

**Report on Water Conservation and Water Use Efficiency
As Required by
House Bill 1215 (Session Law 2002-167), Section 5**



**NORTH CAROLINA
DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES**

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TABLE OF CONTENTS

INTRODUCTION	1
RESIDENTIAL WATER USE	3
CURRENT RESIDENTIAL CONSERVATION MEASURES	4
<i>Home Water Audits</i>	4
<i>Retrofitting and Replacing Inefficient Fixtures</i>	4
<i>Irrigation Efficiency</i>	4
<i>Xeriscaping</i>	4
<i>Results of Residential Programs</i>	5
WATER SUPPLY SYSTEMS	5
CURRENT WATER SUPPLY SYSTEM CONSERVATION MEASURES	5
<i>Water System Audits and Universal Metering</i>	5
<i>Leak Detection and Repair</i>	6
<i>Water Pressure Reduction</i>	6
<i>Water Reuse</i>	6
<i>Public Education</i>	7
WATER SYSTEM EFFICIENCY INCENTIVES	7
<i>Retrofitting and Replacement Incentives</i>	7
<i>Rate structures</i>	7
BUSINESS AND INDUSTRIAL WATER USE	8
CURRENT BUSINESS AND INDUSTRIAL CONSERVATION MEASURES	8
<i>Technical Assistance</i>	8
<i>Cooling Water</i>	9
<i>Fixture Replacement</i>	9
<i>Water Use Procedures</i>	9
<i>Process Water</i>	9
BUSINESS AND INDUSTRIAL EFFICIENCY INCENTIVES	10
<i>Water Conservation Certification Programs</i>	10
STATE GOVERNMENT	10
CURRENT STATE CONSERVATION MEASURES	10
<i>Policies</i>	10
<i>Technical Assistance</i>	10
<i>Facility Water Use Efficiency</i>	11

STATE EFFICIENCY INCENTIVES	11
<i>Loan and Grant Funding</i>	11
<i>Water Use Permit Requirements</i>	11
<i>Environmental Stewardship Initiative</i>	12
<i>NPDES Permit Application Review</i>	12
<i>Metering in Multifamily Residences</i>	12
AGRICULTURAL WATER USE	13
CURRENT AGRICULTURAL CONSERVATION MEASURES	13
<i>Agricultural and Horticultural Water Audits</i>	13
<i>Technical Assistance</i>	13
<i>Livestock Watering Efficiency</i>	13
<i>Irrigation Efficiency</i>	14
AGRICULTURAL EFFICIENCY INCENTIVES	14
<i>Agriculture Cost Share Program</i>	14
<i>Technical Assistance</i>	14
<i>Reclaimed Water</i>	14
CONCLUSION	15
RECOMMENDATIONS	16
REFERENCES	18
Internet Resources	19

INTRODUCTION

House Bill 1215 was ratified by the North Carolina General Assembly on October 3, 2002. House Bill 1215, now Session Law 2002-167, contains a number of provisions related to water conservation and water supply planning, motivated by North Carolina's experience with the extreme drought of 2002 and a heightened awareness of the need to focus more attention on assuring that North Carolina has an adequate water supply for future needs.

After experiencing dryer than normal weather for four years, the drought reached a critical point in 2002. During that year, North Carolina experienced many record lows for stream flows and ground water levels. In some cases these new drought records go back 50 to 75 years. In some of North Carolina's river basins, the State faced a danger that storage capacity in major reservoirs would be exhausted, leading to a disastrous drop in water availability for critical water supply needs. Agriculture experienced such severe drought-related impacts that the U.S. Department of Agriculture issued a disaster declaration for many North Carolina counties at Governor Easley's request.

During the 2002 drought, the Department of Environment and Natural Resources and the Drought Monitoring Council developed a 3-tier classification of communities according to their drought vulnerability. Thirty communities were included in Tier 1, which included those most vulnerable to running out of water. Tier 2 contained 88 communities with a serious but somewhat lesser degree of vulnerability. Tier 3 included 152 other communities of concern. Local governments, other water users, and state agencies responded to the drought challenge by increasing their monitoring of drought conditions, intensifying communication about drought dangers, and coordinating drought response measures. Many communities took vigorous steps to assure water supply availability for essential needs during the drought and to reduce their vulnerability to future droughts.

Against this background of concern regarding drought and the adequacy of future water supplies, House Bill 1215 dealt with two types of "water conservation" that are sometimes lumped together, but are in fact quite different.

The first type of water conservation is addressed by Section 3 of House Bill 1215, which deals with water conservation efforts necessary on a short-term basis during droughts or other emergency situations when water supply suddenly becomes reduced. Section 3 calls for the Environmental Management Commission to develop an administrative rule establishing minimum standards and practices for water conservation and water reuse for the following classes of water users: publicly and privately owned water supply systems, state agencies, local governments, business and industrial users, and agricultural and horticultural users.

During the 2002 drought, there were concerns that neighboring communities adopted very different approaches to emergency water conservation and that various types of water users were treated differently from community to community. There was also a lack of understanding about how water use by one community can affect other communities downstream. The intent of Section 3 of House Bill 1215 is to establish a fair and uniform set of minimum standards for

times when emergency reductions in water use are required to keep water demand in balance with a temporarily limited supply.

Similar to floods, droughts are random and unpredictable natural events. We know that, at some time in the future, droughts of various degrees of severity will occur. It is prudent for all North Carolina water suppliers to have policies and plans in place for emergency conservation when necessary to protect their most critical water needs and to minimize economic damage.

House Bill 1215 also deals with a second type of water conservation, which might be best described as year round water use efficiency. Efficient water use means using better practices or technology to get more economic productivity per unit of water used. Section 5 of House Bill 1215 requires the Department to evaluate water conservation measures being implemented in the state and to identify incentives and voluntary programs that can help foster water conservation and water reuse. The type of water conservation dealt with in Section 5 does not focus on occasional emergencies; instead, it is the kind of water conservation that all water users should work toward on an everyday basis. For every type of water user, including municipal, residential, industrial, agricultural, and others, there are proven practices that can improve the efficiency of water use. To the extent that North Carolina water users can become more efficient, we can stretch our available natural supply of water to support new water users in a growing economy. Improved water use efficiency can also postpone the need for costly capital investments in water supply infrastructure. While the General Assembly directed the Environmental Management Commission to develop an administrative rule for emergency water conservation as included in Section 3 of the Bill, it directed DENR to pursue voluntary measures and incentives that can increase long-range water use efficiency under Section 5.

This report deals only with Section 5 of House Bill 1215, the part directed toward improving long-range water use efficiency by North Carolina water users. This report was developed by the Division of Water Resources (primary responsibility for municipal water use), the Division of Soil and Water Conservation (agricultural water use), and the Division of Pollution Prevention and Environmental Assistance (industrial and commercial facilities and state agencies). The Division of Water Quality and the Division of Environmental Health also participated. To develop this report and recommendations, the Department held a public meeting on March 7, 2003, with participation by a broad range of water users, including municipal water systems, state agencies, businesses and industries, and agricultural water users. We requested the participants at this meeting to send us their recommendations on both techniques and methods to improve water use efficiency and on incentives or other voluntary measures that would motivate water users to become more efficient. The Department also requested and received information and recommendations on water use efficiency from the over 400 local governments that prepared and submitted Local Water Supply Plans (LWSP) to the Department during 2003. We sent out a follow-up email to a very broad list of water users and other interest groups on January 15, 2004 to invite any additional recommendations for the report.

The task of adopting an administrative rule on emergency water conservation during droughts or other temporary water shortages, as required by Section 3 of House Bill 1215, requires a different approach. The Department of Environment and Natural Resources will assemble an informal advisory committee to help us in drafting a rule to set minimum standards

for emergency water conservation for all types of water users. The draft rule will then go through the normal public notice and public hearing process before being considered by the Environmental Management Commission.

Improving water use efficiency in North Carolina, the subject of Section 5 of House Bill 1215, is a long-range effort that will require sustained attention over a period of years. Success will involve public education, improved incentives, and new practices and technology.

Determining the best approach to improve water use efficiency requires participation from all types of water users, who best understand the opportunities for improvement in their own operations. Because of this need for widespread participation and commitment, the Department intends to revise this report toward the end of the year, based on comments from the public and any additional recommendations that we receive during 2004.

Water conservation is an important element in good water resources management, but must be understood in the larger context. Improving the management of North Carolina's water resources and assuring adequate water supplies for our future requires a coordinated effort on three fronts:

- Accurate **monitoring** of the natural availability of water in North Carolina and of the rate of use of our surface and ground water supplies.
- Farsighted **planning** to project future water needs and to determine the most cost effective and environmentally sound water sources to meet these needs.
- Appropriate **incentives** and **regulation** to assure that North Carolina water resources are equitably shared among those who need to use them and that our use of water avoids the depletion or damage of our water resources.

Within this larger context, standards for emergency water conservation during droughts or other occasional water shortages will prepare communities to withstand these emergencies with minimal damage to public health and the economy. Improving our long-range efficiency of water use will improve the cost effectiveness of our water supplies and make water available for future economic development. Both of these aspects of water conservation are an important part of our total strategy for good long-range management of this essential natural resource.

RESIDENTIAL WATER USE

Families use residential water conservation measures to reduce water bills for purchased water or to avoid exceeding the capacity of their private wells. Many individuals are also motivated to conserve water because it contributes to good environmental stewardship. The willingness of individuals to comply with voluntary water conservation measures has a significant effect on total water use. Voluntary water conservation alone can reduce residential water use by an estimated two percent to five percent. Voluntary residential measures include:

shorter showers, turning off faucets while brushing teeth and shaving, washing only full loads of dishes and clothing, using a basin of rinse water when washing dishes by hand, installing automatic shut-off valves on water hoses, and using water efficiently when watering lawns and gardens.

CURRENT RESIDENTIAL CONSERVATION MEASURES

Home Water Audits

Home water audits and retrofit programs offer citizens assistance in quantifying how much water is being used in their home and recommendations to reduce water waste. Utility employees can perform home audits or provide education kits that teach customers to perform self-audits. A home water audit typically entails quantifying the amount of water being used and wasted throughout a household. An audit helps in developing an action plan to reduce wasted water. The plan may require leak detection and repair and retrofitting old faucets, showerheads and toilets with appropriate low flow devices.

Retrofitting and Replacing Inefficient Fixtures

Retrofitting and replacing fixtures and appliances with more efficient models are helping households to significantly reduce water use. Replacing inefficient toilets, showerheads, washing machines, and other water-using appliances can reduce water use by these devices between 18 percent to 44 percent.

Retrofitting involves making an improvement to an existing appliance or fixture rather than replacing it all together. It is generally much less expensive and can frequently be done by the user. A basic retrofitting kit generally includes low-flow faucet aerators, low-flow showerheads, leak detection dye tablets for the toilet, and replacement flapper valves for toilets. Standard retrofit kits are estimated to save 21.1 gallons per person per day (USEPA Water Conservation Plan Guidelines 150 – 151, 163, 166).

Irrigation Efficiency

Landscaping accounts for 31 percent of all residential water use (Vickers 12). Widespread use of xeriscaping and lawn watering guidelines can result in an estimated 22.5 percent to 27.5 percent reduction in outdoor water use (USEPA Water Conservation Plan Guidelines 166). Due to the large potential water savings, many major water systems, including Charlotte, Cary, Asheville, and OWASA, place a strong emphasis on irrigation practices, xeriscaping, and soil and lawn care. Irrigation policies include limitations on time of day, day of week and amount of watering; prohibiting the watering of non-vegetated surfaces such as sidewalks and driveways; eliminating water run-off outside of property lines; and installing moisture or rain sensors on irrigation systems.

Xeriscaping

In addition to modifying traditional irrigation methods, water systems are encouraging customers to reduce the need for irrigation. Educating residents about xeriscaping (landscaping

practices that utilize drought-tolerant native plants and grasses) and aeration of lawns reduces the need for irrigation by an estimated 7.5 percent and helps residents to keep their landscape beautiful (USEPA Water Conservation Plan Guidelines 166).

Charlotte-Mecklenburg has undertaken water efficient landscape education through the Mecklenburg County Solid Waste Division's Piedmont Landscape and Naturescape Training program (PLANT). The program emphasizes planting drought-resistant native plants, mulching to retain moisture, using compost to amend and aerate soil, and efficient watering methods. PLANT reached many Mecklenburg County residents in 2003 through school and community college programs and general public education workshops (Gill).

Results of Residential Programs

Where communities have coupled public education and indoor and outdoor water conservation policies, great water savings have occurred. For example, faced with a more than doubling population over the last 10 years and high water demands during summers, Cary's water resources were seriously strained. Through public education, landscape and irrigation ordinances, toilet flapper rebates, residential audits, a conservation rate structure, a new home water efficiency rating program, landscape water budgets and a water reclamation facility, Cary has drastically cut water demands on its system. These measures are expected to reduce water supply plant production by an estimated 4.6 million gallons per day by the end of 2028. This 16 percent savings will reduce operating costs and allowed Cary to delay two water plant expansions (USEPA Cases in Water Conservation 3).

WATER SUPPLY SYSTEMS

CURRENT WATER SYSTEM CONSERVATION MEASURES

Water System Audits and Universal Metering

In order for water systems to conserve water effectively, an accurate accounting of water entering and leaving the water system is necessary. A water system audit quantifies how much water a system produces and purchases and where that water is going. The first step should include universal metering, or the metering of all water-service connections. Water supply intakes and connections with other systems should also be metered. All the water entering the system should then be tracked through monitored service-connection meters (water that is billed for) and public-use meters (water provided free of charge). An annual average of 16 percent of water systems submitting a 2002 Local Water Supply Plan (LWSP) performed a water audit within the past five years, with 95 audits in 2002. To assure accurate metering, meters must be regularly tested and replaced when necessary. Sixty-seven percent of the water systems submitting a 2002 LWSP currently have a meter replacement program (2002 LWSP data).

If the water audit shows a difference of more than 15 percent between the water withdrawn and the water that can be accounted for, a thorough inspection of the water system is needed to determine the causes for water loss. Water meters should be checked for accuracy and leak detection and repair programs should be implemented (USEPA Water Conservation Plan Guidelines 144-146).

Leak Detection and Repair

Leak detection is a process to identify and repair water system leaks that are causing water loss. Leak detection methods range from visual inspection to using specialized leak detection equipment to find hidden leaks. The use of leak detection equipment is a more accurate and thorough method for locating leaks. Leaks can be detected by listening with a special microphone on contact points such as fire hydrants, meters, and valves and by listening on the ground over water lines with a special ground microphone. While 31 percent of the water systems in the state have an established leak detection program, 26 percent of the systems are seeking help to implement one (2002 LWSP data). A water loss reduction program that includes leak detection and repair enables water systems to reduce water waste and recover more of their operational costs by being able to bill for all the water they produce.

Water Pressure Reduction

Reducing excessive pressure within a water distribution system can save between three percent and six percent of a system's total production by limiting leakage. An auxiliary benefit of reducing pressure is a reduction in stress to the water distribution infrastructure. Decreased stress on the system can increase the life of pipes and valves and reduce maintenance costs. A system-wide decrease in pressure also reduces flow through open faucets and lessens wear on fixtures and appliances.

If the pressure in residential areas is greater than 80 pounds per square inch, water systems should determine if changing the system pressure is feasible. If decreasing the pressure of the entire system is not feasible, other water pressure reductions, such as pressure-reducing valves leading into buildings and flow restrictors on service meters can be put into place for water use efficiency. Water customer savings from pressure reduction range from five percent to 30 percent (USEPA Water Conservation Plan Guidelines 151, 166).

Water Reuse

Not all water uses require top quality potable water. Highly treated wastewater can be used for many purposes, such as irrigation, dust control, and some industrial processes. Reusing treated wastewater for suitable purposes increases efficiency by using the same water twice, allowing a water system to meet potable water demand with a smaller withdrawal from its water supply source.

Over eight percent of the water systems in North Carolina utilize reclaimed water (2002 LWSP data). The Town of Cary implemented a reclaimed water project in June 2001. The project provides reclaimed, non-potable water for 400 residential and commercial users through a parallel distribution system to reduce demand on the potable water supply. As an incentive for reuse, Cary's year-round outdoor watering restrictions do not apply to reclaimed water use. Bulk reclaimed water (up to 200,000 gallons per day) is made available free to be hauled in tanker trucks to work sites for use for dust control, soil compaction, or landscaping. The program is helping Cary to meet its 20 percent water use reduction goal. UNC-Chapel Hill and the Orange Water and Sewer Authority (OWASA) are currently evaluating the feasibility of using highly treated wastewater in the University's cooling and steam cogeneration facilities. The proposed

reuse system would save one million gallons per day of OWASA's potable water production (Davis).

Public Education

Public education is a major factor encouraging year-round residential water conservation. Presently, 34 percent of the water systems submitting a 2002 Local Water Supply Plan (LWSP) have a water conservation public education program. Some water systems are hiring water conservation specialists to increase public awareness of residential water conservation. Other communities are coupling water conservation education responsibilities with other duties. For example, Greensboro's Storm Water Department is also responsible for water conservation education. Education initiatives include media announcements, informative water bills with usage histories, landscaping and irrigation workshops, school programs, and home water audits.

WATER SYSTEM EFFICIENCY INCENTIVES

Retrofitting and Replacement Incentives

The two most commonly practiced replacement and retrofit incentives employed in North Carolina are rebate and give-away programs. Rebate programs require customers to provide proof of purchase and installation of low flow appliances or devices to receive a one-time rebate for each device installed. Some public utilities give away low flow devices (such as low-flow showerheads, toilet bladders, faucet aerators, etc.) free of charge to customers. Currently, 35 percent of the water systems in North Carolina encourage the retrofitting of inefficient water fixtures.

While rebate and incentive programs generate up-front costs for the water system, replacing an old toilet and showerhead will save an estimated 24.1 gallons of water per resident per day (USEPA Water Conservation Plan Guidelines 166). The City of Asheville has an effective retrofit program, which has distributed more than 34,000 kits and produced a 7 percent water savings. The Asheville Housing Authority has upgraded sinks, showers and toilets with low-flow devices for a savings of more than 20 million gallons annually.

Retrofit and replacement programs targeted to older residential areas maximize water conservation efforts. New construction codes usually incorporate the installation of water efficient fixtures, making older homes a priority. Replacing a showerhead installed before 1980 can save over 14 gallons per person per day, with a yearly savings of over 5,000 gallons for the average household (Vickers 88).

Rate Structures

The traditional decreasing-block rate structure does not encourage water conservation (McNeill and Tate). In a decreasing-block rate structure, the price per unit volume of water decreases as the total volume consumed increases. Currently, 24 percent of the water systems in North Carolina submitting a 2002 LWSP use a decreasing-block rate structure. A flat rate (also known as uniform rate) is a constant price per unit of water consumed. Almost a third (31 percent) of the water systems submitting a 2002 LWSP use a flat rate structure.

Rate structures that encourage the efficient use of water include increasing-block rates, seasonal rates, and emergency water conservation rates. The increasing-block rate is a rate structure in which the cost per unit volume increases with the amount used. The more water consumers use above a specified threshold, the greater the cost of each unit. Approximately 22 percent of the water systems submitting local plans are currently using an increasing-block rate structure. The increasing-block rate establishes a clear economic incentive for customers to reduce water use. Customers are more inclined to perform water audits, repair leaks, and make use of conservation measures to avoid paying the higher rates. Simply by applying an increasing block rate to water utility bills, the Town of Cary projects a water savings of 140,000 gallons per day by 2009 (Platt, J. and Delforge M. 78).

Water systems have to be sized to treat and distribute enough water to meet peak demands. It is the growth in peak demands that frequently drives the need to expand treatment plants and the development of additional water sources. Seasonal conservation rates are designed to promote water conservation during the season when water demands are at their peak or available supplies are low. Two different rate structures, typically one for winter and a higher one for summer, are established. By charging more for water during peak use periods, seasonal rates can help control the growth in peak demands and extend the life of existing facilities and supplies. According to the submitted 2002 LWSPs, less than two percent of the systems reporting use a seasonal water rate structure.

BUSINESS AND INDUSTRIAL WATER USE

CURRENT BUSINESS AND INDUSTRIAL CONSERVATION MEASURES

Technical Assistance

Businesses and industries are motivated to use less water to reduce operating costs by lowering water bills. Cost savings can come from reduced water purchases, pumping expenses, and wastewater treatment costs. While many conservation measures used by this group of water users are the same as residential and municipal practices, many others have to be tailored to the specific processes at each plant or facility. DENR's Division of Pollution Prevention and Environmental Assistance and the Waste Reduction Partners (WRP) program provide technical assistance to business and industry to identify potential water, solid waste, and energy efficiency options. WRP is a group of retired engineers who volunteer their services in western North Carolina. As with other water users, the first step is a water audit to measure and evaluate water needs for specific processes within a facility. Common targets for water use reductions in businesses and industries include cooling water, process water, sanitation, exterior maintenance, and domestic water uses. In fiscal year 2003, WRP conducted 17 commercial and industrial water efficiency assessments for the Regional Water Authority of Asheville, Buncombe and Henderson. WRP assessors recommended measures to reduce water consumption by 15.2 million gallons per year. These strategies represent a potential cost saving of \$209,200 per year for clients.

Cooling Water

Cooling towers can consume 20 percent to 30 percent of the water used by commercial and industrial facilities, making them prime targets for water conservation efforts. Depending on the nature of the facility, various measures can be implemented to make the use of cooling water more efficient. Facilities throughout North Carolina are investigating the use of reclaimed water for cooling purposes. For instance, WRP performed a water efficiency audit for a small medical equipment manufacturer in Arden, NC. An inefficient water-cooling system was identified. WRP engineers recommended that a closed loop chiller be installed to reduce costs and save water. The company acted upon the recommendations and is now saving 6.6 million gallons of water per year with an annual cost savings of \$30,500.

Fixture Replacement

Business and industrial operations include domestic water use, such as washrooms and food preparation facilities. Replacing faucets, toilets, showerheads, hose nozzles, and other water delivery devices with more efficient models is a common, low-cost method of reducing water use.

Water Use Procedures

Water is used in many ways within a production facility. Careful investigation typically reveals many possible adjustments that can be made to operations to reduce water use. Switching to dry sweeping of floors instead of hosing them down has reduced water use in many facilities. Not washing waste down floor drains has the added benefit of reducing wastewater discharges. Installing automatic shutoff nozzles on hoses reduces water waste. Restaurant and food service operations have reduced water use by modifying dishwashing procedures and automatic dishwasher operations. For example, the Statesville K&W Cafeteria's water consumption was reduced by 9,000 gallons per day, a 75 percent reduction, by modifying water use practices and equipment.

Process Water

Many production facilities in a variety of industries have been able to reduce water use by making adjustments to their production processes. A common adjustment is to recycle water based on the quality of water needed by various steps in an operation. The car wash industry has made good use of water recycling to reduce the amount of water needed for their operations. The North Carolina Chapter of the Southeastern Carwash Association provided information for this report, including a proposal for an incentive program discussed in the next section.

Sara Lee Knit Products in Winston-Salem requested an audit to help improve water efficiency and reduce production costs. The high cost of production, chemicals, and wastewater treatment was reducing profits. A water use study provided the basis for installing a 240,000-gallon per day filtration system that produces reusable brine and a treatable concentrated color solution. The new system significantly reduces water use, with savings estimated at \$795,000 per year.

BUSINESS AND INDUSTRIAL EFFICIENCY INCENTIVES

Water Conservation Certification Programs

The North Carolina Chapter of the Southeastern Carwash Association suggested a Car Wash Water Conservation Certification Program. This voluntary program would certify that a particular facility is in compliance with a set of best management standards for water conservation. This program could be expanded to encompass other business sectors. The proposal calls for this program to be implemented at the local level with inspection and certification handled by the local water purveyor or local government inspection officials. Improved efficiency will reduce demand for water from the local water system. As an incentive, certified facilities would be recognized as efficient water users and be given consideration in the procedures established to reduce water use in response to drought and other water shortages.

The Regional Water Authority (RWA) of Asheville, Buncombe and Henderson worked with the WRP to assist businesses with a water efficiency certification for facilities that were already practicing state-of-the-art water efficiency measures. The certifications exempted businesses from water use surcharges when water use restrictions were imposed during the 2002 drought. The certification was an excellent incentive for businesses to quickly implement water use efficiency recommendations. The WRP program estimated a water savings of more than 90 million gallons per year from certified facilities.

STATE GOVERNMENT

CURRENT STATE CONSERVATION MEASURES

Policies

In August 2002, Gov. Mike Easley issued Executive Order #26, which banned non-essential water use by state agencies. House Bill 1215 mandates that state agencies reduce water consumption by 10 percent. The Utility Saving Initiative, led by the State Energy Office, is assisting state agencies and universities to reduce all types of utility costs, including reducing water use and water bills.

Technical Assistance

N.C. Project Green began in 1998 when the governor challenged state government to set an example of environmental stewardship in the way agencies operate and conduct business. To help state agencies and universities meet the challenge, the Division of Pollution Prevention and Environmental Assistance developed a number of tools and resources that are available on the N.C. Project Green website (www.sustainablenc.org). The long-term Water Efficiency Plan Guidance provides a step-by-step process, including a template and sample plan, to assist agencies with water use efficiency. The Division of Pollution Prevention and Environmental Assistance is also part of *The Way To Go* design committee. This group of state government divisions has pledged to adopt sustainable building practices in state government capital

remodeling and new construction projects, to use energy and water efficient design in all projects, and to manage natural resources in a sustainable manner.

Facility Water Use Efficiency

Water use by governmental agencies varies from facility to facility and includes indoor and outdoor water uses similar to other residential, institutional and commercial water users. Therefore, agency water efficiency plans include some of the same measures, such as auditing water use, preventing and repairing leaks, establishing water use policies to reduce waste, improving fixture and appliance efficiency, etc. To date, agencies have adopted the following measures to use water more efficiently: better accounting for water used, repair of leaks, reducing vehicle washing, reducing irrigation, converting cooling systems to reuse water, storing rainwater to irrigate athletic fields, consolidating ice making operations, installing water-free urinals, and educating water users. DENR's Washington Regional Office has completed a Water Efficiency Plan that can serve as an example for other agencies.

STATE EFFICIENCY INCENTIVES

Loan and Grant Funding

The Clean Water and Drinking Water State Revolving Fund Programs (CWSRF and DWSRF, respectively) were established by the federal Clean Water Act (CWA) and the North Carolina Clean Water Revolving Loan and Grant Program (NCCWRL&GP) to provide low interest loans and high unit-cost grants to wastewater and water systems. Under these programs, eligible projects receive funding priority points for different rating variables. Incentives for water conservation are created by assigning additional points for demonstrating efficient water use measures such as water loss reduction programs that include water audits, universal metering, and leak detection, water conservation education, incentive rates, retrofit and replacement programs, and a water reclamation or reuse system (15A NCAC 01J, 01L, and 01N).

Water Use Permit Requirements

In an effort to preserve future ground water supplies in the Central Coastal Plain Capacity Use Area (CCPCUA), all ground water users withdrawing more than 100,000 gallons per day are required to obtain a water use withdrawal permit. One condition of the permit requires well operators to "develop and implement a feasible water conservation plan" that must include, at a minimum, a water conservation rate structure, a water loss reduction program for systems exhibiting more than 15 percent unaccounted-for-water, an irrigation ordinance, retrofit and public education programs, and a water reuse feasibility study (15A NCAC 2E .0502(d)(5)).

Interbasin Transfer Certification also includes a water conservation requirement. An applicant must demonstrate that water conservation measures will be used to assure efficient use of the water and avoidance of waste (G.S. 143-215.22I(c)(3)). Communities requesting a water supply allocation from Jordan Lake also must include in their application details on their conservation and demand-management practices (15A NCAC 02G.0503(a)(4)).

Environmental Stewardship Initiative

DENR's Environmental Stewardship Initiative is designed to promote and encourage superior environmental performance by North Carolina's regulated facilities. This voluntary program gives recognition to companies that use innovative pollution prevention methods (including water conservation) to meet and exceed regulatory requirements. The program seeks to improve environmental quality beyond what is required by current laws and permits.

The program has two levels of participation. The "Environmental Partner" level is designed for adoption by a broad range of corporations or other institutions that want to develop a systematic approach to improving their environmental performance. Partners must set environmental performance goals that include pollution prevention and that are appropriate to the nature, scale and environmental impact of the organization. The "Environmental Steward" level is for those organizations that already display a commitment to exemplary environmental performance beyond what is required by law. Stewards are required to set aggressive environmental performance goals that include pollution prevention, a commitment to exceed compliance, and annual improvements to performance.

NPDES Permit Application Review

Applicants for new NPDES permits are encouraged to investigate how implementing water conservation measures could reduce the volume of wastewater discharges. The analysis should include realistic evaluations of how discharges could be reduced or avoided by improving the efficiency with which water is used in the system or facility applying for the permit.

Metering in Multifamily Residences

EPA recently revised a policy regarding the application of the Safe Drinking Water Act (SDWA) requirements to submetered properties in an effort to avoid discouraging this water efficient measure. Under the old policy, multifamily property owners who installed submeters to track and bill water use by individual tenants were subject to SDWA's national primary drinking water regulations. The new policy revision enables multifamily property owners to install submeters without facing any additional regulatory burden (USEPA Office of Water Memorandum, Dec. 16, 3003).

Submetering fosters water efficiency by making tenants and co-op property owners responsible for paying for their water use. The new policy change is a positive step towards water use efficiency and provides an incentive for property owners to implement submetering.

AGRICULTURAL WATER USE

CURRENT AGRICULTURAL CONSERVATION MEASURES

Agricultural and Horticultural Water Audits

As with all types of water use, the first step in improving efficiency is to do a water audit and characterize current conditions. A water audit helps identify components of an operation that are using more water than needed to accomplish the desired task. A major North Carolina livestock operation has reduced water use by 38 percent by tracking water use and making adjustments to reduce wasted water.

Technical Assistance

Technical assistance provided to agriculture for improved water management has a long history in North Carolina. Many agricultural best management practices were designed to improve water quality, but also conserve water resources. The Natural Resource Conservation Service publishes a series of Conservation Practice Standards that address many components of water management and water conservation for agricultural operations. The Soil and Water Conservation Districts and the Agricultural Extension Service provide technical assistance for implementing these practices in each county. Some producers have responded to the 2002 drought by becoming more efficient in water management through the improved use of storage ponds or water control structures. These improvements to water management also result in benefits to water quality by combining improved water storage and retention with the capture and attenuation of potential pollutants.

As improved water management systems are tested and proven effective, state and federal agencies provide technical assistance and incentives to assist farmers in putting them into operation. The North Carolina Soil and Water Conservation Commission is working through its technical advisory committee to consider how these water-saving technologies can be made available to producers through the NC Agriculture Cost Share Program. The program already offers assistance with conservation practices for watering cattle that reduce the wastage associated with earlier systems.

Livestock Watering Efficiency

North Carolina State University has on-going research and outreach programs to improve water management and reduce water waste across the spectrum of agricultural water applications. NCSU research continues to improve the efficiency of watering devices for livestock, especially in the swine industry. Producers and companies have tested various watering devices for the delivery of drinking water to animals in swine houses. Several of these technologies significantly reduce water use and wastewater generation. Similar research is underway for reducing water needs in the poultry industry. Potential water efficiency practices for swine houses can achieve an estimated 10 percent to 65 percent water savings.

Irrigation Efficiency

The simplest measures for water conservation in irrigated agriculture are fine-tuning equipment to avoid leaks and waste and monitoring the amount and timing of irrigation to meet crop requirements without excess. A more costly alternative involves retrofitting irrigation systems with more efficient component parts. For example, switching to low pressure nozzles or drop nozzles will reduce water loss from evaporation and wind drift and result in more effective water placement. Soil and Water Conservation Districts and the Cooperative Extension Service provide demonstrations and information in efficient irrigation practices to help promote water conservation.

AGRICULTURAL EFFICIENCY INCENTIVES

Agriculture Cost Share Program

The NC Agriculture Cost Share Program and the federal USDA Environmental Quality Incentives Program (EQIP) offer financial assistance for water conservation and for water saving technology. These programs offer over forty approved best management practices for producers that contribute to water use reduction and efficiency. Improved water management often results in improved water quality as well as water savings. State and federal agricultural cost share and technical assistance programs recognize this connection and are giving more attention to water use efficiency and conservation.

Technical Assistance

Current agricultural cost-share and technical assistance programs can be augmented by new and innovative approaches to promote efficiency. An example of such a tool is the Agricultural Mobile Irrigation Lab (MIL). This tool was developed by the USDA Natural Resources Conservation Service to help Florida agricultural operators conserve water by learning how to improve their water management and irrigation systems. MIL technicians work with producers to improve system performance through on-site evaluations. By developing proper irrigation schedules and avoiding over-watering, producers can save both water and energy while improving the utilization of nutrients and crop yields. MILs could assist golf courses, nurseries, local governments, homeowner associations, and commercial gardens as well as farmers.

The Division of Pollution Prevention and Environmental Assistance assists pork producers to implement environmental management systems (EMS). EMSs help pork producers to assess their operation's environmental impacts (including water use efficiency) and to develop a plan to reduce these impacts. Some limited funding provides an incentive for producers to participate in the program.

Reclaimed Water

Agriculture has very good potential for the application of reclaimed water. While reclaimed water is not appropriate for direct food chain crops, it does meet water quality standards for application on foraging crops. Agriculture can be a convenient and cost-effective partner for wastewater systems when developing and implementing water reuse projects. In

Florida, agricultural water users (and other users such as golf courses) perform feasibility assessments on the use of reclaimed water for irrigation needs. Farmers enter into agreements with wastewater treatment plants to meet their irrigation needs and provide a use for reclaimed wastewater. The application of reclaimed water to agriculture provides greater assurances of water availability for producers, cost effective treatment and disposal of wastewater, and conservation of water.

CONCLUSION

Improving water use efficiency means getting more benefit from each unit of water. In other words, using water efficiently gives us all the benefits that we are seeking from using water, but without wasting this resource.

Public water supply systems can benefit from improved water use efficiency by being able to postpone costly investments in new water supply capacity and by reducing operating costs for water treatment and wastewater treatment. Improved water use efficiency by existing water system customers can extend water supply availability for new businesses and industries.

Commercial and industrial facilities can benefit from water use efficiency by reducing their water purchase or production costs. Because industrial and business facilities are so diverse in the ways they use water, the opportunities available for improved efficiency are equally diverse. Experience has shown that many businesses and industries have great opportunities to reduce their costs and become more competitive by making careful audits of their water use and developing improved procedures or technology to use water more efficiently.

Agricultural and horticultural water users can benefit from improved efficiency by reducing their costs of pumping and applying water and in some cases by reducing the need to treat wastewater. Improved efficiency can allow a farmer to use his available water supply to support expanded production.

Using water efficiently also benefits North Carolina's environment. By reducing water withdrawals, the stress on rivers, streams, and aquifers is reduced and the amount of wastewater that must be assimilated by our streams also may be reduced. Consequently, water quality and aquatic habitat are improved. In some cases, the environmental benefits of improved water use efficiency are very significant, particularly in cases where reduced withdrawals would reduce overdraft of aquifers or the undesirable dewatering of streams and rivers.

It is important to recognize that the urgency of improving water use efficiency is not the same in all parts of the state or for all water users. Some water users have a more urgent need to make their limited available water supplies go further to serve new users or to postpone having to make investments to expand their water capacity. However, some communities may face difficult financial problems if improved water use efficiency causes their water revenues to drop too sharply. Many North Carolina communities have lost industrial water customers, which have resulted in fewer water users to pay the cost of operating their water systems and paying off

loans that were used to build them. Public water systems must carefully evaluate their revenues and costs and schedule water use efficiency improvements in a way that will not damage their financial security.

RECOMMENDATIONS

House Bill 1215 is directed toward voluntary programs and incentives that will improve water use efficiency. A voluntary or incentive-based approach requires reaching a consensus on water conservation measures that will be supported and implemented by water users. Although the Department of Environment and Natural Resources has met with a broad range of water users and invited their comments and suggestions, the North Carolina community of water users has not yet fully engaged with the water use efficiency issue. Further involvement of water users is needed to work out the best program for North Carolina.

- DENR should circulate this report and recommendations widely to water users in North Carolina and invite further comments and suggestions. DENR should review and revise the report in the fall of 2004 to incorporate the comments that have been received and to make more specific recommendations.

Public water supply systems have many effective tools available to them to improve water use efficiency. Many of these approaches have been successfully pioneered by communities in North Carolina who are willing to share their knowledge and experience.

- Reducing water loss within a water system will reduce water waste without affecting water revenues. Water audits, leak detection and repair programs, and water pressure adjustments should be pursued by all local governments for both environmental and financial stewardship reasons.
- Creating incentives for residential water users to replace or retrofit inefficient water-using appliances and fixtures can save a significant amount of water. Local governments should adopt these programs to improve water use efficiency.
- The use of water for landscape beautification is increasing in North Carolina and appears to be causing an increase in per capita water use in some areas. Local governments should have reasonable policies in place to assure that water for landscaping is efficiently used and to manage the demand from landscape uses, particularly to control the increases in high peak demands that require expensive capital investments.
- Public water supply systems should investigate opportunities for reuse of treated wastewater, which uses the same water supply twice and increases efficiency. Irrigation, construction site water uses, and some cooling and industrial uses are good possibilities. Water reuse projects must be planned with careful attention to all economic and environmental costs and impacts.

- Water use rates are the most powerful incentive available to local governments to motivate efficient water use. Rate changes should be evaluated with careful attention both to potential efficiency improvements and to assure fairness to all types of water users, including low-income users.

Businesses and industry in North Carolina have many opportunities available to improve water use efficiency. In the current economic climate, reducing water costs can help companies stay more competitive in the world economy.

- Because business and industrial water use is so diverse, water audits are a necessary starting point to determine what kinds of efficiency improvements are most cost effective. All businesses that use significant amounts of water should take advantage of efficiency opportunities to improve their balance sheets.
- Water efficiency certification programs, which identify those businesses within a particular category that have met high standards of water use efficiency, encourage efficiency improvements and create more fairness when water use reductions are required by droughts. Efficient water users should be given some degree of priority when water use reductions during droughts are necessary.

North Carolina's large agricultural economy is vitally dependent on water. Efficiency improvements in water use can reduce costs of production by reducing pumping and application costs and can also stretch a farm's water sources to serve expanded production.

- The key to improving agricultural water use efficiency is stronger technical assistance from federal and state agencies, including North Carolina State University, the NC Division of Soil and Water Conservation, the NC Department of Agriculture, and the Soil and Water Conservation Districts. The strong tradition of technical assistance for agriculture is the most effective means of bringing about water use improvements. Making mobile irrigation laboratories available to farmers, nurseries, and golf courses could help these water users improve efficiency and lower their costs.

State government is a large water using institution and has many opportunities to improve water use efficiency. State government is proceeding with the Utility Savings Plan, which will reduce water use as well as other utility costs, and is also working toward a directive from House Bill 1215 to reduce water use by ten percent.

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Internet Resources:

City of Asheville Water Resources Department
<http://www.ci.asheville.nc.us/water/efficiency>

Town of Cary
<http://www.townofcary.org/depts/pwdept/water/waterconservation/overview.htm>

Charlotte-Mecklenburg Utilities
<http://www.charmeck.org/Departments/Utilities/WaterSmart/home>

City of Greensboro Water Resources Department
<http://www.ci.greensboro.nc.us/water/Education/conservation.htm>

NC Division of Pollution Prevention and Environmental Assistance
<http://www.p2pays.org>

NC Division of Soil and Water Conservation
<http://www.enr.state.nc.us/DSWC/>

NC Division of Water Resources
http://www.ncwater.org/Water_Supply_Planning/Water_Conservation/

NC Project Green
<http://www.sustainablenc.org>

OWASA Water Conservation
<http://www.owasa.org/pages/yearroundconserv03>

Raleigh Public Utilities
<http://www.raleigh-nc.org/putilities/h2oconserv>