HIDDEN RESERVOIR:

WHY WATER EFFICIENCY IS THE BEST SOLUTION FOR THE SOUTHEAST

American Rivers
Thriving By Nature

ABOUT AMERICAN RIVERS

American Rivers is the leading national organization standing up for healthy rivers so communities can thrive. American Rivers protects and restores America's rivers for the benefit of people, wildlife and nature. Founded in 1973, American Rivers has more than 65,000 members and supporters nationwide, with offices in Washington, DC and the Mid-Atlantic, Northeast, Midwest, Southeast, California and Northwest regions. Visit **www.AmericanRivers.org**.

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EXECUTIVE SUMMARY

The Southeast United States faces unprecedented challenges to its water supply. Growing populations and the impacts of global warming are putting new strains on communities and their rivers. Our local leaders are facing the pressing question of how to ensure a clean, reliable water supply for current and future generations.

Traditionally, building more dams and reservoirs was the first and only answer to water supply problems. But these 19th century approaches should not be the primary solutions for our new 21st century challenges. They don't address the root problem — we are not using the water we do have wisely. Relying solely on building large new dams is not cost-effective and it won't solve today's water needs. Per gallon, dams cost up to 8500 times more than water efficiency investments. Dams are fixed in one place and hold a limited amount of water. Even when we do get sufficient rains to fill reservoirs, these giant pools can lose tremendous amounts of water through evaporation.

For these reasons, building new dams should be the absolute last alternative for solving our water supply needs.

Hidden Reservoir makes the case that water efficiency is our best source of affordable water and must be the backbone of water supply planning. By implementing the nine water efficiency policies outlined in this report, communities

Water efficiency is our best source of affordable water and must be the backbone of water supply planning.

MIM EISENBERG

JOHN WOLLWERTH, SHUTTERSTOCK.COM

across the Southeast can secure cost-effective and timely water supply. To demonstrate the impact water efficiency could have in our Southeastern communities, we have applied the nine policies to four cities and calculated the amount of water that could be secured. (See Appendix 2 for detailed calculations for each city.)

Metro Atlanta, Georgia

Consumption-652 MGD[1] *
3,974,662 residents

- Water efficiency measures could yield between 130 and 210 MGD, a 21-33% savings.
- Metro Atlanta could save between $300 million and $700 million by pursuing water efficiency to secure water supply as compared to building new dams.[2]
- Total water saved is more than an entire new Lake Lanier which provides 178 MGD to Metro Atlanta.
- Metro Atlanta's Metropolitan North Georgia Water Planning District could eliminate the need for all four of its planned reservoirs (totaling 98 MGD) two times over.[3]
- This water savings could provide water for 790,000 to 1,280,000 new residents.

Charlotte, North Carolina

Consumption-145 MGD[4]
630,478 residents[5]

- Water efficiency measures could yield between 31 and 47 MGD, a 21-33% savings.
- Charlotte could save between $75 million and $160 million by pursuing water efficiency to secure water supply as compared to building new dams.
- This water savings could provide water for 135,000 to 205,240 new residents.

Raleigh, North Carolina

Consumption-66 MGD[6]
435,000 residents[7]

- Water efficiency measures could yield between 13 and 20 MGD, a 27-40% savings
- Raleigh could save between $30 million and $60 million by pursuing water efficiency to secure water supply as compared to building new dams.
- This water savings could provide water for 80,000 to 120,000 new residents.

Columbia, South Carolina

Consumption-98.5 MGD
390,000 residents[8]

- Water efficiency measures could yield between 18 and 27 MGD, a 18-27% savings
- Columbia could save between $45 million and $100 million by pursuing water efficiency to secure water supply as compared to building new dams.
- This water savings could provide water for 75,000 to 120,000 new residents.

***MGD = million gallons per day**

Nine Smart Water Policies

This report outlines nine proven, timely and cost-effective policies that state and local governments and utilities can embrace now to invest in water efficiency as a primary source of new water supply:

Stop Leaks

Aging, broken pipes lose large quantities of precious clean water through leaks. It is estimated that in the U.S. over six billion gallons are lost each day[9] or 14% of total water use. To address this problem, communities should:

- Reduce leaks to as close to zero as possible.
- Conduct self audits to identify system leaks and eliminate unmetered uses.

Price Water Right

Water must be priced to cover costs and to encourage efficiency. Pricing water right can yield a 15% reduction[10] in water consumption for only a fraction of a penny per gallon increase in price. Utilities should adopt a two part fee system which establishes:

- A flat service fee that covers all utility fixed costs, such as pipe maintenance and pump station operations.
- A variable fee for the volume of water consumed, charging significantly higher rates as water consumption increases to discourage water waste, and lower rates for conserving households and low-fixed income customers.
- Higher fees associated with water waste should fund conservation incentive programs and alleviate the increased cost to lower and fixed income customers.

Meter All Water Users

Most apartments, condos, and commercial buildings include a flat rate for water in the rent or monthly fees effectively eliminating any market signals to encourage water efficiency.

- Water meters should be installed on all new homes, multi-family apartment buildings, and businesses.
- Incentives should be provided to retrofit existing multi-family and commercial buildings.

Retrofit All Buildings

Outdated appliances and fixtures waste a lot of water. If all U.S. households installed water-efficient fixtures and appliances, the country would save more than 8.2 billion gallons per day.[11] This savings could provide all eight Southeastern states with their entire public water supply and equals approximately 20% of the total U.S. public water supply.[12] Communities should:

- Invest in voluntary incentive programs that provide rebates, swap-outs, or direct installations to retrofit wasteful water fixtures and appliances.
- Mandate retrofitting of antiquated fixtures and appliances upon resale of homes or establishment of a new water account.
- Provide free audits for all customer sectors to assess where the most cost-effective and water efficient savings can be secured.

Landscape to Minimize Water Waste

Homes in the Southeastern U.S. consume on average 30%[13] of their Evian™ quality drinking water outdoors watering lawns, plants and trees. Tampa Bay, Florida's smart sprinkling education and landscape incentives programs have secured a 25% reduction in outdoor water use. Communities should follow Tampa Bay's lead and:

- Require dedicated irrigation meters for large landscapes (such as office parks, hospitals, school campuses) and create a significantly higher water rate for irrigation water.
- Require moisture or rain sensors for all irrigation systems.
- Provide free irrigation system audits.
- Promote different landscape models to reduce water-intensive plantings.

Increase Public Understanding

Most people in the U.S. know very little about their water supply, having no idea what their water costs or where their water comes from. This leaves water users uninformed and disengaged. Communities should take simple, but powerful steps to:

- Create an outreach campaign about smart, simple, cost-effective water efficiency.
- Demystify the water bill by billing in gallon

RADIUM SPRING RUN, KEVIN MAYES

increments on a monthly basis and sharing historical data to compare use from month to month and year to year.

- Designate a staff member to coordinate water efficiency, conservation and reuse programs.

Build Smart for the Future

In the U.S., 50% of the homes that will exist in 2030 have not yet been built. With global warming and growing populations in mind the current trends of water waste in new developments need to be reversed to stress cost-saving water efficiency.

Communities should:

- Enact policies that promote the use of alternative sources of water, such as gray water and rainwater, for uses that do not require drinking-quality water.
- Design homes and neighborhoods to capture and reuse stormwater on site.
- Require "dual plumbing" for new homes and businesses.
- Regularly update building codes and ordinances to support or require the use of the most water efficient technologies.

Return Water to the River

Lack of water compromises the health of a river as well as its ability to sustain its human and natural communities. To maintain healthy flows, a portion of water efficiency "savings" should be returned to the river to serve as a "savings account" for a not so rainy day.

State level policy should be adopted that requires that river and community "water budgets" be developed for every river, estuary, and aquifer in the state. Water budgets should provide:

- an assessment of the ecologically sustainable flow for a healthy river;
- a determination of how much water can be sustainably 'harvested' from the river; and
- an assessment of community priorities that establishes how the public's shared water resource should be used.

Involve Water Users in Decisions

Opportunities for significant water savings can be overlooked without having all the stakeholders at the table. Involving water users in these discussions encourages higher rates of efficiency.

Communities can involve water users by:

- Creating a standing advisory board, with representatives from all sectors including industrial, commercial and residential, to provide ideas, guidance and assistance with water supply policy and programs.
- Hosting town hall meetings about policy and rate changes to engage questions and develop support for rate changes, outdoor water regulations, and efficiency programs.

The time for action is now

Water is life. We can't afford to waste it. If we can achieve water efficiency, the Southeast's citizens will enjoy a sustainable future that includes healthy communities, a strong economy, and healthy rivers. The Southeast's water crisis is real, but commonsense solutions are within reach. We're all in this together. If we want a bright future for our region, then the time for the right kind of action is now.

SECTION ONE

OUR SOUTHERN RIVER HERITAGE

Clean water is our lifeblood, our birthright. The lush green forests, rivers and farmland of the Southeast U.S. tell us we are home. Water is life, and for so many in the Southeast, a way of life. Our clean water helps us grow and cook our food, enables us to extend our southern hospitality to visitors and neighbors, and nurtures our beloved Southern Magnolias to provide a shaded refuge from the summer sun.

Our rivers and streams supply the clean water that makes our Southeast landscapes thrive. Rivers such as the Altamaha, Black Warrior, Catawba-Wateree, Chattahoochee, Chattooga, Cumberland, Edisto, Savannah, Tennessee, and Yadkin-PeeDee weave the quilt of our natural heritage.

The health of these rivers and the quality and reliability of our water supply are inextricably linked.

New Challenges to Southeast Water Supply

We in the Southeast have been blessed with plentiful water for our communities and way of life… until now.

Today, growing populations, booming development and global warming are putting unprecedented strains on our limited water supplies. As a result, many communities and businesses are facing new threats and uncertainties. And some of our beloved rivers are shrinking, and even drying up.

Traditionally, building more dams and reservoirs was the first and only answer to water supply problems. But 19th century approaches like large-scale, expensive infrastructure such as dams should not be our primary solutions for our new 21st century challenges.

Not only are these old-school approaches extraordinarily costly and harmful to downstream communities and wildlife, but they don't address the root problem — we are not using the water we do have wisely. Thanks to outdated infrastructure and wasteful water management, we lose millions of gallons of water a day. To borrow from the traditional folk song, "there's a hole in the bucket" — and we still haven't gotten around to fixing it.

That is why building new dams should be the absolute last alternative. Dams are fixed in one place and hold a limited amount of water. Even when we do get sufficient rains to fill reservoirs, these giant pools can lose tremendous amounts of water through evaporation.

And dams are expensive. They can cost up to 8500 times more than water efficiency. That's not a typo, that's a fact. According to Georgia's Environmental Protection Division, dams can cost $4000 per 1000 gallons of capacity, while water efficiency costs between $0.46 to $250 per 1000 gallons saved or new capacity.[14]

Nearly two thirds of the U.S. public water supply comes from surface water sources, predominantly rivers and streams.[15]

ANGELA VALVASORI

Dams cost more

Georgia's proposed Lower Little Tallapoosa Dam would provide nearly 10 million gallons per day (MGD) and cost taxpayers $115 million[16] or $11.61 per gallon of capacity. Meanwhile, DeKalb County, Georgia recently enacted a program that replaces outdated fixtures with water efficient products. If applied to the 165,000 older and less water-efficient homes in the county, this program would secure nearly 9 MGD and would cost taxpayers only $10.6 million[17] or $1.17 per gallon of capacity.

Luckily, more and more local decision-makers recognize that addressing water scarcity with forward-thinking, effective, and sustainable solutions must be a top priority.

Reservoirs evaporate water

The capacity of a reservoir is diminished by evaporation which constantly removes water from the reservoir. This means that at times, reservoirs can lose more water than they capture making them a liability in terms of securing water supply. Lake Lanier, the primary water source for Metro Atlanta, lost an estimated .2 inch of water or 194 million gallons of water — nearly 30% of Metro Atlanta's daily use — to evaporation on a single day, June 11, 2008.[19]

Use Less, Do More: The Promise of Water Efficiency

Imagine finding a brand new source of water in the drought-stricken Southeast; a hidden lake or aquifer that could provide water to millions.

This is the promise of water efficiency. By improving how we use and manage water, we can tap a new source of supply that's been hiding in plain sight.

Water efficiency accomplishes more with less by using the best available technology and using water in smarter and more innovative ways. Water efficiency is different from water conservation which, while also important, is generally more focused on changing behavior and habits like turning off the tap while brushing your teeth.

Water efficiency does not mean doing less. Water efficiency isn't about asking citizens to shower once a week or plant a cactus in the front yard.

Water efficiency is about flushing high-efficiency toilets and growing your Southern Magnolia with rainwater or gray water — instead of Evian™ quality drinking water. It is about sustaining a high quality of life. It is about using innovative and smart technology to use less water to accomplish the same work.

Water efficiency is simply the most cost-effective and immediate way to ensure safe, clean and available water for our families, neighbors and businesses.

Water Efficiency: the Backbone of a 21st Century Water Supply Strategy

Water efficiency is proven and tested.

Many communities facing dwindling water supplies have implemented measures to use water more efficiently and cost effectively. Cary, North Carolina effectively increased its water supply by 15% in 11 years through water efficiency. Tampa Bay, Florida increased its per capita water supply by 26% over 12 years. These savings equal "new" supply. This increased supply came from using less, leaving more in the tank to use at a later date. This saved water can be kept in the river to benefit the community in other ways as well, such as protecting fish and wildlife and enhancing recreational opportunities.

Water efficiency is cost-effective.

Water efficiency costs $0.46 to $250 per 1000 gallons saved, while dams can cost $4000 per 1000 gallons of capacity[20] — and dams cost even more if you include maintenance and operations costs. By committing to water efficiency, Boston, Massachusetts was able to grow its customer base by 2 million people, reduce its water consumption by one-third and save $500 million by eliminating the need to build a dam.

Water Efficiency Timeline: Cobb County, Georgia

Water efficiency efforts can take time to implement, but much less time than dams and other large scale infrastructure. Between 2003 and 2008 Metro Atlanta's Cobb County maintained its 65 MGD consumption through water efficiency despite a 10% increase in service population totaling 42,000 people.[21] With each person consuming an average 125 gallons per day, Cobb Water would have needed to secure 5.25 million gallons more a day of "new" supply or an 8% increase in water supply. They wisely chose to secure this supply through efficiency.

Water efficiency gets immediate results.

Water savings can happen right now. Across the country it has been demonstrated that the technology exists to be more efficient with this precious resource and it's getting easier every day. Experience in many U.S. cities has shown that water efficiency investments can achieve results in months.

Water efficiency has added benefits for cities.

Water efficiency relieves pressure on over-taxed sewers and wastewater treatment plants, lowers municipal costs and reduces energy consumption and related greenhouse gas emissions.

Water efficiency adds up.

Water efficiency should be the backbone of local, state and national water supply strategy. The "reservoir" is already in our bathrooms, kitchens, and laundry rooms just waiting to be tapped. It makes economic, ecological and common sense. With the policies outlined below communities could secure between 20% and 35% new water supply to support sustainable growth and downstream communities at a fraction of the cost of other supply options.

We need water policies and management that address today's challenges. We must act now so our communities and future generations can enjoy clean, reliable water supplies, healthy rivers, and a high quality of life. Fortunately, we have the opportunity to make the changes necessary for a thriving and sustainable water future.

The time for water efficiency is now.

JOE KEGLEY

Average residential water use in the U.S. is 101 gallons per person a day. Consider that in Brisbane, Australia they use 36 gallons per person per day with the same high standard of living as in the U.S.[22]

In Atlanta, between 57 billion to 133 billion gallons of rainwater that used to soak into the ground annually — enough to serve the average annual household needs of 1.5 million to 3.6 million people — now pour into sewers as polluted runoff as a result of paving over watersheds. In Charlotte, North Carolina between 13 billion and 31 billion gallons are lost as runoff, in Raleigh-Durham-Chapel Hill between 9 billion and 22 billion gallons, and in Greenville, South Carolina between 13 billion and 30 billion gallons.[23]

Water efficiency's immediate results

On August 1, 2007, residents of Orme, Tennessee turned on their taps and nothing came out. For 21 hours they had no water service. Due to historic drought conditions water service was reduced to just 3 hours a day. The town resorted to trucking in 30,000 gallons of water per day at nearly twice the cost of their public water supply. To address the situation and restore water service, members of the Plumbing Manufacturers Institute donated and installed water-efficient toilets, fill valves, showerheads, aerators and sinks in all Orme homes reducing water consumption by 45%, an average savings estimated at $528.20 per year per household on their public water supply rates. Thanks entirely to the retrofits and other small repairs, Orme was able to quadruple the number of hours of water supply in just 3 days.[24]

Save water, save energy

Most people realize that the hot water heater in your home uses electricity or natural gas, but even before water reaches your home, supplying and treating it requires a significant amount of energy. According to EPA's WaterSense program, "American public water supply and treatment facilities consume about 56 billion kilowatt-hours per year — enough electricity to power more than 5 million homes for an entire year.[25]" Water savings mean energy savings and that means less greenhouse gases produced from coal-burning power plants.

If every other American home replaced their older inefficient toilets, faucets and showerheads with new WaterSense (a certification similar to EnergyStar) toilets, the country could save about 5 billion kilowatt-hours of electricity per year—avoiding 4 million tons of greenhouse gas emissions. That is equivalent to removing nearly 750,000 automobiles from the road for one year![26]

GLOBAL WARMING

New water supply challenges: population growth and global warming

Even under the most optimistic scenarios for cutting greenhouse gas emissions, the Southeast's climate will still experience changes due to the warming gases already in the atmosphere. The impacts will be felt especially on freshwater resources. Overwhelming scientific consensus confirms that warmer temperatures will increase evaporation and lower river, lake and groundwater levels. Traditional precipitation patterns will also be disrupted, with more frequent, intense droughts. This could cause a shortage of water supplies for municipal, recreational and industrial uses and also means less water will be available during dry summer months to meet the needs of people, farms, fish and wildlife.

Rapid population growth is increasing the demands for water in both urban and rural areas. The population in the Southeast has doubled in the past 50 years[27] and some say our current population of 34 million is projected to increase by nearly two-thirds — adding more than 23 million people by the year 2050.[28] In the Atlanta area alone, the population is projected to increase by over 2.2 million new residents by 2030[29] and many of the major cities in North and South Carolina are expecting to see their populations nearly double in that same time period.

Water efficiency in the Southeast

By implementing the nine water efficiency policies outlined in this report, communities across the Southeast can secure cost-effective and timely water supply. To demonstrate the impact water efficiency could have in our Southeastern communities, we have applied the nine policies to four cities and calculated the amount of water that could be secured. (See Appendix 2 for detailed calculations for each city.)

SCOTT CHURCH

Metro Atlanta, Georgia:

Consumption-652 MGD

3,974,662 residents[30]

- Water efficiency measures could yield between 130 and 210 MGD, a 21-33% savings.
- Metro Atlanta could save between $300 million and $700 million by pursuing water efficiency to secure water supply as compared to building new dams.
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- Metro Atlanta's Metropolitan North Georgia Water Planning District could eliminate the need for all four of its planned reservoirs (totaling 98 MGD) two times over.[32]
- This water savings could provide water for 790,000 to 1,280,000 new residents.

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Consumption-98.5 MGD

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- Columbia could save between $45 million and $100 million by pursuing water efficiency to secure water supply as compared to building new dams.
- This water savings could provide water for 75,000 to 120,000 new residents.

Charlotte, North Carolina:

Consumption-145 MGD[34]

630,478 residents[35]

- Water efficiency measures could yield between 31 and 47 MGD, a 21-33% savings.
- Charlotte could save between $75 million and $160 million by pursuing water efficiency to secure water supply as compared to building new dams.
- This water savings could provide water for 135,000 to 205,240 new residents.

Raleigh, North Carolina:

Consumption-66 MGD[36]

435,000 residents[37]

- Water efficiency measures could yield between 13 and 20 MGD, a 27-40% savings
- Raleigh could save between $30 million and $60 million by pursuing water efficiency to secure water supply as compared to building new dams.
- This water savings could provide water for 80,000 to 120,000 new residents.

SECTION TWO

"EFFICIENCY FIRST" AS SMART PUBLIC POLICY

Water utilities provide over 43 billion gallons of drinking water per day[38] to over 85% of people in the U.S.[39] Of that, it is estimated that over six billion gallons are lost each day or 14% of total water use.[40]

Water efficiency equals reliable and plentiful water supply. Water efficiency equals financial security. Water efficiency is our best source of affordable new water. Water efficiency should be more than an add-on; it must be the backbone of water supply planning.

State and local leaders along with water utilities should take the next steps to make "Efficiency First" a reality. Simply put, water is local. Some of our most critical water supply decisions are local. And when we waste water it is local and downstream rivers and lakes that suffer, and local and downstream communities that lose.

Our local governments and water utilities should adopt policies that eliminate water waste, encourage smart water use, and create incentives for saving water to extend existing supplies.

Water efficiency, desalination and dams are all very different means of managing water supply. Water efficiency is the least expensive option with an estimated cost of $0.46 to $250 per 1,000 gallons saved.[41] Efficiency measures also require less water to be treated, and can avoid the need to construct dams and water treatment facilities. Efficiency is almost always less expensive than infrastructure expansion and logistically easier to accomplish. Desalination has been estimated to cost between $3.00 to $5.00 per 1,000 gallons for seawater and $1.00 to $2.50 for brackish water.[42] Dam construction has been estimated to cost $4,000 per 1000 gallons of capacity.[43]

9 Smart Water Policies

Communities that have implemented the water efficiency policies listed below have dramatically reduced water use and found a reliable and cheap source of new water supply.

1 Stop leaks

PROBLEM:

Aging, broken pipes lose large quantities of precious clean water through leaks. Water systems have all sorts of reasons for water loss or "unaccounted for water" such as faulty meters, unauthorized use and unmetered uses, such as firefighting. Often leaky pipes make up a significant portion of drinking water that is lost.

While the water industry recommends that utilities reduce "unaccounted for water" to as close to zero as possible, many utilities don't have a system in place to determine where their lost water is going, much less a system to reduce the loss.

SOLUTION:

Water utilities should regularly conduct self audits to identify system leaks, reduce the amount of water wasted to as close to zero as possible, and eliminate unmetered uses.

Water systems need to know where their water is going so they can take action and address the problem. Utilities should put in place leak detection and abatement programs to deter-

mine exactly where and how much water is lost to leaks, then fix them. To be most effective and maintain minimal leakage and waste, these programs should be an integral part of the utility's ongoing operations.

Potential savings:

The potential for savings can often be significant, though the exact amount varies dependent upon the extent of the leakage and the volume of water running through the system. Reducing leaks to 3% could yield as much as 11 MGD for a system the size of Atlanta, Georgia and 2.8 MGD for a system the size of Durham, North Carolina.

Success: Atlanta, Georgia

In 2003, Atlanta lost upwards of 24.4 MGD or 20% of its clean water to leaks and unmetered uses, such as fire hydrants and system maintenance.[44]

24.4 MGD is

- more than the total daily water consumption for Asheville, North Carolina
- enough to supply 244,000 new Atlanta residents with water
- a significant supply of water for downstream communities

To address the City's long-standing leakage problem, Atlanta's leadership created a leak detection and abatement program that has the task of identifying and fixing leaks every day. Atlanta has reduced its water loss rate from 20% to between 14-15% in only five years saving up to 7 million gallons a day.[45] While its current water loss rate is still well above zero, Atlanta has committed to reduce leakage by 1% a year to lower the leakage rate as much as possible.

Success: Raleigh, North Carolina

Raleigh, North Carolina has a notably low leakage rate attributable to their effective year round leak detection and abatement program. Raleigh has three active leak detection teams that survey the system daily with advanced audio detection equipment to search for and repair leaks. Based on information gathered from leak detection crews, it is estimated that their leakage rate is only 4.5% of their total water consumption or 3 MGD. In addition, they are in the process of replacing all of their old meters with new Automated Meter Reading (AMR) models and this has already resulted in a more accurate accounting of water.[46]

2 Price water right

Problem:

Water waste is encouraged through discounted 'bulk pricing' where utilities actually lower the unit cost of water as consumption increases. In addition, utilities often charge for water based primarily on the volume of water consumed, which means that if water consumption decreases through water efficiency, utilities can be left with budget shortfalls.

Solution:

Utilities provide a vital service and should price water to cover costs and to encourage efficiency, not waste. To accomplish this, utilities should adopt a two part fee system which establishes:

- A flat service fee that covers all utility fixed costs, such as pipe maintenance and pump station operations.

SUSAN RICHARDSON

- A variable fee for the volume of water consumed, charging significantly higher rates as water consumption increases to above average levels to discourage water waste, and lower rates for conserving households and low-fixed income customers. Water waste and its associated higher fees can provide the funding for conservation incentive programs such as toilet rebate programs and the subsidies for lower income customers.

Potential Savings:

Conservation pricing on average can yield a 15% reduction in water consumption[47] for only a fraction of a penny per gallon increase in price. Conservation pricing programs have yielded as much as a 22% reduction in per capita use.[48]

Success: Greensboro, North Carolina

In 2000, Greensboro, North Carolina adopted a conservation pricing structure in order to reduce water consumption. To do this, they eliminated discounted pricing for wasteful consumption and instead put in place a four-tiered price system as well as a "billing and availability" fee to help cover fixed costs. The utility lowered the price per gallon for the water conserving household and increased the price per gallon as consumption increases to above-average levels. In only seven years, average household consumption dropped 22% with only a modest increase of one-third of a penny per gallon even at the highest rate.[49]

RONTECH2000, ISTOCKPHOTO.COM

Tap water: What a deal!

In 2006, Americans bought 8.3 billion gallons of bottled water consuming 827,000 tons of plastic containers — about 6% of all plastic packaging entering the waste stream.[50]

- **In Atlanta, Georgia and Chattanooga, Tennessee you can drink a 12-ounce glass of tap water every day for nearly 11 years for the cost of a 12 ounce bottle of water.[51,52]**
- **In Charlotte, North Carolina you can drink a 12-ounce glass of tap water every day for 13 years for the cost of a 12 ounce bottle of water.[53]**

People may balk at spending more on their water bill, but they clearly value clean water, spending significant amounts of money on bottled water.

3 Meter all water users

Problem:

If it's not measured, it doesn't count. Most apartments, condominiums and rental properties include water in the rent or monthly fees. Regardless of how much the occupant uses they are charged the same amount; in effect, water is free. Water use and water waste are invisible, which effectively eliminates any market signals to encourage water efficiency.

Solution:

Install meters on all new homes and businesses and create incentives to retrofit existing multi-family and commercial buildings.

Potential savings:
15% savings[54]

Success: Austin, Texas
In 2002, as part of their long-term water conservation strategy, Austin Water adopted a policy requiring that all new multi-family housing install pipes that would enable submetering.[55] Then in 2002-2003, a study assessed the water savings potential of sub-metering apartments in Austin and other U.S. cities. Through the study, it was determined that sub-metered apartments used 15.3% less water than master-metered multi-family dwellings (143 GPD vs. 121 GPD after sub-metering[56]). In January 2008, Austin expanded their sub-metering ordinance to require the sub-metering of all multi-family housing. These water efficiency policies will not only help to secure water supply for the future, but it will also delay the costly expansion of water treatment capacity.

4 Retrofit all buildings

Problem:
Outdated appliances and fixtures — old toilets, sinks, showerheads and washing machines — waste a lot of water. Toilets alone use 26.7% of household water.[57] Using an antiquated 3 to 7 gallon per flush toilet consumes between 63% and 81% more water than their more efficient 1.28 gallons per flush counterparts.[58] Additionally, toilets last a long time, providing a disincentive to replace them with more efficient models.

Solution:
Communities can get more for their (or the taxpayer's) money by:

- investing in voluntary incentive programs that provide rebates, swap-outs, or direct installations to retrofit wasteful water fixtures and appliances.
- requiring the retrofit of antiquated fixtures and appliances upon resale of homes, or requiring the retrofitting as a prerequisite for establishing a new water account.
- providing free audits for all customer sectors to assess where the most cost-effective and water efficient savings can be secured.

Potential Savings:
Installing water efficient fixtures and appliances in all homes could yield a 35% savings in household water consumption alone.[59] If all U.S. households installed water-efficient fixtures and appliances, the country would save more than 8.2 billion gallons per day, 3 trillion gallons of water and more than $18 billion dollars per year![60] This savings could supply all eight Southeastern states with their entire public water supply and equals approximately 20% of the total U.S. public water supply.[61]

Success: DeKalb County, Georgia
In February 2008, Metro Atlanta's DeKalb County passed a 'retrofit on reconnect' ordinance requiring that anyone establishing a new account with the water department first upgrade all their plumbing fixtures to water efficient varieties. This is particularly useful in older communities where there are a significant number of homes built before new federal water efficiency requirements went into effect in 1993. If this were applied to all 165,000 pre-1993 homes, DeKalb County would save 9 MGD, nearly 10% of the county's daily 100 MGD consumption.[62]

WaterSense
Across the country it has been demonstrated that the technology exists to be more efficient with our water resources and it's getting better every day. In 2006, the U.S. Environmental Protection Agency launched WaterSense, the water equivalent of Energy Star, to set criteria for high performance, water efficient fixtures, appliances and services and to promote them in the marketplace. WaterSense-certified services and products, such as toilets and faucets, are at least 20% more efficient than their less efficient counterparts. WaterSense provides resources to its expanding circle of utility, industry, government, and non-profit partners to promote and support the smart use of water.

According to EPA WaterSense, weather-based irrigation controllers can save nearly 24 billion gallons per year across the United States — approximately equal to more than 7,000 hoses constantly running for a full year.[63]

5 Landscape to minimize water waste

Problem:

U.S. homes consume on average 30% of their EvianTM quality drinking water outdoors watering lawns, thirsty plants and trees.[64] At the height of summer, when water supply is lowest and the heat is at its most intense, outdoor water consumption skyrockets to levels as high as 80% of household use. Studies have shown that 50% of outdoor water is wasted – lost to the watering of driveways and sidewalks, evaporation, or over-watering.

Solution:

❖ Meter large users of irrigation water and price for efficiency. To curb water waste and encourage conservation, require dedicated irrigation meters for large landscapes (such as office parks, hospitals, school campuses) and create a significantly higher water rate for irrigation water.

❖ Require moisture or rain sensors for all irrigation systems. Rain and moisture sensors automatically shut off irrigation systems when it is raining or there is sufficient moisture in the soil, indicating that irrigation is not needed.

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❖ Landscape to use less water. Utilities should provide free irrigation system audits. They should actively promote different landscape models to reduce water-intensive plantings and provide education materials including drought-tolerant plant lists to be used by developers, homeowners and landscapers.

Potential Savings:

Tampa Bay, Florida's smart sprinkling education and landscape incentives programs have secured a 25% reduction in outdoor water use.[65]

Success: Cary, North Carolina

In 1997, Cary, North Carolina's Town Council set a goal to reduce per capita water consumption by 20% by 2015. The Rain Sensor Ordinance, one of the first water conservation measures adopted, required that all automatic irrigation systems be installed with a rain sensor to prevent irrigation when over a quarter-inch of rain has fallen. Soon after, the Water Waste Ordinance was adopted to prevent watering directly onto impervious surfaces and to prevent over-watering that results in water running off into storm drains. In 2008, Cary added a turf buy-back program that pays residents up to $500 to replace a minimum of 1,000 square feet of turf with either a natural area or a warm season grass.[66] Cary anticipates a water savings of 25 to 33 percent where turf is replaced with naturally landscaped areas and a 21 percent water savings where turf is replaced with warm season grasses.[67]

To complement and reinforce their ordinances, Cary's WaterWise landscaping program includes free workshops, educational materials, and "Beat the Peak" campaigns to promote water efficient landscape practices.

Between 1996 and 2008, Cary's water conservation efforts have reduced per capita water consumption by approximately 15% largely due to landscape water efficiency. Overall per capita water consumption dropped from approximately 82-128 gallons per capita per day (GPCD) in 1996 to 70-109 GPCD in 2008. As a direct result of these efficiency savings, Cary has been able to delay $50-60 million in infrastructure investments in expansion of its water treatment plant.[68]

6 Increase public understanding

Problem:

Most people in the U.S. know very little about their water supply and, on the whole, take for granted that water will come out of the tap when they turn it on. Most have no idea what their water costs and even fewer know where their water comes from or where it goes. The situation is only made worse by puzzling water bills that count water consumption in terms of "ccfs", acre-feet or, worse, unspecified "units", leaving water users uninformed and disengaged.

Solution:

Utilities should provide water users with information about their own water use patterns, and educate the public about smart, simple water efficiency solutions by:

❖ Creating an outreach campaign to inform the public about smart, simple, cost-effective ways to use water more efficiently.

❖ Demystifying the water bill by billing in gallon increments on a monthly basis and sharing historical data to compare use from month to month and year to year.

❖ Designating a staff member to serve as point person for the water utility or local government responsible for coordinating water efficiency, conservation and reuse programs, answering questions from the public and industry, and developing policy recommendations to advance and improve water efficiency and secure water supply solutions.

Potential Savings:

The precise savings attributable to education are hard to quantify, but most experts consider public education to be a key component of an effective multi-faceted water efficiency program, as it supports complementary policies and programs.

Success: Charlotte, North Carolina

In 2000, Charlotte-Mecklenburg Utilities (CMU) kicked off its WaterSmart public education campaign to encourage less water waste. In 2003,

CONGAREE LAND TRUST

the utility hired a full-time conservation coordinator and established a goal to reduce per-account residential water consumption by 20% within the decade. Over the years, Charlotte-Mecklenburg has promoted its WaterSmart program through the use of media stories, bill inserts, print, radio, billboard and cable TV ads, water-efficient lawncare workshops, in-home and business water audits, school programs, a user-friendly and informative website, a showerhead swap program and an ambassadors program in which CMU trains its staff to talk with the public about conservation and other water topics.

In large part due to their education programs, CMU has seen a steady decrease in the average consumption per residential account since 2003. The reduction in consumption is a result of an integrated approach of education, incentives, awareness, and community outreach programs to encourage water conservation. Between 2003 and 2007, CMU successfully reduced water consumption by 15.6% amounting to 22.6MGD in new supply.[69]

In July 2008, the Richmond County Board of Health in Augusta, Georgia adopted a gray water ordinance that will allow the wastewater from bathroom sinks, tubs and washing machines to be used to hand water flower gardens and lawns and for composting. Previously, it was required that the gray water be disposed of through the sewer or a septic tank.[70]

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7 Build smart for the future

Problem:

With global warming and growing populations, water will only grow as a concern and priority for our communities. In the U.S., 50% of the homes that will exist in 2030 have not yet been built. But we are moving in the wrong direction as water consumption on new homes surpasses water consumption on existing homes due to large lawns and new standard and luxury features such as automatic irrigation systems and shower systems with multiple heads.

Solution:

Smart water solutions are needed for all new buildings and landscapes. We must make our homes and our infrastructure more efficient and more adaptable for the future. Policies that promote the use of alternative sources of water — gray water (filtered and minimally treated water collected from sinks, tubs, showers and washing machines) and rainwater — for uses that don't require precious drinking-quality water all support this long-term water security vision. Examples of these policies include designing homes and neighborhoods to capture and reuse stormwater on site, and requiring so-called "dual plumbing" for new homes and businesses that enables use of rain, gray water or other recycled water for non-drinking water uses like toilet flushing and irrigation.

Since new water efficient technologies are in development and on the horizon, certainly too many to mention here, it is important that utilities and local governments update their building codes and ordinances regularly to support, and even promote, water efficiency in new construction and existing buildings.

Potential Savings:

A carefully designed gray water system that is connected to sinks, tubs, showers, and washing machines can collect approximately 35 gallons of re-usable water per capita per day or 35% of average daily per capita use. By using gray water or rainwater, instead of drinking water, to flush toilets, on average 27% of household potable water use could be saved.[71]

If all landscape irrigation used non-potable water sources such as rainwater, gray water, or air conditioner condensate, we could save on average 30% of residential water, most of it during the hottest, driest months of the year when rivers and municipal supplies are most water-stressed.

Success: San Antonio, Texas

In 1998, the San Antonio Water System (SAWS) launched a Large-Scale Retrofit Rebate Program to provide local industry with an incentive to undertake water-efficiency projects. Commercial, industrial, and institutional customers are eligible for up to 50-percent rebate on the installed cost of new water-saving equipment, including rainwater harvesting systems. Participants receive rebates amounting to $200 for every 325,851 gallons of water saved and sign a contract agreeing to keep the project in place for a minimum of ten years. If the project is discontinued prior to year ten, the participant must refund the rebate for the years the water savings were not in place. SAWS has plans to promote more water harvesting systems that use condensate and cooling tower blow down in addition to storm water run off. These systems have been successful at reducing potable landscape irrigation. This program provides San Antonio with its cheapest source of water by far. Water secured through the large-scale retrofit program costs $200 for every 325,851 gallons as compared with desalination of brackish water which costs $2000 for the same amount of water.[72]

8 Return water to the river

Problem:

When a river's flow gets too low, the lack of water compromises the health of the river, fish and wildlife, as well as the ability of the river to sustain the people who also rely on it for their drinking water and livelihoods.

Solution:

Rivers need healthy flows to sustain wildlife and human communities alike. Some rivers are already threatened due to low water flows during drought or at times of peak summer water use and many more are on the brink. To maintain healthy flows, a portion of water efficiency "savings" should be returned to the river to serve as a "savings account" for a not so rainy day. In this way, the river and its communities can prepare themselves for variations in rainfall, more frequent droughts and population growth.

In order to return water back to the river and sustain healthy flows for river and community use, a state level policy should be adopted that requires "water budgets" to be developed for every river. Water budgets provide 1) an assessment of the ecologically sustainable flow for a healthy river; 2) a determination of how much water can be sustainably 'harvested' from the river; and 3) an assessment of community priorities that establishes how our shared water should be used.

If it is determined that the flow is not sufficient or is projected to dip below those levels in the near future, then a restoration plan must be developed and implemented. Water efficiency should be part of the restoration strategy requiring that a portion of the water "saved" be returned to the river.

Success: Tampa Bay, Florida

Florida law requires the state water management districts or the Department of Environmental Protection to establish standards for river flows and levels for aquifers, surface watercourses, and other surface water bodies to identify the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area. These standards are used in the Southwest Florida Water Management District's (District) water use permitting program to ensure that withdrawals do not cause significant harm to water resources or the environment.[73]

In 1998, the District determined that excessive groundwater withdrawals were causing low water levels in wetlands and lakes in the North Tampa Bay area. The District developed a recovery plan in partnership with Tampa Bay Water which required a reduction in groundwater withdrawals from 158 MGD in 1998 to 90 MGD in 2008.[74] To secure the reduction in consumption, an important and, notably, the most cost-effective component of Tampa Bay Water's multi-faceted strategy, has been to reduce demand through water efficiency. Tampa Bay Water member utilities put in place programs such as toilet retrofit programs, landscape irrigation audits and rebates, and high efficiency clothes washer replacement. Through these programs 13 MGD in water savings was secured, a portion of which can now stay in the aquifer.[76]

In 2004, QS/1, a data company based in Spartanburg, South Carolina, built a L.E.E.D. certified building with water efficiency in mind. They installed all water efficient fixtures inside the building and a 20,000 gallon cistern under the building. The cistern collects rainwater from the roof and parking areas which is then used for landscape irrigation. In the four years the building has been in operation, they have only once used potable city water for their outdoor irrigation needs.[75]

Healthy rivers and watersheds perform essential functions for communities and wildlife. They filter and remove pollution, acting as natural sponges that absorb flood waters and release them during dry periods, buffering against droughts. Flowing rivers provide community services, like water for power plant cooling, manufacturing and assimilating wastes. Rivers also provide economic benefits by raising property values and providing boating, fishing and other recreation for residents and visitors.

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According to the Southwest Florida Management District, the standards for flows and levels help advise permit holders "when to say when," thus protecting the environment, the long–term health of the water resource, as well as Florida's quality of life.[77]

9 Involve water users in decisions

Problem:

Often water users are resistant to change and receive water policy decisions with skepticism and resistance. This causes delays, generates ill will and can be counter-productive. Useful perspectives on water waste and opportunities for significant water savings can be overlooked when there is no mechanism in place to include the spectrum of water users (industrial, commercial, residential, etc.) in water utility program and policy development.

Solution:

❖ Create a standing advisory board, with representatives from all sectors including industrial, commercial and residential, to provide ideas, guidance and assistance with water supply policy and programs.

❖ Host town hall meetings about policy and rate changes to engage questions and develop support for rate changes, outdoor water regulations, and efficiency programs. Involving the water users this way develops buy-in and encourages higher rates of participation.

Potential Savings:

It is difficult to quantify savings in dollars; however, in many communities it has been demonstrated that significant time is saved by involving stakeholders up front and significant water can be saved as water users can readily identify opportunities to reduce and eliminate water waste.

Success: San Antonio, Texas

In 1997, the San Antonio Water System (SAWS) was in a difficult situation that was getting worse. With their water withdrawals curtailed due to impacts on endangered species, SAWS identified water efficiency as a critical component of their water supply strategy. However,

there were members of the San Antonio community that were resistant to the idea of cutting water consumption.

To address this issue head on, SAWS created the Community Conservation Committee (CCC) to serve as a hotline for affected stakeholders, to work with staff to determine what could and should be done to reduce water waste, and to provide support and resources for implementing water conservation and efficiency programs. The CCC members include industrial, commercial, residential and environmental interests so that effective programs can be developed to address the concerns and unique water demands of the diverse user groups.[78]

Over time, the San Antonio Water System has reaped significant benefits from the CCC stakeholder group. Not only are the CCC members effective ambassadors for water efficiency, they also generate cost-effective and creative ideas for programs. For example, the industrial and commercial CCC members brought forward the idea for an industrial and commercial retrofit program similar to the toilet and washing machine rebate programs offered to residential customers. They agreed that there was significant potential for water savings in their sectors and that rebates or cost-sharing would be an effective way to encourage participation. They developed a proposal that added a fee onto industrial and commercial users' water bills that would in turn fund the program. The program was well-received and, to date, they have secured 1.15 MGD in water savings through this program alone.[79]

Conclusion

Water is life. We can't afford to waste it. If we can achieve water efficiency, the Southeast's citizens will enjoy a sustainable future that includes healthy communities, a strong economy, and healthy rivers. The Southeast's water crisis is real, but commonsense solutions are within reach. We're all in this together. If we want a bright future for our region, then the time for action is now.

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Appendix I | Water Savings Estimates: Assumptions

Water savings were estimated for five of the nine water efficiency measures presented in this paper for Atlanta, Georgia, Raleigh, North Carolina and Charlotte, North Carolina, and Columbia, South Carolina. The savings estimates provide an example of the amount of water that can be saved through efficiency measures. While the analysis included in this report helps tell a story of how water can be saved, cities and utilities need to conduct a detailed assessment before implementing efficiency programs to identify actual costs and benefits.

As described in this report, water efficiency is typically the least expensive water management strategy available to communities and water utilities. The savings estimates are provided in ranges as a low and high estimates. The difference in the range was calculated based on either a range of program saturation rates or a range in the percentage savings projected per measure.

Saturation rates are based on percentages of water use rather than number of customers. This was done because accurate customer data were not readily available.

Stop Leaks

Estimating the amount of water lost to leaks is very difficult. Typically water utilities report unaccounted for water in production and consumption numbers. Unaccounted for water can include a variety of unmetered uses and usually includes water lost from the system via leaks. The savings potential for leak mitigation programs varies greatly from utility to utility.

For this analysis savings estimates were generated to show how much water can be saved with a:

- Low estimate based in 25% savings of unaccounted for water
- High estimate based on 5o% savings of unaccounted for water

Conservation Pricing

Conservation pricing was estimated to save 15% of residential water use for the low estimate and 22% for the high estimate. This savings assumption is supported by results from the Southwest Florida Management District[80] as well as Greensboro, North Carolina.[81]

- Low estimate based in 15% savings
- High estimate based on 22% savings

Meter All Uses

A 2004 Aquacraft study found a 15% reduction in multifamily water use when submetering was implemented.[82] The estimated savings assume a 15% reduction of 50% of multifamily water consumption for the low estimate and 80% of multifamily water consumption for the high estimate. The 50% and 80% were used to create a range of program saturation.

- Low estimate 15% savings in 50% of multifamily water consumption
- High estimate 15% savings on 80% of multifamily water consumption

Retrofit All Buildings

Vickers estimates that a conserving home may use 35% less water indoors than a non-conserving home.[83] The difference in these homes is the efficiency of plumbing fixtures such as toilets, clothes washers, showers, and faucets. Since 2001 clothes washers have become increasingly more efficient and the 1.6 gallon per flush ultra low flush toilet has been surpassed by the 1.28 gallon per flush high-efficiency toilet. Therefore the 35% savings estimate is likely conservative.

The calculated water savings for retrofits was based on a 35% reduction in water use. This was applied to 70% of single-family water consumption and 81% of multifamily consumption as on average 30% of single-family water use is outdoor, which a retrofit of indoor plumbing fixtures would not impact. While multifamily hous-

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ing units typically do not have outdoor water use, not all of the indoor water consumption applies to toilets, clothes washers, showers, and faucets. Vickers estimates indoor water use from toilets, clothes washers, showers, and faucets to account for 80.9% of all residential indoor water use.[84] The low estimate assumes a 40% saturation rate and the high estimate assumes a 60% saturation rate.

- Low estimate based on 35% savings on 70% of single-family water consumption and 81%of multi-family consumption as applied to 40% saturation.
- High estimate based on 35% savings on 70% of single-family water consumption and 81% of multi-family consumption as applied to 60% saturation.

Landscape

Potential water savings for landscape programs were based on savings achieved by Tampa Bay Water in which a 25% reduction in outdoor water use was achieved.[85] To estimate savings for this program a 25% reduction was applied to 30% of single-family water use (the average percentage of residential outdoor water use). The low estimate assumes a 40% saturation rate and the high estimate assumes a 60% saturation rate.

- Low estimate based on 25% reduction applied to 30% of single-family water use for 40% of single-family consumption
- High estimate based on 25% reduction applied to 30% of single-family water use for 60% of single-family consumption

Appendix II | Water Savings Estimates

Metropolitan Atlanta, Georgia

Water consumption data for Metro Atlanta came from the Metropolitan North Georgia Water Planning District's 2003 Water Supply and Conservation Management Plan.[86] At the time the plan was developed, the Metropolitan North Georgia Water Planning District (District) encompassed a 16-county region and 3,974,662 residents. More recent water consumption data available through the District was not used as it had been adjusted to account for the drought restrictions in place that lowered water consumption. The actual numbers provided in the 2003 report were used to generate the estimated savings numbers.

Metro Atlanta, Georgia

	MGD	Percent of total
Single-Family*	280.36	43%
Multi-Family**	78.24	12%
Commercial	136.92	21%
Industrial	19.56	3%
Public	19.56	3%
Unaccounted for water	117.36	18%
Total	652.00	

* percentage of total Atlanta residential that is single family 0.78
** percentage of total Atlanta residential that is multi family 0.22

Metro Atlanta Estimated Savings Ranges

	Low	High
1 Stop Leaks	29.34	58.68
2 Conservation Pricing	53.79	78.89
3 Meter all Uses	5.87	9.39
4 Retrofit	36.35	54.52
5 Landscape	8.41	12.62
6 Public Awareness		
7 Build it Right		
8 Return Water to Rivers		
9 Involve Water Users		
Total MGD Saved	133.76	214.10
Percent Savings	20.51%	32.84%

Metro Atlanta, Georgia: estimated costs to secure water

	per gallon	low cost (millions)	high cost (millions)
Dams	$4.00*	$535.03	$856.39
Efficiency	$1.00**	$133.76	$214.10

*Georgia Department of Natural Resources Environmental Protection Division and CH2MHill. Georgia Water Use and Conservation Profiles, March 2008.
**Based on DeKalb County, Georgia Retrofit on Reconnect program.

Cost savings: securing supply through water efficiency compared with dams

Low cost savings (millions)*	High cost savings (millions)**
$320.93	$722.64

*Low cost of dams minus high cost of water efficiency
**High cost of dams minus the low cost of water efficiency

Charlotte, North Carolina

Water consumption data for Charlotte, North Carolina was provided by the North Carolina Department of Environment and Natural Resources.[87] For 2008, peak water use was 145MGD and winter (low) water use was 88MGD. We chose to compute the savings based off of the peak usage as it is peak use that drives the need for developing new capacity. The breakdown of water use by sector was derived from Charlotte-Mecklenburg Utilities FY08 Year End Report.[88]

Charlotte, North Carolina

	MGD	Percent of total
Single-Family	66.70	46%
Multi-Family	27.55	19%
Commercial	26.10	18%
Industrial	5.80	4%
Irrigation	7.25	5%
Other*	11.60	8%
Total**	145.00	

*Other water is assumed ot be unaccounted for water.
**Total consumption is based on peak consumption values

Charlotte Estimated Water Savings Ranges

	Low	High
1 Stop Leaks	2.90	5.80
2 Conservation Pricing	14.14	20.74
3 Meter all Uses	2.07	3.31
4 Retrofit	9.66	14.49
5 Landscape	2.00	3.00
6 Public Awareness		
7 Build it Right		
8 Return Water to Rivers		
9 Involve Water Users		
Total MGD Saved	30.77	47.33
Percent Savings	21.22%	32.64%

Charlotte, North Carolina: estimated costs to secure water

	per gallon	low cost (millions)	high cost (millions)
Dams	$4.00*	$123.06	$189.33
Efficiency	$1.00**	$30.77	$47.33

*Georgia Department of Natural Resources Environmental Protection Division and CH2MHill. Georgia Water Use and Conservation Profiles, March 2008.
**Based on DeKalb County, Georgia Retrofit on Reconnect program.

Cost savings: securing supply through water efficiency compared with dams

Low cost savings (millions)*	High cost savings (millions)**
$75.73	$158.57

*Low cost of dams minus high cost of water efficiencyv
**High cost of dams minus the low cost of water efficiency

Raleigh, North Carolina

Water consumption data for Raleigh, North Carolina was provided by the North Carolina Department of Environment and Natural Resources.[89] For 2008, peak water use was 66 MGD and winter (low) water use was 38MGD. We chose to compute the savings based off of the peak usage as it is peak use that drives the need for developing new capacity. The breakdown of water use by sector was provided by the City of Raleigh-Public Utilities Department.[90] The report does not breakdown residential use into single-family and multi-family. In order to generate comparable potential savings, Raleigh's residential consumption was divided proportionally to mirror Atlanta's based on the fact that the cities have a similar percentage of renter occupied housing units.

Raleigh, North Carolina

	MGD	Percent of total
Total Residential	36.96	56%
Single-Family*	29.00	44%
Multi-Family*	7.90	12%
Commercial	14.52	22%
Industrial	1.98	3%
Institutional	6.6	10%
Unaccounted for water	5.94	9%
Total	66.00	

*Raleigh and Atlanta have a similar percentage of renter occupied housing units, so the residential water use from Raleigh was divided the same way proportional to Atlanta.

Raleigh Estimated Water Savings Ranges

	Low	High
1 Stop Leaks	1.49	2.97
2 Conservation Pricing	5.54	8.13
3 Meter all Uses	0.59	0.95
4 Retrofit	3.74	5.62
5 Landscape	0.87	1.31
6 Public Awareness		
7 Build it Right		
8 Return Water to Rivers		
9 Involve Water Users		
Total MGD Saved	12.24	18.97
Percent Savings	24.98%	38.72%

Raleigh, North Carolina: estimated costs to secure water

	per gallon	low cost (millions)	high cost (millions)
Dams	$4.00*	$48.95	$75.90
Efficiency	$1.00**	$12.24	$18.97

*Georgia Department of Natural Resources Environmental Protection Division and CH2MHill. Georgia Water Use and Conservation Profiles, March 2008.
**Based on DeKalb County, Georgia Retrofit on Reconnect program.

Cost savings: securing supply through water efficiency compared with dams

Low cost savings (millions)*	High cost savings (millions)**
$29.98	$63.66

*Low cost of dams minus high cost of water efficiencyv
**High cost of dams minus the low cost of water efficiency

Columbia, South Carolina

Water consumption data was derived from the 2000 South Carolina Statistical Abstract.[91] Maximum daily water consumption in 2000 was 98.5MGD. In 2008, Columbia, South Carolina is planning to increase their drinking water treatment capacity to 125MGD. The breakdown of water use by sector was provided by the City of Columbia Utilities and Engineering Department.[92]

Columbia, North Carolina

	MGD	Percent of total
Single-Family	47.28	48%
Multi-Family	5.91	6%
Commercial	18.72	19%
Heavy Commercial	3.94	4%
Public/Gov	7.88	8%
Unaccounted for water	14.78	15%
Total	98.50	

Columbia Estimated Water Savings Ranges

	Low	High
1 Stop Leaks	3.69	7.39
2 Conservation Pricing	7.98	11.70
3 Meter all Uses	0.44	0.71
4 Retrofit	5.30	7.96
5 Landscape	1.42	2.13
6 Public Awareness		
7 Build it Right		
8 Return Water to Rivers		
9 Involve Water Users		
Total MGD Saved	18.84	29.88
Percent Savings	19.12%	30.34%

Columbia, North Carolina: estimated costs to secure water

	per gallon	low cost (millions)	high cost (millions)
Dams	$4.00*	$75.35	$119.53
Efficiency	$1.00**	$18.84	$29.88

*Georgia Department of Natural Resources Environmental Protection Division and CH2MHill. Georgia Water Use and Conservation Profiles, March 2008.
**Based on DeKalb County, Georgia Retrofit on Reconnect program.

Cost savings: securing supply through water efficiency compared with dams

Low cost savings (millions)*	High cost savings (millions)**
$45.47	$100.69

*Low cost of dams minus high cost of water efficiencyv
**High cost of dams minus the low cost of water efficiency

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