with smoke, indicates sulfur dioxide (SO_2) emissions.

Stop Smoking

Under North Carolina General Statute 20-128.1 - "Control of Visible Emissions," no vehicle may have excess visible emissions. This includes emissions from cars, trucks, buses, and motorcycles using gasoline and/or diesel fuels. The regulation is enforced on area roadways by any sworn officer (i.e. Mecklenburg County's Police Department or Sheriff's Office, N. C. Highway Patrol, or the N. C. Division of Motor Vehicles).

There are a number of ways that citizens can report smoking vehicles observed within Mecklenburg County. These can be reported by phone (704-336-5500), by FAX (704-336-4391), by e-mail (*MCDEP01@Co.Mecklenburg.NC.US*), or through the world wide web (*http://www.co.mecklenburg.nc.us/coenv/smoking_vehicle_form.htm*). For each of these reporting methods, the following information is required:

- North Carolina license plate number
- Make of Vehicle (Ford, Chevy, Honda, Mack, etc.)
- Model of Vehicle (if available - Escort, Nova, Civic, etc.)
- Location (street/intersection/parking lot where the smoking vehicle was observed)
- Town (City/County where observation was made)
- Date (observation was made)
- Time (observation was made)
- A name for the observer
- An address for the observer

Once the information is received, MCDEP mails a letter notifying the owner of the vehicle that it was observed smoking excessively and the requirements of State law, and requesting that the vehicle be repaired or adjusted to eliminate the problem. The letter also reminds the owner that air quality improvement efforts such as these do make a difference in improving the overall air quality in Mecklenburg County.

So the next time someone doing a cheap imitation of Agent Ozone's latest escape maneuver is driving in your neck of the world, take a moment and reach for a pen and paper. Jot it down and give us a call. After all, "the pen is mightier than the sword." SOER

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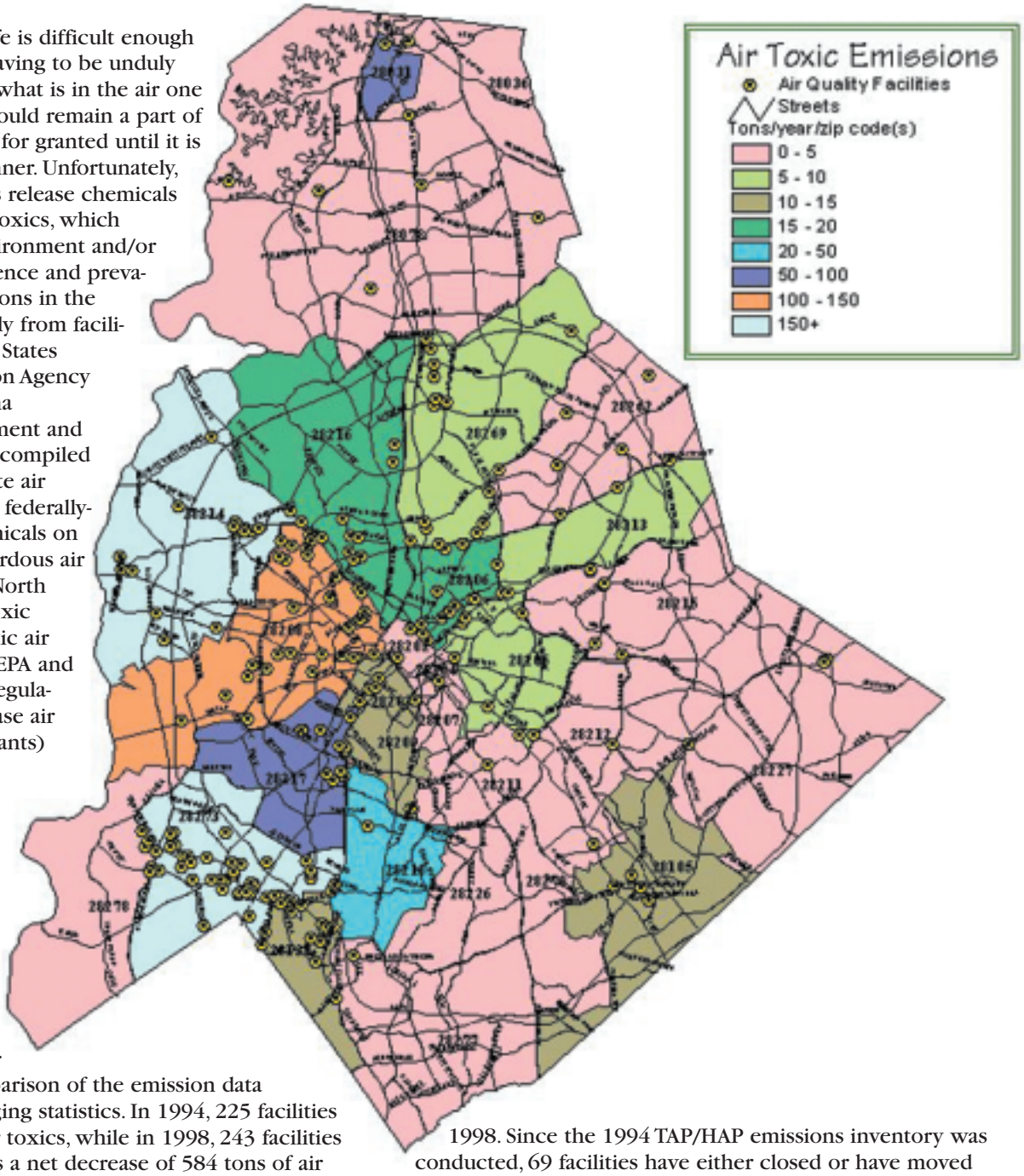
REGULATORY COMPLIANCE AND INDUSTRY INITIATIVES DECREASE AIR TOXICS POLLUTION

For most people, life is difficult enough already without having to be unduly concerned about what is in the air one is breathing. It is and should remain a part of life that most of us take for granted until it is threatened in some manner. Unfortunately, many industrial facilities release chemicals generally known as air toxics, which adversely affect the environment and/or human health. The presence and prevalence of air toxic emissions in the atmosphere varies widely from facility to facility. The United States Environmental Protection Agency (EPA) and North Carolina Department of Environment and Natural Resources have compiled different federal and state air toxic pollutant lists. The federally-regulated air toxic chemicals on EPA's list are called hazardous air pollutants (HAPs), and North Carolina regulated air toxic chemicals are called toxic air pollutants (TAPs). Both EPA and the State have written regulations designed to decrease air toxics (and other pollutants) from industrial facilities.



Emission Inventory Comparison

The Mecklenburg County Department of Environmental Protection (MCDEP) collected 1994 and 1998 TAP/HAP emission inventory data from Mecklenburg County air quality facilities. A comparison of the emission data revealed some encouraging statistics. In 1994, 225 facilities emitted 1503 tons of air toxics, while in 1998, 243 facilities emitted 919 tons. That is a net decrease of 584 tons of air toxics emissions! The 1998 TAP/HAP emissions inventory included 87 facilities that were not permitted in 1994.

These 87 facilities emitted 72 tons of air toxics in 1998. Since the 1994 TAP/HAP emissions inventory was conducted, 69 facilities have either closed or have moved out of the County resulting in a decrease of 211 tons of air toxics. The facilities reporting TAP/HAP emissions in both 1994 and 1998 inventories reported a 445 ton decrease.

Initiatives Decrease Air Toxics Pollution

Both the individual and total air toxics emissions have significantly decreased since the 1994 TAP/HAP emissions inventory was conducted. The exceptions were increases in acetaldehyde, glycol ethers and hexane isomers. The acetaldehyde emissions increased between 1994 and 1998 due to discovery of an acetaldehyde emission source in 1999 that was unaccounted for in 1994. Appropriate controls were added to the emission source upon discovery and the acetaldehyde emissions are expected to decrease dramatically in calendar year 2000. The increased reporting of hexane isomers and glycol ethers is at least partly due to additional knowledge about the chemicals which are included in these groups.

Comparison of 1994 and 1998 Air Toxic Pollutant Emissions

	Total Number of Facilities		Overall change [1] in emissions from 1994 to 1998 (tons)
	1994	1998	
Facilities that reported emissions in 1994 **only**	69		-211
Facilities that reported emissions in 1998 **only**		87	+72
Facilities that reported emissions for 1994 and 1998	156	156	-445
All facilities reporting emissions in Mecklenburg County	225	243	-584

[1] Change in emissions is equal to 1998 emissions minus 1994 emissions. A positive number indicates an increase in emissions. A negative number indicates a decrease in emissions.

Reasons Contributing To The Decline In Air Toxics Emissions

The mere existence of air toxics regulations could be the main reason behind the emissions decreases that are being realized. In order to comply with or avoid applicability to the toxic regulations, several facilities implemented product reformulation, process changes, and/or removal of larger sources of air toxic pollutants. Changes between the 1994 and 1998 air toxic inventories result from other factors, including emissions reductions due to safety improvements and health concerns, business fluctuations, and the latest information on emissions. With overall TAP/HAP emissions reductions occurring all around us, we can all breathe a little easier.

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A PACT FOR MORE MACTs AND GACTs

The 1970 Clean Air Act set health-based standards for eight hazardous air pollutants (HAPs). The 1990 CAA Amendments expanded the list to 189 HAPs and directed the EPA to develop technology-based standards [i.e. Maximum Achievable Control Technology (MACT) and Generally Available Control Technology (GACT) standards] for these HAPs in all listed source categories. All MACT standards target major sources of HAPs and some even have requirements for small sources of HAPs. GACT standards target small sources.

At this date, EPA has written more than 30 MACT/GACT regulations. More than half of these regulations became effective in or after 1997. Seven of the promulgated MACT/GACT regulations directly affect 16 permitted air quality facilities in Mecklenburg County. The most recent MACT standard affecting a Mecklenburg County facility was for Flexible Polyurethane Foam Production, which became effective on October 7, 1998.

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Top Air Toxic Pollutants Emitted in 1994 and 1998

Air Toxic	Effects [1,2]		1994 Inventory			1998 Inventory		
	Health	Environmental	Rank	Tons Emitted	Number of Facilities Emitting This Air Toxic	Rank	Tons Emitted	Number of Facilities Emitting This Air Toxic
Methylene chloride / dichloromethane	A, R, CN, N		1	322	33	1	105	22
Ammonia	A, N	-	2	226	43	2	96	35
Acetaldehyde	A, D, CN, N	S	52	1	20	3	93	32
Toluene / methylbenzene	A, C, D, R, N	S	4	176	134	4	82	186
n-Hexane	A, C, D, N	S	6	114	37	5	77	69
Methyl Ethyl Kelone / 2-butanone	A, C, D, R, N	S	5	161	65	6	65	64
Hexane isomers [3,4]	A, N	S		ND [5]		7	58	7
Xylene / dimethylbenzene	A, C, D, R, N	S	7	35	131	8	31	144
Glycol ethers [3]	A, C, D, R, N	S	21	6	19	9	29	40
Hydrogen chloride / hydrochloric acid	A	-	3	182	21	10	29	20
Ethyl acetate	A, N	S	10	24	27	12	23	34
Perchloroethylene / tetrachloroethylene	A, D, R, CN, N	-	9	25	23	15	16	21
1,1,1-trichloroethane / methyl chloroform	A, C, D, R, N	O	8	12	31	26	4	23

[1] Effects may be known or suspected.
[2] For chemical groups (hexane isomers and glycol ethers) effects may be applicable only to certain chemicals in the groups.
[3] Codes: Health: A=acute, C=chronic (non cancer), D=developmental, R=reproductive, CN=cancer, N=neurotoxic/central nervous system
Environmental: S=smog formation, O=stratospheric ozone depletion
[4] This group of isomers does not include n-hexane.
[5] No data is available.

Uncle Sam, Urban Air Toxics and You

Since the Clean Air Act (CAA) was passed in 1970, much has been done to reduce air pollution across the country. A great deal of attention has been given to the unique air quality related problems of our nation's cities and suburbs. However, more needs to be done. The first major revision of the CAA came with the passage of the Clean Air Act Amendments (CAAA) of 1990. In response to the amendments, the EPA compiled a list of 188 toxic substances, labeled Hazardous Air Pollutants (HAPs), and expanded their role in indentifying toxic urban air pollutants that they were now charged with regulating. Such toxic air pollutant (TAP) emissions in and around our cities are usually emitted from a heavy concentration of factories, numerous motor vehicles, and other commercial activities. EPA is currently focusing its work efforts on the TAPs present in such areas and is developing an integrated corrective action strategy that will effectively target those pollutants posing the greatest public health threat.

In urban areas, TAPs are of particular concern because of the multitude of people living in close proximity to sources of these types of emissions. The current witch's brew of TAPs being emitted from vehicles, industry and multiple area sources serves to create a recipe for an unhealthy air mixture that widely varies in its potency depending upon a host of local variables, such as geography, industry, population, and other miscellaneous contributing factors.

TAPs can cause assorted human health effects ranging from nausea and difficulty in breathing to cancer. Other potential health effects can also include birth defects, serious developmental delays in children, and reduced immunity to disease in adults and children. TAPs falling onto the soil or into lakes and streams can weaken ecological systems and concentrate as they move progressively higher in the food chain, eventually increasing the odds of adversely affecting human health when eaten in a food, such as contaminated fish.

The Mechanics Of EPA's New Urban Air Toxics Strategy

The goal of EPA's new urban air toxics strategy is to reduce health risks. As a first step, under Section 112 of the CAA, EPA has identified 33 of the 188 known TAPs as being the greatest threat to public health in urban areas in terms of their various sources, toxicity and emissions. These select 33 pollutants are responsible for an estimated 38% of all TAP emissions. Based on a 1998 toxic air pollutant inventory conducted for permitted air pollution sources in Mecklenburg County, the most prevalent of these pollutants locally are acetaldehyde, methylene chloride, and perchloroethylene.

Where it is appropriate to do so, urban TAPs will be subject to national and local controls as EPA exercises its CAA authority and other statutes to reduce TAP emissions from area, mobile and major sources. EPA will obtain more reliable information on TAPs through enhanced mon-

List of 33 Air Toxics identified by EPA to be high risks in urban areas

acetaldehyde	coke oven emissions*	manganese and compounds
acrolein	dioxin	mercury and compounds
acrylonitrile	ethylene dibromide*	methylene chloride
arsenic and compounds	propylene dichloride	nickel and compounds
benzene	1,3-dichloropropene	polychlorinated biphenyls (PCB)
beryllium and compounds	ethylene dichloride	polycyclic organic matter (POM)
1,3-butadiene	ethylene oxide	quinoline
cadmium and compounds	formaldehyde	1,1,2,2-tetrachloroethane
carbon tetrachloride*	hexachlorobenzene	perchloroethylene
chloroform	hydrazine	trichloroethylene
chromium VI and compounds	lead and lead compounds	vinyl chloride

* Toxic air pollutants with less significant emissions contributions from area sources.

itoring, additional research, reducing public health risk, and implementing specific controls that will be most beneficial to the greatest number of people in and around cities.

The urban air toxics strategy identifies 29 area source categories that emit significant amounts of the listed air toxics. Some of these sources are already subject to emission standards and some could be subject to future regulation. It also identifies the need for further studies of mobile and stationary sources in urban environments and will focus on both near- and long-term objectives to achieve the desired level of TAP emission reductions.

Public Input Process

The urban air toxics strategy will cover most of the major metropolitan areas in the United States. Within these urban areas, various interests may perceive the proposed actions to be taken differently. EPA is making every effort to address the unique perspectives of the following groups and welcomes their input to support an equitable approach:

Public Health Groups - Public health concerns of susceptible groups, like children and seniors, are a priority to EPA and emphasis will be placed on identifying the health risk impact of air toxics on them.

Environmental Justice Communities - The cumulative impact of multiple emission sources on minority populations and low income populations in urban areas is of special concern. The urban air toxics strategy will help identify and plan actions to decrease emissions that affect these communities.

Small Business Communities - Because of the focus on reducing emissions from area sources in the urban air toxics strategy, impacts could be felt by small businesses. However, EPA strives to ensure that any regulations will not unfairly affect them.

State and Local Governments - National standards for mobile and major sources may not adequately address the risks in urban areas because of the combined emissions from these and many different types of smaller sources. For this reason, state and local agencies will have an active role in tailoring local approaches to reducing risks in urban areas and will be asked to help develop practical programs that allow them to carry out the strategy.

Environmental Interest Groups - Environmental groups will be encouraged to help EPA ensure that it improves public health while also providing flexibility for the business community.

Urban Developers - The urban air toxics strategy is designed so as not to unfairly limit the efforts of developers interested in creating business opportunities in urban industrial sites or areas needing revitalization. EPA will work with these interests to ensure that public health protection is achieved and economic development is encouraged.

Urban Air Toxics Strategy Timeline

The EPA's urban air toxics strategy was published as a final document on July 19, 1999. It includes a 2-year schedule to develop and implement mobile source standards for air toxics, coupled with a 10-year schedule to develop

List of 29 Area Source Categories

Area source categories already subject to standards or which will be subject to standards

Chromic Acid Anodizing	Industrial Boilers
Commercial Sterilization Facilities	Institutional/Commercial Boilers
Other Solid Waste Incinerators (Human/Animal Cremation)	Municipal Waste Combustors
Decorative Chromium Electroplating	Medical Waste Incinerators
Dry Cleaning Facilities	Portland Cement Manufacturing
Halogenated Solvent Cleaners	Open Burning of Scrap Tires
Hard Chromium Electroplating	Secondary Lead Smelting
Hazardous Waste Combustors	Stationary Internal Combustion Engines

New area source categories being listed

Cyclic Crude and Intermediate Production	Municipal Landfills
Flexible Polyurethane Foam Fabrication Operations	Oil and Natural Gas Production
Hospital Sterilizers	Paint Stripping Operations
Industrial Inorganic Chemical Manufacturing	Plastic Materials and Resins Manufacturing
Industrial Organic Chemical Manufacturing	Publicly Owned Treatment Works
Mercury Cell Chlor-Alkali Plants	Synthetic Rubber Manufacturing
Gasoline Distribution (Stage I)	----------

urban area source emissions standards and a work plan to address remaining risks.

Each year in the U.S. millions of tons of HAPs are released into the air. By cutting emissions of air toxics, we are reducing significant health and environmental risks. The urban air toxics strategy promises to make great strides toward identifying the most effective ways to control these pollutants. As compared to 1990, it is expected that nationwide, the end result of deployment of this new urban air toxics strategy will be the achievement of at least a 75% reduction in cancer occurrence due to exposure to air toxics, as well as reductions in risks of other diseases. The information in this article was derived from US EPA publications EPA/452-F-98-002, "Air Toxics Emissions In The City: EPA's Strategy for Reducing Health Risks in Urban Areas" and 64FR38705, "National Air Toxics Program: The Integrated Urban Strategy." SOER

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WHAT ARE AALs ?

At the outset of its air toxics program, North Carolina decided to take an approach protective of public health. It established airborne concentrations of chemicals "above which the substance may be considered to have an adverse effect on human health." These substances became known as toxic air pollutants or TAPs and the concentrations were called acceptable ambient levels or AALs. AALs are expressed in weight per unit volume and are most often written as milligrams/cubic meter. North Carolina has developed acceptable ambient levels for 105 toxic air pollutants (TAPs).

Establishment of AALs

AALs were established by two means:

1. For health effects other than cancer, the AALs were set by taking the occupational exposure guidelines and lowering the acceptable concentration levels by a safety factor of 10 to 160, depending on the nature and severity of the toxic effect and the amount of information known about the health effects of that chemical. Generally speaking, highly toxic chemicals such as mercury have much higher safety factors and lower AALs. (Occupational standards are essentially "no effect levels" and as such, safety factors tend to decrease those concentrations well below the level at which adverse health effects have been demonstrated in occupationally exposed humans.)
2. For substances known to cause cancer in humans (i.e. carcinogens), the AALs were set at levels calculated to represent a "one in a million" risk. That is, if one million individuals are exposed continuously for 70 years to a carcinogen at its AAL concentration, one person might be expected to contract cancer as a result of that exposure. For "probable" human carcinogens the corresponding risk levels are set lower to reflect the uncertainty of the evidence for human carcinogenicity and reduced health risk.

North Carolina's air toxics program does not set state-wide or even community ambient standards for TAPs in the same sense as national standards are set for familiar air pollutants such as ozone and carbon monoxide. National standards set ambient targets for the air we all breathe and every state is expected to meet these standards. Wide-ranging pollution control strategies have been adopted to enable us to achieve these standards. AALs are applied on a much smaller scale.

AALs, Computer Modeling and Compliance

Although termed acceptable ambient levels, North Carolina's AALs actually are used as industrial permitting limits to insure that toxic air pollutants from new or modified facilities do not make matters worse on a case by case basis. Since we do not know the background levels for the 105 toxic air pollutants, the program focuses on what applicable facilities add to the existing environment. For example, if a facility tests its emissions and then conducts air dispersion computer modeling and finds that each of its toxic emissions is below the AAL, we say that the facilty has not added concentrations of toxic pollutants to the air that are harmful to human health. This statement is independent of the existing environmental conditions. The results of the computer modeling are used to determine a facility's compliance with the AALs. (Air dispersion computer models use mathematical equations to simulate the real world. These equations attempt to account for all conditions affecting the release and dispersal of the pollutant, such as wind, temperature, terrain, exit velocity, and stack height. The model input conditions are used to predict the downwind concentration at a certain location of a given pollutant.)

The North Carolina Division of Air Quality maintains a scientific body of experts known as the Science Advisory Board to continually review the AALs and update them, as necessary. Their reviews tend to be more complex than the use of occupational standards and safety factors, but the goal is the same: to establish airborne concentrations for toxic substances that allow an ample margin of safety for potentially exposed individuals. SOER

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INDUSTRY VOLUNTEERS DEMONSTRATE AIR TOXICS COMPLIANCE

Currently, there are 243 facilities in Mecklenburg County known to emit one or more of the 105 North Carolina regulated toxic air pollutants (TAPs) and/or one or more of the 188 federally regulated hazardous air pollutants (HAPs). Since 1996, 21 industrial facilities have voluntarily demonstrated that toxic air emissions from their operations do not increase the public health risk due to cancer. TAPs are defined as being any of the carcinogens, chronic toxicants, acute systemic toxicants, or acute irritant air pollutants regulated under Mecklenburg County Air Pollution Control Ordinance (MCAPCO) Regulation 2.1104 - "Toxic Air Pollutant Guidelines." A HAP is identified as being any pollutant listed in Section 112(b) of the federal Clean Air Act. Most of the time, a facility becomes subject to these rules only if their TAP emissions increased after 1990. Facilities that are subject are required to demonstrate that their facility does not add an amount of toxic air pollutant(s) to the environment, which would increase the public's risk to adverse health effects. Facilities that emit TAPs can avoid applicability to TAP requirements if they do not install or modify equipment that would result in an increase in TAP emissions.

INVENTORIES PROACTIVELY USED TO INITIATE VOLUNTARY COMPLIANCE DEMONSTRATIONS

The Mecklenburg County Department of Environmental Protection (MCDEP) Air Quality Program has taken a pro-active approach to addressing the TAP emissions being released in Mecklenburg County. The following timeline portrays the actions taken to date:

- In 1995, MCDEP conducted an air toxics emissions inventory of all permitted facilities for their 1994 emissions. The inventory also addressed federal hazardous air pollutants (HAPs) that were being emitted. Two hundred twenty-five facilities were identified as actual TAP/HAP emitters. Six of of the top 17 facilities had already demonstrated compliance with North Carolina TAP regulations through the air quality permitting process. The remaining 11 facilities were requested to voluntarily demonstrate that their toxic air emissions did not exceed acceptable ambient levels. Seven facilities conducted air dispersion modeling and demonstrated compliance, and the four remaining facilities showed that their TAP emission rates were below the minimum rule applicability levels.
- In 1998, additional facilities were selected from the previous TAP/HAP inventory for voluntary demonstrations. The selection criteria included facilities reporting carcinogenic emissions in excess of 100 times the toxic permitting emission rate. After disqualifying facilities that only had TAP emissions from combustion processes, facilities that were previously contacted and facilities that already had TAPs regulated in their permits, or had gone out of business, the list was whittled down to ten. Six facilities conducted voluntary modeling demonstrating compliance with North Carolina TAP regulations, and the remaining four provided additional emission information that eliminated the need for modeling.

CONTINUED PROMOTION OF VOLUNTARY COMPLIANCE DEMONSTRATIONS EXPECTED

In 1999, MCDEP conducted another TAP/HAP emissions inventory of all permitted facilities relating to their 1998 annual emissions. A total of 281 facilities forwarded their emissions data with only 243 actually emittting TAP/HAP's. The available information will be reviewed and additional requests for voluntary toxic compliance demonstrations are expected to be sent to facilities of interest.

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A FIRST FROM THE LAST CENTURY

Typical polyurethane form manufacturing facility.

During the 20th century, there were many first's for mankind. Some of the more memorable moments were breaking the sound barrier, splitting the atom, walking on the moon, and in 1999, the North Carolina Division of Air Quality (NCDAQ) made it's first "Director's Call" for toxic air pollutants. Due to increasing public concern over the potentially harmful health effects of the chronic toxicant toluene diisocyanate (TDI) that is emitted by polyurethane foam ("PUF") manufacturing facilities, NCDAQ began conducting studies in August 1997. NCDAQ tried to determine if TDI emissions from the eight PUF manufacturing facilities in North Carolina were in compliance with the acceptable ambient level (AAL) listed in the state toxic air pollutant regulations. After carefully reviewing the data that was received, NCDAQ determined that three PUF manufacturing facilities were in compliance with the toluene diisocyanate acceptable ambient level; however, four other facilities each released TDI emissions that were two to two hundred times higher than the AAL. The remaining facility was closed voluntarily. Alan Klimek, Director of NCDAQ, issued the first "Director's Call" for toluene diisocyanate to those four PUF manufacturing facilities on October 26, 1999. The facilities each received a letter instructing them to meet with NCDAQ within 30 days, submit computer modeling analyses within 60 days and a complete air quality permit application demonstrating that they are below the applicable emission limit within 180 days. It also recommended that the PUF manufacturers examine their methylene chloride emissions; however, they do not have to be quantified at this time. The gathering of emissions data is being delayed because all facilities have to comply with the new federal Environmental Protection Agency rules for methylene chloride by October, 2001.

In July 1998, MCDEP received modeling information from the only local PUF manufacturing operation. The review of the pertinent emissions data indicated the qualifying criteria for participation in the "Director's call" regarding TDI emissions were not met. The facility will have to modify the production process and/or add air pollution control equipment to comply with the federal standards for methylene chloride by October 2001. Mecklenburg County air toxics regulations require the facility to comply with the TDI standard at that same time.

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THE *RETRIBUTION*, RESERVATIONS and REVIVAL of ASBESTOS USE

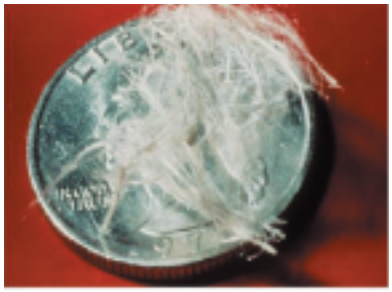
"I've worked around asbestos for years and I ain't got sick. Don't know what the fuss is about."This "it ain't killed me yet" attitude is also that of many cigarette/cigar smokers when discussing the harmful effects of tobacco. But just as with lung cancer being caused by smoking, illnesses such as asbestosis or mesothelioma, which are associated with asbestos exposure, often require long term exposure and have a lengthy latency period. Generally, many years of breathing high concentrations of asbestos fibers is required before lung impairment is apparent and its presence begins to adversely affect the health status of an exposed individual.

There is no known safe exposure to asbestos.

No Known Safe Exposure To Asbestos

Information published by the American Lung Association (ALA) states "There is no known safe exposure to asbestos.The greater the exposure, the greater the risk of developing asbestos-related diseases." EPA considers asbestos exposure such a threat that it has pursued banning most uses of asbestos.A rule published July 12, 1989, banned most applications of asbestos, only to be overturned by the Fifth Circuit Court of Appeals in October 1991. However, the court did maintain the ban on certain uses of asbestos, such as in textured ceiling spray and sprayed-on fireproofing for structural support beams.

One may ask how can the use of something considered so dangerous by the EPA, ALA, and the Occupational Safety and Health Administration (OSHA) be allowed. After all, OSHA estimates that 1.3 million employees in construction and general industry face significant asbestos risk of exposure on the job. Understanding what asbestos is and its many varied uses may help explain the court's decision. Asbestos is the common name for a group of naturally occurring silicate minerals that separate into strong fibers having exceptional thermal and electrical insulating properties. They are so small that individual asbestos fibers cannot be seen without the aid of a microscope because they are so small.



EPA does have a regulation in place which requires removal of certain asbestos-containing materials prior to demolition. It is generally accepted that common demolition practices can release significant amounts of asbestos fibers, potentially exposing the general public to an unnecessary health risk. The Mecklenburg County Department of Environmental Protection is responsible for enforcing Title 40 Part 61 - Subpart M of the Code of federal regulations, often called the National Emission Standards for Hazardous Air Pollutants - Subpart M. Subpart M addresses demolition and renovation with regard to asbestos fiber releases. During this recent economic period of growth, Mecklenburg County area has continued to replace older buildings at an increasing rate, thus the incidences requiring asbestos removal has also increased.

The New Look Of Asbestos In The Marketplace

Six different asbestos minerals have been used in thousands of private, commercial and public applications. The Asbestos Institute reports that "modern asbestos products are as different from the old ones as night and day." Only one of the six asbestos minerals is presently used in the marketplace. Chrysotile, which is the form of asbestos having the longest and largest fibers and therefore is less likely to be inhaled or ingested, historically has been the variety of the mineral used most widely in the manufacturing arena and that remains the same today. The Asbestos Institute further touts the safety of the present asbestos materials by saying many of the old products of the 1970s were dusty, easily crumbled under hand pressure and could readily release asbestos fibers. Currently, the asbestos industry only markets dense and non-friable materials in which the fiber is "bound" or encapsulated in a cement or resin. Of the asbestos that is mined worldwide, ninety percent (90%) of it is being mixed with cement in the form of pipes, sheets and shingles resulting in a product that tightly binds the asbestos fibers together, thereby minimizing potential fiber release.

Asbestos removal is still a frequent occurrence. It is a very costly procedure which is regulated by federal and state regulations, and is generally required to be conducted by highly specialized contractors. These regulations are written to pre-

vent significant public exposure to airborne asbestos fibers during building demolition or renovation.

Actions To Take When Dealing With Asbestos

Very few individuals dispute the fact that asbestos can cause illness. The best advice is to take appropriate steps to minimize the likelihood of asbestos exposure. There are still no regulations that require removal of asbestos containing materials, unless the structures are being demolished or renovated. Asbestos-containing materials that are in good condition and are not sanded or sawed are often better left in place and perhaps covered over for additional stability and protection. EPA recommends a proactive established management program with removal of the asbestos-containing materials occurring only if they are in poor condition or when they are likely to release asbestos fibers as a result of some type of contact activity. Finally, the labels of new construction products should be examined closely to learn if asbestos is one of the materials used in the manufacturing process. This will be valuable information when determining whether to use the material and if so, how to manage it after installation.

Asbestos. The desirable, physical properties of this valuable natural mineral remain as unchanged as the Rock of Gibraltar. However, the asbestos industry has been forced to change itself for the better in order to compete as a building component in today's marketplace, reduce its potential liabilities and to help protect the innocent and unknowing from undue exposure to asbestos fibers. SOER

Partial List Of Products Which May Contain Asbestos

Acoustical Plaster	Fire Curtains
Adhesives	Fire Doors
Asbestos Floor Tile	Fireproofing Materials
Base Flashing	Heating and Electrical Ducts
Blown-in Insulation	High-temperature Gaskets
Boiler Insulation	HVAC Duct Insulation
Breeching Insulation	Joint Compounds
Caulking / Putties	Laboratory Gloves
Ceiling Tiles and Lay-in Panels	Laboratory Hoods / Table Tops
Cement Pipe	Packing Materials
Cement Siding	Pipe Insulation
Chalkboards	Roofing Felt
Cooling Towers	Roofing Shingles
Construction Mastics (adhesives)	Spackling Compounds
Decorative Plaster	Spray-Applied Insulation
Ductwork Flexible Fabric Connections	Taping Compounds
Electrical Cloth	Textured Paints/Coatings
Electrical Panel Partitions	Thermal Paper Products
Electric Wiring Insulation	Vinyl Floor Tile
Elevator Brake Shoes	Vinyl Sheet Flooring
Elevator Equipment Panels	Vinyl Wall Coverings
Fire Blankets	Wallboard

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Just Like The Stock Market, MCDEP'S NESHAP Notifications Continue To Rise

Mecklenburg County's burgeoning building boom continues to maintain its pace. No where is that more evident than in the number of NESHAP notifications received by Mecklenburg County Department of Environmental Protection (MCDEP) in a given calendar year. NESHAP is an acronym for the National Emission Standard for Hazardous Air Pollutants which is found in the Code of Federal Regulations Title 40 Part 61, Subpart 61, Section 61.145 - "Standard for demolition and renovation." A critical part of the regulation requires the owner or operator of the demolition to submit a completed notification form providing key information for each demolition/renovation project. 373 NESHAP notifications were received and processed during 1999 – more than at anytime in the past. That is an average of more than one a day for every day of the year! The next closest year was back in 1994 when 319 NESHAP notifications were processed. During the time period between 1994 to 1998, the number of NESHAP notifications held fairly steady as it hovered between 290 to 300 notifications for each of those years.

When To File A NESHAP Notification Form

NESHAP notifications are filed with MCDEP whenever a facility (i.e. industrial, commercial, business, school, church buildings, even private residences in certain circumstances) is scheduled to either:

- undergo extensive renovation entailing the disturbance of significant quantities of identified regulated asbestos containing materials (RACM) (i.e. quantities equaling or exceeding 260 linear feet/160 square feet/35 cubic feet), or
- undergo partial or complete demolition of the facility.

Subpart M is applicable and enforced by MCDEP whenever removal of RACM is to occur at a facility that is undergoing renovation/demolition or is to be demolished even though it contains little or no RACM.

When one does finally decide to invest in a building by extensively renovating it or chooses to demolish an entire city block to accommodate development of a new high rise building, it is just like buying a large number of blue chip stocks, both paths to profits and progress come at a very high price. All the appropriate paperwork has to be filed with the authorities, whether they be the Securities and Exchange Commission (SEC) or MCDEP, in order to proceed.

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Air Environmental Indicators 1999				
Tons Emitted in 1999				
Pollutant	Stationary Sources	Mobile Sources	Area Sources	Total
Carbon Monoxide (CO)	1,875	84,315	40,628	126,819
Volatile Organic Compounds (VOCs)	2,383	6,570	14,511	23,464
Nitrogen Oxides (NO_x)	926	12,410	6,715	20,050
Source Totals	5,184	103,295	61,854	170,233
Permitted Air Pollution Sources				
Major	> 100 tons actual emissions			14
Minor	< 100 tons actual emissions			264
Stage I	Gasoline Distribution Facilities (not including terminals)			309
Transportation	Parking Lots/Decks/Garages			39
Days Exceeding the National Ambient Air Quality Standard				
Ozone	1-hour			4
	8-hour			34
Carbon Monoxide	1-hour			0
	8-hour			0
Particulates	<= 2.5 microns			0
	<= 10 microns			0
	<= 100 microns			0
Nitrogen Oxides				0
Sulfur Oxides				0
Air Quality Index (AQI) Designations				
Good (Green Days)				128
Moderate (Yellow Days)				203
Unhealthy for Sensitive Groups (Orange Days)				29
Unhealthy (Red Days)				5
Mobile Source Activity				
Registered Vehicles in Mecklenburg County				540,363
Daily Vehicle Miles Traveled (VMT) in Mecklenburg County				16,373,330
Bus Transit Ridership (Total Passengers)				11,959,875
Number of Vehicle Emissions Testing Stations in Mecklenburg County				346
Weather				
Days Classified as Hazy				77
Days with Temperatures > 90° F				41
Notices of Violation				
Permitted (Stationary and Area) Sources				133
Permitted - Non-Procedural				32
Total Issued				153