

Water and Wastewater Rates and Rate Structures in North Carolina

Shadi Eskaf, David Tucker, Dayne Batten and Amy Patel: Environmental Finance Center
Chris Nida: North Carolina League of Municipalities

January 2013

Click on any of the following questions:

Tools for Comparisons

- What is this study?
- How many and which utilities and types of rates are analyzed in this report?
- Where can I find tools and tables I can use to help me evaluate our rates?

Current Rate Structure Designs

- What are the utilities' base charges?
- How much consumption is included in these base charges?
- What are the most common rate structure types in North Carolina?
- How do rate structures differ between commercial and residential customers?
- How do rate structures differ between indoor and irrigation/outdoor rates?
- For block rate structures, how much consumption is included in the first block?
- How much do utilities charge per 1,000 gallons near the average consumption level?
- What does the State recommend for residential rate structures?

Current Rates

- How much is charged for residential consumption?
- How much is charged for commercial consumption?
- How much is charged for residential irrigation water?
- How do rates differ based on utility size, utility type or river basin?
- How do rates differ for customers inside or outside municipal boundaries?

How Rates Changed Last Year

- How often do utilities change their rates?
- How did residential rate structures change in the past year?
- By how much did utilities raise their residential rates last year?
- Did the price for high levels of consumption increase last year?

Affordability

- What does the average North Carolinian pay for water and/or wastewater service?
- How affordable are utility rates in North Carolina?

Promoting Conservation

- What can utilities do with rates to encourage conservation?
Click here to download the [NC State Water Infrastructure Commission Recommended Guidance for North Carolina Utilities Attempting to Support Water Conservation in the Long-Term through Rate Structure Design and Billing Practices](#).

Financial Sustainability

- Do prices reflect the true cost of water services in North Carolina?
- Are high rates always bad?

Water and Wastewater Rates and Rate Structures in North Carolina January 2013

This report details the results of a survey of FY 12-13 water, irrigation and wastewater rates and rate structures conducted by the North Carolina League of Municipalities and the Environmental Finance Center at the UNC School of Government¹. Rates and rate structures are analyzed for 507 local government, not-for-profit and multi-system for-profit utilities throughout the State. For more information, or to download tables of every rate structure and its computed bills, use interactive Rates Dashboards designed to allow you to compare rates using multiple selection criteria, and to view rate sheets of individual utilities, please visit www.nclm.org or www.efc.unc.edu/projects/NCWaterRates.htm.

Any reference to tables, figures or subheadings, whether in the table of contents or within the text, are hyperlinked. Click on them to jump to the corresponding page.

Contents

Introduction.....	1
Overview of Rates and Rate Structures.....	2
Base Charges.....	2
Variable Charges: Uniform, Increasing Block, Decreasing Block, and Other Rate Structures.....	4
Changes in Residential Rate Structures in the Last Year.....	8
What Utilities Charge their Customers.....	9
Residential Water and Wastewater Bills.....	9
Changes in Residential Rates in the Last Year.....	11
Commercial Water and Wastewater Bills.....	12
Irrigation Bills for Residential Customers.....	13
What Utilities Charge by River Basin.....	14
What Utilities Charge Customers Located Outside their Political Boundaries (Inside vs. Outside).....	15
Affordability of Residential Rates.....	16
What the Average North Carolinian Pays for 5,000 Gallons.....	16
Annual Bills as a Percent of Household Income.....	16
Do Prices Reflect the True Cost of Water Services in North Carolina?.....	17

¹ Partial funding for this activity was provided by the U.S. Environmental Protection Agency.

List of Figures

Figure 1: Monthly Base Charges for Residential Customers Among 506 Water and 410 Wastewater Rate Structures.....	2
Figure 2: Consumption Included with Base Charge for Residential Customers Among 511 Water and 425 Wastewater Rate Structures	3
Figure 3: Residential Water Rate Structures (n=511).....	4
Figure 4: Residential Wastewater Rate Structures (n=425).....	4
Figure 5: Commercial-Specific Water Rate Structures (n=130).....	5
Figure 6: Commercial-Specific Wastewater Rate Structures (n=92)	5
Figure 7: Maximum Quantity in the First Block among 220 Water and 109 Wastewater Residential Block Rate Structures .	5
Figure 8: Water Rate Structures Applicable to Residential Consumption up to 15,000 gallons/month (n=511).....	6
Figure 9: Wastewater Rate Structures Applicable to Residential Disposal up to 15,000 gallons/month (n=425).....	6
Figure 10: Price for the Next 1,000 Gallons at 5,000 gallons/month for 511 Water and 425 Wastewater Rate Structures	7
Figure 11: In What Calendar Year were the Current Rate Structures First Instated? (n=528).....	8
Figure 12: Monthly-Equivalent Residential Water Bills by Consumption (n=511)	9
Figure 13: Monthly-Equivalent Residential Wastewater Bills by Disposal (n=425)	9
Figure 14: Monthly-Equivalent Residential Combined Water and Wastewater Bills by Consumption (n=390).....	10
Figure 15: Percent of Rate Structures that Increased Residential Rates in the Last Year.....	11
Figure 16: Increase in Residential Monthly Bill Amount Since Last Year for 5,000 gallons/month Among 216 Water and 194 Wastewater Rate Structures that Raised Rates	11
Figure 17: Percent Increase in Residential Monthly Bills Since Last Year for 5,000 gallons/month Among 216 Water and 194 Wastewater Rate Structures that Raised Rates	11
Figure 18: Price for Water for the Next 1,000 Gallons at 14,000 gallons/month in 487 Water Rate Structures in FY2011-12 and 511 Water Rate Structures in FY2012-13.....	12
Figure 19: Monthly-Equivalent Commercial Water Bills by Consumption (n=511).....	12
Figure 20: Monthly-Equivalent Commercial Wastewater Bills by Consumption (n=425)	12
Figure 21: Comparing the Irrigation Bill to the (Indoor) Water and Wastewater Bills for Residential Customers at 15,000 gallons/month among the 75 Unique Irrigation Rate Structures.....	13
Figure 22: Monthly-Equivalent Bills for Irrigation Water Use by Residents, Including Irrigation Rates, by Consumption (n=511).....	13
Figure 23: Median Water and Wastewater Monthly Bills at 5,000 gallons/month, by River Basin.....	14
Figure 24: Ratio of Outside Residential Bills to Inside Bills at 5,000 gallons/month (n=511 water, n=425 wastewater).....	15
Figure 25: Median Combined Residential Water and Wastewater Bills for Rate Structures with Different Inside/Outside Rates (n=259)	15
Figure 26: Annual Bills for 5,000 gallons/month as a Percent of the Serviced Community's 2011-Adjusted Median Household Income (n=475 water, n=402 wastewater).....	17
Figure 27: Combined Residential Bill in FY2011-12 for 5,000 gallons/month for Utilities with Reported LGC Data on Total Operating Revenues and Total Operating Expenses in FY2011-12 (n=320).....	18

List of Tables

Table 1: Number of Participating Utilities with Rates Data for FY 2012-13.....	1
Table 2: Monthly Residential Base Charges in Water and Wastewater Rate Structures, by Utility Size.....	2
Table 3: Maximum Monthly Base Charge Applied to Commercial Customers by Utilities whose Base Charges Vary by Meter Size	3
Table 4: Changes to Water Rate Structures from March 2012 to January 2013.....	8
Table 5: Median Water and Wastewater Monthly Bills at 5,000 gallons/month, by Utility Size	10
Table 6: Median Water and Wastewater Monthly Bills at 5,000 gallons/month, by Utility Type.....	10
Table 7: Median Water and Wastewater Monthly Bills at 5,000 gallons/month, by River Basin	14

Introduction

Water and wastewater rate setting is one of a local government's most important environmental and public health responsibilities. Water and wastewater rates ultimately determine how much revenue a community will have to maintain vital infrastructure. The purpose of this document is to help utilities in rate setting by providing an up-to-date, detailed survey of current statewide rate structures and trends. This report represents a collaborative effort between the [NC League of Municipalities](#) and the [Environmental Finance Center](#).

Over the course of this survey, 531 local-government owned, non-profit and multi-system for-profit water and wastewater utilities were contacted by email, fax, letter or phone, and 507 utilities (96 percent) responded by sending in their rate schedules. These utilities serve approximately 7.3 million North Carolinians and account for 94 percent of the population served by community water and wastewater systems in the state. Table 1 describes the utilities analyzed. Some utilities use more than one rate structure for different portions of their service areas, raising the total number of rate structures in our sample to 546. Copies of the 546 rate structures of participating utilities are available online at www.efc.unc.edu/projects/NCWaterRates.htm.

Table 1: Number of Participating Utilities with Rates Data for FY 2012-13

Institutional Arrangement	Provides Water and Wastewater	Provides Water Only	Provides Wastewater Only	Total
Municipality	333	32	19	384
County/District	26	30	4	60
Sanitary District	7	6	4	17
Authority	5	2	1	8
Metropolitan District	0	0	2	2
Not-For-Profit	1	33	0	34
For-Profit Multi-System Utility	2	0	0	2
Total Number of Utilities	374	103	30	507
<i>Number of Rate Structures</i>	<i>390</i>	<i>121</i>	<i>35</i>	<i>546</i>

In addition to this report, tables of each utility's rates and key components of their rate structures are available from NCLM (www.nclm.org) and the EFC (www.efc.unc.edu/projects/NCWaterRates.htm). **It is important to stress that an examination of rates and rate structures only tells a part of the story.** Pressure to maintain low or relatively low rates has the potential to force utilities to run a deficit or avoid making necessary operational and capital expenditures. Ideally, rates should reflect the cost of providing service, which depends on diverse factors including size of treatment facilities, customer base, age of assets, type of water supply, and quality of receiving waters. Two neighboring utilities with similar customer bases may have very different costs that justify very different rate structures and rates. **Therefore, policy decisions drawn from the comparative information in this document should also consider many other factors such as age of system, geographic location, site-specific regulatory requirements, source of water, demand, and availability of resources.** A free, interactive NC Water and Wastewater Rates Dashboard that combine utility financial, physical and customer characteristics with the capability of comparing rates among utilities that are similar in various categories is available on the web at www.efc.unc.edu/RatesDashboards/.

High rates do not necessarily reflect poor or inefficient management — in fact some utilities with low rates do not generate sufficient revenue to properly maintain their system's assets, thereby reducing short-term investments that are likely to have long-term adverse cost and service impacts. Other utilities may have low rates because they have not re-examined their rate structures in many years. Even when a utility customer base does not grow, operating costs rise every year and rates should be examined and readjusted on a yearly basis.

Overview of Rates and Rate Structures

Utilities employ a range of rate structures to determine what their customers pay. Almost all utilities use a combination of base charges and variable charges in their rate structures. There is considerable variation in how these are calculated and how they are charged for different classes of customers.

Base Charges

Base charges contribute to revenue stability because they do not vary from month to month, regardless of consumption. However, high base charges can also make it difficult for a utility to encourage conservation for the same reason. The number of residential rate structures with base charges and the range of the charges are shown in Figure 1. The median² residential base charges are presented in Table 2 by utility size. The median residential base charge applied by utilities in 2012 is \$14.01 per month for water and \$15.30 per month for wastewater. For combined utilities, the median combined water and wastewater base charge is \$30.00 per month.

Figure 1: Monthly Base Charges for Residential Customers Among 506 Water and 410 Wastewater Rate Structures

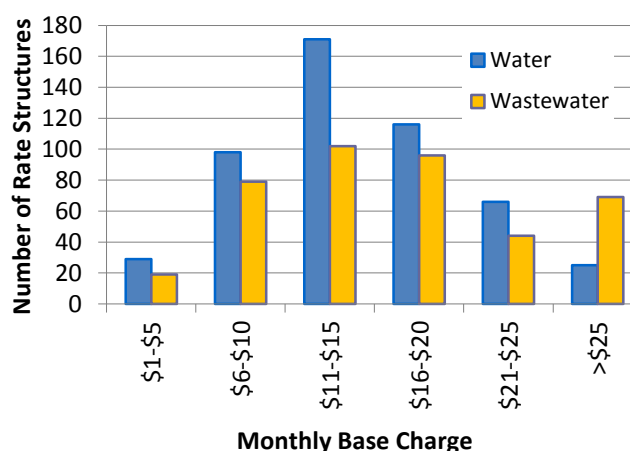


Table 2: Monthly Residential Base Charges in Water and Wastewater Rate Structures, by Utility Size

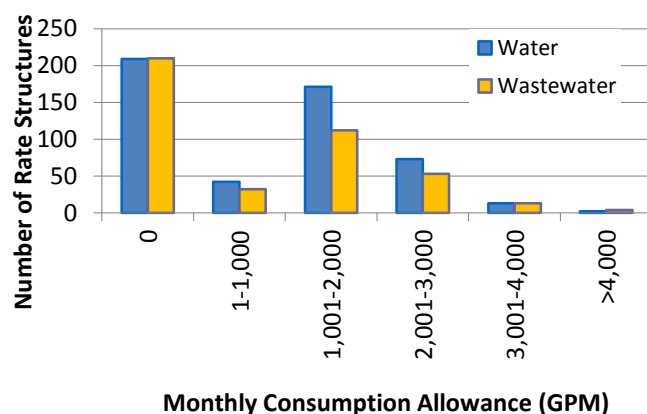
Size of Utility (Service Population)	Water Rate Structures			Wastewater Rate Structures		
	Total Number of Structures	Number with Base Charge	Median Base Charge	Total Number of Structures	Number with Base Charge	Median Base Charge
1 - 999	117	117	\$15.50	98	97	\$18.50
1,000 – 2,499	90	89	\$15.00	80	78	\$16.03
2,500 – 4,999	81	80	\$14.00	77	72	\$16.00
5,000 – 9,999	75	74	\$13.83	55	53	\$14.10
10,000 – 24,999	76	74	\$14.61	55	52	\$12.92
25,000+	72	72	\$9.12	57	55	\$10.00
All Rate Structures	511	506	\$14.01	425	410	\$15.30

While nearly every rate structure (99 percent of water and 96 percent of wastewater rate structures) has a base charge, their amounts vary by utility size. The largest utilities have smaller base charges than the smallest utilities. This may be a reflection of the fact that larger utilities have broader customer bases that provide a more stable revenue stream. Smaller utilities may, on average, have less stable customer consumption and therefore decide to shift a greater portion of their operating costs into the base charge.

² Most of the statistics cited in this report refer to *medians*. Exactly half of the rate structures in the sample have a value that is equal to or greater than (or equal to or lower than) the median value. The median is preferred over the average because averages are influenced by exceptionally high or low values whereas medians are not.

The majority of residential rate structures (59 percent of water and 52 percent of wastewater rate structures) include a minimum amount of water consumption or wastewater disposal with their base charges (see Figure 2). For these utilities, the variable portion of the rate structure only takes effect when a customer uses more than the minimum included in the base charge. Thus, all customers of these utilities who consume or dispose of an amount up to the minimum allocation would receive the same bill, which is equal to the base charge. For both water and wastewater utilities, the median amount of allowance included with the base charge is 2,000 gallons per month. Only 3 percent of water and 4 percent of wastewater utilities include more than 3,000 gallons/month with the base charge.

Figure 2: Consumption Included with Base Charge for Residential Customers Among 511 Water and 425 Wastewater Rate Structures



A large number of utilities vary the base charges based on the customer’s water meter size in order to distinguish between large commercial and industrial users from residential and small commercial customers. Of the 511 water rate structures applied to commercial and non-residential customers, 113 (22 percent) vary the base charge by meter size. Similarly, of the 425 wastewater rate structures for commercial customers, 81 (19 percent) vary the base charge by the water meter size. The range of meter-based base charges used by this subset of utilities is shown in Table 3. For example, half of the commercial rate structures that vary by meter size charge base charges up to \$48.30 per month for water a 2” meter and up to \$159.76 for a 4” meter.

Table 3: Maximum Monthly Base Charge Applied to Commercial Customers by Utilities whose Base Charges Vary by Meter Size

	Percentage of Meter-Based Commercial Rate Structures					
	10%	25%	50%	75%	90%	100%
<i>Water (n = 113)</i>						
5/8"	\$3.77	\$6.60	\$11.67	\$16.00	\$21.97	\$42.00
3/4"	\$3.95	\$6.60	\$11.67	\$16.70	\$22.94	\$42.00
1"	\$6.60	\$12.75	\$19.50	\$33.00	\$49.46	\$90.00
1 1/2"	\$10.04	\$16.00	\$31.19	\$56.25	\$83.64	\$144.16
2"	\$15.45	\$24.00	\$48.30	\$96.38	\$152.10	\$392.26
3"	\$24.58	\$44.42	\$93.39	\$163.17	\$252.50	\$782.92
4"	\$27.60	\$55.94	\$159.76	\$288.19	\$426.45	\$1,407.42
6"	\$32.00	\$90.20	\$221.44	\$496.15	\$782.44	\$3,094.66
8"	\$36.80	\$114.55	\$280.00	\$621.10	\$1,083.40	\$3,094.66
10"	\$39.20	\$114.55	\$300.00	\$723.00	\$1,115.71	\$3,094.66
<i>Wastewater (n = 81)</i>						
5/8"	\$3.98	\$7.02	\$12.50	\$19.00	\$24.77	\$42.78
3/4"	\$4.06	\$7.02	\$12.50	\$19.00	\$24.77	\$48.74
1"	\$6.53	\$13.60	\$21.92	\$33.35	\$52.00	\$81.23
1 1/2"	\$9.85	\$18.00	\$35.23	\$59.50	\$89.74	\$162.45
2"	\$14.50	\$26.41	\$56.38	\$101.35	\$158.00	\$356.52
3"	\$25.15	\$39.40	\$101.58	\$190.45	\$270.09	\$743.94
4"	\$38.06	\$51.75	\$155.28	\$308.61	\$480.00	\$1,676.52
6"	\$53.50	\$78.35	\$225.65	\$581.70	\$863.35	\$2,975.76
8"	\$58.77	\$112.44	\$308.61	\$770.00	\$1,160.00	\$2,975.76
10"	\$64.60	\$125.46	\$308.61	\$840.21	\$1,606.76	\$3,126.18

Variable Charges: Uniform, Increasing Block, Decreasing Block, and Other Rate Structures

Figure 3-6 present information on water and wastewater rate structures for “inside” customers: those who live within a utility’s political jurisdiction or municipal boundaries. The three most common rate structures are uniform, increasing block, and decreasing block. In a uniform rate structure, the rate at which water/wastewater is charged does not change as the customer uses more water. In an increasing block structure, the rate increases with greater water consumption. This structure is often employed by utilities that want to encourage conservation. In a decreasing block structure, water rates decrease as consumption rises. This structure might be used to encourage economic development. Other rate structures used in North Carolina include a hybrid of increasing and decreasing blocks where rates increase or decrease for specific targeted blocks of consumption, seasonal rate structures applying different rates at different times of the year, uniform rates that are capped at a maximum billable consumption amount, tiered flat fees, and a block rate structure that charges all consumption at the rate of the last used block. Seasonal uniform rate structures support conservation, especially for those utilities that experience large seasonal consumption changes (e.g. tourist locations). Wastewater bills are almost always calculated based on the amount of metered water consumption. However, a fraction of wastewater utilities use rate structures with a cap on residential wastewater consumption. For example, if a utility caps its wastewater bill at 20,000 gallons, a customer that uses 25,000 gallons of water will only be charged for 20,000 gallons of wastewater disposal.

Figure 3: Residential Water Rate Structures (n=511)

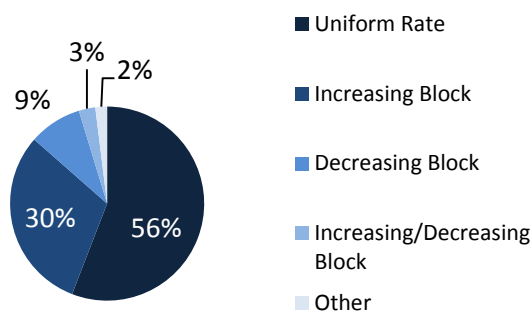
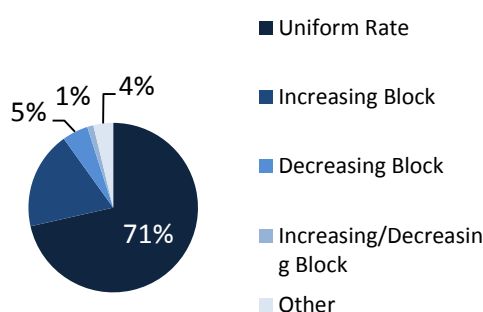


Figure 4: Residential Wastewater Rate Structures (n=425)



Most water and wastewater utilities use the same rate structure for residential, commercial, and industrial customers, but some have separate rate structures. In this survey, 25 percent of water utilities have a separate rate structure for their commercial customers, and a fraction of these utilities also has a separate structure that pertains to their industrial customers. On the wastewater side, 22 percent have a separate rate structure for their commercial customers. The percentages of all utilities that use each rate structure for commercial users (whether or not a separate rate structure is used) are similar to those for residential structures. The pattern is different when looking at only those utilities that use a separate commercial rate structure. Information on the rate structures that pertain only to commercial customers is presented in Figure 5 and Figure 6.

Figure 5: Commercial-Specific Water Rate Structures (n=130)

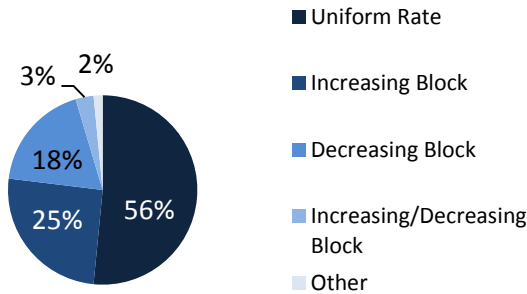
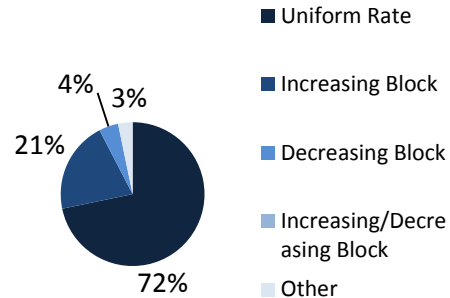
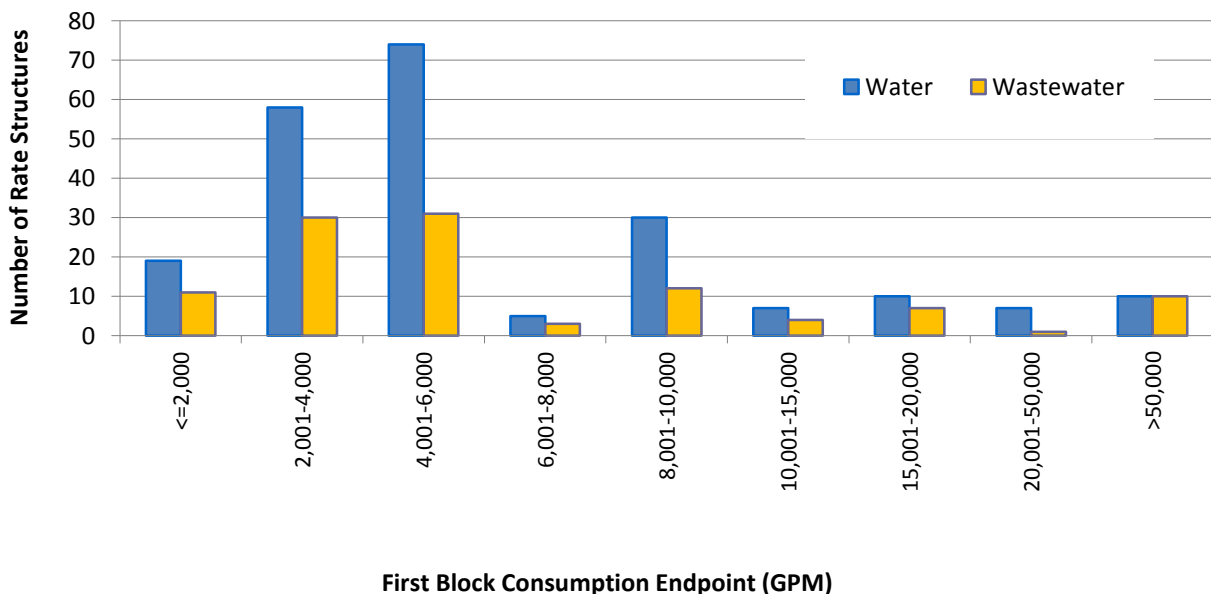


Figure 6: Commercial-Specific Wastewater Rate Structures (n=92)



While some utilities design separate rate structures for commercial users, other utilities use only one rate structure but design the blocks so that they inherently distinguish residential use from that of large commercial customers. A common practice is to set the first block high enough so that essentially all residential consumption is charged one rate (which is equivalent to a uniform rate for these customers) while most large commercial customers will typically exceed the first block, thus paying an increasing or decreasing block rate. Figure 7 shows how many rate structures include various amounts of consumption and disposal in the first block of their residential block rate structure.

Figure 7: Maximum Quantity in the First Block among 220 Water and 109 Wastewater Residential Block Rate Structures



An examination of rate structures over the range of typical residential consumption reveals that many increasing and decreasing block structures are effectively uniform below 15,000 gallons/month (shown in Figure 8 and

Figure 9). For example, whereas 9 percent of residential water rate structures are decreasing block structures (Figure 3), only 6 percent actually apply decreasing rates within the first 15,000 gallons/month of consumption (Figure 8) – the other 3 percent have a first block that exceeds the range of typical residential use. Figure 8 and Figure 9 also show the percent of the population served under each rate structure applicable to consumption/disposal levels of up to 15,000 gallons/month. While only 28 percent of the water rate structures are increasing block structures through 15,000 gallons/month, 51 percent of all residential customers are served by these rate structures. Figure 9 shows that the vast majority of residential customers pay uniform rates for wastewater disposal.

Figure 8: Water Rate Structures Applicable to Residential Consumption up to 15,000 gallons/month (n=511)

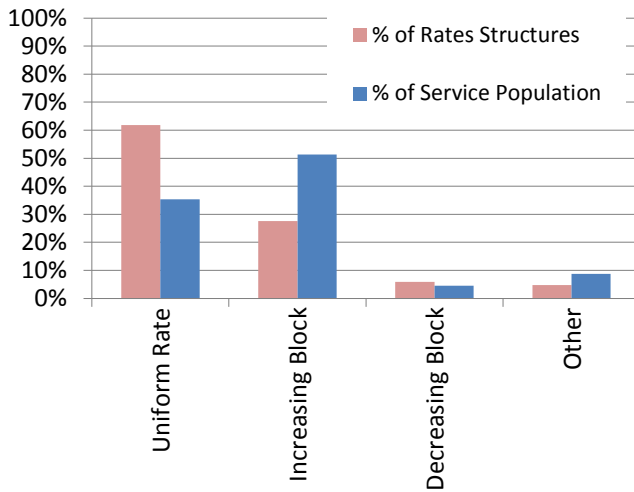
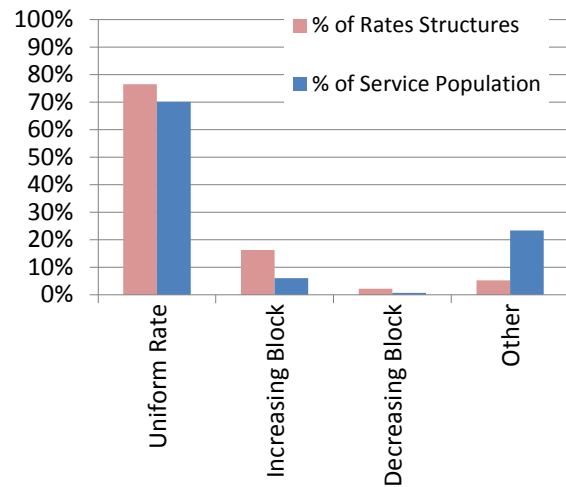


Figure 9: Wastewater Rate Structures Applicable to Residential Disposal up to 15,000 gallons/month (n=425)



The State of North Carolina is now actively discouraging the use of decreasing block rate structures for residential consumption. In 2008, the General Assembly created G.S. 143.355.4 stating:

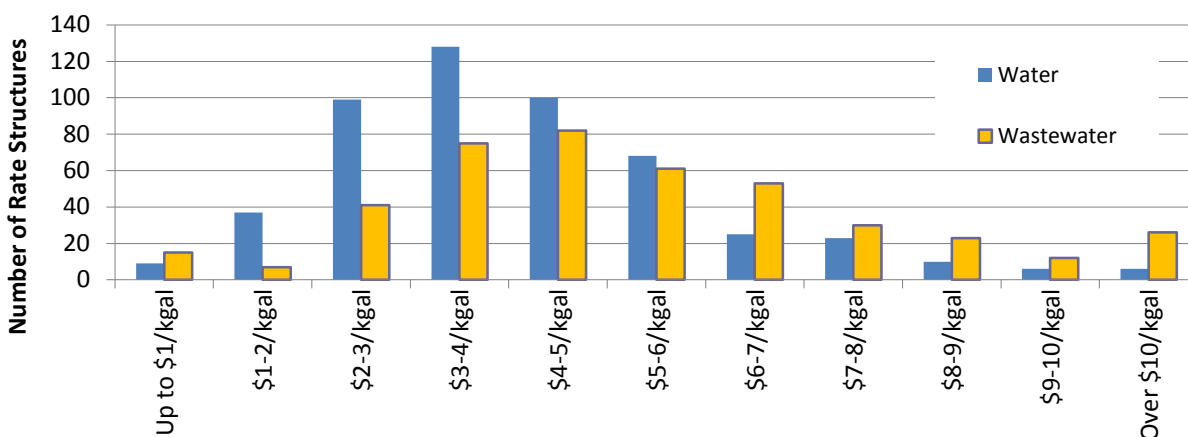
“To be eligible for State water infrastructure funds from the Drinking Water State Revolving Fund or the Drinking Water Reserve or any other grant or loan of funds allocated by the General Assembly whether the allocation of funds is to a State agency or to a nonprofit organization for the purpose of extending waterlines or expanding water treatment capacity, a local government or large community water system must demonstrate that the system:
 ... (5) Does not use a rate structure that gives residential water customers a lower per-unit water rate as water use increases.”

As shown in Figure 8, 6 percent of the water rate structures analyzed in this study are still designed to charge residential customers using less than 15,000 gallons/month decreasing rates as water use increases. To be eligible for the aforementioned funds, these utilities would need to change their water rate structures.

Residential customers in North Carolina consume an average of 4,000 to 5,000 gallons/month. Among the 511 water rate structures in the sample, the median price for the next 1,000 gallons (not including base charges) at the consumption level of 5,000 gallons/month is \$4.00 per 1,000 gallons – 50 percent of the water rate structures have a price that is between \$3.00 and \$5.18 per 1,000 gallons. Changes in rate structures since last year are shown on page 8, and changes in rates are shown on page 11.

The price for wastewater is slightly higher. Among the 425 wastewater rate structures in the sample, the median wastewater price for the next 1,000 gallons at 5,000 gallons/month is \$5.00 per 1,000 gallons – 50 percent of the wastewater rate structures have a price that is between \$3.62 and \$6.61 per 1,000 gallons. The range of water and wastewater prices for the next 1,000 gallons at the 5,000 gallons/month consumption level is shown on Figure 10.

Figure 10: Price for the Next 1,000 Gallons at 5,000 gallons/month for 511 Water and 425 Wastewater Rate Structures



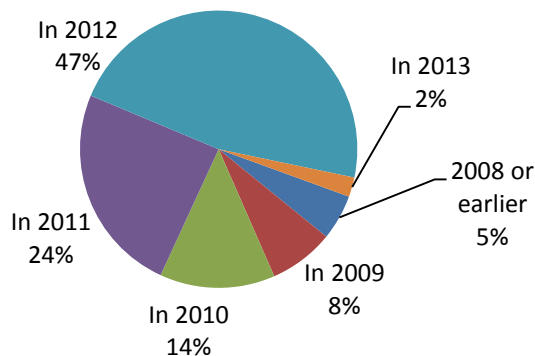
Among the 390 combined water and wastewater rate structures, the median combined price for the next 1,000 gallons is \$9.00 per 1,000 gallons – 50 percent of the combined rate structures have a price that is between \$6.81 and \$11.41 per 1,000 gallons.

Many utilities provide the option to residential customers to install separate irrigation meters to supply their outdoor water usage. In some cases, the utilities have created a separate, unique rate structure specifically for these irrigation meters. In our sample of 511 water rate structures, only 75 (15 percent) had a unique rate structure for residential irrigation meters. Almost all, 73 out of 75, use a uniform or an increasing block rate structure. Read more about irrigation rates, and how they compare to standard rates, on page 13.

Changes in Residential Rate Structures in the Last Year

Most North Carolina utilities actively evaluate and modify their rate structures every one to two years. The calendar year in which each of 528 of the rate structures active as of January 2013 were first put into effect is shown in Figure 11. The figure shows that 49 percent of the current rate structures were made effective since January 2012, and 73 percent have changed their rates in the last two years. Only approximately 5 percent of the rate structures were instated prior to 2009 (more than four years ago).

Figure 11: In What Calendar Year were the Current Rate Structures First Instated? (n=528)



The trend among North Carolina utilities for many years has been to move away from decreasing block rate structures to either uniform or increasing block structures. This trend is largely driven by an interest in preserving water supplies by promoting water conservation and discouraging excessive or wasteful consumption. The trend is in keeping with the State’s encouragement of using conservation-oriented rates and rate structures as mentioned previously.

This year’s survey included 486 water rate structures and 408 wastewater rate structures that were also included in the 2012 survey. Out of the 486 water rate structures included in last year’s rates survey, 23 changed in the last year, shown in Table 4. Most of the changes were from decreasing blocks changing to uniform rates, and uniform rates changing to increasing block rate structures. Overall, 5 decreasing block rate structures were changed in the last year, and 16 increasing block structures were gained. Only 14 wastewater rate structures were changed between 2012 and 2013, out of the 486 surveyed in both years. An analysis of how much rates have increased in the past year is shown on page 11.

Table 4: Changes to Water Rate Structures from March 2012 to January 2013

		Changed To				
		TOTAL	Increasing Block	Uniform Rate	Decreasing Block	Other
Changed From	TOTAL	16	5	1	1	1
	Increasing Block	2		1	0	1
	Uniform Rate	13	12		1	0
	Decreasing Block	5	1	4		0
	Other	3	3	0	0	

What Utilities Charge their Customers

Residential Water and Wastewater Bills

Figure 12 and Figure 13 show the median amount that utilities bill their residential water and wastewater customers, respectively, for a range of consumption/disposal amounts on a monthly basis³. These calculations include base charges and consumption allowances. The colored bars highlight what the middle 80 percent of utilities charge (between the 10th and 90th percentile) across the consumption spectrum. Utilities that charge below or above the colored bars are charging less than or more than 90 percent of all other utilities in the sample, respectively.

Figure 12: Monthly-Equivalent Residential Water Bills by Consumption (n=511)

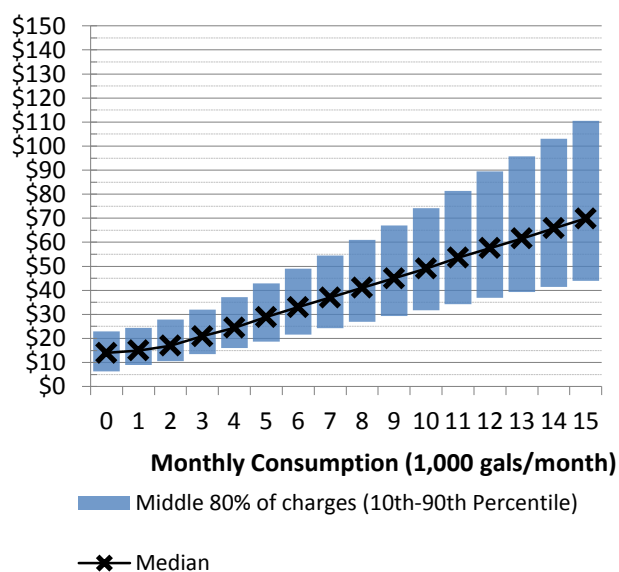
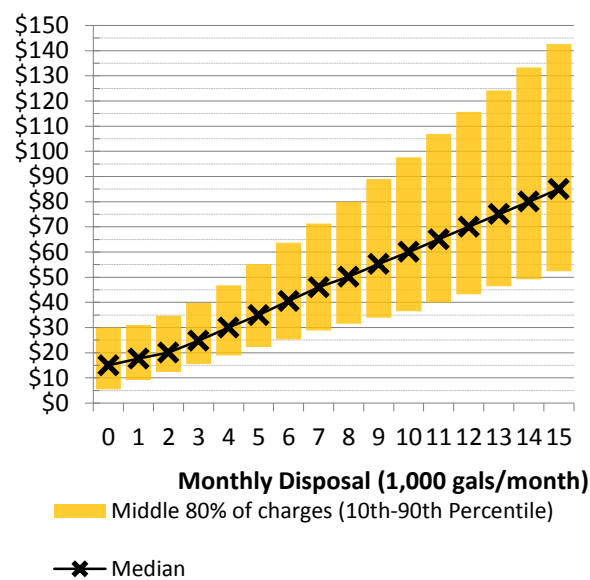


Figure 13: Monthly-Equivalent Residential Wastewater Bills by Disposal (n=425)



The median monthly amount charged for zero gallons of water is \$14.00, \$28.88 for 5,000 gallons and \$49.03 for 10,000 gallons. As a point of comparison, a gallon of potable water at a major grocery retailer is approximately \$1.00 while the median bill for 5,000 gallons of tap water is approximately \$0.0058 per gallon, which is 173 times cheaper.

Wastewater bills are generally higher than water bills. The median monthly wastewater bill for customers disposing zero gallons of water is \$15.00, \$34.95 for 5,000 gallons and \$60.00 for 10,000 gallons.

The range of combined water and wastewater bills for various levels of consumption is shown on Figure 14. The median monthly combined bill for zero gallons is \$29.33, \$62.60 for 5,000 gallons and \$108.90 for 10,000 gallons.

³ For utilities that bill on a non-monthly basis (bi-monthly or quarterly), charges have been calculated and presented on a monthly basis to allow for accurate comparison.

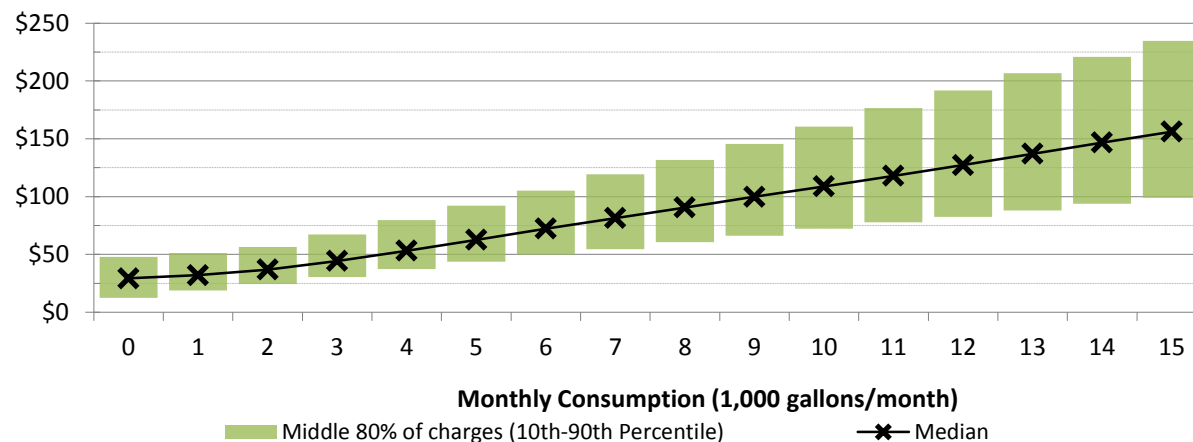
Figure 14: Monthly-Equivalent Residential Combined Water and Wastewater Bills by Consumption (n=390)

Table 5 shows that water and wastewater bills are generally lower among the larger utilities. This is probably because large utilities are able to spread their fixed costs among a greater customer base. Table 6 shows that municipal utilities generally have lower water and wastewater bills than other service providers, possibly because the population density is highest for municipal utilities, which translates into lower per customer costs (and therefore bills) for distribution and collection. Conversely, county utilities, which are typically more spread out, have the highest water bills.

Table 5: Median Water and Wastewater Monthly Bills at 5,000 gallons/month, by Utility Size

Utility Size (Service Population)	Water Rate Structures		Wastewater Rate Structures	
	Number of Rate Structures	Median 5,000 gallons/month Monthly Bill	Number of Rate Structures	Median 5,000 gallons/month Monthly Bill
1 - 999	117	\$29.35	98	\$38.83
1,000 – 2,499	90	\$30.48	80	\$36.80
2,500 – 4,999	81	\$30.29	77	\$34.58
5,000 – 9,999	75	\$27.05	55	\$35.00
10,000 – 24,999	76	\$28.60	55	\$31.80
25,000+	72	\$26.30	57	\$34.81
All Rate Structures	511	\$28.88	425	\$34.95

Table 6: Median Water and Wastewater Monthly Bills at 5,000 gallons/month, by Utility Type

Utility Type	Water Rate Structures		Wastewater Rate Structures	
	Number of Rate Structures	Median 5,000 gallons/month Monthly Bill	Number of Rate Structures	Median 5,000 gallons/month Monthly Bill
Municipality	377	\$27.50	364	\$34.64
County/District	71	\$36.25	37	\$40.00
Sanitary District	17	\$29.50	11	\$40.00
Authority/Metropolitan District	7	\$33.50	7	\$37.50
Not-For-Profit	35	\$29.08	1	\$33.75
For Profit	4	\$33.16	3	\$41.55
All Rate Structures	511	\$28.88	425	\$34.95

Changes in Residential Rates in the Last Year

Out of the 486 water and 408 wastewater rate structures included in last year’s rates survey, residential rates were increased from last year for 44 percent of the water rate structures and 48 percent of wastewater rate structures, as shown in Figure 15. Similar to this past year, 50 percent of water and 51 percent of wastewater rate structures had raised residential rates between 2011 and 2012.

Figure 15: Percent of Rate Structures that Increased Residential Rates in the Last Year

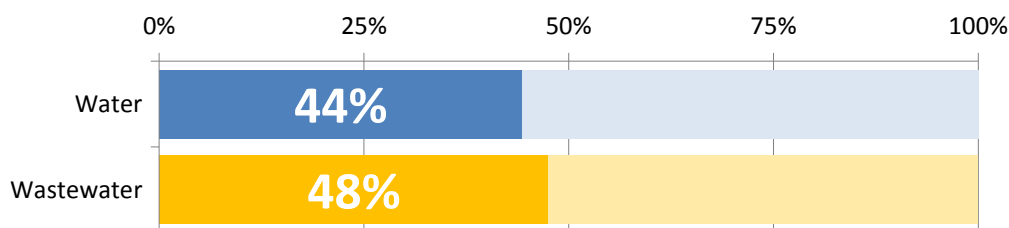


Figure 16 and Figure 17 show the residential monthly bill increase for customers that use 5,000 gallons/month among the 216 water and 194 wastewater rate structures that have raised rates in the last year. The median increase was \$1.60/month for water (a 5.7 percent increase) and \$1.91/month for wastewater (a 5.3 percent increase). This compares to a median increase of 4.1 percent and 5.0 percent increase in monthly bills for customers using 5,000 gallons/month between the 240 water and 198 wastewater rate structures, respectively, that were surveyed and had raised rates between 2011 and 2012.

Figure 16: Increase in Residential Monthly Bill Amount Since Last Year for 5,000 gallons/month among 216 Water and 194 Wastewater Rate Structures that Raised Rates

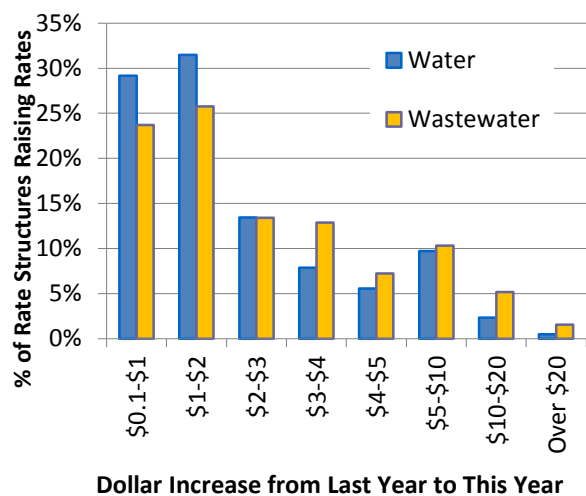
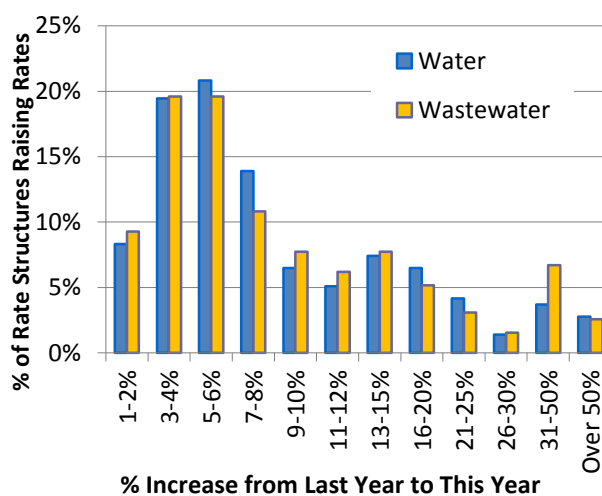


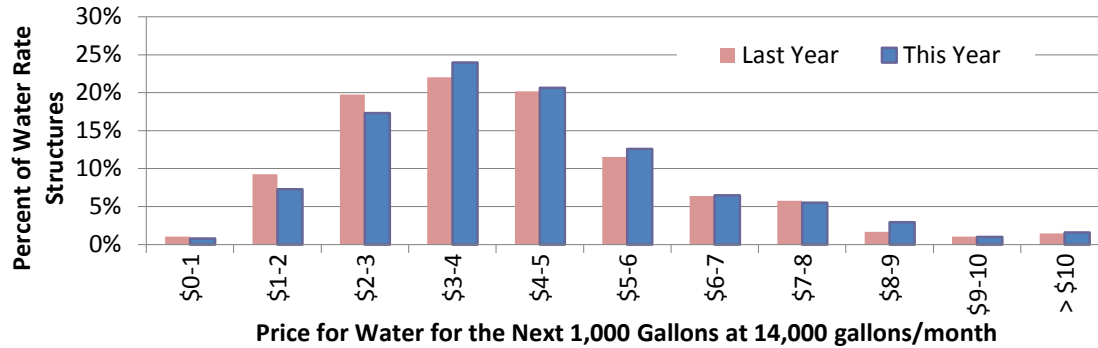
Figure 17: Percent Increase in Residential Monthly Bills Since Last Year for 5,000 gallons/month among 216 Water and 194 Wastewater Rate Structures that Raised Rates



One of the water rate structure components that utilities can manipulate to send a strong pricing signal to encourage water conservation is the rate that customers pay at higher levels of consumption. Average residential consumption is between 4,000 and 5,000 gallons/month. Seasonal use of water can raise consumption levels for some customers to two or three times this amount, or more, and utilities can discourage excessive use by setting high prices for the next 1,000 gallons of water at that level of consumption. Almost half of North Carolina’s utilities raised the residential water rate at high levels of consumption in the past year. Out of the 487 water rate structures included in last year’s survey, the price for the next 1,000 gallons at 14,000 gallons/month was raised

for 211 rate structures (43 percent). The distribution of the prices for water for the next 1,000 gallons at that consumption level is shown in Figure 18. Utilities generally have shifted their high use water rates upwards. In particular, a smaller proportion of utilities charge less than \$2/1,000 gallons than did last year, and 11 percent of utilities charge over \$7/1,000 gallons, whereas 10 percent charged that much last year.

Figure 18: Price for Water for the Next 1,000 Gallons at 14,000 gallons/month in 487 Water Rate Structures in FY2011-12 and 511 Water Rate Structures in FY2012-13



Commercial Water and Wastewater Bills

Figure 19 and Figure 20 show the median monthly water and wastewater bills, respectively, for commercial customers at different levels of disposal⁴. The middle 80 percent of charges also are indicated. The median monthly bill for commercial customers consuming zero gallons (on a 3/4” meter⁵) is \$14.95 for water and \$15.44 for wastewater. The median monthly bill for 50,000 gallons/month is \$216.72 for water and \$273.28 for wastewater. The median bill for those consuming 500,000 gallons/month (on a 1½” or 2” meter) is \$2,033.37 for water and \$2,697.77 for wastewater. The variation in commercial bills across rate structures increases significantly as the consumption/disposal amount increases.

Figure 19: Monthly-Equivalent Commercial Water Bills by Consumption (n=511)

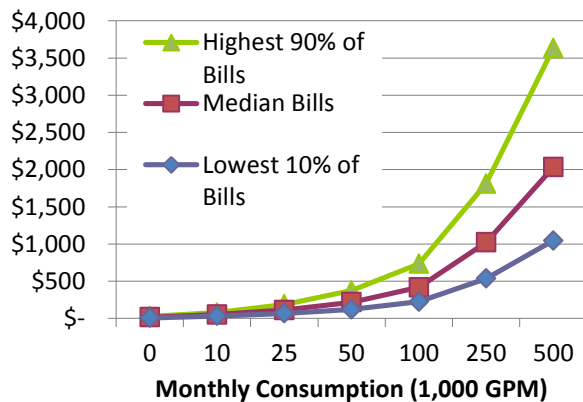
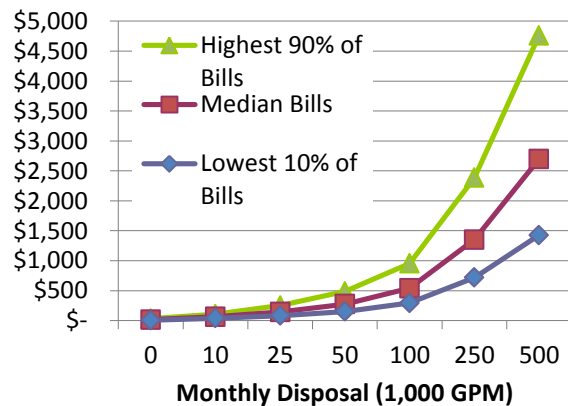


Figure 20: Monthly-Equivalent Commercial Wastewater Bills by Consumption (n=425)



⁴ The residential rate structure is used to calculate the billings for commercial customers except for the utilities that specify different rates and rate structures for commercial or non-residential customers.

⁵ Some utilities use different base charges for different meter sizes for customers. Bills for consumption or disposal of up to 100,000 gallons/month was computed assuming a 5/8” or 3/4” meter size, 250,000 gallons/month assuming a 1” meter size, and 500,000 gallons/month assuming a 1½” or 2” meter size. When applicable, the “next largest” meter size is used in calculating the bills when a utility does not utilize a specific meter size.

Irrigation Bills for Residential Customers

Residential customers that water their lawns, wash their cars, or otherwise use water outdoors frequently use much more water outdoors than they do indoors. An EFC study of customers in five cities in North Carolina shows that residents with irrigation meters tend to use, on average, two to seven times as much water outdoors in the summer months as they do indoors⁶.

With such large volumes of water used outdoors, particularly in the summer months, and with S.L. 2008-143 clearly encouraging the use of rates to support conservation, some utilities have taken the opportunity to charge for water used through irrigation meters at a unique rate structure. In our survey, 75 rate structures included such unique rates. Typically, irrigation rates are higher than the standard water rates, but less than the combined water and wastewater rates. The ratio of the irrigation water bill at 15,000 gallons/month to the residential (indoor) water or combined bill is shown in Figure 21. The irrigation bill for 15,000 gallons/month is higher than what the customer would have been charged under the standard water rate structure for that consumption amount in 45 out of the 75 rate structures (60 percent). However, 16 of the irrigation rate structures actually provide a price discount to customers for their outdoor water usage, which essentially discourages water conservation.

As shown in Figure 21, almost all of the irrigation rate structures provide residential customers with a price break compared to the combined water and wastewater charge for 15,000 gallons/month. This is logical, since outdoor water usually does not enter the sewer system after use, and therefore the utility does not encounter wastewater treatment costs for the water that flows through the irrigation meters.

Whether or not a utility has a unique rate structure for irrigation water, all utilities must evaluate carefully what they are charging for large consumption of water through their residential rate structures. The monthly-equivalent bills for all 510 rate structures in our sample are shown in Figure 22 for a consumption range that is typical of residential irrigation usage.

Figure 21: Comparing the Irrigation Bill to the (Indoor) Water and Wastewater Bills for Residential Customers at 15,000 gallons/month among the 75 Unique Irrigation Rate Structures

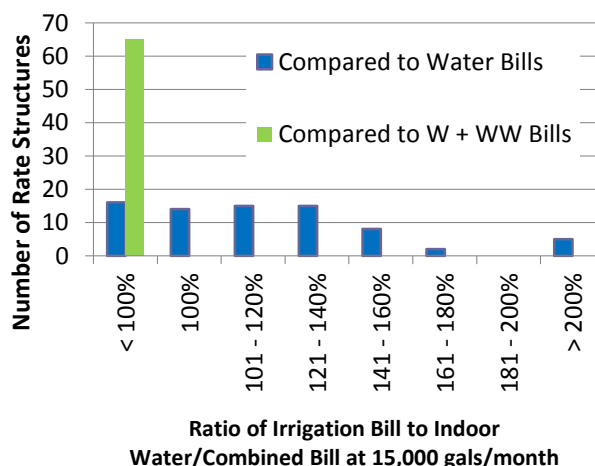
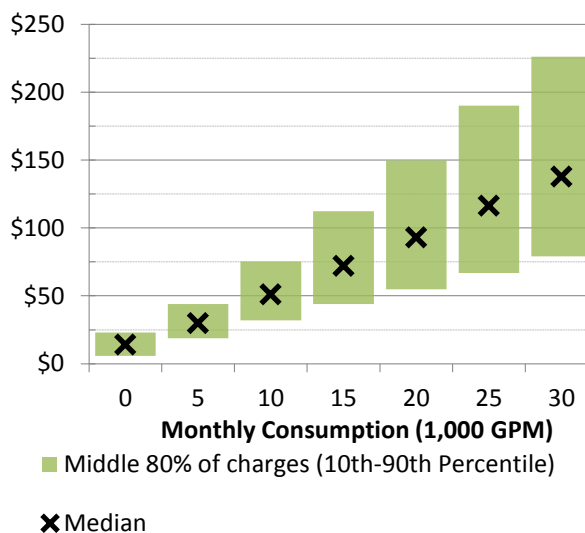


Figure 22: Monthly-Equivalent Bills for Irrigation Water Use by Residents, Including Irrigation Rates, by Consumption (n=511)



⁶ Tiger, M.W., Eskaf, S. & Hughes, J. (2011) "Implications of Residential Irrigation Metering for Customers' Expenditures and Demand." *JAWWA*, 103:12, 30-41.

What Utilities Charge by River Basin

It is important to consider the operating environment when comparing rates among utilities. Source water quality and quantity can have a significant impact on the cost to produce water. Likewise, receiving water quality can have a major impact on the cost of wastewater treatment. In an attempt to consider these impacts, median water and wastewater bills for 5,000 gallons/month were calculated for each of North Carolina’s 17 major river basins; they are displayed in Table 7 and Figure 23.

The highest median water charges in river basins with a sample of more than 10 rate structures can be found in the Tar-Pamlico river basin. The lowest median water charges, by contrast, are found in the Chowan river basin. The highest median wastewater charges can be found in the Pasquotank river basin. Wastewater charges in the Neuse and the Tar-Pamlico river basins are higher than average for the state, and both river basins are under stringent discharge regulations. The lowest median wastewater charges can be found in the French Broad river basin.

Table 7: Median Water and Wastewater Monthly Bills at 5,000 gallons/month, by River Basin

Utility Type	Water Rate Structures		Wastewater Rate Structures	
	Total Number of Structures	Median Monthly Bill at 5,000 gallons/month	Total Number of Structures	Median Monthly Bill at 5,000 gallons/month
Broad	17	\$32.30	17	\$40.05
Cape Fear	97	\$27.60	80	\$34.83
Catawba	43	\$27.19	41	\$29.50
Chowan	18	\$22.88	15	\$29.60
French Broad	25	\$29.24	18	\$29.37
Hiwassee	3	\$38.20	3	\$21.95
Little Tennessee	6	\$27.14	6	\$28.36
Lumber	33	\$24.05	30	\$33.10
Neuse	72	\$29.20	62	\$44.08
New	6	\$31.14	6	\$29.57
Pasquotank	18	\$35.78	13	\$50.25
Roanoke	36	\$32.59	26	\$32.40
Savannah	0	--	0	--
Tar-Pamlico	50	\$35.82	35	\$45.75
Watauga	4	\$34.45	3	\$30.18
White Oak	10	\$28.18	5	\$39.96
Yadkin-PeeDee	72	\$27.57	64	\$35.67

Figure 23: Median Water and Wastewater Monthly Bills at 5,000 gallons/month, by River Basin



What Utilities Charge Customers Located Outside their Political Boundaries (Inside vs. Outside)

All of the charges presented above refer to what utilities charge customers that live within their political boundaries. Municipal utilities often serve customers who live outside of city limits, and a handful of other utilities specify geographical boundaries within their service areas and identify their customers as residing “inside” and “outside” those boundaries. In many cases, utilities charge different rates for customers living inside or outside the boundary. Overall, 64 percent of water rate structures and 65 percent of wastewater rate structures specified different rates for customers living outside, and the vast majority were for municipal utilities. In fact, 84 percent of the rate structures from municipal utilities in the sample charged more for outside customers than for inside customers. At 5,000 gallons/month, outside customers who are charged a different rate than inside customers pay, at the median, a water bill that is 1.88 times more than inside customers. For wastewater, the median ratio is 1.97. Most utilities with different outside rates charged less than double the inside charges, as shown in Figure 24. Figure 25 shows median charges for combined residential water and wastewater service for all utilities that have a separate rate schedule for outside customers for both water and wastewater service. For utilities that charge for both water and wastewater, the median combined bill charged to inside customers for 5,000 gallons/month is \$68.50 compared to \$117.14 for outside customers.

Figure 24: Ratio of Outside Residential Bills to Inside Bills at 5,000 gallons/month (n=511 water, n=425 wastewater)

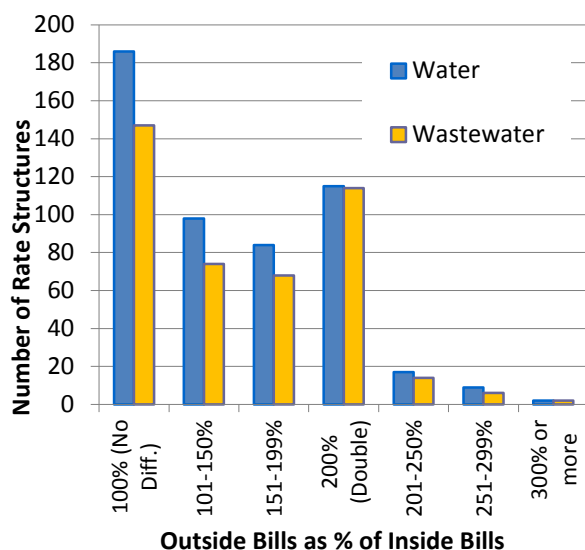
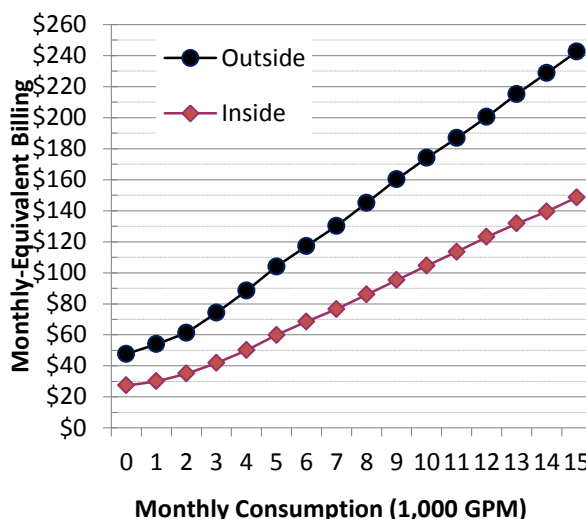


Figure 25: Median Combined Residential Water and Wastewater Bills for Rate Structures with Different Inside/Outside Rates (n=259)



There are at least three reasons why utilities might charge more for outside customers. First: in the case of municipalities, higher outside charges might be part of managing growth and annexation. Second: for all utilities, outside customers are often inherently more expensive to serve because of lower densities and the fact they reside farther, on average, from the water or wastewater treatment plant than inside customers. Extra costs for distribution and collection systems justify higher rates for outside customers. Third: inside customers, as citizens of the unit of local government that provides the utility service, bear more of the investment risks of owning and operating a utility. They also bear more of the burden of financing and facilitating its operations through their local government unit⁷.

⁷ AWWA (2000). *Principles of Water Rates, Fees, and Charges*. Manual of Water Supply Practices: M1. 5th Ed.

Affordability of Residential Rates

What the Average North Carolinian Pays for 5,000 Gallons

The above figures and tables are useful in determining the range of rates that utilities across the state are currently charging. As mentioned above, the median price for 5,000 gallons/month across all the utilities is \$28.88 for water and \$34.95 for wastewater, using “inside” residential rates. This indicates that half of the 511 water rate structures in this sample charge more than \$28.88 for water for 5,000 gallons/month, and half of 425 wastewater rate structures charge more than \$34.95 for wastewater. However, as shown in Table 5, larger utilities may be charging lower rates because they are able to spread their costs across a large customer base. The utilities in this study serve just over 7.3 million North Carolinians. If we assume that everyone in this sample pays “inside” rates only, the average North Carolinian in this sample would be paying a weighted average⁸ of \$25.19 for water, \$34.41 for wastewater or \$67.15 for combined water and wastewater for 5,000 gallons/month. These numbers represent a good estimate of average bills across the population of the state. The actual average bill for a North Carolinian for 5,000 gallons is likely to be higher, however, since a substantial portion of the citizens are paying “outside” rates that are greater than “inside” rates as shown in Figure 24. Furthermore, some citizens may be paying a portion of their water bill through irrigation rates, making it impossible to accurately estimate what the average North Carolinian actually pays for 5,000 gallons.

Annual Bills as a Percent of Household Income

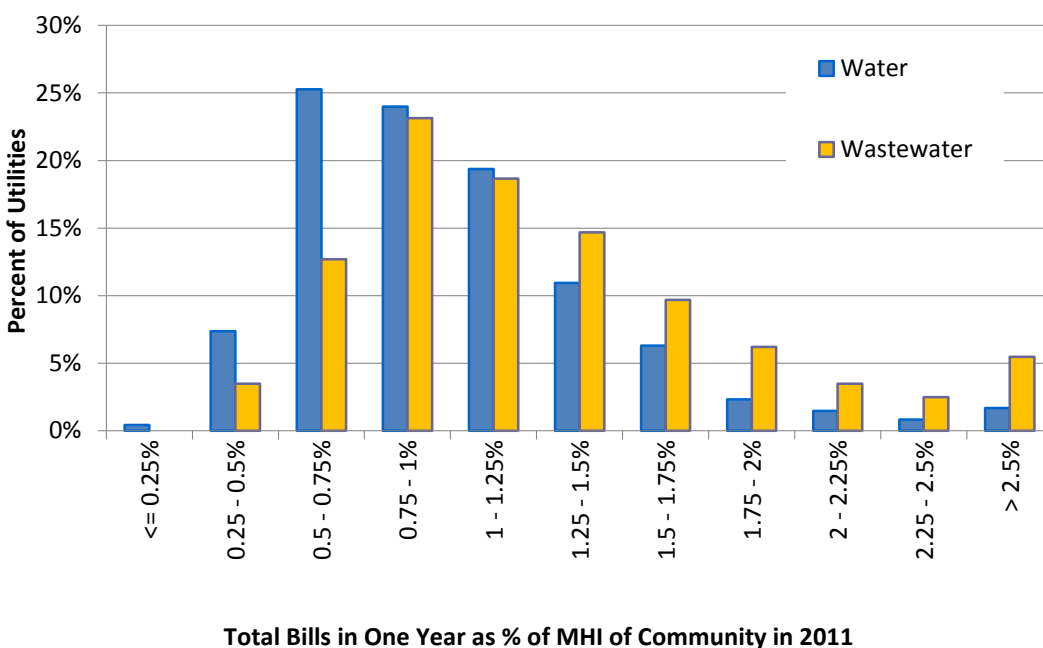
Is the weighted average bill of \$67.15 per month for combined water and wastewater for 5,000 gallons too high for most North Carolinians? Compared to monthly electric bills, gas bills, grocery bills, and even discretionary bills such as cable TV bills or high-speed internet bills, water and wastewater bills usually make up a smaller portion of a household budget. Nevertheless, because citizens may not have an alternative to the water service they are currently receiving, and water service is necessary for public health, the issue of affordability of water and wastewater rates remains vital.

Affordability is very difficult to assess, and there is no one true, accurate measure for affordability. The most commonly used and most cited measure in the water industry is “percent MHI” – that is, calculating what a year’s worth of water and wastewater bills for an average level of consumption (e.g.: 5,000 gallons/month) is compared to the median household income (MHI) in the community served by the utility. This indicator is easy to calculate by simply using the calculated bill amount and the U.S. Census Bureau’s median household income data from their latest 5-year American Community Survey estimates, available at <http://factfinder2.census.gov>. Each year, the US Census Bureau publishes a new estimate of MHI for each Census Place in the country.

Compared to the 2011 median household incomes of the communities served by the 475 water and 402 wastewater utilities in this survey, annual bills for 5,000 gallons/month range from 0.25% MHI to over 2.5% MHI for each service, as shown in Figure 26. The majority of water rates fall between 0.5% and 1.25% MHI, with a median of 0.93% MHI across all utilities. Wastewater rates are higher, with the majority of wastewater rates falling between 0.75% and 1.5% MHI, and a median of 1.12% MHI across the utilities. For combined water and wastewater bills at 5,000 gallons/month, half of the utilities charge more than 2.35% MHI.

⁸ The “weighted average bill” is the average bill being paid by customers, taking into account the different utility’s rates and service populations, assuming that all of the customers are paying their utility’s bill for 5,000 gallons/month.

Figure 26: Annual Bills for 5,000 gallons/month as a Percent of the Serviced Community's 2011-Adjusted Median Household Income (n=475 water, n=402 wastewater)



There is no single target for affordability, even in terms of percent MHI. Currently, 44 percent of utilities in North Carolina charge more than 2.5% MHI for combined water and wastewater at 5,000 gallons/month.

Do Prices Reflect the True Cost of Water Services in North Carolina?

Comparing rates across the State or among specific utilities is further complicated by the variation in the extent to which utilities charge the full cost of providing service. Rates that provide enough revenue to balance an annual budget do not necessarily provide enough revenue to cover long term capital and maintenance needs and many utilities charge much less than the full cost of service provision. Figure 27 shows rates from FY 2011-12 in terms of combined water and wastewater charges for customers using 5,000 gallons/month plotted against the ratio of operating revenue over operating expenses (including depreciation) from the same fiscal year. This measure, often referred to as an operating ratio, helps identify if an entity is operating at a financial loss, financial gain, or is breaking even. Financial data were provided by the Local Government Commission in the Department of the State Treasurer. The figure shows that many utilities are not covering their operating expenses, making it difficult or impossible to rehabilitate aging infrastructure, save for operating emergencies, finance system improvements and expansion, and engage in proactive asset management. It is interesting to note that the utilities that did not recover their operating expenses (operating at a financial loss) are not always charging low rates – even some utilities with high rates can be operating at a financial loss. Nevertheless, there are several utilities that charged low rates in FY 2011-12 (to the left of the graph), which resulted in operating at a financial loss (below the horizontal line on the graph) in that fiscal year.

Operating ratio as calculated here may be a flawed measure, however, due to the distorting effects of book value depreciation. Due to inflation, older plants’ assets that were purchased long ago have nominally cheaper prices than assets of plants that are newer. This makes older plants’ depreciation expense smaller in comparison to the depreciation of a newer plant with the same types of assets. In turn, this means that the operating ratio seems higher (better) for older plants than for newer plants, due to the effect of inflation. Despite this, the measure

maintains a level of intuitive power which makes it a useful tool for examining the ongoing capacity for the utility to bring in enough revenue to cover its operating costs. The performance of each utility on several financial indicators and benchmarks can be viewed in the NC Water and Wastewater Rates Dashboard at <http://www.efc.unc.edu/RatesDashboards/>

Figure 27: Combined Residential Bill in FY2011-12 for 5,000 gallons/month for Utilities with Reported LGC Data on Total Operating Revenues and Total Operating Expenses in FY2011-12 (n=320)



For advice on rate setting or more information on making appropriate rate comparisons, please contact Shadi Eskaf (eskaf@sog.unc.edu) at the Environmental Finance Center.

About this Report

This report is one of an annual series of reports on water and wastewater rates and rate structures in North Carolina, compiled by the North Carolina League of Municipalities (NCLM) and the Environmental Finance Center (EFC) at the UNC School of Government (SOG). For reports from previous years, including more in-depth analysis on the relationships between rates, rate structures, system characteristics and policies including cost-recovery, conservation, affordability, regionalization, economic development and growth management, please visit our websites at www.nclm.org and www.efc.unc.edu. You may also access the Rates Dashboards – free, interactive tools designed to allow you to compare rates across the State along with financial, affordability and socioeconomic indicators – at www.efc.unc.edu/RatesDashboards/. Each year in November, we request that local government and not-for-profit utilities submit a copy of their water and wastewater rate schedules.

Funding for this study was provided by the [U.S. Environmental Protection Agency](http://www.epa.gov).