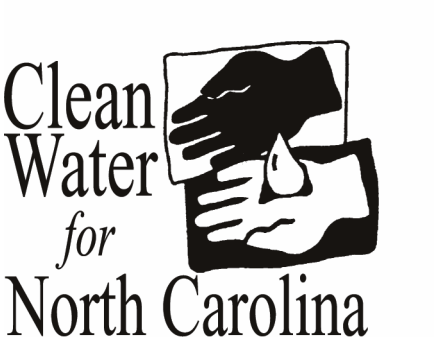
A FAIRLY WATERED STATE

LESSONS FOR NORTH CAROLINA FROM THE DROUGHT-VULNERABLE YADKIN BASIN REGION



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INTRODUCTION

In 1998, the Yadkin River basin of North Carolina entered into a five-year drought that taxed the region and revealed how poorly prepared it was to cope with a long-term drought. The Yadkin region, like many historically water rich areas, had not adequately planned its response. This report will examine existing water use policies and patterns in the Yadkin Basin, the effect of the 1998-2002 drought, and outline policy recommendations for the future for this drought prone region and throughout the state to protect access to water for all North Carolinians.

Basin Description

The Yadkin River drains the state's second-largest watershed and runs from Wilkes County to Rowan County in North Carolina. It then joins with the Uwharrie River at the Montgomery-Stanly County line and becomes the Pee Dee River, which flows through South Carolina to the ocean near Georgetown. The Yadkin River's tributaries divide the Yadkin Basin into four sub-basins: Yadkin River, South Yadkin River, Uwharrie River, and Rocky River. [1]

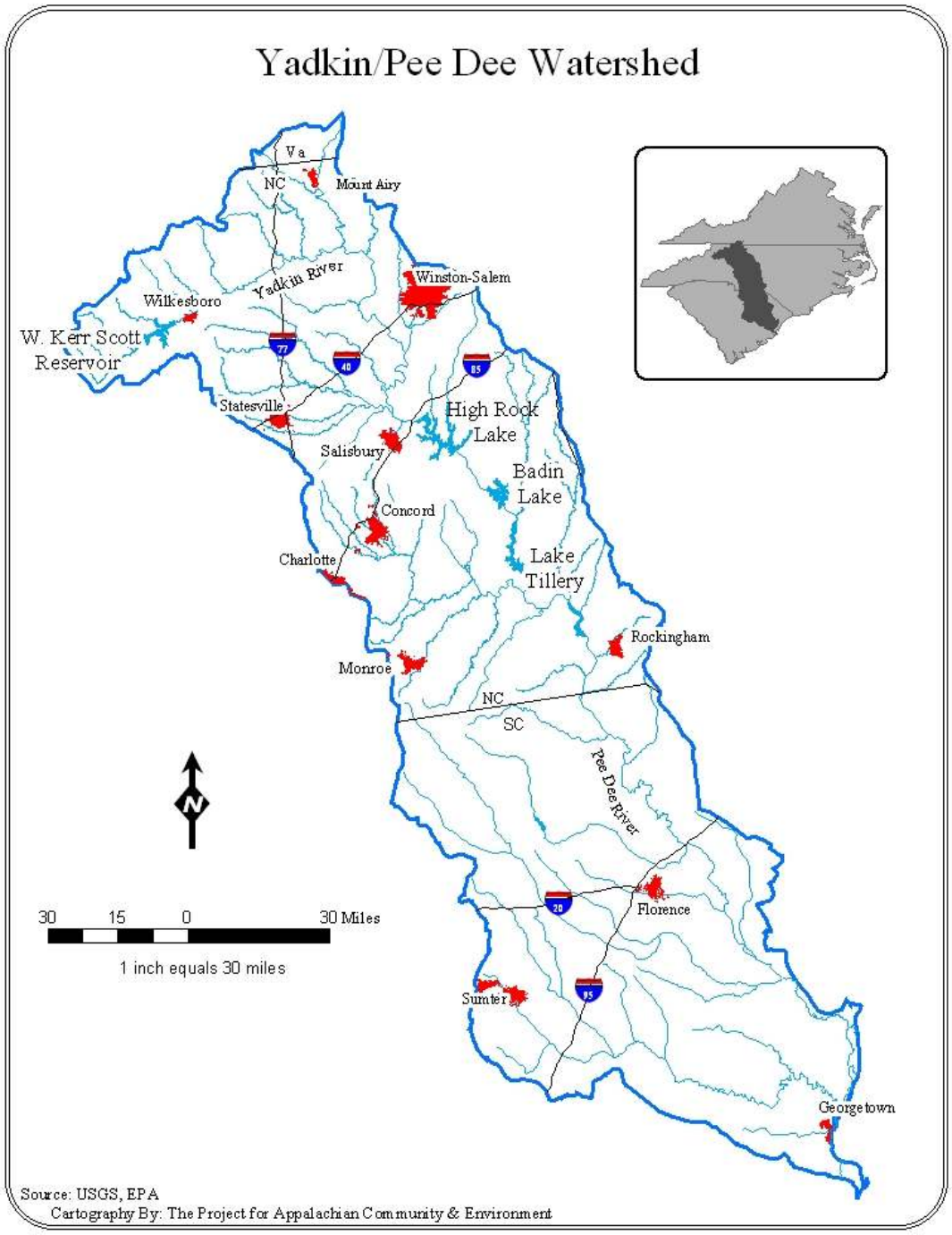
There are a number of impoundments on the river, including W. Kerr Scott Lake, High Rock Lake, Tuckertown Reservoir, Narrows Lake, Falls, Lake, Lake Tillery, and Blewett Falls Lake. All of these reservoirs except Kerr Scott are licensed by the Federal Energy Regulatory Commission (FERC) for the generation of hydroelectric power.[2] However, their large storage capacities also make them critical to water use planning and maintenance of the river to keep ecosystems healthy.

In 2001, about 17% of the state's residents lived in the Yadkin Basin,[3] concentrated mainly in the urban areas of Winston-Salem, Concord-Kannapolis, Lexington and Wilkesboro. However, the Yadkin is not a highly urbanized watershed, with approximately half of its land cultivated for annual crop agriculture or used as pasture.[4] Between 1997 and 2020, public water supply systems in the basin expect the number of residents they supply with water to increase by 43%. [5] Their service area demand is projected to increase by 36% in that same period.[6] As the basin is transformed from primarily rural to primarily urban, the demands on its water will increase, the impacts on water quality will become more challenging, and the need for proper water planning will become more critical.

Drought in North Carolina

Although the 1998-2002 drought caught many North Carolinians by surprise, it is only the latest in a series of historical droughts. In its State Water Supply Plan, the North Carolina Department of Environment and Natural Resources (DENR) describes drought as "a normal, recurring weather phenomenon that can have a profound impact on our state's water supplies."[7] In the 1930s, the drought that created the Dust Bowl in the western plains also dried up North Carolina agriculture and water supplies, with major economic impacts. Then again in the 1950s and 1980s, drought struck North Carolina. However, in the piedmont region, which includes the Yadkin Basin, the recent extended period of below-normal precipitation and low stream flows created the most severe conditions since precipitation records have been kept.[8]

The severity of the 1998-2002 drought's impact was a combined result of the much reduced precipitation, high water demand, and municipalities' slow response to dwindling supplies. The three types of drought described by the National Weather Service are meteorological, agricultural and hydrologic. Meteorological drought is a function of the specific region, and is an expression of precipitation's departure from normal over a particular period of time. Agricultural drought occurs when the soil is not moist enough to meet the needs of a particular crop at a particular time.[9] Hydrological drought occurs when there are deficiencies in surface and subsurface water supplies.[10]



Map of the Yadkin River Basin, including both North and South Carolina.

Agriculture is usually the first sector to feel the effects of a drought because of its dependence on soil moisture, which is easily depleted without frequent rain. Users who depend on deeper ground water are usually the last to be affected, but their sources are also the last to be replenished once the rains return.[11] Agriculture in the Basin experienced varying stress, depending on the type of production. Among dairy farmers in Rowan and Iredell counties who had previously relied on streams for irrigation, many resorted to drilling new deep wells to reach water, potentially further impacting groundwater levels.[12]

A fourth type of drought is socioeconomic drought, which occurs when physical water shortage affects people, individually and collectively. To prevent socioeconomic drought, supply capacity must keep pace with demand increases,[13] either by reducing consumption (conservation) or expanding the water supply. The primary economic effects of a drought include costs and losses to agricultural, livestock, timber and fishery producers; increased energy demand and reduced supply; cost of new or supplemental water resource development; loss from impaired navigability of streams, rivers and canals; and increases in food prices.[14] Economic and residential users further down a basin are selectively disadvantaged by failure of upstream water users to respond promptly and effectively to reduced flows. Large groundwater withdrawals are likely to result in more rapid drawdown of a local water table under drought conditions, to the extent that residential wells run dry. A number of residents who had not drilled deeper wells during previous droughts were forced to do so in 2001 or 2002, with a few residents reporting temporary hookups to public water supplies in hopes that their wells would return to reasonable flows in a few years.[15]

Environmental impacts of drought can be very severe, and in some cases irreversible, at least in the short term. Most obvious is the reduction and degradation of fish and wildlife habitat, and the lack of food sources and drinking water.[16] The low stream flows can result in loss of wetlands and an influx of salt water into groundwater supplies in the coastal portion of a basin. Aquifers, which store groundwater, may "collapse" permanently if too much water is withdrawn from them. This happens when the water-filled spaces inside the rock that forms the aquifer are drained, and the rock collapses. Those water-filled spaces are destroyed and the aquifer's storage capacity is permanently reduced. Low flows can also affect water quality, as any toxins or excess nutrients discharged into streams will tend to become more concentrated.[17]

In addition to economic and environmental impacts, drought can have profound health and social impacts. Increased respiratory ailments and other infections may develop. Conflicts between water users and water managers may erupt. In some areas, the quality and economy of home and business life, including ability to maintain clean appearance, landscaping, etc, may be significantly impacted as household and commercial water becomes scarce.[18]

CURRENT PATTERNS OF USE

The North Carolina State Water Supply Plan includes a profile of the Yadkin Basin that discusses water use patterns. It cites a 1995 United States Geological Survey study that estimated total water use in the basin to be 306 million gallons of water per day (MGD). Approximately 80% of this water came from surface water sources, with the remainder drawn from groundwater sources. 146 MGD of the surface water was withdrawn and distributed by public water systems, and approximately 100 MGD was "self-supplied", or withdrawn from groundwater or surface water by the individual homeowner or business. 6 MGD of ground water were supplied by public water systems, and approximately 52 MGD were self-supplied. Residential use accounted for 76 MGD, while non-residential use (industry, commercial, irrigation) accounted for approximately 230 MGD. In all, about half of the water used in the Yadkin Basin was publicly supplied.[19] [1]

Every five years, all local governments that supply water to the public are required to complete a Local Water Supply Plan (LWSP) and submit it to the Division of Water Resources (DWR). These plans include average annual daily water use by type of use (residential, commercial, industrial, and institutional) in addition to other information, which is discussed in greater detail later in the report. According to the 1997 LWSPs, residential use accounted for 39% of total municipally-supplied water use, non-residential use accounted for 47%, and at least 9% was "unaccounted-for" water (water that is lost between the water supply and the wastewater treatment plant, usually due to leaks in aging distribution lines). [20]

[1] The careful reader will note that these numbers from the NC State Water Supply Plan do not add up exactly to the 306 million gallons per day estimated to be the total water usage in the basin.

Irrigation

Lawn irrigation is often touted as the biggest water waster, and perhaps rightly so. Fescue, a popular lawn and pasture grass in North Carolina due to its relative drought tolerance, can survive on approximately half an inch of water per week, but many residents use three or four times that much. In-ground sprinkler systems, which indiscriminately water grass and pavement, are now standard in at least 25 per cent of new homes, according to estimates from the North Carolina Irrigation Association. Some municipalities, such as Concord, require sprinkler systems to have rain gauges to prevent them from irrigating during rainfall. In addition, municipalities may penalize irrigators who water driveways and sidewalks with fines.

To ensure future water availability for the most critical uses, home owners and commercial developers must rethink their water use priorities and the high value that they place on lush, green lawns. "Xeriscaping" is the term used for landscaping with drought-resistant plants, rather than traditional turf. It has become common practice in the southwest, where water is truly scarce and citizens have had to choose drinking water over pretty yards. In Cary, all commercial property building permits are contingent on the use of drought-resistant plants. In Concord, the city publishes a list of drought-resistant plants and works with local nurseries to find out which plants work best in their growing area, and to make those plants available. In Charlotte, Centex Homes, a residential developer, has begun sodding with Bermuda grass because it has the look of a traditional lawn without the water needs. A more drastic step is to limit the amount of turf allowed on a property. For example, Albuquerque, New Mexico limits traditional turf to 20 percent of a lot.

Water reclamation involves treating wastewater and then returning it to users for other applications. Cary is the first North Carolina town to install a true water reclamation system, and has had great success using it to irrigate its many lawns, both public and private. The town, which is the seventh largest metropolitan area in North Carolina, charges less for the reclaimed water and imposes no conservation restrictions on its users, while such restrictions are permanently in place for non-reclaimed water irrigators. These incentives have succeeded in encouraging use of the reclaimed water, despite some initial skepticism about its cleanliness.

Hydroelectric Projects on the Yadkin & Implications for Water Management

The Yadkin Hydroelectric Project first licensed by Alcoa Power Generation, Inc. in 1958, includes four reservoirs managed for electrical generation. The furthest upriver reservoir, High Rock Lake, is a few miles downstream of the principal water supply source for the City of Salisbury, which slows the river flow down, thus increasing sediment deposition. Salisbury officials have expressed concern that the mode of operation of High Rock dam ("store and release") may be resulting in undue sediment deposition near the City's water intakes (increasing treatment costs and complications) and has asked for the dam to be operated in a "run of the river" or continuous flow mode, an example of an issue raised as the Yadkin Project applies for relicensing by the Federal Energy Relicensing Commission in 2008.

Alcoa responds that the heavy sediment levels are generated further upstream, increasingly due to heavy urbanization and development activities, and that the operation of its system does little to effect the quality of the City's water. Nevertheless, the relicensing process is an opportunity for impacted users to call on the Yadkin Project to take additional measures to ensure protection of other uses, including recreation, fisheries and drinking water, in its project reservoirs, by reducing sedimentation. Such measures could include additional conservation measures for upriver riparian areas, and support for local programs that monitor and enforce the state and local sediment control programs. In addition, low dissolved oxygen even in the "tailwaters" below the dam results in degraded habitat for aquatic species. [21]

High Rock has experienced extended periods of water quality impairment in recent years due to excessive chlorophyll a (algal blooms due to excess nutrients), low dissolved oxygen and the highest level of sediment deposition and has been listed as "impaired" for its intended uses (drinking water) by the NC Division of Water Quality. Conflicting uses, such as in-reservoir boating and downstream economic uses, have historically arisen and must be negotiated during a relicensing process that will define operations for the coming 50 years—a staggering amount of time for equitable operations in a drought-vulnerable basin with a rapidly increasing population. Even salt intrusion due to reduced flows, effecting drinking water, habitat and industrial uses in the South Carolina reaches of the Pee Dee River is an impact that must be minimized by reservoir management hundreds of miles upstream. As of this date, the Project acknowledges from comments submitted that there are substantive

disagreements between different stakeholders on various issues of resource management that will need to be resolved to go forward with licensing.

The downstream three reservoirs—Tuckertown, Narrows and Falls—have not experienced persistent water quality impairments, due largely to the fact that most of the upstream sediments are captured by High Rock Reservoir. With rapid urbanization in North Carolina's southwest piedmont, it must be expected that additional river and reservoir water supply intakes will be installed in coming years and both water quantity and quality will become more critical. Ironically, despite the recent multi-year drought in the region, the Yadkin Project application does not contain a specific proposal for a Low Flow Protocol for management of prioritized needs when the available flows are unable to satisfy all uses, including flows into South Carolina. The downstream state was severely impacted in 2002 by reduced flows, with industries and municipalities facing massively reduced production and water availability.

Progress Energy's Yadkin-Pee Dee River Project is immediately downstream of the Yadkin Project and comprises the Tillery and Blewett Falls reservoirs. Progress pays for "headwaters benefits" to ensure adequate flows out of the lowest of the Yadkin Project reservoirs for hydroelectric production and minimum flows from its own reservoirs. As in the Yadkin Project upstream, there are problems with low dissolved oxygen levels in the tailwaters, reducing the quality of aquatic habitat. Sedimentation in this portion of the basin is less severe, due to capture of most of sediment in the Yadkin Project reservoirs.

STATE LAWS GOVERNING WATER USE

North Carolina has several statutes and regulations that govern water use in the state. Brief summaries of a few of these laws follow and can be accessed in full from the NC Division of Water Resources website: http://www.ncwater.org/.

Registration of Withdrawals and Transfers

This statute was enacted in 1993 to regulate large surface water transfers between any of the 38 river basins defined in the statute, including the Yadkin River Basin. A transfer is any "withdrawal, diversion, or pumping of surface water from one river basin and discharge of all or any part of the water in a river basin different from the origin." The object of this law is to require registration of any water withdrawals and transfers that exceed 100,000 gallons per day. There is an exemption for agricultural users who withdraw or transfer less than 1 million gallons of water per day. Failure to register withdrawals could result in a late fee of only $5 per day, with a maximum penalty of $500. The statute does not limit the amount of such self-supplied withdrawals for any user, even in drought conditions.

The statute also forbids the transfer of 2 million gallons of water per day or more from one river basin to another without first securing a "certificate." However, the certificate requirements are not especially stringent, especially for temporary water transfers. Further, there is no enforcement provision for failing to secure such a certificate prior to implementing a transfer.

Water Use Act of 1967

The purpose of the Water Use Act is to declare that water resources must be "put to beneficial use to the fullest extent to which they are capable, subject to reasonable regulation in order to conserve these resources and to provide and maintain conditions which are conducive to the development and use of water resources." In reality, the Water Use Act simply allows the state to declare "capacity use" areas, whose groundwater and/or surface water requires "coordination and limited regulation" to protect property owners or the public interest. This definition is somewhat vague, and the procedures for declaring a capacity use area are equally so. However, the practical outcome is that if a capacity use area is declared, the Water Use Act only has the power to prevent increases in pollution and water withdrawal. Since the Water Use Act's creation, only one capacity use area has been declared. It encompasses all or parts of Beaufort, Carteret, Craven, Hyde, Martin, Pamlico, Tyrrell and Washington Counties and was declared in 1976 due to concern over withdrawals by PCS Phosphate, a massive phosphate mining operation in the region.

Dam Safety Law of 1967

The Dam Safety Law provides for the certification and inspection of dams in order to protect people and property. However, its rules for maintenance and construction do not apply to any dam that is licensed by the Federal Energy Regulatory

Commission (FERC) or is pending licensure. This means that all but one of the large reservoirs in the Yadkin Basin are exempt from the Dam Safety Law because they are all licensed by FERC to provide hydropower. This law and related dam certification information are available at the NC Division of Land Resources, Land Quality Section website: http://www.dlr.enr.state.nc.us/pages/landqualitysection.html.

HOUSE BILL 1215 AND WATER CONSERVATION STATE POLICY IN DEVELOPMENT

North Carolina's experience with the extreme drought that culminated in 2002 heightened awareness of the need to assure that the state has an adequate water supply for future needs. As a result, House Bill 1215 was ratified by the North Carolina General Assembly on October 3, 2002. The bill's provisions

- direct units of local government to evaluate their efforts to conserve water;
- direct the environmental management commission to adopt rules governing water conservation and water reuse; and
- establish a goal to reduce water consumption by state agencies by at least ten percent.

House Bill 1215 is best understood when dissected into three different sections relevant to this report.

Section 3 of House Bill 1215
As this report highlights, through case studies in the Yadkin Basin, neighboring communities adopted markedly different approaches to emergency water conservation during the drought. Furthermore, the various classes of water users (e.g. agricultural, industrial, residential, etc.) within the state were treated differently from community to community. Section 3 of House Bill 1215 establishes "a fair and uniform set of minimum standards for times when emergency reduction in water use are required to keep water demand in balance with a temporarily limited supply."

Section 4 of House Bill 1215
This section establishes a goal for State agencies to reduce water consumption by at least 10 percent. While the state's intent to improve water use efficiency by 10 percent is an admirable interim goal, it is not an ambitious goal for the long term, and provides no target date for this reduction.

Section 5 of House Bill 1215
Section 5 employs the Department of Environment and Natural Resources (DENR) to conduct an evaluation of water conservation measures being implemented, including incentive and other voluntary programs that foster water conservation and reuse measures across the state. These efforts and programs are summarized in the February 2004 Report on Water Conservation and Water Use Efficiency. [22]

In a series of early 2006 public hearings on the NC draft drought water management rule, golf developers and other economic interests expressed considerable resistance, while several environmental advocacy groups commented on the need for an even stronger rule. The Hearing Officers_ summary, with any recommended revisions, will be presented at the July 2006 Environmental Management Commission meeting for a vote on final acceptance. If opposition is strong enough from developers to this very modest water conservation rule, the process could be tied up for an extended period of legislative review, even as the current drought continues.

LOCAL WATER SUPPLY PLANS

Another important component of water use planning is a municipality's Local Water Supply Plan (LWSP). These plans are an assessment of local water supply needs and the ability of the water system to meet them. LWSPs are required from all local governments that provide or plan to provide public water service, and any community water system that regularly provides water to 1,000 or more service connections, or 3,000 or more individuals.[23] Community water systems include both publicly owned (municipal) and privately owned suppliers. The statute was amended in summer 2003 to include private suppliers.

They must be updated every five years unless more frequent revisions are requested by the Division of Water Resources. The minimum requirements of a LWSP include:

> [P]resent and projected population, industrial development, and water use within the service area; present and future water supplies; an estimate of the technical assistance that may be needed at the local level to address projected water needs; current and future water conservation and water reuse programs; a description of how the local government or community water system will respond to drought and other water shortage emergencies and continue to meet essential public water supply needs during the emergency; and any other related information as the Department may require in the preparation of a State water supply plan.

The Division of Water Resources uses these LWSPs as a tool to help communities plan for water shortages, such as droughts, by having them collect water use and availability data, and outline contingency plans. This will reduce the likelihood of water conflicts and shortages, and allow more time for resolution when these problems do occur by identifying them sooner. In addition, certain grants and loans for water supply systems are contingent on local governments having a LWSP on file with DWR.

WATER RATES

Water and sewer rates are an integral part of any water use plan/conservation plan. According to Jeff Hughes, Director of the Environmental Finance Center based at the School of Government of UNC-Chapel Hill, "The power of rate structures has never been as evident as it was during the drought of 2002."[24] Water rates, which determine how much users must pay for their water, can strongly influence user behavior and utility revenues. North Carolina law states that government-owned and operated water and sewer enterprises "may use a variety of charges." [25] There are no specifications how these charges should be applied. In practice charges, fees, rates, and penalties vary widely across the state and within the Yadkin Basin. A commonly cited problem with encouraging water conservation is the loss of revenue to the water utility. However, through rate setting that encourages conservation, both the environmental and economic goals may be realized. This section will outline some of the basic structures used throughout the state, attempt to demystify the topic of setting rates, and comment on the how establishing more conservation-oriented rates and fees may encourage appropriate use of natural resources in the state while at the same time, promoting justice in water access for all users.

DISSECTING THE RESIDENTIAL WATER BILL

Water and sewer utilities predominantly collect water-generated revenue through monthly bills. In some cases, this revenue is collected from customers on a bimonthly or even quarterly basis. Regardless of billing cycles, water bills generally include a **fixed charge**. Again, the services included in fixed charges and the actual name assigned to this charge vary depending on the municipality, but may include such costs as bill-processing and meter reading**.** Water utilities in North Carolina generally apply a charge based on the volume of water used and/or treated. This generally takes the form of a **minimum charge** for a set amount of service.[26]

These charges can be applied, depending on the water supplier and community, according to at least three different rate structures. Deciding on a rate structure and calculating costs accordingly is perhaps one of the most important decisions that utilities must make.[27] Key decision-makers in drought prone regions like the Yadkin, should consider the far-reaching impacts of this responsibility. Rate allocation and calculation significantly impacts the bottom line as well as water user behavior.[28]

Water and sewer utilities generate customer revenue in two ways: 1) through monthly billing and upfront charges often called "connection" or "tap-on charges." This report will primarily explore the structure of monthly billing charges though we acknowledge potential financial challenges for low-income populations depending on the pricing structure of this second type of customer revenue.[29]

There are three basic types of rate structures: 1) flat or uniform rate, 2) decreasing or declining block rate, and 3) increasing or inverted block rate (conservation rate structure). A utility using a uniform rate structure charges the same amount for every gallon of water used. For example, if a user uses 1000 gallons of water, she will pay $1, and if she uses 100,000 gallons of water, she will pay $100 at a flat rate of $1 per 1000 gallons. Uniform rates are the easiest to administer because of their simplicity.[30] (See Table 2, Understanding Water Rate Structures)

A utility using a **decreasing rate** or declining block rate charges less for each gallon of water as more is used.[31] For example, it may charge $1 for the first 1000 gallons of water, but only 80 cents for the next 1000 gallons. In other words, the more water that a customer uses, the less she must pay per gallon; a form of bulk discount. This type of rate structure tends to encourage waste because of the water's decreasing cost with greater volume used. A decreasing rate structure is often justified as needed for industrial/commercial recruitment. It can be a boon for water hungry industrial users who pay far less for the water used to make widgets than the average residential user, who is drinking, cooking and showering with the same water.

Increasing rates or "Inverted" block rates actually increase the unit cost of water as more is used.[32] For example, the first 1000 gallons might cost $1, but the next 1000 gallons cost $1.30. This structure is favored by conservationists because it provides an incentive for customers to be efficient. Wasting water becomes proportionally more expensive. This type of pricing better aligns environmental goals with "water justice" goals; access to water to meet basic needs is thus less expensive than using water for lawn irrigation or other non-critical uses.

Seasonal and peak rate structures may be layered on top of these other rate structures. Both seasonal and peak rates recognize that water is in higher demand at certain times of year and certain times of day, and that this demand increase strains treatment plants. (For example, summer irrigation, swimming pools, etc.). By charging more during peak usage, the utility can encourage conservation and also recoup the higher costs of providing water at peak times.[33]

TABLE 2: Understanding Water Rate Structures

RATE STRUCTURE	HOW IT WORKS	IMPACT ON WATER CONSERVATION
"Decreasing" (or declining block rate)	The unit price for each gallon consumed decreases in stepwise fashion as the consumer uses more water.	▪ Discourages water conservation and encourages misuse and degradation of water resources; and ▪ Aggravates and perpetuates drought conditions. Example: Industrial users expect discounts for large use, avoid consideration of water conservation or re-use strategies. Residential customers are more likely to water driveways and sidewalks as they irrigate lawns.
"Increasing" (or inverted block rate)	The unit price for each gallon consumed increases in stepwise fashion as the consumer uses more water.	▪ Encourages water conservation and preparedness for drought conditions. Significant financial incentives exist for water users to decrease their water consumption habits for the short and long-term. Example: Large water users, such as golf courses, are motivated to explore options for water reuse and drought resistant plantings in order to make their industry more sustainable, especially in anticipation of extreme or severe drought.
Uniform rate	The unit price for a specific amount of water consumption remains the same as the consumer uses more water.	▪ Provides no strong incentives for conservation, most simple and common structure. Example: rate structure does not encourage drought-resistant plantings for agricultural and horticultural users and drought-resistant landscaping, such as xeriscaping for homeowners and residential, commercial and recreational developers.

In 2002, The North Carolina League of Municipalities prepared a comprehensive report, "How Much Does Water Cost?" on water rate practices in the state for 2002, including 253 municipal water suppliers in their survey. For

2005-06, The North Carolina League of Municipalities partnered with the Environmental Finance Center (EFC) of the University of North Carolina at Chapel Hill to analyze water and sewer rates and practices. Thirty-seven of these suppliers operate within the Yadkin Basin and use a variety of pricing techniques, which are summarized in this report. The table below illustrates the pricing structures used by suppliers in Yadkin Basin and any changes that have occurred between 2002 and 2005-06 reporting. It is important to note that only municipal suppliers are included in the report, leaving out private suppliers such as Davidson Water Co. To view the full report, which includes summary, visit the website for the North Carolina League of Municipalities (The report can be accessed at www.nclm.org, on the homepage. Under "Hot Items" on the right side, select "FY2005-06 Water and Sewer Information Available").

The overall analysis reveals that the statewide trend is for utilities to apply the same rate structure (predominanty uniform) to commercial and residential accounts. However, more recent reporting indicates a slightly different trend in the Yadkin Basin. Since 2002, at least 12 of 37 suppliers (Asheboro, Ellerbe, Jonesville, Kannapolis, King, Lexington, Mocksville, Monroe, Morven, Mount Pleasant, Oaksboro, Peachland, Rockingham, and Wilkesboro) have changed from uniform rate structures to declining rate structures for commercial users.[34]

In addition, 13 suppliers are have changed from uniform rates for commercial users to declining rates while maintaining residential customers at uniform rates. Concord, one of the case studies in this report, has changed from uniform rates to declining rates for commercial users while residential users remain on an increasing rate structure. Finally, Lilesville has changed from a uniform rate structure to a decreasing rate structure for commercial users, and from a decreasing to an increasing rate structure for its residential users. Returning to our case studies, Statesville has changed from a declining rate to a uniform rate structure for residential customers. There has been no change in rates structures for commercial customers who remain on a uniform rate. Our final case study, Winston-Salem, has made no changes in its rate structures for either commercial or residential users since the 2002 drought.[35] (See Table 2: Water Rate Trends in the Yadkin Basin)

One reasonable explanation for a trend towards declining rates for commercial customers might be the loss of large customers (i.e. textile) in the region. As part of a strategy to attract new commercial customers and maintain existing large-scale users which may provide a level of predictability, suppliers might be offering artificially low water costs.

In conclusion, uniform or water-wasting "declining" rate structure continue to be the norm in North Carolina, and especially in the Yadkin Basin even after the lessons learned from the 2002 drought. Some of the largest cities in other basins, including Charlotte and Greensboro, have adopted water-conserving or increasing rate structures.

TABLE 2: WATER RATE TRENDS IN THE YADKIN BASIN

KEY TO CHART:			
↓	decreasing block rate	Inside water rates are greater than outside water rates	I > O
Uniform	uniform block rate	Inside water rates are less than outside water rates	I < O
↑	increasing block rate	Inside water rates are equal to outside water rates	I = O
--	no data available rate		

MUNICIPALITY	# OF CITY ACCOUNTS	RESIDENTIAL WATER RATE STRUCTURE 2002-03	RESIDENTIAL WATER RATE STRUCTURE 2005-06	INSIDE VS OUTSIDE RATES 2005-06	COMMERCIAL WATER RATE STRUCTURE 2002-03	COMMERCIAL WATER RATE STRUCTURE 2005-06	SPECIFIC COMMERCIAL RATE STRUCTURE	INSIDE VS OUTSIDE RATES
ALBEMARLE	308	↓	↓	I < O	↓	↓	No	I < O
ANSONVILLE	210	↓	U	*	↓	↓	No	***
ASHEBORO	11,326	U	U	I < O	U	↓	Yes	I < O
BISCOE	870	U	U	I < O	↓	↓	Yes	I < O
CONCORD	28,645	↑	↑	--	U	U	Yes	
CONCORD COMMUNITY WATER SYSTEM	483	--	U	*	--	--	--	--
EAST BEND		↓	--	--	↓	--	--	--
ELKIN	20,046	U	U	I < O	U	↓	No	I < O
ELLERBE	643	↓	↑	I < O	↓	↓	No	
FAITH	234	↓	↓	I < O	↓	↓	No	I < O
HAMLET	1,957	↓	U	I < O	↓	↓	No	I < O
JONESVILLE	11	U	U	I < O	U	↓	No	I < O
KANNAPOLIS	17,542	U	U	--	U	↓	No	
KING	7,601	U	U	I < O	U	↓	No	I < O
LEXINGTON	8,390	U	U	--	U	↓	No	I < O
LILESVILLE	151	↓	↑	--	U	↓	No	I < O
MCFARILIN		↓	--	--	↓	--	--	--
MOCKSVILLE	1,461	U	U	I < O	U	↓	No	I < O
MONROE	10,726	U	U	--	U	↓	No	I < O
MOORESVILLE	9,893	↓	↓	--	↓	↓	No	I < O
MORVEN	191	U	U	I < O	U	↓	No	I < O
MOUNT AIRY	5,037	↓	↓	--	↓	↓	No	I < O
MOUNT GILEAD	463	↓	↓	I < O	↓	↓	No	I < O
MOUNT PLEASANT	979	U	U	I < O	U	↓	No	I < O

NORTH WILKESBORO	1,383	↓	↓	I = O	↓	↓	No	I = O
NORWOOD	1,522	↓	↓	I < O	↓	↓	No	I < O
OAKBORO	389	U	U	I < O	U	↓	Yes, outside only	I < O
PEACHLAND	195*	↓	↓	I < O	↓	↓	No	I < O
POLKTON	385	U	U	*	U	↓	No	***
ROCKINGHAM	4,670	↓	↓	I < O	↓	↓	No	I < O
SALISBURY	15,997	U	U	--	U	↓	No	***
STATESVILLE	10,775	↓	U	--	↓	↓	No	I < O
TROUTMAN	559	--	U	I < O	U	U	No	I < O
WADESBORO	2,300	↓	↓	I < O	↓	↓	No	From 0 gallons to 100,000: I < O From 250,000 gallons: I > O
WILKESBORO	1,854	U	U	I < O	U	U	Yes	
WINSTON-SALEM	112,841	↓	↓	I < O	↓	↓	No	I < O
YADKINVILLE	1,552	↓	↓	I < O	↓	↓	No	I < O

* 1/3 of 2004 municipal population was used in place of total number accounts due to missing data.

*** No info available

WATER USERS & "CLASSES" OF CUSTOMERS

As state rules are not prescriptive for water pricing structure, there is ample opportunity exists for economic discrimination to occur in water pricing and rate structures. According to Jeff Hughes of UNC-Chapel Hill's Environmental Finance Center, "more and more communities are struggling to maintain a financially healthy water and sewer enterprises without imposing excessive hardships on their financially struggling customers."[36] Aggravated by a drought situation, these economic justice concerns with environmental implications are another reason why it is extremely important for decision-makers to adopt conservation-based water and sewer rates. If water and sewer enterprises make efforts to ensure that all classes of customers are treated fairly, and basic uses are prioritized during a year with normal rainfall, communities will be better equipped to deal with the hardships of drought conditions.

One of the most common reasons cited for maintaining unsustainably *low rates for all customers* is the potential for negative impacts to low-income customers. Through experience we have learned that seemingly equitable rates, like uniform rate structures, may not serve communities well in the long run.

One approach to maintaining water and wastewater facilities while at the same time caring for low-income customers is for the utility to carefully shift the responsibility to social services.
While not located in the Yadkin Basin, the Orange Water and Sewer Authority (OWASA) provides a model for this. Implemented in 1997, "Taste of Hope" is an optional, voluntary program that gives its customers the option of rounding up their bills to the nearest dollar. According to Denise Battle of OWASA, "the program allows the community to help itself."[37] The Inter-Faith Council for Social Services(IFC), a local non-profit, receives funds through OWASA and administers assistance to local residents. In this way, OWASA is able to make already difficult decisions about operating their water and wastewater enterprise without having to make decisions about the income classes of their customers. Currently, about 6 percent of OWASA customers participate in this program that earmarks funds for water customers to help other water customers. Participation continues to grow steadily without significant marketing.[38]

Some people that have opted to participate in the program have later taken advantage of the assistance. For example, one woman who had participated in the program was diagnosed with cancer. When faced with many unexpected medical bills, Taste of Hope was able to relieve her of her water bill during an overall stressful situation.

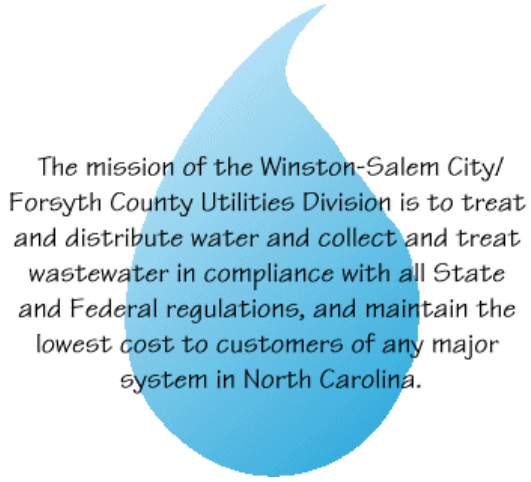
OWASA provides services to the relatively affluent communities of Carrboro and Chapel Hill. One challenge of a bill rounding program like this one is that, while it may work well in areas with few low-income customers, it probably would not be as effective in areas with high poverty rates, and fewer volunteer donors.

LOCAL DROUGHT RESPONSE

Most municipalities in the Yadkin Basin had to deal with some form of water shortage during the drought, most notably during the summer of 2002. Three of the larger cities in the Basin – Winston-Salem, Concord, and Statesville – used three different approaches to water use management during this period. Winston-Salem had access to abundant water supplies throughout the drought, so it hardly changed its water use habits. Concord, on the other hand, realized its poor outlook for the rest of the drought in early 2001 and proactively instituted rigorous restrictions in order to better conserve its resources. Statesville, like Winston-Salem, had access to a water supply that it viewed as abundant, but failed to recognize the severe effects that the drought would have on its water supply. As a result, it scrambled to impose limitations in July of 2002, but still had a water emergency on its hands – getting down to nine days of remaining water supply even *after* adding more emergency water sources in August.

CASE STUDIES OF MUNICIPAL WATER SUPPLIES PRICING AND CONSERVATION

Winston-Salem



Winston-Salem is the Yadkin Basin's largest city as well as its largest water supplier, serving 110,000 customers in 2002.[39] The Winston-Salem/Forsyth County utility also provides the cheapest water in the basin and some of the cheapest water in the state, especially compared to other large cities. Included in its mission statement is the claim that Winston-Salem provides water at the lowest cost to consumers of any large system in the state, which is borne out by data presented in the League of Municipalities study. The city uses a water-wasting "decreasing" rate structure, which provides a discount for use of larger volumes, while charging higher rates for small residential customers who use the water to meet basic human needs. Winston-Salem can provide this inexpensive water because of its access to an abundant water supply – the Yadkin River – and its ownership of the top 30 feet of W. Kerr Scott Reservoir, which holds an estimated 11 billion gallons of water.[40] In June of 2002, the reservoir was full because the water that it impounds comes from the mountain counties, which had received more precipitation than the Piedmont counties. Winston-Salem had not yet adopted voluntary restrictions, despite the Yadkin River having only a quarter of its average flow. In addition, many streams and wells in Forsyth and nearby counties had dried up. The Winston-Salem Journal reported that one family in rural Yadkin County had used their 260-foot-deep well for over 30 years, but had to drill a new 743-foot-deep well in order to provide a reliable supply of water to their house. Other rural families have reported wells drying up and have pointed to a combination of the drought conditions and major groundwater withdrawals by private companies as the likely cause.

Davidson Water, a large private supplier, uses the same type of water-wasting rate structure as Winston-Salem, but charges far more to provide water to consumers who live in the same area of the Yadkin Basin as the Winston-Salem utility. While charging more for water tends to encourage conservation by hitting people in their pockets, where it hurts, it also makes even the small amounts of water necessary to meet basic human needs less affordable.

In July of 2002, Winston-Salem adopted voluntary restrictions on water use. Officials attempted to cut water use by 20 percent through voluntary water restrictions on residential use, rather than by restricting water use by companies. This may have seemed like the most straightforward policy choice because residential use now outpaces industrial use, due to the loss of manufacturing jobs in Forsyth County and Winston-Salem.[41] Between 1991 and 2001, there was a 38 percent decline in the amount of water used by Forsyth County's top ten water industrial consumers (96 million gallons of water per year to 60 million gallons of water per year).[42] During that same time span, total water consumption has increased 14% (14 billion gallons of water per year to 16 billion gallons of water per year), much of which reportedly comes from residential consumption. Another consideration is the difference in peak usage – industrial water use remains steady throughout the year, but residential use increases significantly during the summer.

By using a water-wasting rate structure, charging so little for the resource, and not imposing use restrictions during extreme drought conditions, Winston-Salem is discouraging conservation and establishing unsustainable water use practices among its commercial and residential users. Although the area is in a

time of lower drought level stress at the time of this report, the population of Forsyth County is growing, and will eventually exhaust the county's abundant resources if the city continues to focus on increasing supply and providing water at unsustainable rates. Winston-Salem completed a low head dam in 2003 (see photo) to allow access to even more Yadkin River water that is being pumped to a new reservoir. Reportedly, this water is intended for sale to industrial users.[43]

Winston-Salem's new low head dam on the Yadkin River creates a recreational hazard while allowing the city, which has a water-wasting rate structure, to sell even more of the river water that it withdraws and treats.

Concord

The City of Concord is positioned to feel the harsh effects of an extended drought. Located approximately 20 miles north of Charlotte, it is in an area experiencing rapid population growth and development. It is the fourteenth largest city in the state, with nearly 60,000 residents. The water utility services about 65,000 people who use about 10.7 million gallons of water per day. Although Concord is located in the Rocky River sub-basin of the Yadkin, the state considers the city to be between the Yadkin Basin and the Catawba Basin to its west. This means that withdrawal from either river is subject to interbasin transfer limitations. In part because of these limits, Concord only had an emergency connection to the Charlotte-Mecklenburg system, which takes its water from the Catawba River. Until late 2002, Concord could withdraw up to 1.5 million gallons of water per day on an emergency basis. The city recently completed an expansion of that connection, which will allow Concord to withdraw up to 5 million gallons of water per day.[44]

Rather than using river water, as Winston-Salem and Charlotte do, Concord depends on surface collection lakes. It has three such impoundments: Lake Howell, Lake Fisher, and Lake Concord, which vary in size and shape. These lakes are filled almost exclusively by rainfall. When the rain stopped coming, Concord realized it would be in trouble very soon if it didn't take action.

In early 2001, Concord's city water resources director, Henry Waldroup, recognized that he had a developing water shortage ahead of him. Using a program that tracks rainfall, climate data, and lake levels, Waldroup's department saw that their lakes would not be able to sustain current levels of use and recommended to the city council that it impose water restrictions. As a result, Concord instituted mandatory water restrictions in February 2001, nearly a year before most other municipalities. These mandatory restrictions were in place until November 14, 2003. It used other tools in its conservation plan as well, such as education, increasing rates, and limiting residential growth.[45]

Concord developed its ordinance and strategy by trial and error, finding that the best tools for the job were partnerships and education. Initially, Concord tried to shut down water-dependent industries such as carwashes, and eliminated all irrigation. Not surprisingly, the carwash and landscaping industries did not respond positively to this. Concord then tried a different approach – working with its industrial and commercial users to develop individualized plans for cooperation – and received a very positive response. The carwash industry became more water efficient and recycled its water. Hotels and motels, filled to capacity during race weeks at the Lowe's Motor Speedway, reduced their linen washing and informed their guests of Concord's water shortage, including leaving a list of water-saving tips in each bathroom. Rather than forcing every restaurant to use paper plates, Concord allowed restaurants to find the best way to cut their consumption by 25 percent. Some restaurants included a conservation pamphlet in take-out bags. [46]

Waldroup says that it makes more sense for each business to find the best way to conserve water than for the government to levy a one-size-fits-all ban on particular uses. By offering businesses a choice, the city had better compliance and more innovative solutions to the water shortage. According to Waldroup, Phillip Morris, Concord's largest water user (1.5 million gallons of water per day), reduced its usage by 30% by modifying its hardware to be more water efficient. These partnerships also had the positive side-effect of bringing businesses, government, and the rest of the public into a closer-knit community.[47]

In addition to limiting commercial and industrial water use, Concord instituted mandatory water restrictions that limited the way that residential customers used their water. The city banned all irrigation systems and sprinklers, and threatened violators with a $100 penalty for residents and a $500 penalty for businesses. These fines increased to $300 and $1500 for repeat offenders. By 2003, Concord had assessed approximately $30,000 in fines for water restriction violations. The city's "water cops" even made it into USA Today for cutting off water to a developer because he violated the water restrictions nine times.[48]

The restrictions were relatively simple, and thus easy for people to understand and follow, and easy to enforce (see sidebar with excerpts of Concord's ordinance). The city also set out to educate people about *why* they were conserving water and why it was important to follow the ordinances. The city used billboards, mailers, handouts and educational sessions for kids, encouraged drought-resistant plantings, and even sponsored a contest that gave out prizes for unusual conservation tips.

In addition to the water restrictions, Concord increased their water rates, which already incorporated a water conservation structure. The city estimated that the average residential consumer uses between 5500 and 6000 gallons of water per month, and set their tiers accordingly. The first 7500 gallons cost $3.79/1000 gallons, but all water in excess of 7500 gallons costs $5.49/1000 gallons, a 45 percent increase. All irrigation services, including industrial and commercial irrigation, start at $5.49/1000 gallons to encourage conservation for this non-essential water use. By separating irrigation rates from the other use rates, Concord really narrowed in on a prime water-wasting activity that *all sectors* can cut back on.

Residential Volume Charges (inside city)		
	Block 1 (0-7,500 gallons)	$3.79/1000 gal.
	Block 2 (>7,500 gallons)	$5.49/1000 gal.
	Residential Irrigation	$5.49/1000 gal.

Commercial/Institutional Volume Charges		
	Commercial/Institutional Commercial/Institutional Irrigation	$3.22/1000 gal. $5.49/1000 gal.
Industrial Volume Charges		
	Industrial Industrial irrigation	$2.35/1000 gal. $5.49/1000 gal.
Volume water rates for the City of Concord, effective July 1, 2002 for the Fiscal Year 2002-2003. Available at http://www.ci.concord.nc.us/downloads/budget/fees0203final.pdf.		

Concord controlled all growth and development within its boundaries because of the lack of water by limiting new connections to the water supply. Development without new water connections grew at about 4 percent, rather than 6-10 percent, which is normal. Few other municipalities took measures to limit growth because of water shortages.

Through this combination of approaches, Concord reduced its water consumption from 10.7 million gallons of water per day to 8 million gallons of water per day. This is an overall reduction of approximately 25 percent. It is currently planning for its water future by maintaining some water restrictions, even after the official end of the drought, and evaluating new water sources such as a permanent pipeline into the Yadkin or Catawba Rivers. Hopefully Concord's careful planning and conscientious citizens will make it possible for the city to continue to use such a pipeline mostly as an emergency back-up source rather than an excuse to give up their water conservation habits.

Concerns mount especially as the cities of Concord & Kannapolis are requesting an interbasin transfer certificate from the Environmental Management Commission (EMC) for a total transfer of 46 million gallons/day (MGD)—(36 million from the Catawba River to the west and 10 million from the Yadkin River to the east) to add to the municipalities' water supply.[49] Surrounding counties and downstream communities in South Carolina have expressed strong opposition to the transfer certificate. They are concerned about the long-term effects of the transfer on water resources.[50] This opposition has in part led to the Environmental Management Commission's decision to extend the public comment period on the Environmental Impact Statement (EIS) for an additional period of 60 days. The EMC is expected to make a final decision on the interbasin transfer in September 2006.[51]

Sec. 62-36. Water emergency management (excerpted from Concord's water use ordinance)

(c) staged water use restrictions.

(1) Level I. During a level I water emergency, voluntary water conservation practices including the following are encouraged:
   a. Watering of lawns, ornamental gardens only as necessary for survival
   j. Filling of pools shall be limited to hours between 9:00 p.m. and 6:00 a.m.

(2) Level II. During a declared level II water emergency, mandatory water use restrictions include:
   a. All voluntary practices become mandatory.
   d. Use of water for wash-down of outside areas prohibited.
   g. Commercial, industrial and construction operations eliminate all possible waste.

(3) Level III. During a declared level III water emergency, mandatory water use restrictions include:
   a. Watering and irrigation of lawns, gardens and other plants are prohibited.
   e. Large commercial and industrial water customers and construction activities utilizing 5,000 or more gallons water per day, shall achieve mandatory reductions in daily water usage of 25, 50 or 75 percent, with the target reduction determined by the severity of the water emergency. Variances may be granted to designated public health facilities.

(4) Level IV. During a declared level IV water emergency,
   a. All use of water for purposes other than public safety is prohibited
   b. Where the city system is not functional, daily residential water use shall not exceed 300 gallons at each metered location.

(e) Noncompliance of water emergency management section.

(1) Penalties. Any person violating the mandatory restrictions shall be issued a civil citation and a penalty up to $100.00 for residential customers and $500.00 for commercial industrial users. Each occurrence shall be a separate violation.

(2) *Water* service may be temporarily discontinued for willful disregard of this section. In the event of continued gross noncompliance with this section, service will be discontinued. Tap fees and deposits will be forfeited.

(3) *Adoption and enforcement of provisions.* Municipal customers, water corporations or company compliance municipalities, water corporations or companies purchasing water from the city shall adopt and enforce these provisions as a condition of continuing existing water sales agreements, with service to be terminated to such municipalities and companies if they do not enforce these provisions.

The full text of the ordinance is available at http://www.ci.concord.nc.us/cityhall_2.asp.

Statesville

The City of Statesville faced water shortage problems that were similar to Concord's, but waited until they were near emergency status to take action – leaving the city with only nine days of water.[52] Unlike Concord, Statesville had tapped into a major tributary, the South Yadkin River, as its primary water source,[53] so it did not depend solely on collection lakes. The untreated water from the South Yadkin River is either pumped directly to the water treatment plant or is stored in a 49 million-gallon reservoir and then pumped to the treatment plant later.[54] However, it was the only city of its size (approximately 24,000) that did not have a connection to another municipality's water supply,[55] which would provide it with relief in a water emergency.

Director of Statesville water resources, Joe Hudson stated in June, 2002 that about half of the water used in Statesville is used to irrigate lawns.[56] Hudson himself acknowledged that watering less frequently or not at all was an easy way to save water.[57] Yet despite the beginning of the hot, water-hungry summer months, and the fact that the South Yadkin River was at its lowest levels in years, and that Statesville was using a million gallons of water per day *more* than average,[58] Hudson was quoted in the Winston-Salem Journal in June of 2002 as saying that the water situation was not serious enough yet to institute mandatory restrictions. [59]

One month later, on July 10, 2002, Statesville moved to mandatory water restrictions. The restrictions forbid residential users from watering lawns, washing cars, washing down driveways or sidewalks, and irrigating.[60] Each violation of these restrictions could have resulted in a $100 fine, and repeated misuse could have led to the city shutting off the abuser's water.[61] These restrictions also applied to municipalities who purchased water from Statesville, including the Town of Troutman, Iredell Water Corp. and West Iredell Water Corp.[62] At this time, Statesville was still using between 6.5 and 7 million gallons per day, which Hudson said needed to be reduced to 4.5 million gallons per day.[63]

According to the Raleigh News and Observer, by August 13, 2002, Statesville had met the goal of using 4.5 million gallons of water per day, but had set a new goal of reducing water use further to 3 million gallons per day.[64] This new goal is less than half of the average use only two months earlier in June. The city had adopted stronger water restrictions that forced its industrial customers who use 5,000 gallons of water or more per day to cut their water use by 40 percent.[65]

In August of 2002, the North Carolina Division of Water Quality (DWQ) wrote out an emergency permit for Statesville to build an emergency dam on untapped Fourth Creek. A DWQ official wrote out the permit on the spot, by hand, and then crews worked for 48 hours to build the emergency dam.[66] After completing a well that pumped 500,000 gallons of water into Statesville's treatment plant, and after collecting 700,000 gallons of water from the Fourth Creek emergency dam, city officials publicly estimated that the water supply would last for only nine more days.[67]

At the end of the summer of 2002, Statesville violated a drinking water standard for Total Haloacetic Acids.[68] The city believed that the violation was the result of drought conditions, which increased the amount of time that water spent sitting in the water system, reacting with chlorine disinfectant. City officials estimated that the water system was then operating at approximately two million gallons per day, which was less than a third of the normal amount of use.[69]

Statesville is completing a new raw water line to Lookout Shoals Reservoir on the Catawba River. It will yield a 15 million gallon per day withdrawal, in addition to existing withdrawals from the South Yadkin River.[70] It is also evaluating a connecting line between Statesville and Salisbury, which will provide emergency relief for both cities.[71] The proposed interconnect will be governed by interbasin transfer rules, which would limit the transfer to 2 million gallons per day until the cities

have a transfer certificate. The city has lifted all water use restrictions and is focusing on increasing its water supplies, rather than prioritizing water conservation as part of its future water use strategy. However, in one modest measure of progress in water sustainability, the city has recently implemented a uniform rate structure rather than its previous water-wasting decreasing rate structure.

POLICY RECOMMENDATIONS FOR JUST AND SUSTAINABLE WATER MANAGEMENT

As a result of our studies of water use practices associated with the drought in Yadkin basin that culminated in 2002, and comparative research included in this report, we believe that state and local officials, and advocates for a sustainable water future, must strengthen water use knowledge and management policies.

(1) BETTER INFORMATION AND FULL "WATER ACCOUNTABILITY": as a state and as concerned citizens, we must know who is using water, what it is being used for, its source and discharge points.

- The registration requirement should be lowered to 10,000 gallons per day
- There should not be an agricultural exemption to the registration requirement, as it is the largest user of groundwater resources and, in many locations, surface water as well.
- There should be stiffer penalties for failure to register or comply with registration requirements. The current maximum penalty of $5 per day with a cap of $500 has no economic effect on large companies. Penalties should be at least proportional to the size of unregistered withdrawals and should increase sharply with time of failure to report.
- Water resource officials should have adequate funding to monitor water use and climatic conditions, as well as to enact and enforce limitations on water use.
- Water audits and technical assistance should be available to all sectors to help them reduce use. Water audits should be mandatory for large water users.
- Install more tracking technologies. For example, digital readouts on wells linked to an internet site that shows ground water data, comparable to USGS site showing surface water flow rates.

(2) CHANGE INCENTIVES: municipalities that do plan and manage their water use to avoid emergency situations should be given the resources to do. The focus on emergency funding encourages municipalities to avoid planning for future water shortages and increased demand.

(3) CHANGE WATER SUPPLY RATE STRUCTURES: all water suppliers should adopt conservation rate structures with steeply increasing rates. This can be done in an incremental way that increases net revenue to local governments while promoting conservation. These efforts can be coupled with technical assistance, as well as business and residential water audits.

(4) FOCUS ON FAIR AND ACHIEVABLE WATER REDUCTION GOALS: reductions for some users are more feasible than others, but all should feel that they have made reasonably equitable adjustments and sacrifices, prioritized to meet basic needs.

(5) STRONGER AUTHORITY: the state needs general authority to regulate water withdrawals, protect in-stream uses, and monitor surface and groundwater use statewide. Without these basic powers, the state faces destructive, growth-driven water wars.

- State or regional authorities should have the power to set a system of drought indicators and consequent mandatory use reductions that apply whenever local ordinances are inadequate.
- Ordinances should be developed to trigger water conservation measures automatically in times of drought.
- All new, surface and groundwater withdrawals above 10,000 gallons/day should first be required to obtain approval from the NC DWR.
- Interbasin transfers should be viewed as inevitably resulting in ecological change and an escape from accountability and sustainable water use in region. A certificate should not granted to any entity that is not already implementing significant water conservation strategies.

(6) ADOPT WATER CONSERVING ENERGY GENERATION STRATEGIES: North Carolina must prioritize energy sources that are non-water consuming or intensive and limit approval of water temperature variances and withdrawals for power generation facilities.

APPENDIX 1: Public Water Supply System Data Reported for 2002

Date excerpted from: The North Carolina League of Municipalities, "How Much Does Water Cost? 2002" December 2002

							3000 gallons (res)		10,000 gallons (res)		100,000 gallons (res)		3000 gallons (com)		10,000 gallons (com)		100,000 gallons (com)	
Municipality	city water accts	Residential water accts	residential water rate structure	commericial water rate structure	min monthly res water charges	gallons provided with min charge	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside
Albemarle	6705	5332	decreasing block	declining	$8.35	1500	$9.99	$19.98	$22.99	$45.98	$157.33	$314.66	$9.99	$19.98	$22.99	$45.98	$157.33	$314.66
Ansonville	500	474	decreasing block	declining	$11.00	3000	$10.00	$10.00	$25.75	$25.75	$210.25	$210.25	$10.00	$10.00	$25.75	$25.75	$210.25	$210.25
Asheboro	11895	10045	uniform	uniform	$9.15	3000	$9.15	$8.30	$23.64	$47.28	$209.94	$419.88	$9.15	$18.30	$23.64	$47.28	$209.94	$419.88
Biscoe	863	736	uniform rate	declining	$6.24	2000	$8.60	$18.90	$26.80	$53.20	$260.80	$494.20	$18.00	$30.00	$42.50	$65.00	$357.50	$515.00
Concord	25531	23500	inverted	uniform			$14.43	$17.04	$45.21	$53.99	$539.31	$647.09	$13.89	$14.46	$36.43	$37.00	$326.23	$326.80
East Bend	532		decreasing block	declining	$11.00	3000	$15.00	$30.00	$43.45	$86.90	$195.50	$391.00	$15.00	$30.00	$43.45	$86.90	$195.50	$391.00
Elkin	2008	1589	uniform rate	uniform			$8.45	$15.50	$24.90	$48.40	$236.40	$471.40	$8.45	$15.50	$24.90	$48.40	$236.40	$471.40
Ellerbe	678	640	Increasing block	declining	$5.73	2000	$10.05	$16.40	$29.20	$35.00	$189.25	$212.90	$18.95	$18.95	$38.35	$38.35	$221.35	$221.35
Faith	385	357	Decreasing block	declining	$18.00	6000	$18.00	$45.00	$25.70	$64.25	$131.80	$329.50	$18.00	$45.00	$25.70	$64.25	$131.80	$329.50
Hamlet	3699	3228		declining			$9.00	$18.00	$18.80	$37.60	$144.80	$289.60	$9.00	$18.00	$18.80	$37.60	$144.80	$289.60
Jonesville	1220	1000		uniform			$15.25	$30.48	$35.48	$70.80	$295.58	$589.20	$15.25	$30.48	$35.48	$70.80	$295.58	$589.20
Kannapolis	16700	13372		uniform			$14.01	$16.80	$39.70	$47.60	$370.00	$443.60	$14.01	$16.80	$39.70	$47.60	$370.00	$443.60
King	7275	6900	Uniform rate	uniform	$20.00	4000	$11.25	$11.25	$25.81	$25.81	$213.01	$213.01	$11.25	$11.25	$25.81	$25.81	$213.01	$213.01
Lexington	8480	7238		uniform			$6.90	$13.83	$14.74	$29.58	$115.54	$232.08	$12.55	$25.13	$20.39	$40.88	$121.19	$243.38
Lilesville	369		Increasing block	uniform			$12.92	$16.10	$36.59	$42.77	$332.69	$380.00	$7.33	$6.92	$27.28	$27.61	$283.78	$293.74
Mcfarlin	50		Uniform rate	declining	$13.00	2000	$12.95	$12.95	$33.60	$33.60	$237.40	$237.40	$12.95	$12.95	$33.60	$33.60	$237.40	$237.40
Mocksville	22225	1978	Uniform rate	Uniform	$12.00	3000	$6.00	$10.00	$18.60	$35.20	$180.60	$359.20	$6.00	$12.00	$18.60	$37.20	$180.60	$361.20
Monroe	9900	8200	Uniform	Uniform			$11.40	$18.12	$22.32	$29.04	$162.72	$169.44	$18.48	$32.28	$29.40	$43.20	$169.80	$183.60

			rate															
Mooresville	7685	6766	Decreasing block	Declining			$8.20	$16.40	$21.50	$43.00	$184.40	$368.80	$15.70	$31.40	$29.00	$58.00	$191.90	$383.80
Morven	338	223	uniform	Uniform	$8.00	2000	$9.50	$12.50	$20.00	$23.00	$155.00	$158.00	$9.50	$12.50	$20.00	$23.00	$155.00	$158.00
Mount Airy	4441	3619	declining	declining	$0.00		$12.27	$18.51	$24.03	$36.15	$175.23	$262.95	$20.40	$31.61	$32.16	$49.25	$183.36	$276.05
Mount Gilead	605	560	declining	declining	$10.00	2000	$15.90	$25.00	$47.00	$78.60	$342.00	$654.10	$15.90	$25.00	$47.00	$78.60	$342.00	$654.10
Mount Pleasant	847	628	uniform	uniform	$17.00	2000	$20.20	$40.40	$42.60	$85.20	$330.60	$661.20	$20.20	$40.40	$42.60	$85.20	$330.60	$661.20
North Wilkesboro	1800	1584	declining	declining	$15.00	6000	$15.00	$22.50	$27.44	$41.16	$265.74	$398.61	$15.00	$22.50	$27.44	$41.16	$265.74	$398.61
Norwood	1191	1036	declining	declining	$9.19	1000	$13.93	$27.86	$30.54	$61.08	$213.06	$426.12	$13.93	$27.86	$30.54	$61.08	$213.06	$426.12
Oakboro	808	807	uniform	uniform	$8.30	2000	$11.02	$20.27	$30.06	$65.35	$274.86	$475.75	$11.02	$20.78	$30.06	$74.12	$274.86	$759.92
Peachland	254	227	declining	declining	$8.00	2000	$10.85	$12.85	$28.95	$30.45	$217.45	$219.45	$10.85	$12.85	$28.95	$30.45	$217.45	$219.45
Polkton	350	322	uniform	uniform	$8.50	3000	$8.50		$22.01		$195.71		$8.50		$22.01		$195.71	
Rockingham	4791	3922	declining	declining	$6.30	2000	$7.75	$15.50	$17.90	$35.80	$135.90	$271.80	$7.75	$15.50	$17.90	$35.80	$135.90	$271.80
Salisbury	15296		uniform	uniform	$3.56	0	$12.56	$12.56	$35.06	$35.06	$305.06	$305.06	$14.06	$14.06	$36.56	$36.56	$306.56	$306.56
Statesville	9423	7807	declining	declining	$5.01	1500	$7.97	$19.93	$22.77	$56.93	$200.37	$500.93	$7.97	$19.93	$22.77	$56.93	$200.37	$500.93
Troutman	1059	924		uniform	$18.50	2000	$10.50	$21.00	$35.00	$70.00	$350.00	$700.00	$10.50	$21.00	$35.00	$70.00	$350.00	$700.00
Wadesboro	2392	2250	declining	declining	$10.50	2000	$13.00	$18.41	$30.50	$49.28	$219.50	$296.98	$13.00	$18.41	$30.50	$49.28	$219.50	$296.98
Wilkesboro	2013	1536	uniform	uniform	$3.00	3000	$3.00	$4.50	$8.39	$12.59	$77.69	$116.54	$3.00	$4.50	$8.39	$12.59	$77.69	$116.54
Winston-Salem	110000	104282	declining	declining	$3.23	2244	$4.31	$6.45	$15.01	$22.58	$112.47	$168.86	$4.31	$6.45	$15.01	$22.58	$112.47	$168.86
Yadkinville	1600	1329	declining	declining	$6.89	3000	$7.58	$16.53	$23.29	$50.83	$200.19	$437.43	$7.58	$16.53	$23.29	$50.83	$200.19	$437.43

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