

REPORT 3

Water, Sewer & Stormwater Capital Needs



WATER 2030



Water 2030 Initiative

The North Carolina Water 2030 Initiative was launched in March 2004 to determine North Carolina's water resource needs for the next 25 years and to explore choices that will ensure that North Carolinians, in every part of the state, will have access to ample supplies of clean water for years to come. The initiative is being led by the N.C. Rural Economic Development Center in collaboration with an advisory group representing business, agriculture, economic development, environmental protection, and national, state and local governments. Funds have been provided by the N.C. General Assembly, U.S. Congress through the Environmental Protection Agency, the N.C. Clean Water Management Trust Fund and the Rural Center Board of Directors.

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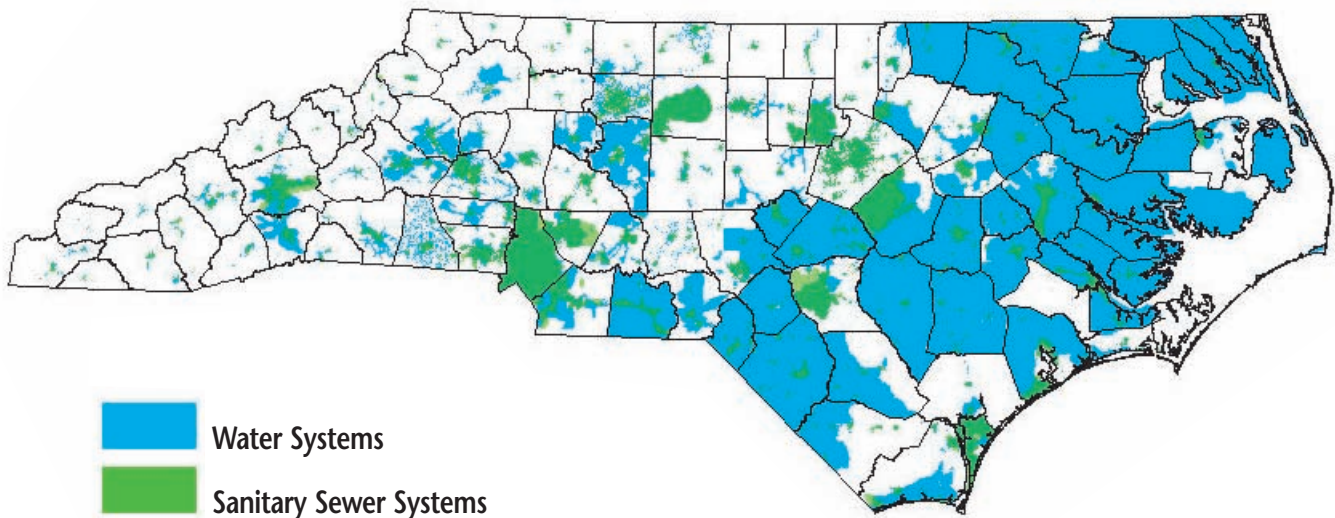
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EXECUTIVE SUMMARY

North Carolinians must soon make unprecedented decisions about water resources. To assist this process, the Water 2030 Initiative provides a detailed analysis of water, sewer and stormwater systems statewide. This includes information about existing infrastructure and fiscal condition, plus projections of needed investments through the year 2030. Among the initiative's most important findings:

- North Carolina's public water, sewer and stormwater utilities will require investments totaling \$16.63 billion to keep pace with necessary improvements and population growth over the next 25 years.
- These utilities will require \$6.85 billion in investments within the next five years.
- By 2010, the number of people served by North Carolina's public sewer systems will grow by 2.9 percent each year—nearly double the rate of overall population growth.
- By 2030, North Carolina's public water systems are projected to serve 9.8 million people, 70 percent more than today.
- The need for water system improvements will soon outpace that of sewer systems as localities develop new water supplies, bring systems into compliance and institute repair and replacement programs.
- New federal regulations require some N.C. communities to address stormwater issues to protect waters from pollutants. Current estimates of stormwater needs—\$1.47 billion by 2030— may be conservative.
- Most water and sewer systems in North Carolina are small, and many are located in economically distressed areas. Monthly bills in these areas are often twice as high as in areas with larger systems.
- Many systems already exceed the state standard—1.5 percent of median household income—for water and sewer charges.
- Water loss is a significant problem. Each year public water systems "lose" more than 35 billion gallons of water because of leaks, unmetered connections and other situations.
- Water and sewer rate structures most widely used in the state do not encourage customers to conserve.

N.C. Water and Sanitary Sewer Systems



The next 25 years: Determining the Capital Needs of North Carolina's Public Utilities

In coming years, North Carolinians will be called upon to make unprecedented decisions about water resources. To help guide these decisions, the Rural Economic Development Center in 2004 launched the multifaceted Water 2030 Initiative. One of the initiative's core missions was to create a detailed analysis of the state of water, sewer and stormwater systems statewide. The analysis includes information about existing infrastructure and fiscal condition, plus projections of needed investments through the year 2030. This report summarizes those findings.

Setting the stage

Water 2030 is the Rural Center's second major inventory of water-related infrastructure. In 1998, the center concluded a three-year project that created a database and mapping system for all community water and sewer systems in 78 of the state's 100 counties. The purpose was to answer questions about the condition of water and sewer systems and needed investments as a guide for planning and public policy development, particularly with regard to infrastructure financing. The project obtained information on more than 700 water and sewer systems. This information was then incorporated into the state database managed by the Center for Geographic Information and Analysis.

Analysis of the data, summarized in the report "Clean Water: Our Livelihood, Our Life," projected \$11.34 billion in needed repairs, upgrades and expansions for public water and sewer systems statewide by 2015. A companion study of capital financing revealed an increasing reliance on loans rather than grants for water and sewer construction, yet 60 percent of North Carolina's local governments lacked the capacity to borrow money. Together, these findings gave impetus for passage of the 1998 Clean Water Bonds. Those bonds provided \$800 million for water and sewer projects across the state.

There were other significant outcomes as well, including:

- Needs documented by the initiative doubled the estimates then being used by the U.S. Environmental Protection Agency to apportion federal money going into the State Revolving Loan Funds. This data, coupled with outreach efforts by state and regional office staff, helped increase subsequent allocations to the Drinking Water State Revolving Loan Fund.
- The survey revealed that a majority of sewer pipes were of vitreous clay that had exceeded its expected lifetime of 40 years. As a result, most systems were experiencing problems with groundwater and stormwater infiltrating the sewer lines and overtaxing wastewater treatment capacity. This substantiated the need for the state's 1998 Sewer Collection Enforcement Program, requiring that every system develop a schedule of inspections, maintenance and improvements.
- The data provided evidence for the need for regionalization and consolidation of water systems. Three out of four public water systems in 1998 served fewer than 3,300 customers. Greater efficiencies of scale were needed to meet increasingly

stringent drinking water regulations while maintaining affordable rates. An emphasis on regionalization was incorporated into the legislation creating the 1998 Clean Water Bonds, and nearly 90 percent of all bond-funded projects included aspects of regionalization or consolidation.

- As intended, federal and state funders have used the report and database in planning for and making decisions on funding of joint projects and managing their own funding resources. The computerized maps also proved vital in the response to the flooding that followed Hurricane Floyd in 1999.

Complex and evolving picture

The 1998 initiative provided a detailed examination of the state of water and sewer infrastructure at the time. Over the next few years, substantial investments were made to improve and expand systems throughout the state. Yet there were indications that critical problems were far from resolved.

The 2000 Census showed that North Carolina's population had grown by 1 million people over the preceding decade, outpacing predictions. Most of the population growth occurred in urban or urbanizing regions, stretching the ability of those communities to keep pace with the need for infrastructure investments. Increasing urbanization and resulting stormwater runoff also created significant water quality concerns.

Longheld assumptions about the abundance of water resources underwent serious challenge. A series of studies documented dwindling aquifers in the Coastal Plain, where most communities rely on groundwater supplies. As a result, the Environmental Management Commission imposed a Capacity Use Area designation on 15 counties, directing them to reduce groundwater withdrawals by up to 75 percent over 16 years. In the Piedmont, four consecutive years of drought showed the vulnerability of certain surface water supplies. In 2002, more than 90 systems were placed under mandatory water conservation, and many others agreed to voluntary conservation. Heavy rains in early 2003 relieved the immediate crisis, but in 2005, drought again threatened the water supplies in the northern Piedmont.

Competition for the use of water resources became more apparent. Stakeholder groups formed in the Catawba and Yadkin river basins to take part in the hydroelectric relicensing process of the Federal Energy Regulatory Commission. Water usage and flow regulation are part of the discussion. On the Roanoke and other rivers, environmental groups are urging the adoption of ecologically sustainable flow regulation.

Additional regulations are leading to increasing costs. New, more stringent regulations govern water and sewer treatment, and new pollution control rules require communities to better manage stormwater runoff.

At the same time, local governments face uncertainties in the financial arena. Many benefited from extraordinarily low interest rates over the last decade as they turned increasingly to private market lenders to finance capital improvements. Whether those low rates will continue is unclear. Furthermore, federal support for grants and loans —

Launching Water 2030

once a significant factor in infrastructure development — has been declining. In the face of record federal budget deficits, this trend is expected to continue. The state has made several efforts to supplement federal financing — most significantly through the 1998 Clean Water Bonds. Its ongoing role in infrastructure financing has yet to be determined.

Against this background, the Rural Center determined that North Carolina would benefit from a new, far-reaching examination of water, sewer and stormwater infrastructure. In 2004, it launched Water 2030 to detail the state's water resource needs over the next 25 years and to explore choices that will ensure North Carolinians in every part of the state will have access to ample supplies of clean water.

The initiative encompassed several related projects. These included an assessment of the impact of the 1998 Clean Water Bonds, the latest in the Rural Center's ongoing effort to track water and sewer construction financing, an infrastructure and capital needs inventory, an examination of the available supply of water against the growing demand for it, and an extensive public education and outreach campaign. This report focuses on Water 2030's capital needs inventory. Other aspects of the initiative are covered in accompanying publications.

Inventory design and execution

The capital needs inventory was designed to capture information critical to assessing public water and clean water infrastructure throughout North Carolina. It sought to determine both the short- and long-term need for water, sewer and stormwater infrastructure improvements.

To help carry out data collection and analysis, the Rural Center retained the services of three consulting agencies. Two engineering firms conducted data collection on water, sewer and stormwater systems: McGill Associates in the west and Hobbs, Upchurch and Associates in the east. AMEC Earth and Environmental Inc. provided quality control oversight.

Specific steps in the process included:

- Identification of all public systems owning and/or operating drinking water, sewer or stormwater utilities in each of North Carolina's 100 counties.
- Development and testing of questionnaires. Initial questionnaires were tested on three systems in each of the state's distinct geographic regions. The questionnaires were modified to clarify questions and improve the accuracy of responses.
- Survey implementation. Each system owner received the detailed questionnaire and three maps. Two of the maps showed the service area boundaries for water and sewer systems as they existed in 1998. (Maps were generated from 1998 survey data for systems that had participated in it and from information available through the State Center for Geographic Information and Analysis.)

Participants were asked to update the boundaries and to note any improvements made to their utilities since that time. The third map was provided to obtain baseline information on stormwater systems, which were not part of the 1998 study. Participants also were asked to provide details of their rate structure and of future needs based on near-term capital improvement plans (2005-2010) and projected growth (2011-2030).

- **Quality assurance.** Data were scrutinized for accuracy by the engineering firms responsible for the survey and by AMEC.
- **Analysis.** Responses to the questionnaire were then tabulated, and the digital master copy of the maps was updated.

Ultimately, the data will be turned over to the state Center for Geographic Information and Analysis where, after another layer of quality control, they will be incorporated into N.C. OneMap, the state’s Geographic Information System database.

Statewide overview

The statewide inventory shows that North Carolina will continue to require substantial investments to serve the needs of communities for water, sewer and stormwater infrastructure. Capital needs are expected to total \$16.63 billion by 2030. In the near term, communities report needing \$6.85 billion in infrastructure investments by 2010.

Capital Needs Projections

	2005-2010 (in billions)	2011-2030 (in billions)	Total (in billions)
Water	\$ 2.84	\$ 4.80	\$ 7.64
Sewer	\$ 3.44	\$ 4.08	\$ 7.52
Stormwater	\$ 0.57	\$ 0.90	\$ 1.47
Total	\$ 6.85	\$ 9.78	\$ 16.63

Water systems

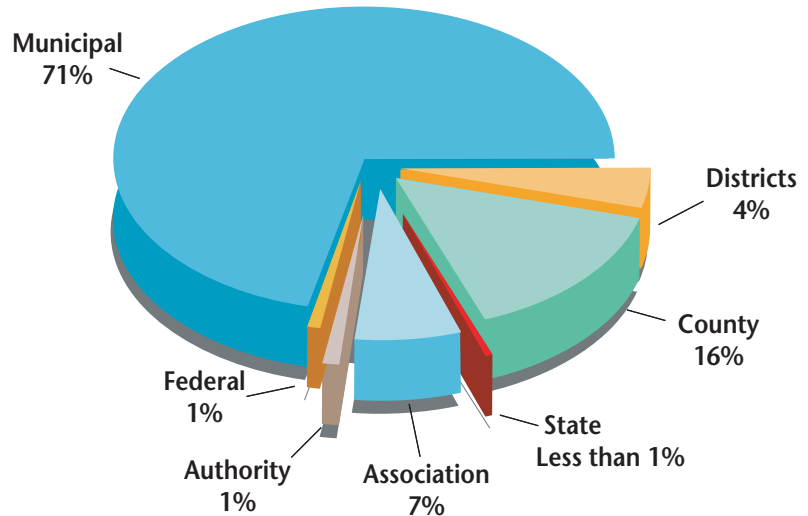
Definition: Water systems include all public water systems that serve at least 25 people or 15 service connections for at least 60 days per year. A system may consist of distribution lines, a water treatment plant and holding facilities (from tanks to lakes), or holding and distribution capacity only. The latter may occur when a community purchases treated water from a neighboring town but retains ownership of its distribution lines.

Major considerations: Both regulatory and practical issues are affecting water system investments. Drinking water systems currently must comply with 100 or more requirements. In December 2005, the U.S. Environmental Protection Agency finalized two new regulations related to drinking water. One increases monitoring and treatment requirements to reduce the risk that disease-causing microorganisms will enter the water supply. The second limits the amount of potentially harmful disinfectant byproducts allowed in drinking water. On the practical side, water supply shortages — from dwindling aquifers and recent droughts — have forced localities to look for alternative and back-up sources of water. This often requires major investments of capital in piping and pumping equipment, in addition to other costs.

At a glance

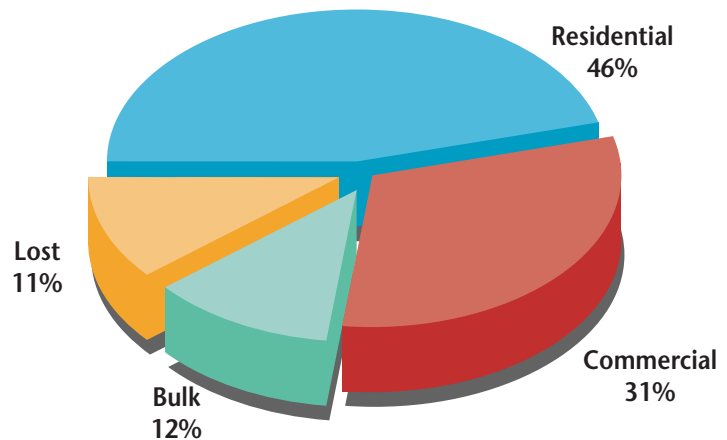
- The Water 2030 survey identified 535 public water systems statewide.
- Nearly three-quarters of these systems are owned and operated by incorporated municipalities.

Ownership of North Carolina Public Water Systems



- Public water systems provide water to 5.8 million people, or 67 percent of the state's 2005 population.
- The number of people served by these systems is expected to grow by 2.7 percent annually, at least through 2010. This is greater than the overall rate of population growth statewide (1.5 percent). At this rate of growth, the state's water systems will serve 9.8 million people by 2030, 70 percent more than today.
- Public water systems dispense more than 244.5 billion gallons of water a year.
- Residential use accounts for 46 percent and commercial use, 31 percent, of water purchased from public utilities.
- More than half of all systems bill at a uniform rate, that is, the price is the same for each unit of water.
- The median monthly water bill was \$21.08 for households within the jurisdictional boundary of a service provider (city limits in most cases) and \$35.50 for households outside the boundaries. This is based on 6,000 gallons of consumption.
- Systems statewide lose 11 percent of treated water annually to leaks and other means not "accounted for." This amounts to 35 billion gallons of treated water each year, enough to supply the entire Charlotte-Mecklenburg region for a full year.

Treated Water Consumption by User



- Currently, about 87 percent of water plants have some excess treatment capacity.
- System owners have identified \$2.84 billion in needed capital expenditures by 2010 and an additional \$4.80 billion in the succeeding 20 years, or a total of \$7.64 billion in a 25-year period. These improvements are required to serve expected growth, correct existing problems and meet new drinking water standards.

Sewer systems

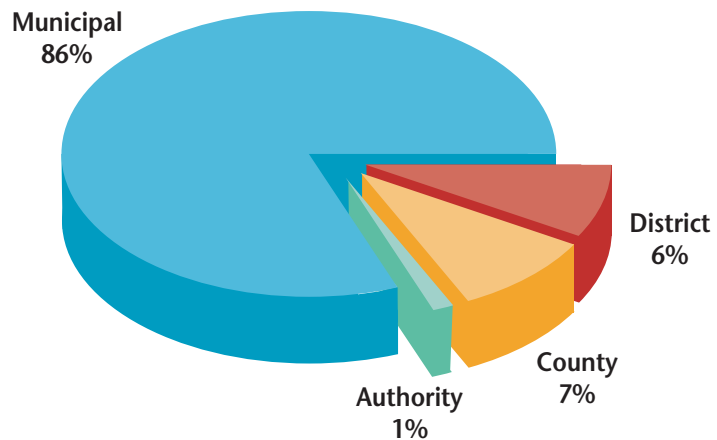
Definition: A system may include wastewater treatment and collection or collection only. In the latter case, the community contracts with a neighboring system to handle sewage treatment, but this practice is far less common for sewage than for water systems.

Major considerations: Since the Clean Water Act was first adopted in 1972, the federal government has taken an active role in defining wastewater treatment requirements. The purpose is to prevent excessive nutrients, harmful chemicals and other pollutants from entering the nation's surface waters and threatening human and environmental health. In North Carolina, these rules are enforced by the state. In recent years, North Carolina has adopted additional nutrient requirements for the Neuse and Pamlico-Tar river basins in response to specific water quality problems in those rivers and their estuaries.

At a glance

- The Water 2030 survey identified 409 public sewer systems.
- The overwhelming majority (86 percent) are owned and operated by incorporated municipalities.
- These systems serve some 4.4 million people, or roughly 51 percent of the total population in 2005.
- The number of people served by these systems is expected to grow by 2.9 percent annually at least through 2010. This is greater than the growth rate for water systems and nearly double the rate of overall population growth.

Ownership of North Carolina Public Sewer Systems

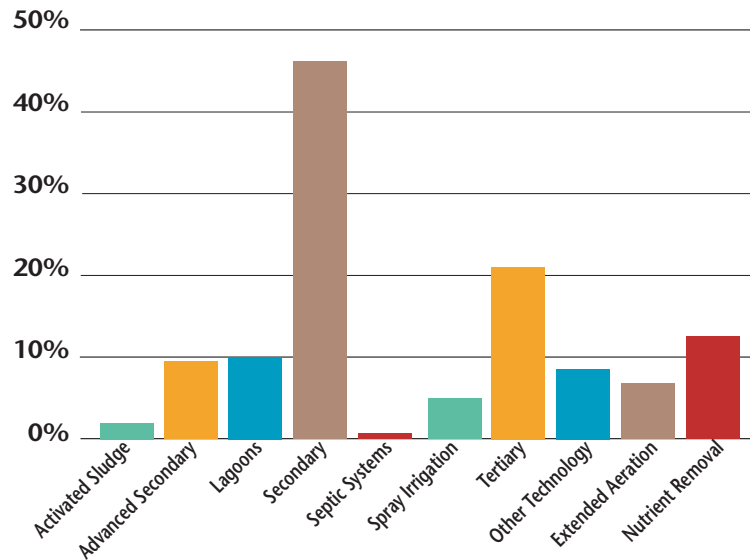


- Statewide, sewer systems include 351 treatment plants. These plants are called on to treat more than 255 billion gallons of wastewater each year.
- On the highest flow days, wastewater exceeds the treatment capacity of 40 percent of these plants. The amount of rain and groundwater entering the sewer lines on these high-flow days (158 million gallons altogether) doubles the average daily flow of the Charlotte-Mecklenburg system.
- Nearly three-quarters of sewage collected by public systems originates in residential dwellings.
- A wide variety of treatment technologies is employed across the state, with the type often selected to meet local characteristics. Technologies continue to advance in complexity and cost in order to keep pace with regulations. This is reflected in the growing number of tertiary treatment systems.
- Four out of five systems charge a uniform rate for all wastewater treatment.
- The median monthly bill for sewer service was \$25.54 for households within the jurisdictional boundary of the service provider (city limits in most cases) and \$42.80 for households outside the boundaries. This bill is based on 6,000 gallons a month of use.
- System owners identified \$3.44 billion in needed sewer investments by 2010 and an additional \$4.08 billion between 2011 and 2030, for a total needed investment of \$7.52 billion by 2030. These improvements would serve new customers, correct such existing problems as aged pipes and bring treatment technologies up to current standards.

Stormwater systems

Definition: In general terms, stormwater systems collect, store or transport rain or other stormwater runoff for drainage or flood control purposes. For Water 2030, stormwater systems were identified and included in the study if a unit of government indicated it had significant drainage or flooding problems or topography causing stormwater runoff.

Sewage Treatment Technologies in Use

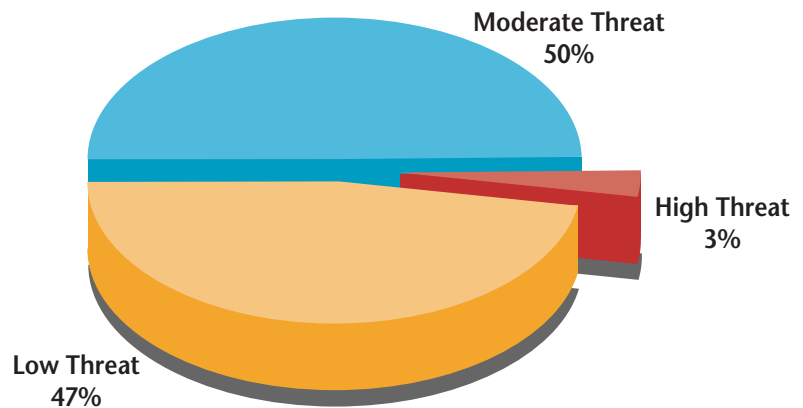


Major considerations: In years past, issues related to stormwater may have been addressed on a piecemeal basis or as part of other infrastructure systems, such as highways. New regulations growing out of the National Pollution Discharge Elimination Systems (NPDES) program require designated local governments to address stormwater runoff in a more concerted fashion as part of the effort to protect the nation’s rivers, streams and other surface waters. Stormwater runoff causes concerns because of excess nutrients and pesticides flowing from lawns, oil residue that washes off city streets and a host of other chemicals that can harm water quality and aquatic life. The NPDES rules have been implemented in two phases. North Carolina’s six largest municipalities came under its requirements in 1990. An additional 130 municipalities fall under the program’s second phase, which went into effect in March 2004. Most communities are still learning what these new regulations will mean for them.

At a glance

- The survey identified 465 municipal stormwater systems for further analysis.
- These include all municipalities covered by Phase I and II of the NPDES regulations.
- Other stormwater systems identified but not included in the analysis were systems owned by 58 counties that indicated they are confronting stormwater issues and by the N.C. Department of Transportation.
- Approximately half of all North Carolinians live in a municipality operating a stormwater system.
- About half of these communities report at least a moderate incidence of flooding.

Threat of Flooding in Communities with Stormwater Systems



- Six out of 10 municipalities with stormwater systems have guidelines preventing new development within the 100-year floodplain, the minimum standard for the National Flood Insurance Program. Compliance rates may be higher if county plans cover municipalities.
- Only 5.6 percent of municipalities currently operate their stormwater systems like other utilities, with fees to raise revenue for improvements.
- Analysts project the statewide need for stormwater control investments at \$0.57 billion by 2010 and an additional \$0.90 billion in the following 20 years, or a total of \$1.47 billion by 2030.

Major findings

North Carolina's public utilities will require a major infusion of capital to keep pace with necessary improvements and population growth.

North Carolina has invested heavily in water, sewer and stormwater infrastructure in recent years. (For additional details, see the accompanying reports "Impact of 1998 Clean Water Bonds" and "Trends in Water and Sewer Financing.") Even so, the demands of a growing population and requirements related to environmental protection and safe drinking water will continue to challenge the state and its localities over the next 25 years. Slightly over half of the needed investment falls in rural counties: \$8.56 billion of the total \$16.6 billion in projected capital needs. With struggling economies and small populations, many rural communities have lacked the financial resources to upgrade their infrastructure. One result is that a high percentage of sewer systems under moratoria and Special Orders of Consent are located in rural counties. Rural systems also reported more than twice the volume of I&I as urban systems.

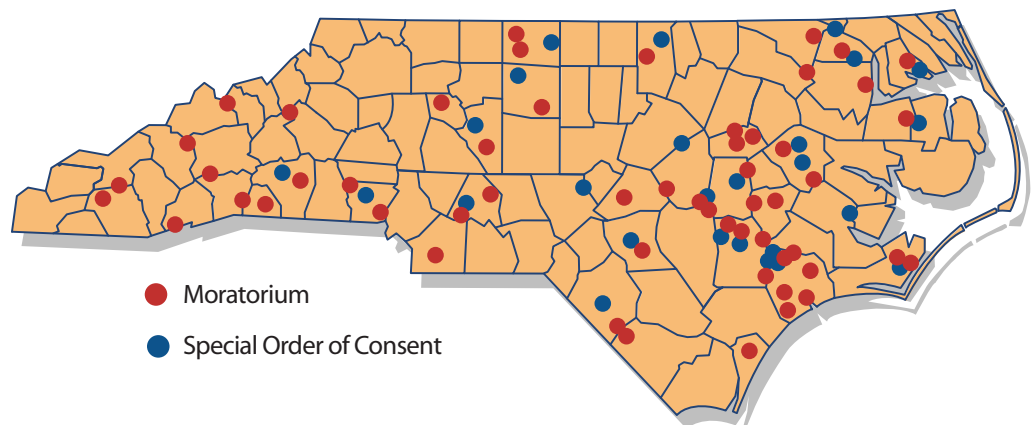
The need for water system improvements will soon outpace that for sewer systems.

Sewage treatment systems are complex and costly operations, and they consumed the majority of water/sewer funding in recent years as communities struggled to come into compliance with clean water regulations. The need for drinking water, however, will

Rural/Urban Usage and Capital Needs

	Urban	Rural
Number of Counties	15	85
Population served by water system (2004)	3.2 million	2.6 million
Annual Water Use	180 billion gallons	164 billion gallons
Population served by sewer system (2004)	2.9 million	1.5 million
Annual Wastewater Flow	151 billion gallons	104 billion gallons
Capital Needs		
Water	\$4.2 billion	\$3.4 billion
Sewer	\$3.0 billion	\$4.6 billion
Total	\$7.2 billion	\$8.0 billion

North Carolina Sewer Moratoria and Special Orders of Consent December 2005



soon overtake sewer needs as localities develop new water supplies, bring their systems into compliance with new federal regulations and institute repair and replacement programs. For the years 2011 to 2030, local governments project they will need \$4.8 billion to improve and expand water systems — 18 percent more than they anticipate spending on sewer system improvements during that period.

Stormwater control presents a major unanswered question for infrastructure planners.

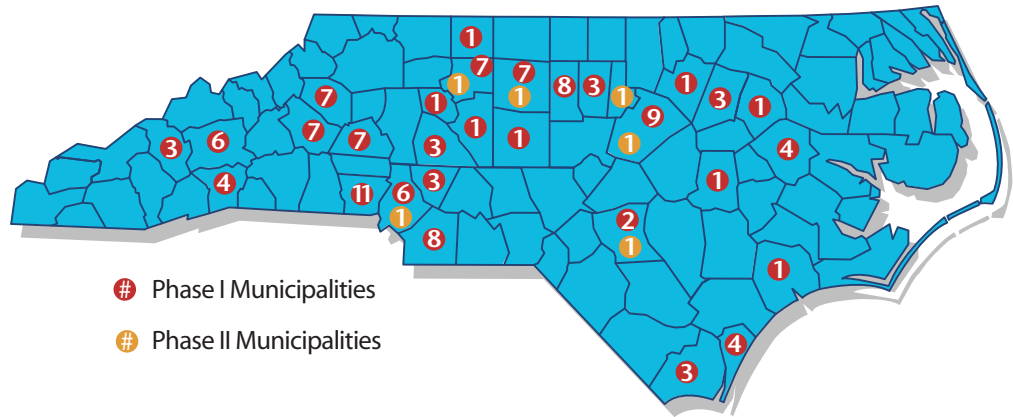
The experience of municipalities in Phase I of the NPDES program demonstrates that collecting and treating stormwater runoff in ways similar to a sewer system can be extremely expensive. Smaller cities in Phase II are only beginning to grapple with possible approaches and costs. Only 16 percent of stormwater systems have even been

mapped. The uncertainties are so great that a mere 6 percent of system owners were able to calculate their capital needs with any degree of confidence. For this reason, projections for stormwater investments (\$1.47 billion) may be less reliable than those for water and sewer systems. Adjustments, however, are more likely to increase rather than decrease the future needs.

Water and Sewer Capital Needs Over Time

	1995-2005 (actual expenditure)	2005-2010 (documented need)	2011-2030 (projected need)
Water	48%	45%	54%
Sewer	52%	55%	46%

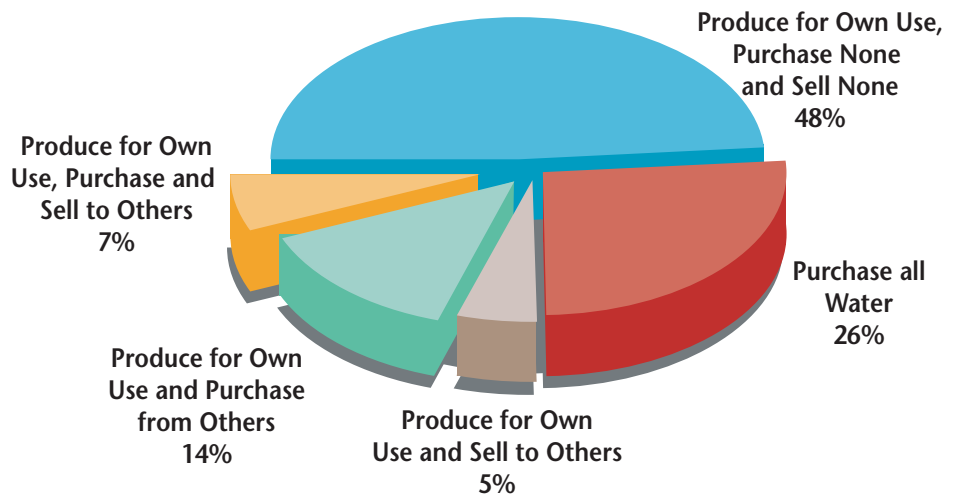
**Phase I and II Designated Municipalities by County
National Pollution Discharge Elimination System Program**



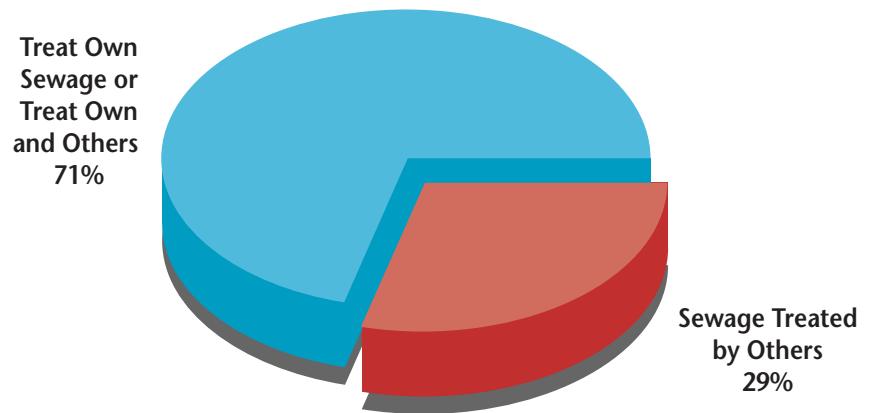
Localities are moving toward regionalization faster with water service than with sewer service.

Slightly more than half of all water systems have some interconnection with other systems and those interconnected systems serve nearly 80 percent of all people on public water systems. Two forces appear to be driving regionalization of water systems: the search for more cost-efficient operations and the need for back-up in times of water shortages. Widespread regionalization in the east may be related in part to the sheer number of systems in the east and in part to the flat terrain, which reduces the obstacles to laying pipe over long distances. Piedmont water systems, however, increased their interconnections following the drought of 2002. Greensboro alone has 11 interconnections.

Water Regionalization



Sewer Regionalization

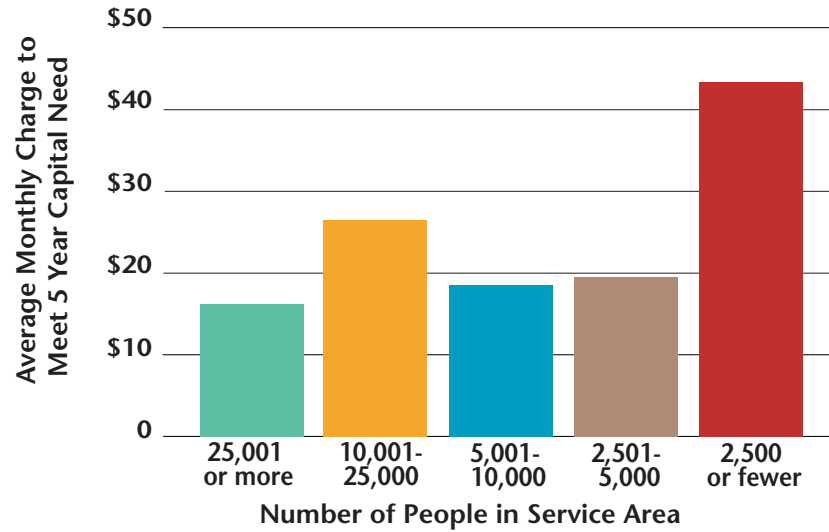


Small systems remain the rule throughout much of the state, and their size is costing ratepayers.

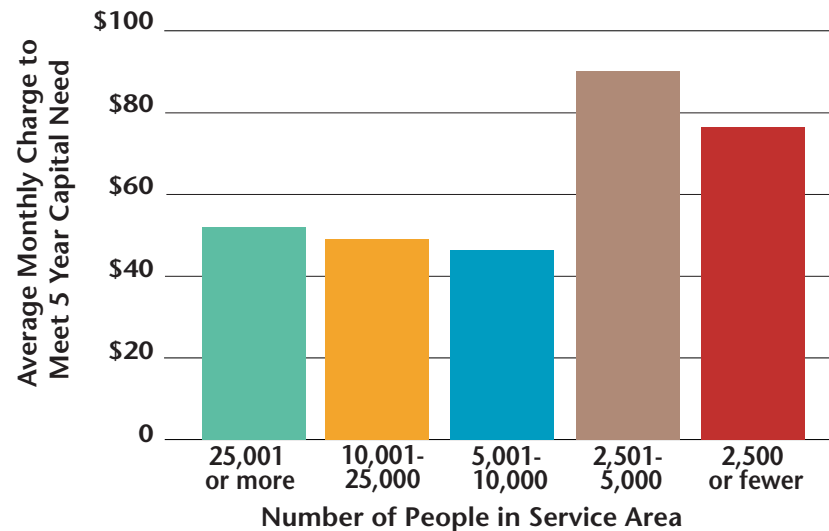
Small systems dominate despite some movement toward regionalization. Water systems demonstrate this issue. About half of North Carolina’s water systems serve 2,500 people or fewer, and 70 percent serve 5,000 or fewer. To look at it another way, the state’s 37 largest systems provide water for 65 percent of all people on public water systems. The remaining 35 percent receive their water from 493 different utilities. (These numbers exclude five systems that sell bulk water only to two or fewer customers.) Lacking economies of scale, most of these small systems charge significantly higher rates than do their larger counterparts. Monthly bills for households on those smaller systems often run twice as high as those for customers of large systems. The differences for sewer customers can be even more dramatic. Needed improvements in upcoming years will magnify the disparities. If the next five year’s worth of needed investments were spread across their customer bases during that period, the smallest water systems would

need to raise the monthly charge to each customer by \$43.50. By contrast, the result for the largest systems would be an additional \$16.32 a month per connection. Sewer costs would rise even more dramatically in the same scenario: an additional \$75.38 for customers of the smallest systems compared with \$52.03 for customers of the largest systems. Most of the smallest systems — two-thirds of those serving 2,500 or fewer people — are located in economically distressed counties where a large proportion of residents live in poverty.

Water Systems by Size



Sewer Systems by Size

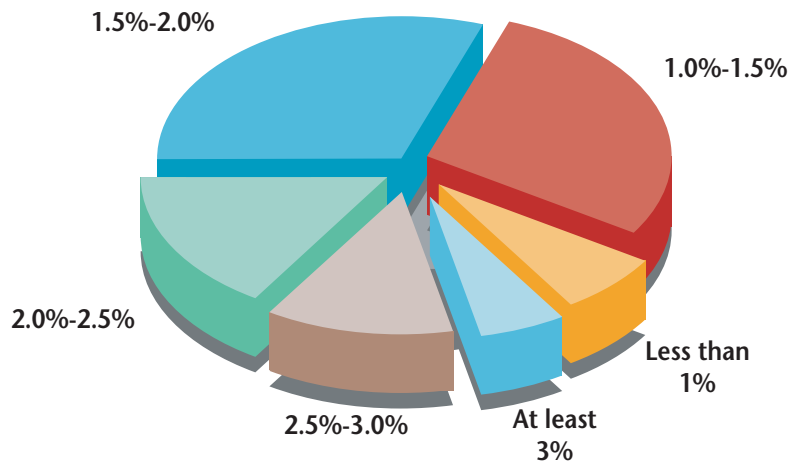


Many systems already exceed the state standard for water and sewer charges.

The North Carolina General Assembly has adopted 1.5 percent of median household income as the standard for affordability of combined water and sewer service.¹ This means that in a system’s service area, the average utility bill for both services should not exceed 1.5 percent of the median household income for that locality. The state uses this

¹ North Carolina General Statutes, Chapter 159G-6(b)(2).

Municipal Water/Sewer Bill as Percentage of Median Household Income



standard as a guide for decision-making in construction grant programs. A study by the N.C. League of Municipalities identified 162 cities and towns reporting both water and sewer rates². Of those, 64 percent had average combined rates (based on 6,000 gallons of consumption for each utility) in excess of the state standard. Nine utilities more than doubled the standard. Financing needed construction programs will clearly send more utilities over the standard and, for those already exceeding it, make services even less affordable, especially for low-income residents. It should be noted, however, that North Carolina set its standard far below the level suggested by the U.S. Environmental Protection Agency. The EPA's current measure of affordability is a systemwide average of 4.5 percent of median household income.

Efforts to Reduce Sewer Inflow and Infiltration by Municipalities

Total Systems in North Carolina	409
Urban	75
Rural	334
	Percent of Total Sewer Systems
Have completed a Headworks Analysis	41%
Have Conducted Smoke Testing	55%
Have Done Camera Inspection	39%
Have Line Inspection and Cleaning Program	65%
Have Line Rehab and Replacement Program	42%
Have Sewer System Mapped	83%
Mapping Done in GIS	23%
Have Capital Improvement Plan in Place	48%

² N.C. League of Municipalities, "North Carolina Water and Sewer Rates and Rate Structures," May 31, 2005.

Sewer system operators are stepping up to identify and correct problems with ground-water infiltration and inflow.

State and federal regulations have clamped down on sewer systems that release untreated or inadequately treated sewage flowing into streams and rivers. A leading cause of these releases has been inflow and infiltration (I&I) — rain and groundwater seeping into sewer systems and overtaxing the capacity of treatment plants. The Rural Center’s 1998 inventory of clean water infrastructure identified a significant source of the I&I problem as aged, deteriorating pipes, yet only 5 percent of systems reported making improvements to their sewer lines at that time. I&I and pipe replacement remain significant issues, but systems have begun to identify and locate leaking pipes. More than half of all systems have now conducted smoke tests to pinpoint leaks, and 65 percent have adopted a regular line inspection and cleaning program.

Efforts to Curb Water Loss by Improving Operations and Maintenance Work

Total Systems in North Carolina	535
Urban	90
Rural	445
Average Monthly Unaccounted for Water Loss	Percent of Total Water Systems
Have Active Leak Detection Program	31%
Have Valve Exercise Program	43%
Have Meter Replacement Program	62%
Have Conducted a Leak Detection Study	25%
Have Located all Valves Locations and Meters	74%
Have Water System Mapped	89%
Mapping Down in GIS	27%
Improvement Plan in Place	44%

Water loss is a significant problem receiving inadequate attention.

Statewide, public water systems “lose” more than 35 billion gallons of water a year to leaking pipes, unmetered connections and similar problems. That’s approximately 10 percent of all treated drinking water. In spite of this, less than a third of all systems support a regular leak detection program, and only a quarter have conducted even a single leak detection study.

Inadequate maintenance shows up on the bottom line.

Systems are losing money because of inadequate infrastructure maintenance and replacement. Water and sewer systems represent a majority of assets for units of local government in North Carolina. Operating those systems at a loss threatens the financial solvency of those governments. Each year, the State Treasurer’s Office releases an audit

**Comparison of Use of Measures to Sewer Inflow and Infiltration
Among Municipal Systems With Audits (2004)**

	Systems with Net Income	Systems with Negative Net Income
Have Conducted a Headworks Analysis	52%	34%
Have Smoke Tested Sewer System	64%	58%
Have Conducted Camera Inspection of System	50%	36%
Have Line Inspection and Cleaning Programs	74%	68%
Have Line Rehab and Replacement Program	52%	39%
Have Water System Mapped	91%	88%
Mapped in GIS	28%	19%
Have Capital Improvement Plan in Place	59%	46%

**Comparison of Use of Measures to Reduce Water Loss
Among Municipal Systems With Audits (2004)**

	Systems with Net Income	Systems with Negative Net Income
Have Leak Detection Program	35%	29%
Have Valve Exercise Program	43%	37%
Have Meter Replacement Program	72%	64%
Have Conducted a Leak Detection Program	27%	26%
Have all Valves, Hydrants & Meters Located	74%	72%
Have Water System Mapped	90%	89%
Mapped in GIS	29%	14%

summary of all systems operated by N.C. local governments. The most recent reports indicated that the number of units operating in a fiscal danger zone increased over the previous year.³ Of the 358 water systems covered for 2004, 61 percent had solvent operations and 39 percent operated in the red. Of the 318 sewer systems audited for 2003, 63 percent at least broke even while 37 percent lost money. A closer examination of these systems shows that those losing money reported 10 percent more “lost” water from their water systems and 24 percent more I&I problems in their sewer systems. One of those water systems in the red was losing 60 percent of its treated water every month. Systems losing money also were less likely to have regular inspections and maintenance programs in place.

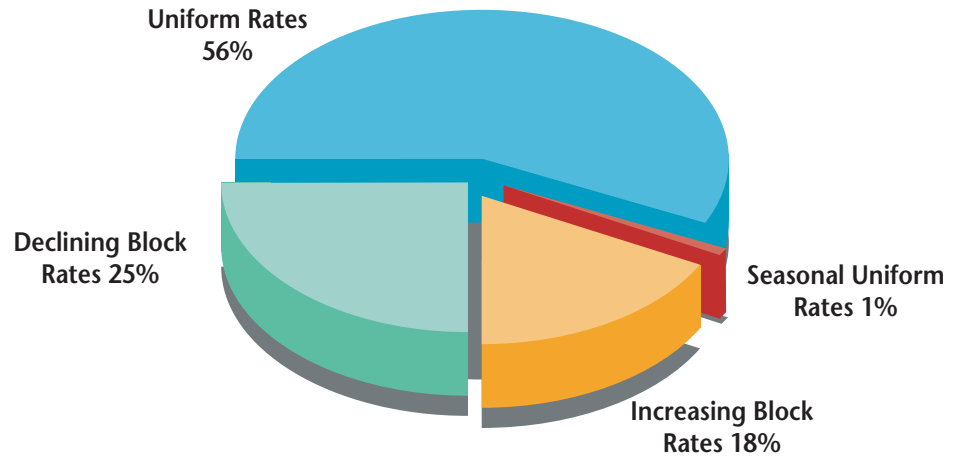
The water and sewer rate structures most widely used in the state do not encourage customers to conserve.

Conservation ranks alongside leak correction as a way that utilities can stretch the life-time of existing water and sewer treatment plants and thus avoid costly construction projects focused on developing new supplies or treatment capacity. Current rate schedules, however, do little to encourage customers to avoid unnecessary use. Only 19 percent of water systems and 11 percent of sewer systems employ conservation rate structures. Conservation rates include increasing block rates (higher unit fees for higher

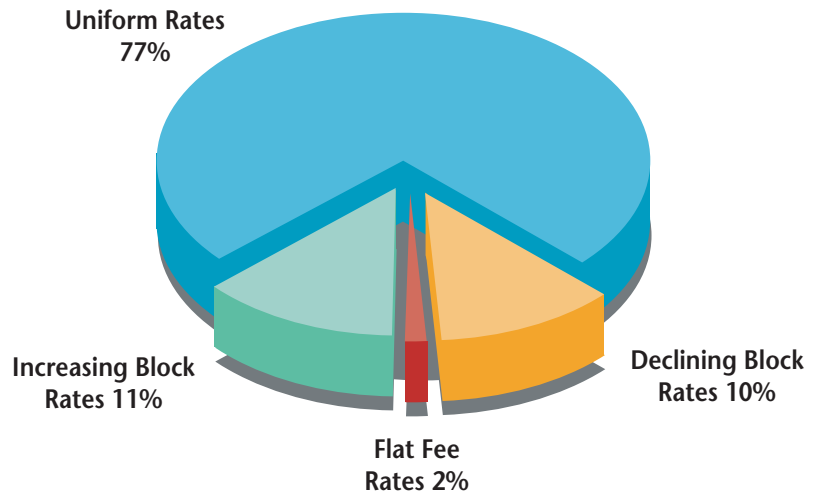
³ N.C. Department of State Treasurer, Memorandum No. 1032, April 15, 2005.

increments of use) and, for water systems, seasonal uniform rates (higher fees during months — generally summer — when demand is greatest).

Water Rate Structures North Carolina Municipalities



Sewer Rate Structures North Carolina Municipalities



Capital Needs by County

Counties	No. of Sewer Systems	No. of Stormwater Systems	Water Capital Need (2005-2010) in thousands	Sewer Capital Need (2005-2010) in thousands	Stormwater Capital Need (2005-2010) in thousands	Percent Total Statewide Need (2005-2010)	Water Capital Need (2011-2030) in thousands	Sewer Capital Need (2011-2030) in thousands	Stormwater Capital Need (2011-2030) in thousands	Percent Total Statewide Need (2011-2030)	Additional Annual Capital Need Per Connection for Water (2005-2010) in thousands	Additional Annual Capital Needed Per Connection for Sewer (2005-2010) in thousands
Alamance	8	9	\$22,222	\$29,105	\$13,018	0.94%	\$56,159	\$61,002	\$15,262	1.36%	\$2,604	\$3,183
Alexander	2	1	\$5,229	\$3,141	\$470	0.13%	\$11,060	\$14,460	\$524	0.27%	\$3,484	\$11,641
Alleghany	1	1	\$930	\$1,726	\$473	0.05%	\$1,145	\$1,287	\$528	0.03%	\$1,635	\$2,502
Anson	7	7	\$16,503	\$11,052	\$2,899	0.45%	\$13,212	\$14,064	\$3,202	0.31%	\$3,256	\$7,781
Ashe	3	3	\$763	\$1,293	\$1,006	0.04%	\$1,897	\$1,942	\$1,088	0.05%	\$1,877	\$2,283
Avery	4	4	\$3,582	\$2,662	\$900	0.10%	\$2,823	\$2,322	\$960	0.06%	\$4,194	\$4,446
Beaufort	7	7	\$3,897	\$4,771	\$3,088	0.17%	\$21,821	\$11,926	\$3,504	0.38%	\$1,793	\$2,607
Bertie	5	8	\$7,541	\$5,804	\$2,034	0.22%	\$10,511	\$7,835	\$2,200	0.21%	\$2,805	\$5,282
Bladen	5	7	\$6,027	\$5,731	\$2,696	0.21%	\$8,996	\$9,496	\$2,953	0.22%	\$1,539	\$3,079
Brunswick	9	19	\$56,894	\$20,660	\$5,111	1.21%	\$42,691	\$25,966	\$5,733	0.76%	\$2,508	\$3,595
Buncombe	1	4	\$61,627	\$82,813	\$13,110	2.30%	\$282,870	\$130,000	\$15,608	4.39%	\$6,139	\$4,837
Burke	5	4	\$16,125	\$22,115	\$4,516	0.63%	\$31,901	\$19,631	\$5,259	0.58%	\$2,145	\$4,040
Cabarrus	5	4	\$52,143	\$105,390	\$4,928	2.38%	\$86,706	\$201,027	\$12,892	3.08%	\$2,944	\$6,964
Caldwell	6	6	\$29,155	\$19,717	\$6,516	0.81%	\$27,579	\$12,592	\$7,579	0.49%	\$2,130	\$3,127
Camden	1	0	\$11,044	\$480	\$0	0.17%	\$27,090	\$523	\$0	0.28%	\$10,402	\$6,079
Carteret	3	11	\$16,687	\$36,552	\$3,336	0.83%	\$34,387	\$12,264	\$3,843	0.52%	\$2,946	\$6,240
Caswell	2	2	\$1,650	\$2,307	\$748	0.07%	\$2,372	\$1,893	\$816	0.05%	\$3,916	\$4,398
Catawba	8	7	\$32,578	\$45,370	\$11,348	1.31%	\$109,956	\$185,583	\$14,249	3.17%	\$4,107	\$8,327
Chatham	2	2	\$6,674	\$7,700	\$1,880	0.24%	\$20,270	\$5,935	\$2,175	0.29%	\$2,661	\$2,883
Cherokee	2	2	\$5,215	\$2,825	\$912	0.13%	\$7,550	\$3,800	\$1,015	0.13%	\$3,934	\$3,152
Chowan	1	1	\$2,042	\$1,770	\$956	0.07%	\$1,945	\$1,005	\$1,108	0.04%	\$2,013	\$1,402
Clay	1	0	\$2,427	\$2,778	\$0	0.08%	\$2,546	\$6,645	\$0	0.09%	\$8,530	\$33,297
Cleveland	5	6	\$22,342	\$16,106	\$6,814	0.66%	\$74,535	\$54,384	\$7,936	1.40%	\$2,608	\$4,666
Columbus	7	11	\$8,578	\$18,689	\$2,757	0.44%	\$14,002	\$14,383	\$3,028	0.32%	\$2,374	\$5,125
Craven	8	9	\$46,282	\$54,040	\$1,416	1.49%	\$44,193	\$47,625	\$1,540	0.96%	\$2,633	\$6,229
Cumberland	6	9	\$92,531	\$117,116	\$32,229	3.54%	\$198,480	\$178,649	\$38,354	4.25%	\$3,783	\$4,327
Currituck	0	0	\$7,000	\$0	\$0	0.10%	\$8,774	\$0	\$0	0.09%	\$4,030	\$0
Dare	3	6	\$30,748	\$6,478	\$1,582	0.57%	\$49,814	\$5,650	\$7,936	0.65%	\$3,237	\$9,336
Davidson	4	3	\$140,253	\$31,821	\$7,729	2.63%	\$111,039	\$34,381	\$9,156	1.58%	\$2,975	\$1,488
Davie	3	2	\$12,267	\$8,618	\$1,408	0.33%	\$21,461	\$10,042	\$1,610	0.34%	\$2,808	\$4,228
Duplin	10	11	\$8,184	\$14,565	\$4,112	0.39%	\$17,016	\$24,931	\$4,535	0.48%	\$1,883	\$6,840
Durham	2	1	\$193,517	\$97,942	\$38,200	4.82%	\$156,700	\$77,795	\$44,286	2.85%	\$5,018	\$2,357
Edgecombe	5	7	\$34,791	\$10,594	\$2,972	0.71%	\$14,219	\$9,305	\$3,404	0.28%	\$4,771	\$3,047
Forsythe	1	1	\$51,486	\$51,442	\$29,288	1.93%	\$152,350	\$137,565	\$35,106	3.33%	\$1,996	\$2,551
Franklin	5	5	\$4,017	\$13,921	\$4,615	0.33%	\$7,844	\$11,106	\$5,340	0.25%	\$2,458	\$7,736
Gaston	13	13	\$17,692	\$37,735	\$12,805	1.00%	\$126,450	\$71,017	\$23,069	2.26%	\$2,762	\$2,359
Gates	0	1	\$3,912	\$0	\$257	0.06%	\$5,964	\$0	\$269	0.06%	\$2,766	\$0
Graham	1	1	\$822	\$838	\$312	0.03%	\$2,195	\$1,947	\$334	0.05%	\$2,303	\$4,566
Granville	6	4	\$11,160	\$21,502	\$2,702	0.52%	\$11,998	\$18,748	\$3,917	0.35%	\$2,918	\$5,331
Greene	5	3	\$11,693	\$4,821	\$1,264	0.26%	\$10,121	\$3,096	\$1,077	0.15%	\$3,526	\$5,101
Guilford	3	4	\$111,377	\$178,803	\$27,374	4.64%	\$309,608	\$367,561	\$37,826	7.32%	\$3,356	\$4,313
Halifax	8	7	\$27,732	\$16,412	\$2,322	0.68%	\$29,525	\$22,173	\$2,547	0.56%	\$3,198	\$2,959
Harnett	6	5	\$29,603	\$17,129	\$4,396	0.75%	\$54,550	\$12,051	\$5,075	0.73%	\$2,051	\$2,013
Haywood	5	4	\$14,293	\$10,517	\$3,158	0.41%	\$21,751	\$17,808	\$3,630	0.44%	\$2,324	\$2,950
Henderson	2	3	\$12,237	\$2,452	\$2,752	0.26%	\$3,563	\$12,276	\$3,182	0.19%	\$668	\$1,612
Hertford	4	6	\$8,053	\$7,158	\$1,745	0.25%	\$7,375	\$5,496	\$1,933	0.15%	\$2,069	\$3,121
Hoke	2	1	\$6,899	\$13,092	\$740	0.30%	\$11,300	\$11,730	\$848	0.24%	\$2,466	\$7,963
Hyde	2	0	\$6,900	\$1,548	\$0	0.12%	\$2,900	\$1,699	\$0	0.05%	\$3,129	\$5,608
Iredell	3	2	\$81,785	\$42,461	\$7,200	1.92%	\$155,716	\$65,713	\$8,560	2.35%	\$6,567	\$3,935
Jackson	1	0	\$2,900	\$3,200	\$0	0.09%	\$10,000	\$16,000	\$0	0.27%	\$6,336	\$8,484
Johnston	10	10	\$25,482	\$16,807	\$6,858	0.72%	\$66,327	\$47,358	\$7,890	1.24%	\$4,508	\$3,509
Jones	3	2	\$4,393	\$2,158	\$826	0.11%	\$5,335	\$1,737	\$910	0.08%	\$2,555	\$4,215
Lee	2	2	\$11,849	\$3,840	\$3,744	0.28%	\$28,588	\$4,750	\$4,452	0.39%	\$2,029	\$1,000
Lenoir	4	3	\$15,440	\$17,567	\$4,399	0.55%	\$19,766	\$18,950	\$5,158	0.45%	\$1,448	\$3,164
Lincoln	2	1	\$8,535	\$31,024	\$1,751	0.60%	\$24,252	\$25,699	\$2,061	0.53%	\$2,672	\$10,064

Capital Needs by County

	No. of Sewer Systems	No. of Stormwater Systems	Water Capital Need (2005-2010) in thousands	Sewer Capital Need (2005-2010) in thousands	Stormwater Capital Need (2005-2010) in thousands	Percent Total Statewide Need (2005-2010)	Water Capital Need (2011-2030) in thousands	Sewer Capital Need (2011-2030) in thousands	Stormwater Capital Need (2011-2030) in thousands	Percent Total Statewide Need (2011-2030)	Additional Annual Capital Need Per Connection for Water (2005-2010) in thousands	Additional Annual Capital Needed Per Connection for Sewer (2005-2010) in thousands
Macon	2	2	\$9,056	\$12,423	\$1,083	0.33%	\$5,097	\$16,152	\$1,220	0.23%	\$2,415	\$9,823
Madison	3	3	\$1,637	\$3,477	\$1,095	0.09%	\$5,751	\$5,868	\$1,194	0.13%	\$4,295	\$6,144
Martin	4	9	\$30,830	\$10,514	\$2,661	0.64%	\$11,839	\$7,953	\$2,954	0.23%	\$7,596	\$4,609
McDowell	2	1	\$1,059	\$1,555	\$346	0.04%	\$3,922	\$5,550	\$375	0.10%	\$1,015	\$2,444
Mecklenburg	1	1	\$219,260	\$377,499	\$75,000	9.82%	\$484,200	\$382,644	\$200,000	10.92%	\$3,461	\$4,316
Mitchell	2	2	\$3,963	\$498	\$760	0.08%	\$3,097	\$1,338	\$832	0.05%	\$2,895	\$1,268
Montgomery	5	5	\$3,325	\$2,559	\$2,353	0.12%	\$8,472	\$6,039	\$2,624	0.18%	\$2,021	\$2,286
Moore	6	11	\$31,595	\$64,274	\$7,099	1.51%	\$23,480	\$66,269	\$8,159	1.00%	\$2,308	\$16,367
Nash	8	10	\$29,750	\$22,436	\$9,528	0.90%	\$68,398	\$61,709	\$13,473	1.47%	\$3,081	\$2,667
New Hanover	5	4	\$41,789	\$96,515	\$4,332	2.09%	\$52,190	\$102,662	\$8,772	1.67%	\$1,588	\$11,546
Northampton	9	9	\$7,562	\$6,513	\$2,860	0.25%	\$8,533	\$4,885	\$3,069	0.17%	\$3,089	\$4,527
Onslow	6	6	\$43,530	\$93,059	\$16,360	2.24%	\$90,337	\$29,457	\$19,433	1.42%	\$3,110	\$7,114
Orange	2	2	\$47,361	\$98,027	\$32,731	2.60%	\$38,633	\$86,863	\$39,197	1.69%	\$3,046	\$8,116
Pamlico	1	9	\$5,600	\$13,550	\$330	0.28%	\$8,200	\$2,775	\$356	0.12%	\$2,173	\$7,144
Pasquotank	1	1	\$15,341	\$13,889	\$3,350	0.48%	\$20,957	\$15,611	\$3,980	0.41%	\$2,924	\$4,984
Pender	3	6	\$4,225	\$4,091	\$1,199	0.14%	\$9,251	\$4,800	\$1,587	0.16%	\$2,412	\$2,551
Perquimans	2	2	\$922	\$1,287	\$1,022	0.05%	\$600	\$873	\$1,146	0.03%	\$1,144	\$1,691
Person	1	1	\$26,500	\$3,303	\$1,529	0.46%	\$16,000	\$6,564	\$1,795	0.25%	\$9,555	\$2,841
Pitt	9	10	\$39,303	\$49,754	\$13,867	1.51%	\$87,332	\$82,073	\$16,361	1.90%	\$2,487	\$4,266
Polk	2	2	\$3,521	\$1,324	\$821	0.08%	\$6,833	\$2,305	\$905	0.10%	\$3,719	\$2,576
Randolf	6	6	\$38,287	\$36,430	\$7,449	1.20%	\$30,064	\$31,696	\$8,699	0.72%	\$3,128	\$3,265
Richmond	3	4	\$12,566	\$7,440	\$5,234	0.37%	\$20,700	\$11,359	\$6,161	0.39%	\$2,104	\$2,365
Robeson	10	15	\$14,837	\$16,525	\$10,873	0.62%	\$43,998	\$13,424	\$24,241	0.84%	\$1,455	\$1,783
Rockingham	6	5	\$29,689	\$22,561	\$5,420	0.84%	\$48,257	\$43,312	\$6,305	1.00%	\$3,600	\$4,071
Rowan	6	6	\$22,421	\$30,347	\$6,941	0.87%	\$108,710	\$109,122	\$8,090	2.31%	\$6,107	\$7,443
Rutherford	4	6	\$24,987	\$16,413	\$3,805	0.66%	\$26,420	\$27,624	\$4,326	0.60%	\$3,545	\$5,561
Sampson	5	7	\$10,722	\$12,064	\$470	0.34%	\$13,387	\$13,253	\$484	0.28%	\$2,794	\$5,266
Scotland	4	4	\$7,816	\$9,528	\$753	0.26%	\$23,002	\$17,907	\$793	0.43%	\$2,901	\$3,554
Stanly	4	3	\$9,004	\$7,549	\$968	0.26%	\$21,849	\$20,003	\$4,028	0.47%	\$2,025	\$3,278
Stokes	3	3	\$11,136	\$3,508	\$1,756	0.24%	\$10,122	\$4,572	\$1,987	0.17%	\$2,454	\$2,217
Surry	4	4	\$24,840	\$27,499	\$3,101	0.81%	\$45,734	\$35,890	\$3,561	0.87%	\$8,586	\$7,926
Swain	2	1	\$1,351	\$1,481	\$415	0.05%	\$4,949	\$5,696	\$458	0.11%	\$4,280	\$7,272
Transylvania	2	2	\$1,295	\$779	\$1,496	0.05%	\$4,820	\$3,282	\$1,716	0.10%	\$1,491	\$999
Tyrrell	3	1	\$7,835	\$1,919	\$347	0.15%	\$8,287	\$2,214	\$376	0.11%	\$9,197	\$5,292
Union	4	3	\$71,958	\$36,287	\$2,016	1.61%	\$194,183	\$166,309	\$2,299	3.71%	\$7,407	\$8,125
Vance	1	3	\$21,081	\$31,880	\$2,673	0.81%	\$11,239	\$3,000	\$3,167	0.18%	\$3,147	\$5,050
Wake	10	12	\$403,381	\$560,699	\$14,812	14.31%	\$461,972	\$480,503	\$92,563	10.59%	\$5,381	\$6,652
Warren	3	3	\$3,157	\$7,080	\$963	0.16%	\$5,631	\$6,134	\$1,075	0.13%	\$4,885	\$8,449
Washington	3	3	\$3,119	\$4,776	\$2,424	0.15%	\$7,067	\$3,980	\$2,952	0.14%	\$2,181	\$4,119
Watauga	3	4	\$19,124	\$5,195	\$3,165	0.40%	\$14,489	\$17,533	\$3,638	0.36%	\$4,115	\$3,309
Wayne	6	7	\$63,003	\$56,445	\$7,589	1.86%	\$63,235	\$42,211	\$8,947	1.17%	\$3,541	\$6,709
Wilkes	3	3	\$17,627	\$9,329	\$1,772	0.42%	\$36,461	\$11,240	\$2,006	0.51%	\$3,330	\$5,791
Wilson	6	7	\$13,271	\$362,853	\$9,096	5.63%	\$33,668	\$35,543	\$10,636	0.82%	\$1,908	\$18,158
Yadkin	4	4	\$4,467	\$4,069	\$1,827	0.15%	\$15,312	\$14,248	\$2,032	0.32%	\$5,340	\$6,685
Yancey	1	1	\$972	\$1,660	\$444	0.04%	\$1,074	\$784	\$493	0.02%	\$1,402	\$2,461
	409	465	\$2,829,783	\$3,437,021	\$571,807	100.00%	\$4,790,950	\$4,076,052	\$903,932	100.00%	\$3,384	\$5,144

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MISSION

The mission of the North Carolina Rural Economic Development Center is to develop, promote and implement sound economic strategies to improve the quality of life of rural North Carolinians. The center serves the state's 85 rural counties, with a special focus on individuals with low to moderate incomes and communities with limited resources.

Created in 1987, the Rural Center operates a multi-faceted program that includes conducting research into rural issues; advocating for policy and program innovations; and building the productive capacity of rural leaders, entrepreneurs and community organizations.

The center is a private, nonprofit organization, funded by both public and private sources and led by a 50-member board of directors.

North Carolina Rural Economic Development Center

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