

## Water and Wastewater Rates and Rate Structures in North Carolina

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*Click on any of the following questions:*

### Tools for Comparisons

- 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?

### Four Myths about Rates

- Myth #1: Higher rates are bad.
- Myth #2: Comparing rates is simple.
- Myth #3: Pricing is simple.
- Myth #4: Promoting conservation requires increasing block rate structures.

### Current Rate Structure Designs

- What are the utilities' base charges, and consumption allowances?
- 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?

### Rates Changes Over Time

- How often do utilities change their rates?
- How have residential rates changed in recent years?

### 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 to download guidelines for promoting conservation through rate structures.*

### Financial Sustainability

- Are utilities financially self-sufficient in North Carolina?

# Water and Wastewater Rates and Rate Structures in North Carolina

## March 2016

*This report details the results of a survey of January 2016 water, wastewater and residential irrigation rates and rate structures conducted by the North Carolina League of Municipalities and the Environmental Finance Center at the UNC School of Government. Rates and rate structures are analyzed for 418 local government, not-for-profit and multi-system for-profit utilities throughout the State of North Carolina. For more information, or to download tables of every rate structure and its computed bills, use the interactive NC Water and Wastewater Rates Dashboard designed to allow you to compare rates using multiple selection criteria, and to view rate sheets of individual utilities, please visit [www.nclm.org](http://www.nclm.org) or [www.efc.sog.unc.edu/project/north-carolina-water-and-wastewater-rates-and-rate-structures](http://www.efc.sog.unc.edu/project/north-carolina-water-and-wastewater-rates-and-rate-structures).*

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.

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## 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 \(NCLM\)](#) and the [Environmental Finance Center \(EFC\) at the UNC School of Government](#).

Over the course of this survey, 522 local-government owned, non-profit and multi-system for-profit water and wastewater utilities were contacted by email, phone, letter or fax, and 418 utilities (80%) responded by sending in their rate schedules. These utilities serve approximately 7.4 million North Carolinians and account for 95% of the population served by community water and wastewater systems in the state. Table 1 describes the utilities analyzed in this survey. 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 454.

**Table 1: Number of Participating Utilities with Rates Data for FY 2015-16**

<b>Institutional Arrangement</b>	<b>Provides Water and Wastewater</b>	<b>Provides Water Only</b>	<b>Provides Wastewater Only</b>	<b>Total</b>
<b>Municipality</b>	279	25	11	<b>315</b>
<b>County/District</b>	28	27	3	<b>58</b>
<b>Sanitary District</b>	6	6	2	<b>14</b>
<b>Authority</b>	5	2	1	<b>8</b>
<b>Metropolitan District</b>	0	0	2	<b>2</b>
<b>Not-For-Profit</b>	0	19	0	<b>19</b>
<b>For-Profit Multi-System Utility</b>	2	0	0	<b>2</b>
<b>Total Number of Utilities</b>	<b>320</b>	<b>79</b>	<b>19</b>	<b>418</b>
<i>Number of Rate Structures</i>	<i>332</i>	<i>95</i>	<i>27</i>	<i>454</i>

In addition to this report, **tables of each utility’s rates and key components of their rate structures** are available from NCLM and the EFC, as well as **copies of the rate structures of participating utilities**. Those resources are available at <http://www.efc.sog.unc.edu/project/north-carolina-water-and-wastewater-rates-and-rate-structures>, along with a free, interactive **NC Water and Wastewater Rates Dashboard** that combines a utility’s financial, physical, and customer characteristics with the capability of comparing rates among utilities that are similar in various categories.

## Four Myths about Pricing

There are many oversimplifications and bits of “conventional wisdom” in the world of water finance and pricing which don’t necessarily hold up upon deeper investigation. Some of the myths dispelled by the analysis in this report include:

- 1. MYTH: Higher rates are bad.** Higher rates often do not necessarily reflect poor or inefficient management. In fact, data show that some utilities with low rates do not generate sufficient revenue to properly maintain their system’s assets, which could ultimately lead to long-term adverse cost and service impacts. Pressure to maintain low rates has the potential to force utilities to run a deficit or avoid making necessary operational and capital expenditures. Some utilities may have low rates because they have not re-examined their rate structures in many years, and their pricing structure may not support key finance and policy goals such as promoting conservation or maintaining affordability.
- 2. MYTH: Comparing rates is simple.** An examination of rates and rate structures will only tell part of the story, and there are many different methods of comparing pricing. Ideally, rates should reflect the cost of providing service. Cost of service depends on diverse factors including geographic location, size of treatment facilities, customer base, age of assets, site-specific regulatory requirements, type of water supply, and quality of source water and 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 should also consider the many other factors listed above. Furthermore, figuring out the most pertinent factors to compare can be a challenge. For example, the EFC’s analysis revealed that in some cases, when comparing two utilities, one utility’s rate may be higher than the other utility’s rate for bills in the 0 to 4,000 gallon range, but lower at 5,000 to 10,000 gallon range, or vice versa. Comparing rates among utilities is really just a starting point for a more in-depth analysis.
- 3. MYTH: Pricing is simple.** North Carolina utilities employ a tremendous variety of pricing structures. Utilities show wide variation in how they set base charges and design block structures. Utilities have many design choices and should be thoughtful in customizing their rate structure to serve their specific needs, objectives and priorities as they evolve in time, rather than maintaining outdated rate structures or copying their neighbor’s rate structure.
- 4. MYTH: Promoting conservation requires increasing block rate structures.** Many utilities are facing water supply challenges and are looking for ways to use pricing structures to promote conservation. Many different types of pricing structures can be adopted to encourage conservation; some of these are quite complicated and some are very simple. Increasing block or increasing tier price structures are sometimes heralded as the solution to conservation rate setting. While increasing block rates are sometimes priced in a way to encourage conservation, the EFC’s analysis shows that some utilities with simpler rate structures (such as uniform rates) sent customers stronger conservation price signals than other utilities with increasing block structures. In fact, a significant minority of the utilities using increasing block rate structures had less effective conservation pricing signals than some utilities employing aggressive uniform rates. Rather than focusing on rate structures alone, utilities should consider all aspects of pricing. The rates set at each block are more important than having a block rate structure by itself. Above conservation, utilities must determine if their rates are set to truly reflect their costs, and make sure that rates are not artificially low.

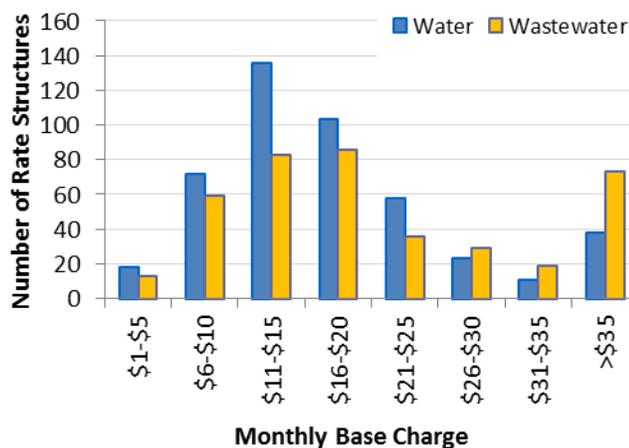
## Overview of Rates and Rate Structures

Utilities employ a variety 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 create affordability concerns and 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 median<sup>1</sup> residential base charges are presented in Table 2 by utility size. The median residential base charge applied by utilities in 2016 is \$15.00 per month for water and \$16.18 per month for wastewater. For combined utilities, the median combined water and wastewater base charge is \$31.00 per month.

**Figure 1: Monthly Base Charges for Residential Customers Among 425 Water and 350 Wastewater Rate Structures**



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

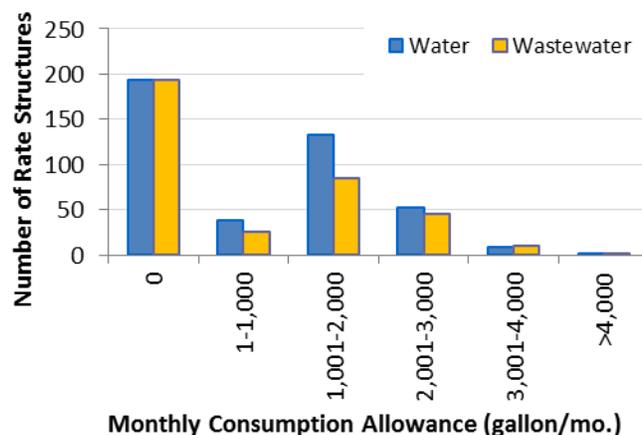
Size of Utility (Service Population)	Water Rate Structures			Wastewater Rate Structures		
	Total Number of Structures	Number with Base Charge	Median Base Charge	Total Number of Structures	Number with Base Charge	Median Base Charge
1 - 999	74	74	\$17.00	61	61	\$19.50
1,000 – 2,499	69	69	\$15.50	63	63	\$17.12
2,500 – 4,999	68	67	\$15.00	65	62	\$18.14
5,000 – 9,999	68	67	\$15.00	50	49	\$15.00
10,000 – 24,999	76	76	\$14.98	57	54	\$14.78
25,000+	70	70	\$11.38	60	58	\$11.75
<b>All Rate Structures</b>	<b>427</b>	<b>425</b>	<b>\$15.00</b>	<b>359</b>	<b>350</b>	<b>\$16.18</b>

While nearly every rate structure (>99% of water and 97% 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.

<sup>1</sup> 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.

A large number of residential rate structures (55% of water and 48% 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% of water and 3% 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 427 Water and 359 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 427 water rate structures applied to commercial and non-residential customers, 102 (24%) vary the base charge by meter size. Similarly, of the 359 wastewater rate structures for commercial customers, 79 (22%) 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 \$61.47 per month for water a 2” meter and up to \$183.18 for a 4” meter.

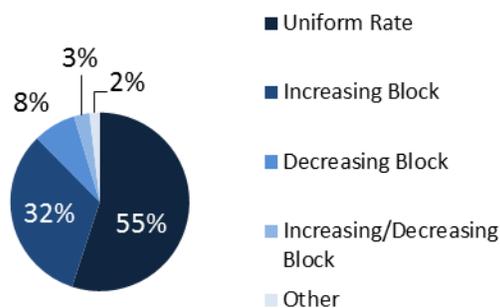
**Table 3: Maximum Monthly Base Charge Applied to Commercial Customers by Utilities Whose Base Charges Vary by Meter Size**

	Percentage of Meter-Based Commercial Rate Structures					
	10%	25%	50%	75%	90%	100%
<i>Water (n = 102)</i>						
5/8"	\$5.79	\$9.04	\$12.95	\$17.19	\$23.00	\$42.00
3/4"	\$5.79	\$9.50	\$12.95	\$18.00	\$23.79	\$42.00
1"	\$10.00	\$14.84	\$20.62	\$33.00	\$46.85	\$90.00
1 1/2"	\$14.14	\$19.63	\$35.78	\$56.18	\$89.94	\$130.00
2"	\$18.11	\$31.36	\$61.47	\$96.29	\$163.75	\$404.03
3"	\$30.00	\$56.01	\$111.83	\$191.93	\$312.07	\$806.30
4"	\$40.18	\$80.27	\$183.18	\$302.40	\$484.23	\$1,449.64
6"	\$47.10	\$113.51	\$289.00	\$570.00	\$811.86	\$3,187.50
8"	\$47.10	\$134.37	\$359.69	\$701.41	\$1,235.99	\$3,187.50
10"	\$48.80	\$152.65	\$446.55	\$793.96	\$1,311.70	\$3,187.50
<i>Wastewater (n = 79)</i>						
5/8"	\$4.42	\$9.12	\$13.18	\$20.65	\$28.50	\$52.26
3/4"	\$4.63	\$9.32	\$13.59	\$21.13	\$28.50	\$52.26
1"	\$7.00	\$15.97	\$23.42	\$36.62	\$58.78	\$130.65
1 1/2"	\$10.90	\$23.58	\$40.18	\$67.08	\$112.81	\$261.30
2"	\$16.97	\$33.45	\$67.23	\$116.70	\$187.41	\$418.08
3"	\$29.54	\$59.40	\$112.50	\$217.63	\$375.36	\$783.90
4"	\$49.97	\$81.75	\$174.83	\$365.88	\$585.01	\$1,726.82
6"	\$70.65	\$115.85	\$347.25	\$671.75	\$1,211.23	\$3,065.03
8"	\$84.06	\$161.42	\$485.82	\$947.75	\$1,349.69	\$3,065.03
10"	\$84.06	\$164.67	\$537.85	\$1,012.86	\$1,733.68	\$3,097.62

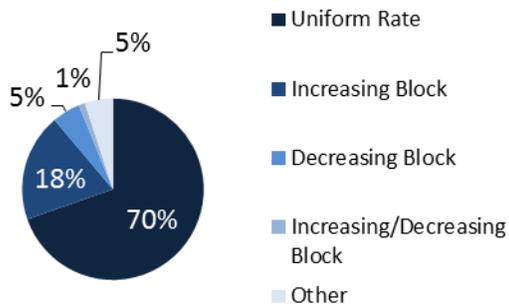
Variable Charges: Uniform, Increasing Block, Decreasing Block, and Other Rate Structures

Figure 3 through 6 present information on water and wastewater rate structures for “inside” customers, i.e. 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 wastewater 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 = 427)**

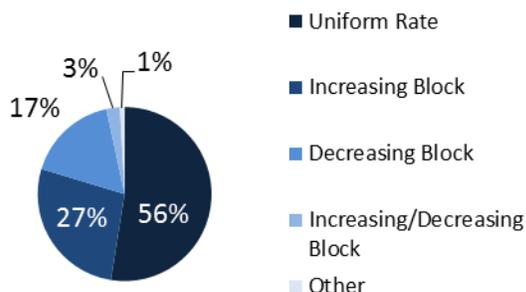


**Figure 4: Residential Wastewater Rate Structures (n = 359)**

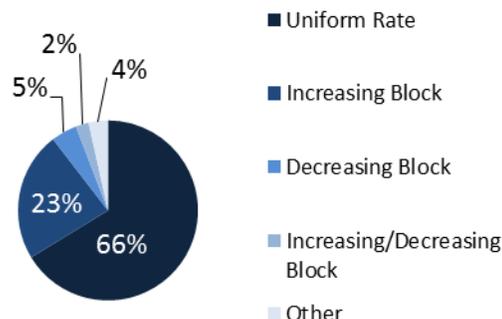


Most water and wastewater utilities use the same rate structure for residential, commercial, and industrial customers, but some have separate rate structures. In this survey, 28% of water utilities have a separate rate structure for their commercial customers, and a fraction of these utilities also has a separate structure that pertains to their industrial customers. On the wastewater side, 24% 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. More details on commercial rates are available on page 17.

**Figure 5: Commercial-Specific Water Rate Structures (n=118)**

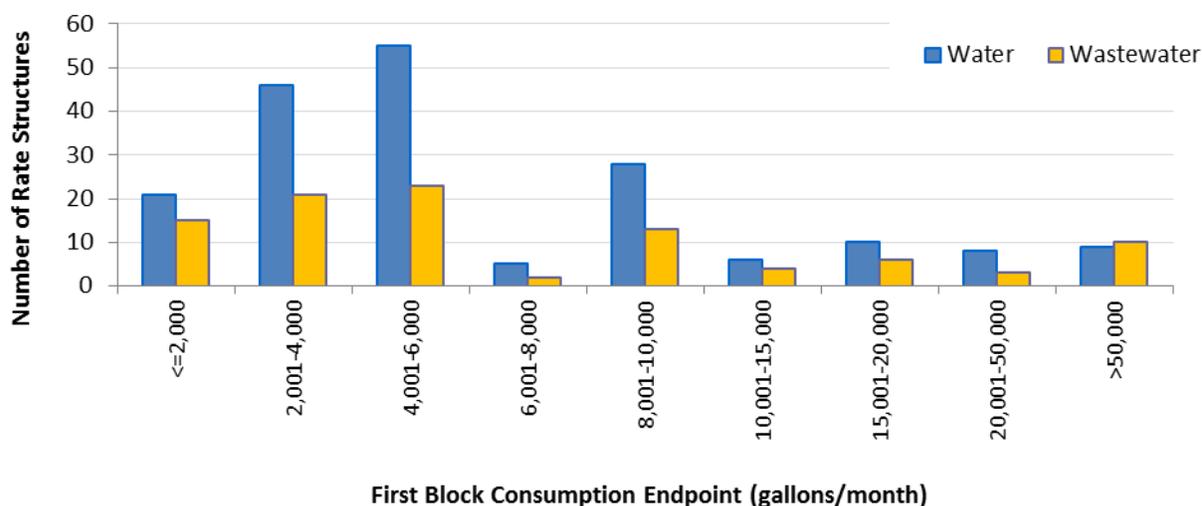


**Figure 6: Commercial-Specific Wastewater Rate Structures (n=86)**



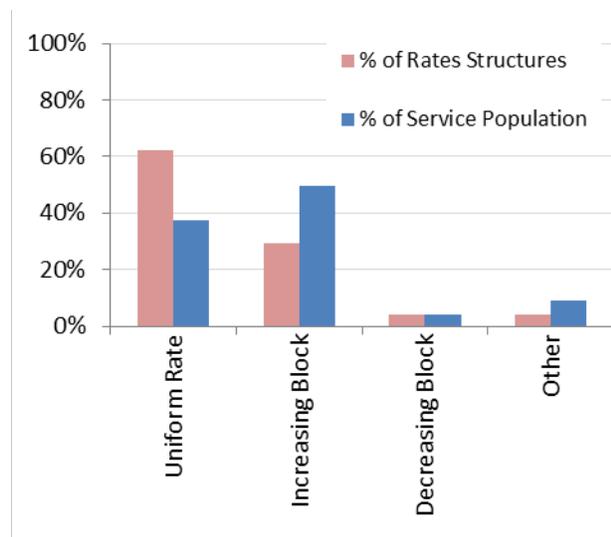
While some utilities design separate rate structures for commercial users, other utilities use only one rate structure but design the blocks so that they inherently distinguish residential use from that of large commercial customers. A common practice is to set the first block high enough so that essentially 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 188 Water and 97 Wastewater Residential Block Rate Structures**

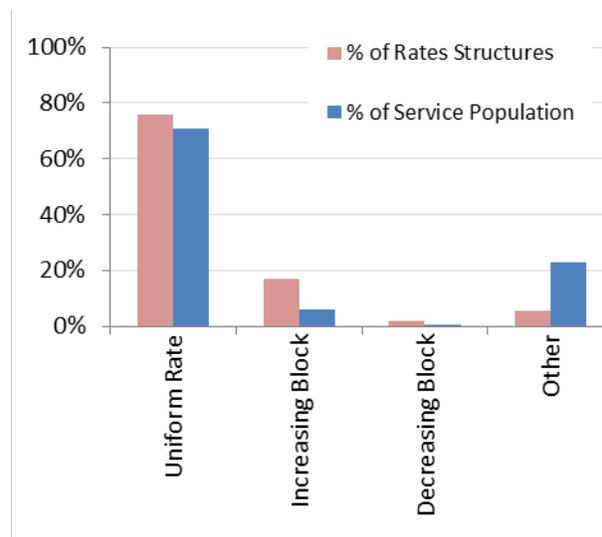


An examination of rate structures over the range of typical residential consumption reveals that many increasing and decreasing block structures are effectively uniform below 15,000 gallons/month (shown in Figure 8 and Figure 9). For example, whereas 8% of residential water rate structures are decreasing block structures (Figure 3), only 4% actually apply decreasing rates within the first 15,000 gallons/month of consumption (Figure 8) – the other 4% 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 30% of the water rate structures are increasing block structures through 15,000 gallons/month, 50% 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=427)**



**Figure 9: Wastewater Rate Structures Applicable to Residential Disposal up to 15,000 gallons/month (n=359)**



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:

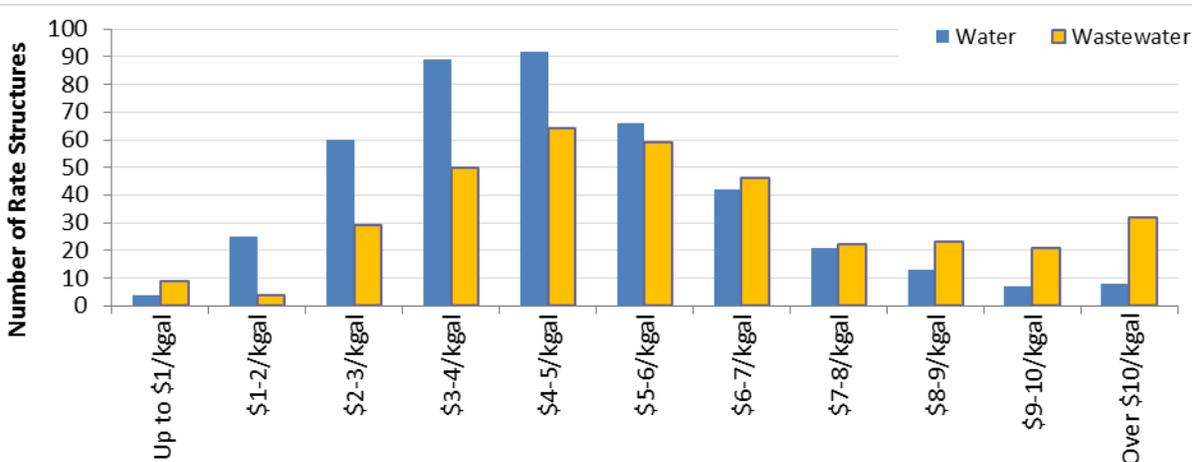
“To be eligible for State water infrastructure funds from the Drinking Water State Revolving Fund or the Drinking Water Reserve or any other grant or loan of funds allocated by the General Assembly whether the allocation of funds is to a State agency or to a nonprofit organization for the purpose of 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, 4% 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 427 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 \$4.50 per 1,000 gallons – 50% of the water rate structures have a price that is between \$3.22 and \$6.00 per 1,000 gallons. Changes in rate structures since last year are shown on page 8, and changes in rates are shown on page 13.

The price for wastewater is higher. Among the 359 wastewater rate structures in the sample, the median wastewater price for the next 1,000 gallons at 5,000 gallons/month is \$5.47 per 1,000 gallons – 50% of the wastewater rate structures have a price that is between \$4.00 and \$7.35 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. Among the 332 combined water and wastewater rate structures, the median combined price for the next 1,000 gallons is \$9.74 per 1,000 gallons – 50% of the combined rate structures have a price that is between \$7.54 and \$13.10 per 1,000 gallons.

**Figure 10: Price for the Next 1,000 Gallons at 5,000 gallons/month for 427 Water and 359 Wastewater Rate Structures**

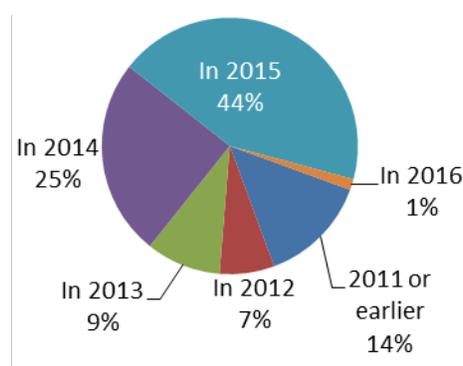


Many utilities provide the option to residential customers to install separate irrigation meters to supply their outdoor water usage. In some cases, the utilities have created a separate, unique rate structure specifically for these irrigation meters. In our sample of 426 water rate structures, only 73 (17%) had a unique rate structure for residential irrigation meters. Almost all, 72 out of 73, use a uniform or an increasing block rate structure. Read more about irrigation rates, and how they compare to standard rates, on page 18.

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 the 434 rate structures active as of January 2016 were first put into effect is shown in Figure 11. The figure shows that 45% of the current rate structures were made effective since January 2015, and 70% have changed their rates in the last two years. Only approximately 14% of the rate structures were instated in 2011 or earlier (at least five years ago).

**Figure 11: In What Calendar Year Were the Current Rate Structures First Instated? (n=434)**



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 418 water rate structures and 350 wastewater rate structures that were also included in the 2015 survey. Out of the 418 water rate structures included in last year’s rates survey, 11 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, 3 decreasing block rate structures were changed in the last year, and 5 increasing block structure was gained. Only 6 wastewater rate structures were changed between 2015 and 2016, out of the 350 surveyed in both years. An analysis of how much rates have increased in the past year is shown on page 13.

**Table 4: Changes to Water Rate Structures from January 2015 to January 2016**

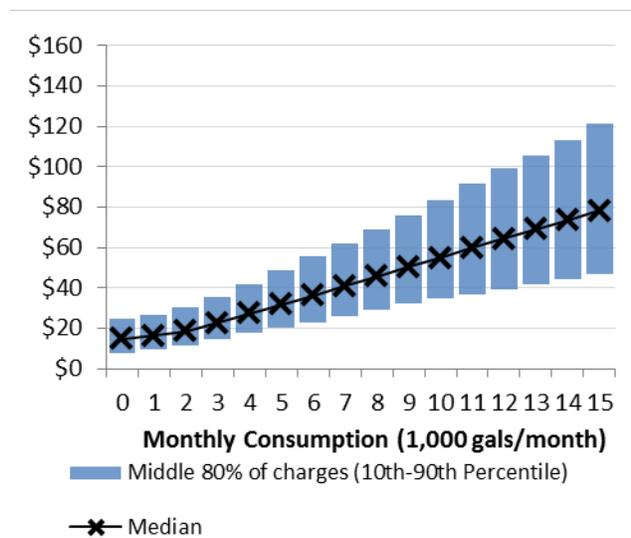
Changed From	Changed To				
		Increasing Block	Uniform Rate	Decreasing Block	Other
	<b>TOTAL</b>	<b>5</b>	<b>4</b>	<b>2</b>	<b>0</b>
Increasing Block	1		1	0	0
Uniform Rate	6	5		1	0
Decreasing Block	3	0	3		0
Other	1	0	0	1	

### What Utilities Charge their Customers

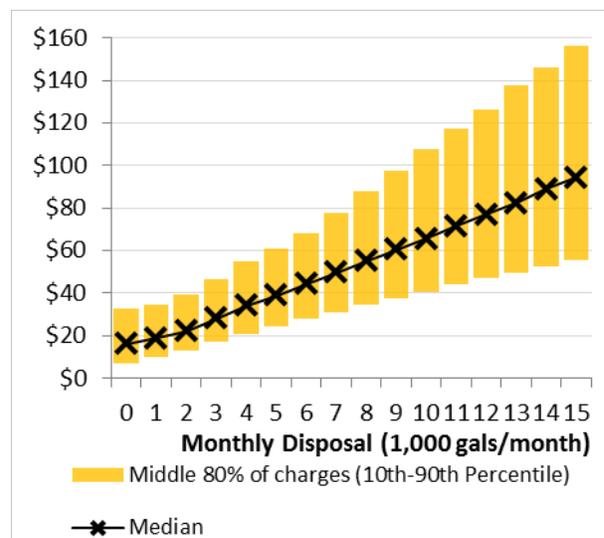
#### Residential Water and Wastewater Bills

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 basis<sup>2</sup>. These calculations include base charges and consumption allowances. The colored bars highlight what the middle 80% of utilities charge (between the 10<sup>th</sup> and 90<sup>th</sup> percentile) across the consumption spectrum.

**Figure 12: Monthly-Equivalent Residential Water Bills by Consumption (n=427)**



**Figure 13: Monthly-Equivalent Residential Wastewater Bills by Disposal (n=359)**

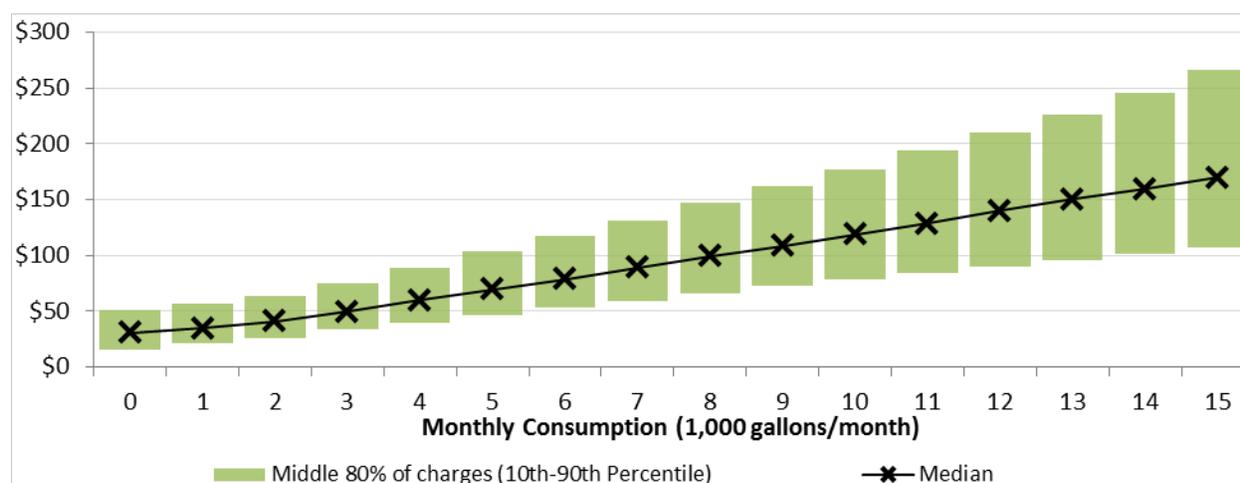


<sup>2</sup> For utilities that bill on a non-monthly basis (bi-monthly or quarterly), charges have been calculated and presented on a monthly basis to allow for accurate comparison.

The median monthly amount charged for zero gallons of water is \$15.00, \$31.80 for 5,000 gallons and \$55.00 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 \$0.0064 per gallon, or 157 times cheaper. Wastewater bills are generally higher than water bills. The median monthly wastewater bill for customers disposing zero gallons is \$16.00, \$38.88 for 5,000 gallons and \$65.60 for 10,000 gallons.

The range of combined water and wastewater bills for various usage levels is shown on Figure 14. The median monthly combined bill for zero gallons is \$30.49, \$69.42 for 5,000 gallons and \$118.84 for 10,000 gallons.

**Figure 14: Monthly-Equivalent Residential Combined Water and Wastewater Bills by Consumption (n=332)**



#### **By System Size and Type of Ownership**

Table 5 shows that water and wastewater bills are generally higher among the smallest 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	74	\$34.38	61	\$40.59
1,000 – 2,499	69	\$35.00	63	\$39.49
2,500 – 4,999	68	\$31.23	65	\$37.90
5,000 – 9,999	68	\$29.20	50	\$39.91
10,000 – 24,999	76	\$31.24	57	\$36.42
25,000+	70	\$29.94	60	\$38.01
<b>All Rate Structures</b>	<b>427</b>	<b>\$31.80</b>	<b>359</b>	<b>\$38.88</b>

**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	312	\$29.98	297	\$38.33
County/District	71	\$41.30	40	\$44.60
Sanitary District	13	\$39.00	8	\$41.00
Authority/Metropolitan District	8	\$36.83	7	\$44.40
Not-For-Profit	19	\$33.20	0	--
For Profit	4	\$36.64	5	\$62.81
<b>All Rate Structures</b>	<b>427</b>	<b>\$31.80</b>	<b>359</b>	<b>\$38.88</b>

**By Water Source Type**

Table 7 shows the median water charge for 5,000 gallons/month based on the water supply source. The water rates set by purchase water systems (those that buy at least a portion of their water from another water system), are, on average, higher than those of groundwater or surface water systems. Purchase water systems must account for their own operational costs in addition to the costs of the supplier treating the water. Water systems treating their own water face costs that are dependent on the source of water. Generally, treating surface water is more expensive than treating groundwater. In North Carolina, water rates for water systems that withdraw surface water are higher at the median than water rates for water systems withdrawing groundwater, but this could be due to the fact that surface water systems in North Carolina tend to be much larger than groundwater systems.

**Table 7: Median Charge for 5,000 gallons/month for Water Systems Based on Type of Water Supply**

Water Source Type	Number of Water Rate Structures	Median 5,000 gallons/month Monthly Bill
Groundwater	136	\$31.80
Surface Water	118	\$28.20
Purchase*	168	\$35.97
<b>All Rate Structures</b>	<b>422</b>	<b>\$32.33</b>

\* "Purchase" water systems are those that buy at least a portion of their water from another water system, which could be either surface water or groundwater.

**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 Figure 15.

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 Lumber river basin. The highest median wastewater charges can be found in the Tar-Pamlico 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.

**Figure 15: Median Water and Wastewater Monthly Bills at 5,000 gallons/month, by River Basin**



Changes in Residential Rates Over Time

Out of the 418 water and 350 wastewater rate structures included in last year’s rates survey, residential rates were increased from last year for 43% of the water rate structures and 45% of wastewater rate structures, as shown in Figure 16.

**Figure 16: Percent of Rate Structures that Increased Residential Rates in the Last Year**

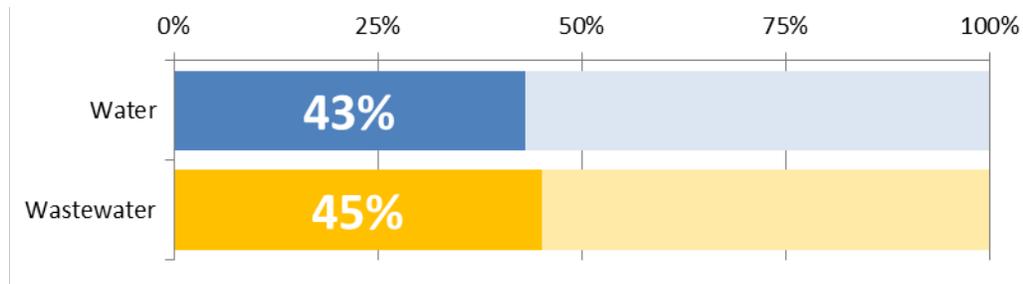
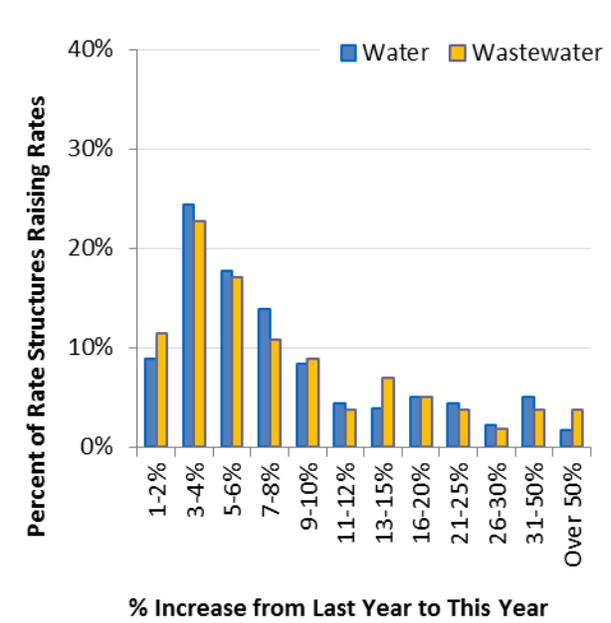
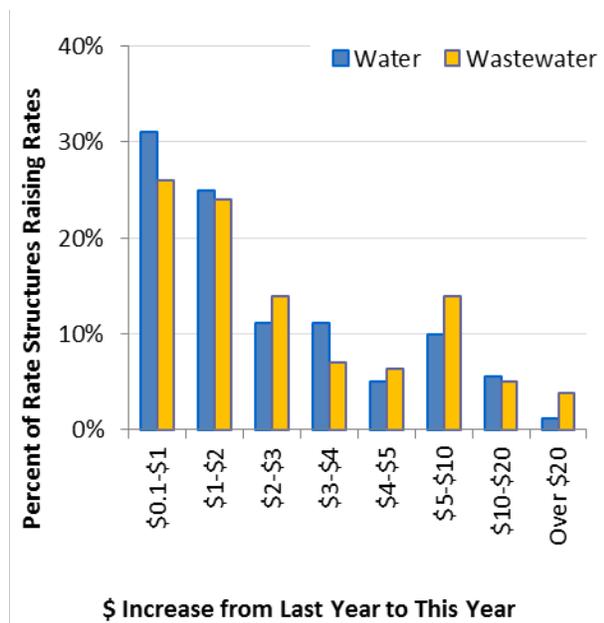


Figure 17 and Figure 18 show the residential monthly bill increase for customers that use 5,000 gallons/month among the 180 water and 158 wastewater rate structures that have raised rates in the last year. The median increase was \$1.50/month for water (a 5.0% increase) and \$1.59/month for wastewater (a 5.0% increase).

**Figure 17: Increase in Residential Monthly Bill Amount Since Last Year for 5,000 gallons/month among 180 Water and 158 Wastewater Rate Structures that Raised Rates**

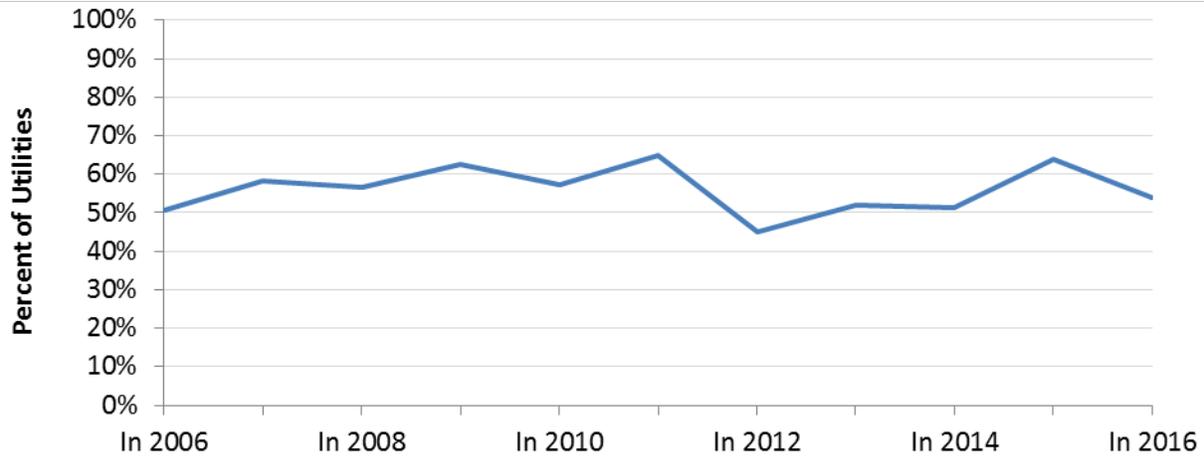
**Figure 18: Percent Increase in Residential Monthly Bills Since Last Year for 5,000 gallons/month among 180 Water and 158 Wastewater Rate Structures that Raised Rates**



Among 185 North Carolina water utilities that provided rates data every single year since 2006, usually more than half raised rates from one year to the next, as shown in Figure 19. Between 2008 and 2011, a larger proportion of the utilities raised rates, possibly in reaction to reduced water demands from customers during and after a significant drought that affected the majority of the state in 2007-2008. As water customers cut demand,

utilities were forced to raise rates in order to balance their budgets since declining demands do not reduce utilities' expenses at the same rate.

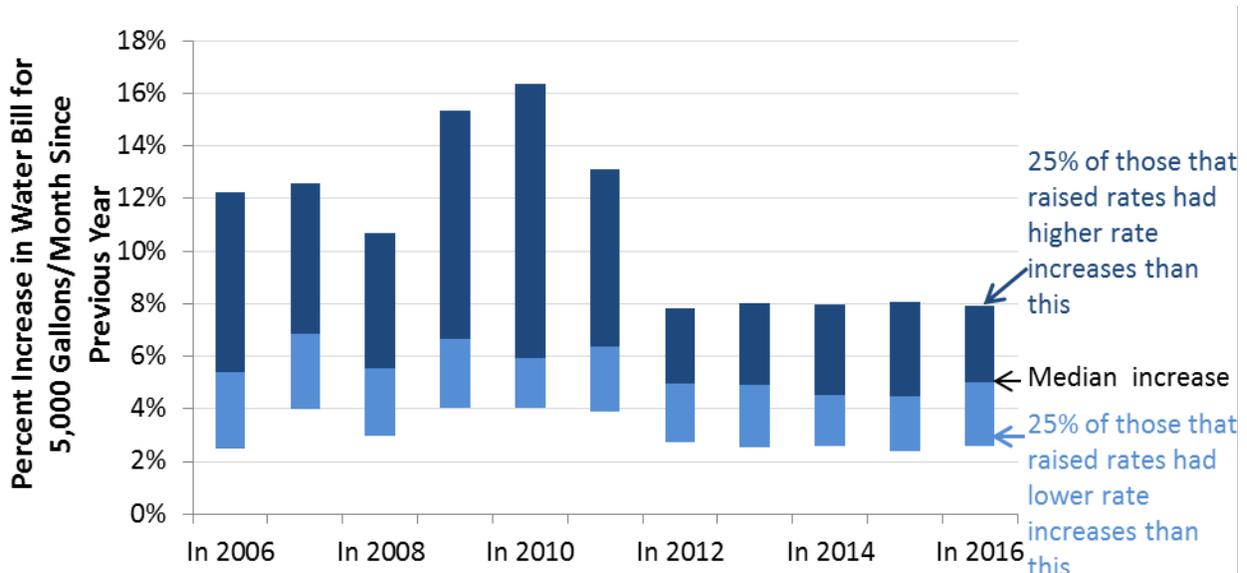
**Figure 19: Utilities Changing Water Rates among the Same 185 Utilities**



The cohort of utilities is consistent across all years.

The effects of declining demands during and after the drought are also evident in the magnitude of the rate increases adopted by these 185 water utilities, as shown in Figure 20. The median rate increases implemented prior to 2012 was around 6-7%, and a quarter of the utilities that raised rates had rate increases greater than 15% in 2009 and 2010. By comparison, since 2012, fewer utilities raised rates (as shown in Figure 19), and rate increases for water were more consistent and typically ranged between 2.5% and 8%. The median rate increase was also consistent among these 185 utilities since 2012, at around 4.5-5%/year.

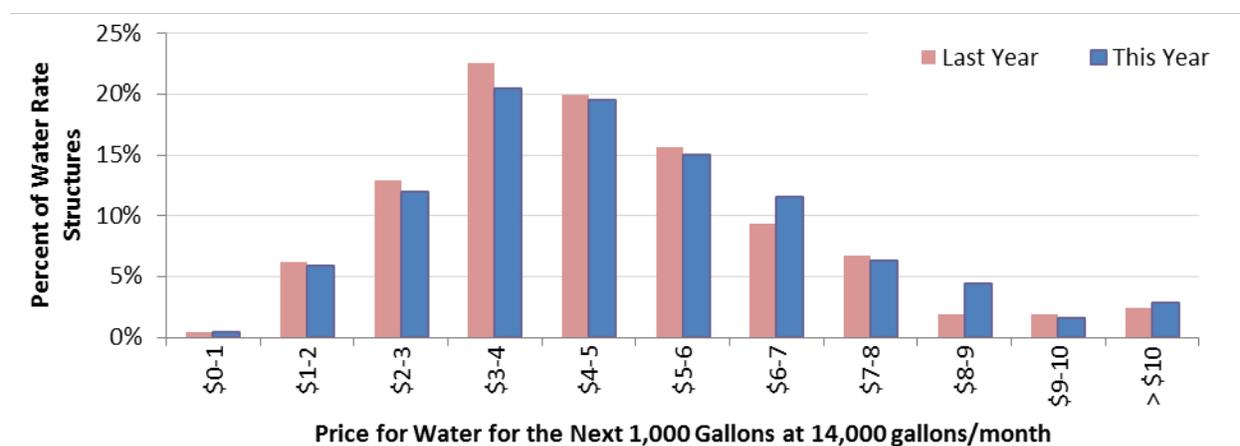
**Figure 20: Increases to the Water Bill for 5,000 Gallons/Month by Utilities that Raised Rates from the Same 185 Utilities**



The cohort of utilities is consistent across all years. Only utilities that raised rates are analyzed in each year.

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 418 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 197 rate structures (47%). The distribution of the prices for water for the next 1,000 gallons at that consumption level is shown in Figure 21. Utilities generally have shifted their high use water rates upwards. In particular, the proportion of utilities charging between \$3-4/kgal declined several percentage points over the last year, while the proportion charging between \$6-7/kgal increased several percentage points from last year.

**Figure 21: Price for Water for the Next 1,000 Gallons at 14,000 gallons/month in 418 Water Rate Structures in 2015 and 427 Water Rate Structures in FY2016**



For households that use an average amount of water, the price per thousand gallons at the 5,000 gallon point is a good indicator of the relative size of the pricing signal they encounter. Among the 427 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 \$4.50 per 1,000 gallons. Figure 22 shows the significant variation in this signal across the state, with some utilities charging more than \$10 per 1,000 gallons and others charging as little as \$1 per 1,000 gallons. Wastewater systems tend to be more expensive than water systems between 5,000 and 6,000 gallons/ month, with a median of \$5.47 per 1,000 gallons for the 359 wastewater structures in the sample. If a utility feels the need to increase conservation signaling, increasing the marginal price at 5,000 gallons/month rather than at 14,000 gallons/month is an effective method to encourage all customers to cut back, rather than just heavy users.

**Figure 22: Marginal Price Change for Water and Wastewater at 5,000 gallons/month for 427 Water Utilities and 359 Wastewater Utilities**

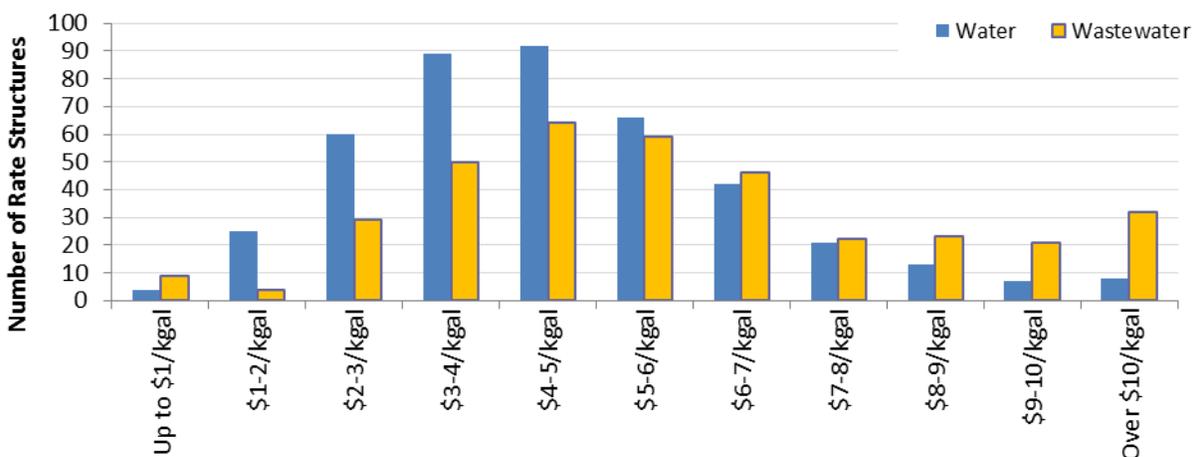
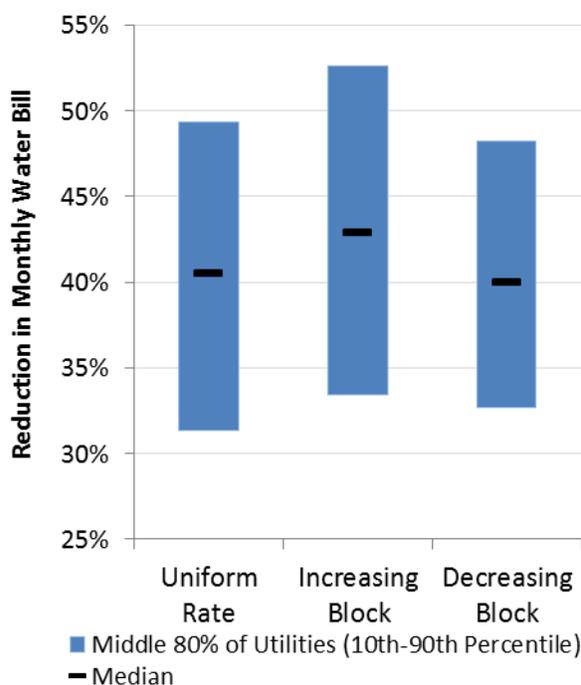


Figure 23 shows pricing signal in another format: the financial reward that a customer receives in terms of a reduction in their water bill when they halve their monthly water use from 10,000 gallons (well above average in North Carolina) to 5,000 gallons (near the average in North Carolina). The reduction in the monthly water bill acts as a price incentive to encourage conservation for heavy users, and is measured both in terms of absolute bill savings and as a percentage of bill reduction. Figure 23 shows that there are some utilities that reward customers substantially in terms of bill reduction percentage for cutting back, whereas other utilities provide relatively little incentive. Interestingly, while some increasing block rate structures clearly send very high conservation pricing signals, there are many increasing block rate structures that send a weaker pricing signal than some uniform rate structures. Put another way, a utility with a uniform rate structure that charges a high price for water, say \$7.00 per thousand gallons, sends a significantly higher pricing signal than a utility that charges \$3.00 per thousand gallons even if the utility has an increasing block rate structure. It is possible to design a simple, uniform rate structure to incentivize water conservation as well as, or sometimes better than, many increasing block rate structures currently in use.

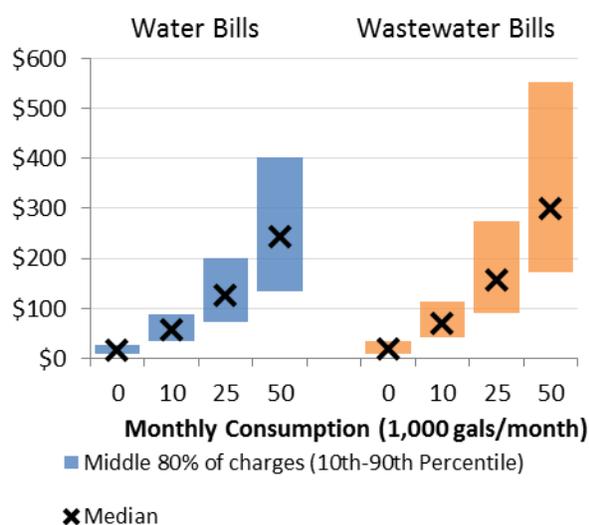
**Figure 23: Reduction in Monthly Water Bill from 10,000 gallons/month to 5,000 gallons/month**



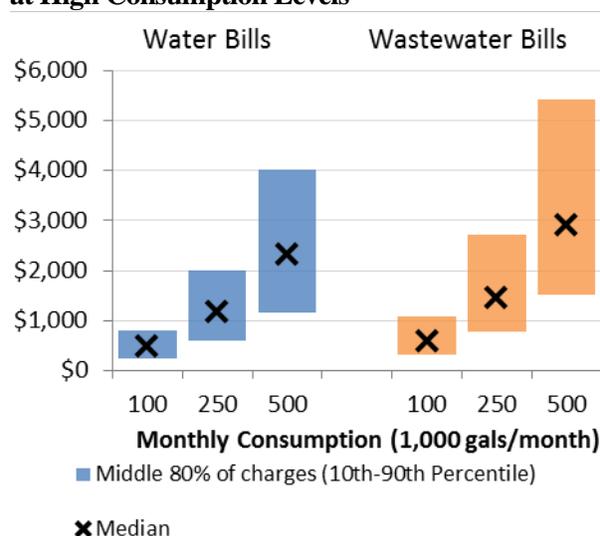
Commercial Water and Wastewater Bills

Figure 24 and Figure 25 show the median monthly water and wastewater bills, respectively, for commercial customers at different levels of disposal<sup>3</sup>. The middle 80% of charges also are indicated. The median monthly bill for commercial customers consuming zero gallons (on a 3/4” meter<sup>4</sup>) is \$15.15 for water and \$16.55 for wastewater. The median monthly bill for 50,000 gallons/month is \$243.44 for water and \$299.75 for wastewater. The median bill for those consuming 500,000 gallons/month (on a 1½” or 2” meter) is \$2,325.88 for water and \$2,898.75 for wastewater. The variation in commercial bills across rate structures increases significantly as the consumption/disposal amount increases.

**Figure 24: Monthly-Equivalent Commercial Water (n=427) and Commercial Wastewater Bills (n=359) at Low Consumption Levels**



**Figure 25: Monthly-Equivalent Commercial Water (n=427) and Commercial Wastewater Bills (n=359) at High Consumption Levels**



<sup>3</sup> 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.

<sup>4</sup> 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

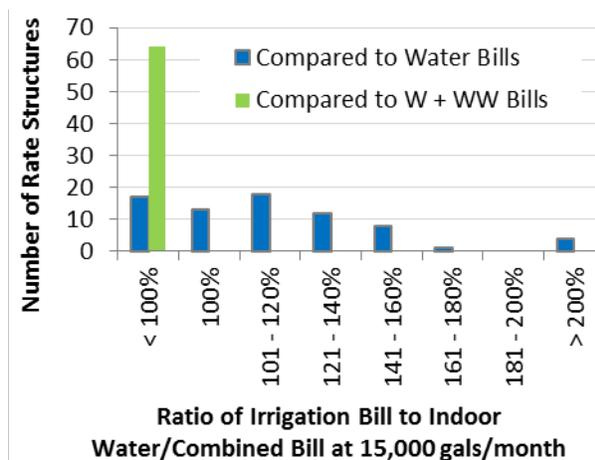
Residential customers that water their lawns, wash their cars, or otherwise use water outdoors frequently use much more water outdoors than they do indoors. An EFC study of customers in five cities in North Carolina shows that residents with irrigation meters tend to use, on average, two to seven times as much water outdoors in the summer months as they do indoors<sup>5</sup>.

With such large volumes of water used outdoors, particularly in the summer months, and with G.S. 143.355.4 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, 73 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 26. 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 43 out of the 73 rate structures (59%). However, 17 of the irrigation rate structures actually provide a price *discount* to customers for their outdoor water usage, which essentially discourages water conservation.

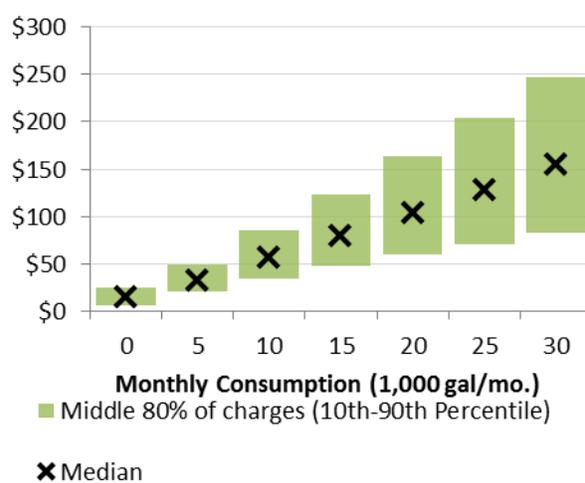
As shown in Figure 26, all of the irrigation rate structures provide residential customers with a price break compared to the combined water and wastewater charge for 15,000 gallons/month. This is logical, since outdoor water usually does not enter the sewer system after use, and therefore the utility 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 427 rate structures in our sample are shown in Figure 27 for a consumption range that is typical of residential irrigation usage.

**Figure 26: Comparing the Irrigation Bill to the (Indoor) Water and Wastewater Bills for Residential Customers at 15,000 gallons/month among the 73 Unique Irrigation Rate Structures**



**Figure 27: Monthly-Equivalent Bills for Irrigation Water Use by Residents, Including Irrigation Rates, by Consumption (n=427)**

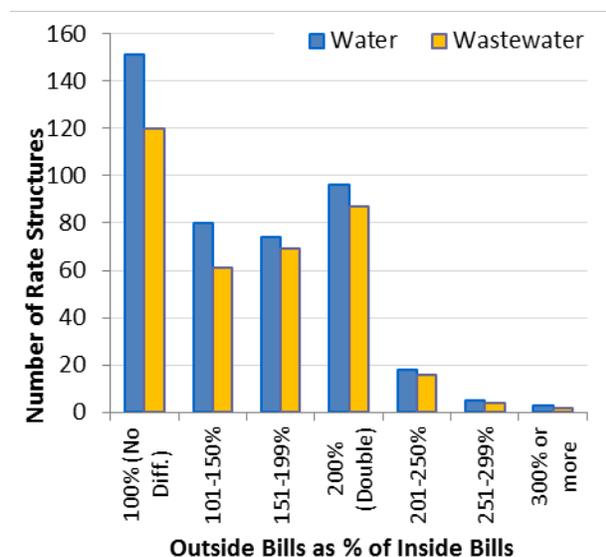


<sup>5</sup> Tiger, M.W., Eskaf, S. & Hughes, J. (2011) "Implications of Residential Irrigation Metering for Customers' Expenditures and Demand." *JAWWA*, 103:12, 30-41.

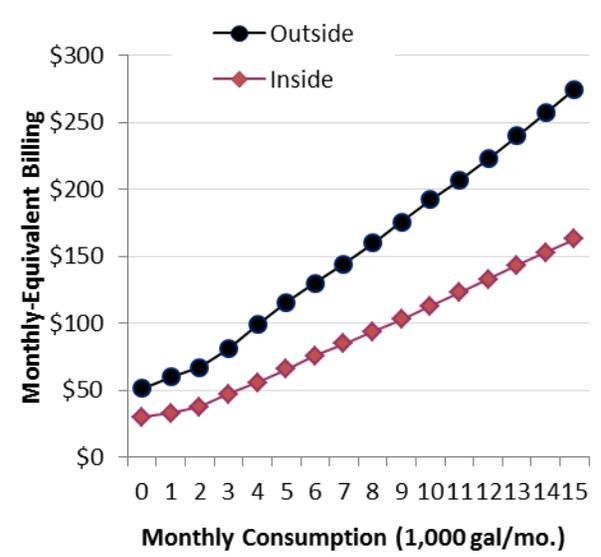
### What Utilities Charge Outside their Political Boundaries (i.e. “Outside Rates”)

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, 65% of water rate structures and 67% of wastewater rate structures specified different rates for customers living outside, and the vast majority were for municipal utilities. In fact, 85% 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 1.92 times more than inside customers. For wastewater, the median ratio is 1.94. Most utilities with different outside rates charged less than double the inside charges, as shown in Figure 28. Figure 29 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 \$75.60 compared to \$129.72 for outside customers.

**Figure 28: Ratio of Outside Residential Bills to Inside Bills at 5,000 gallons/month (n=427 water, n=359 wastewater)**



**Figure 29: Median Combined Residential Water and Wastewater Bills for Rate Structures with Different Inside/Outside Rates (n=228)**



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 unit<sup>6</sup>.

<sup>6</sup> AWWA (2012). *Principles of Water Rates, Fees, and Charges*. Manual of Water Supply Practices: M1. 6<sup>th</sup> 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 \$31.80 for water and \$38.88 for wastewater, using “inside” residential rates. This indicates that half of the 427 water rate structures in this sample charge more than \$31.80 for water for 5,000 gallons/month, and half of 359 wastewater rate structures charge more than \$38.88 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 about 7.4 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 average<sup>7</sup> of \$27.85 for water, \$37.90 for wastewater or \$74.27 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 28. 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 \$74.27 per month for combined water and wastewater for 5,000 gallons too high for most North Carolinians? Compared to monthly electric 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://factfinder.census.gov>. Each year, the US Census Bureau publishes a new estimate of MHI for each Census Place in the country.

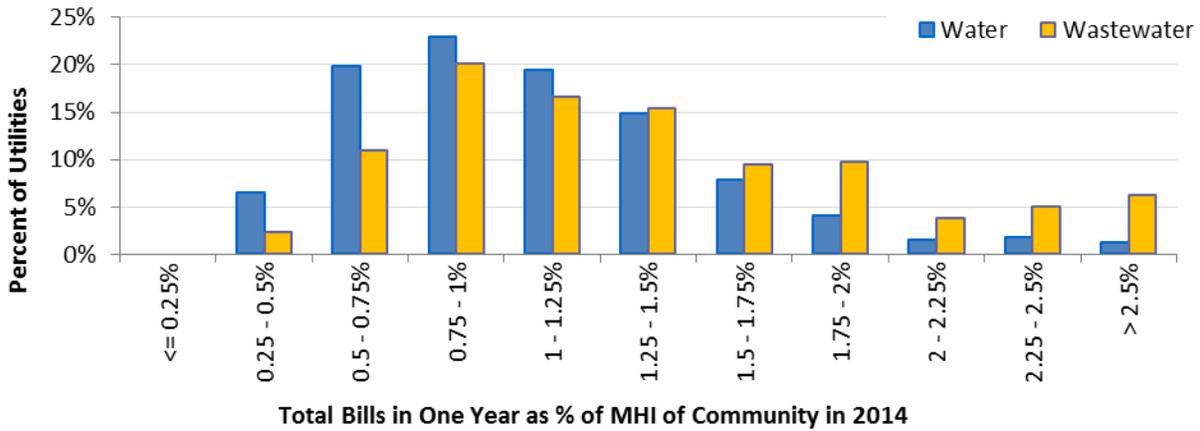
Compared to the 2014 median household incomes of the communities served by the 397 water and 337 wastewater utilities in this survey, annual bills for 5,000 gallons/month range from 0.3% MHI to over 5.6% MHI for each service, as shown in Figure 30. The majority of water rates fall between 0.5% and 1.25% MHI, with a median of 1.01% 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 1.25% MHI across the utilities. For combined water and wastewater bills at 5,000 gallons/month, half of the utilities charge more than 2.65% MHI.

There is no single target for affordability, even in terms of percent MHI. Currently, 54% of utilities in North Carolina charge more than 2.5% MHI for combined water and wastewater at 5,000 gallons/month.

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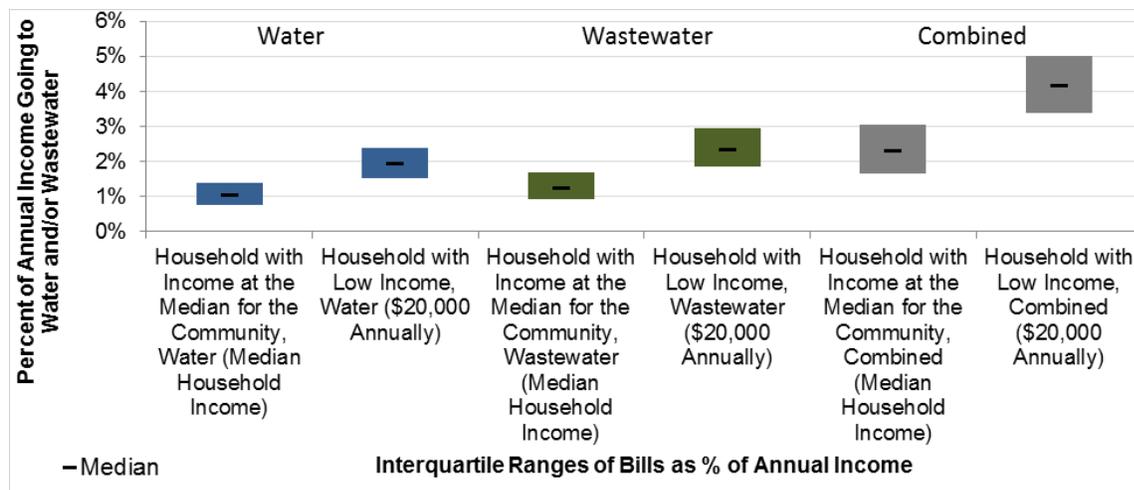
<sup>7</sup> The “weighted average bill” is the average bill being paid by customers, taking into account the different utility’s rates and service populations, assuming that all of the customers are paying their utility’s bill for 5,000 gallons/month.

**Figure 30: Annual Bills for 5,000 gallons/month as a Percent of the Serviced Community's 2014 Median Household Income (n=397 water, n=337 wastewater)**



The left-hand bars for each utility type (denoted by color) in Figure 31 show the interquartile range (25<sup>th</sup>-75<sup>th</sup> percentile) of water, wastewater, and combined system bills as a percent of MHI, using 5,000 gallons/month. This metric has numerous shortcomings, but it does show the variation in financial impact across the state. In a quarter of the utilities, customers making the median household income in their communities would spend less than 0.74% of their income annually for 5,000 gallons/month of water, whereas in another quarter of the utilities, those median household income customers would spend more than 1.40% of their income. Figure 31 also shows what percentage of income a household that makes \$20,000 per year (near poverty threshold) would pay for the same volume of water, in the right-hand columns. Not surprisingly, the bills amount to greater percentages of this low household income level. This method of showing how two affordability metrics compare across the state shows that while there are some utilities that have customers at the median income paying relatively little, these communities still have prices that place a greater burden on lower income customers. Figure 31 displays financial impacts for customers that use relatively low amount of water. Larger low-income families, or families that live in substandard housing stock with older appliances that are less water efficient, may end up paying an even higher percentage of their income for essential water service.

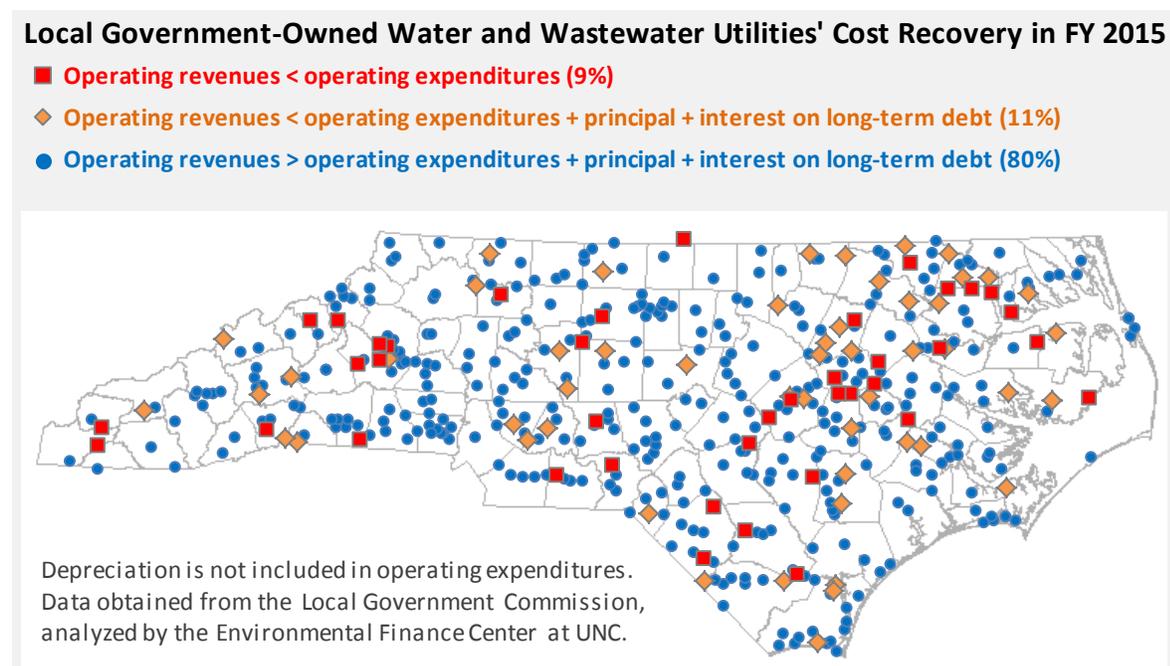
**Figure 31: Percent of Annual Income spent on Water and/ or Wastewater for Median Income Households and Low Income Households, for 417 Water Utilities and 349 Wastewater Utilities**



## 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. In FY2014-2015, 20% of local government water and/or wastewater utilities in North Carolina did not generate enough revenue during the year to pay for their day-to-day operations and maintenance expenses and debt service, let alone enough funds to pay for future capital expenses. While these utilities are geographically dispersed, as shown in Figure 32, all were utilities that serve fewer than 10,000 accounts, and 62% serve fewer than 1,000 accounts. This reflects the difficulties that small utilities face in generating sufficient revenue from their small customer base to pay for the high fixed costs of operating a utility.

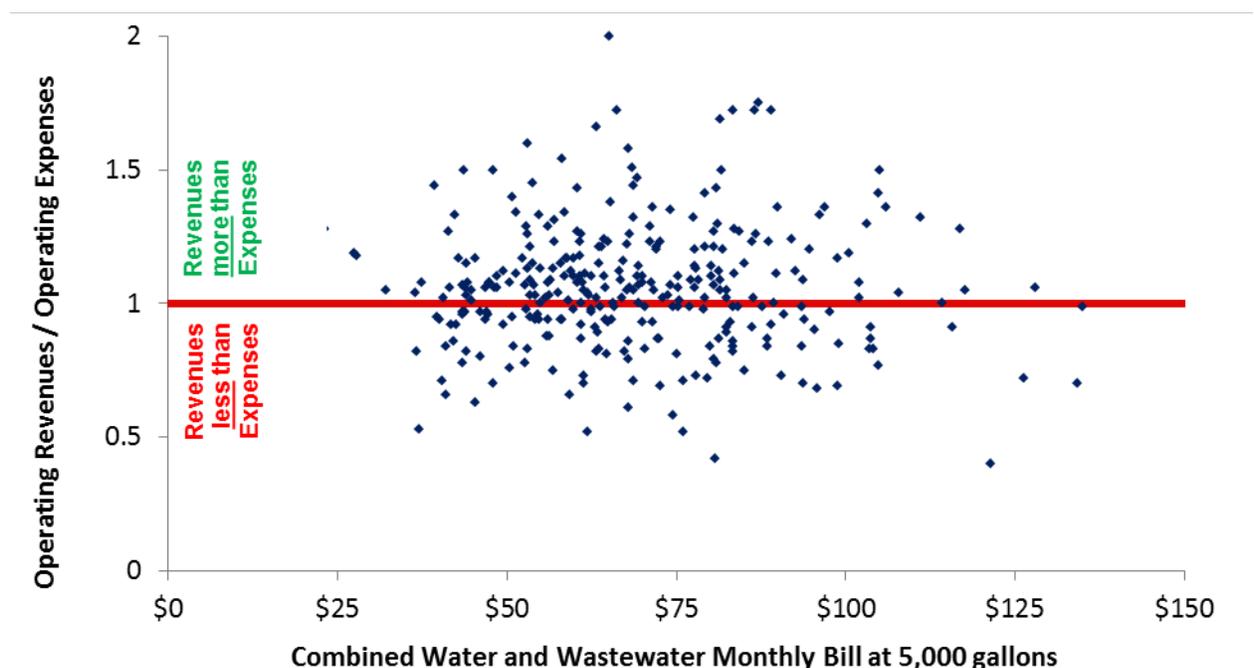
**Figure 32: Local Government-Owned Water and Wastewater Utilities' Cost Recovery in FY 2015 (n=466)**



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 33 shows rates from FY 2014-15 in terms of combined water and wastewater charges for customers using 5,000 gallons/month plotted against the ratio of total operating revenues over total 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 total 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 (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 [www.efc.sog.unc.edu/reslib/item/north-carolina-water-and-wastewater-rates-dashboard](http://www.efc.sog.unc.edu/reslib/item/north-carolina-water-and-wastewater-rates-dashboard).

**Figure 33: Combined Residential Bill in FY2014-15 for 5,000 gallons/month for Utilities with Reported LGC Data on Total Operating Revenues and Total Operating Expenses in FY2014-15 (n=312)**



For advice on rate setting or more information on making appropriate rate comparisons, please contact Shadi Eskaf ([eskaf@sog.unc.edu](mailto:eskaf@sog.unc.edu)) at the Environmental Finance Center at the UNC School of Government.

**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 and the Environmental Finance Center at the UNC School of Government. 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](http://www.nclm.org) and [www.efc.sog.unc.edu](http://www.efc.sog.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.sog.unc.edu/project/utility-financial-sustainability-and-rates-dashboards](http://www.efc.sog.unc.edu/project/utility-financial-sustainability-and-rates-dashboards). Each year in the fall, we request that local government and investor-owned utilities submit a copy of their water and wastewater rate schedules to be included in the annual survey of rates and rate structures.