MISSISSIPPI SURVEY OF DRINKING WATER SYSTEM

Characteristics and Rate Structures

MISSISSIPPI STATE UNIVERSITY™

EXTENSION

INTRODUCTION

Eighty-eight percent of the approximately 1,200 public water systems in Mississippi are considered community water systems; that is, they serve at least 15 service connections or 25 residents on a year-round basis. In 2012, Mississippi State University Extension Service faculty surveyed public water systems in the state to acquire information about the structure and level of water rates for Mississippi's community water systems. An equally important goal was to obtain information about how rates were set and general information regarding system characteristics.

Many of these systems (particularly the water associations) were created in the 1960s to provide safe drinking water to rural areas through a program developed and implemented by the Farmers Home Administration (now USDA Rural Development). Today, many of these systems face substantial challenges, including aging infrastructure, increased legal mandates and regulations, and subpar management practices. These challenges stress the need for water systems to continually monitor their rate structures and remain aware that they may use the rate structure to remain (or become) viable. As a result of these substantial challenges, an updated survey was conducted in October 2018, and the outcomes are provided in this study.

To gain insight regarding the environment of water rate levels and structures in the state, surveys were sent to all public water systems in the state of Mississippi. Each Mississippi public water system has a Public Water System Identification Number assigned by the Mississippi State Department of Health–Bureau of Public Water Supply (MSDH–BPWS). For the purposes of this study, multiple individual public water systems having the same responsible party and mailing address were determined to belong to a single organizational body and to be governed in the same manner. These organizational bodies (whether municipal, rural, county district, utility authority, or privately owned) will be referred to in this publication as organizations unless otherwise specified.

The organizations were asked to complete one survey per organization since one organization can consist of multiple systems with separate Public Water System Identification Numbers. The organizations were asked to respond to survey questions regarding population, connections, rate structures, etc., that reflect the organization as a whole. Aggregated data was verified using a master list of system information and characteristics provided by the MSDH–BPWS.

Surveys were sent to 843 community organizations across the state that charge customers for water. These organizations control 1,043 individual community water systems. Systems serving institutions such as schools, hospitals, factories, and prisons (non-community systems) were not included in this publication. One hundred fifty-eight organizations returned the surveys for a response rate of 19 percent.

Four survey responses were discarded because they came from schools or federal programs that do not charge individual customers for water. Thus, 154 survey responses were used in the following analyses.

The 154 organizations responding to the survey represented 185 water systems as defined by the MSDH–BPWS. One hundred thirty-three organizations were comprised of one system, 15 organizations were comprised of two systems, 3 organizations were comprised of three systems, 2 organizations were comprised of four systems, and 1 organization was comprised of five systems.

WATER ORGANIZATION CHARACTERISTICS

One hundred (64.9 percent) of the usable survey responses from community water organizations in Mississippi were organized as water associations, while approximately 48 organizations (31.2 percent) were municipal water organizations. This compares favorably to the overall population of water organizations in the state, with 55 percent being organized as associations and 32 percent being organizations governed by a municipality. The remaining six responses were classified as utilities, districts, or privately owned community systems.

Ninety-five (61.7 percent) of the responding organizations were classified as small based on population[1] data provided by the MSDH–BPWS. Using a definition provided by the Environmental Protection Agency, the term small is typically used to define a system with a served population between 501 and 3,300 people; for the purposes of this study, this definition was applied to the overall organization.

Sixteen (10.4 percent) of the responses were from organizations serving a population of 500 or fewer and were, thus, considered to be very small. Thirty-four (22.1 percent) of the responding organizations were classified as medium (serving between 3,301 and 10,000 customers), while nine organizations (5.8 percent) were considered large (serving between 10,001 and 100,000 customers). The smallest responding organization indicated that it served a population of 62, while the largest responding organization served a population of 29,172. While applying these size definitions to organizations rather than individual systems is not a common practice, researchers determined that it was acceptable for this study since it provided a commonly understood delineation.

Since a major component of system cost concerns the cost of treating raw water, it is advantageous to divide the organizations by treatment category. Because one organization may contain multiple systems that fall into multiple treatment categories, researchers decided to delineate the organization by the most

[1] System population is calculated as 2.6 people per system connection.

intensive treatment category used by the organization's systems. For example, an organization that consists of one Class B system and two Class C systems would be classified as a Class B organization.[2]

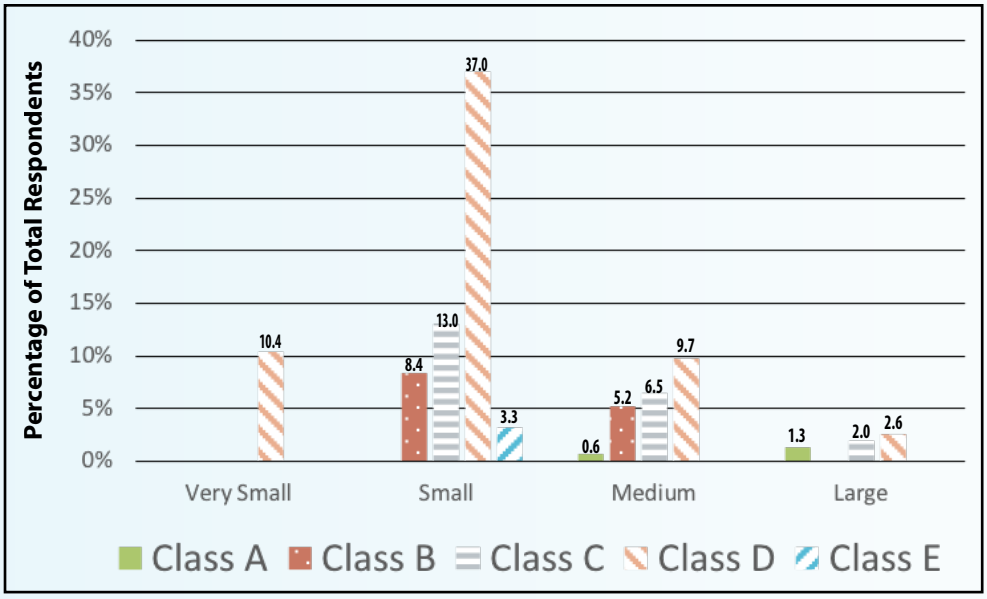

Figure 1. Water organization size and class.

Ninety-two of the responding organizations (59.7 percent) were classified as Class D treatment organizations, while 33 organizations (21.4 percent) were Class C, 21 organizations (13.6 percent) were Class B, 5 organizations (3.2 percent) were Class E, and 3 organizations (1.9 percent) were Class A. Nine organizations indicated that they purchase between 3 percent and 100 percent of the water sold. Of these nine responses, four organizations are E systems that purchase 100 percent of their water. The remaining five organizations purchased finished water from other organizations in addition to treating groundwater. **Figure 1** shows the percentage of organizations in each size category broken into the various classes.

Along with providing drinking water, some responding organizations provided additional utility services to the public, such as sewer/wastewater, electricity, natural gas, and/or garbage/refuse collection. Fifty-one organizations (33.1 percent) responding to the survey provided drinking water and one or more other services (the majority of these were municipal organizations). Of these 51 organizations providing other services, 48 organizations provided sewer/wastewater services along with drinking water. Four organizations provided electricity, four organizations provided natural gas, and 32 organizations provided garbage/refuse collection. **Figure 2** depicts the number of organizations providing additional utilities.

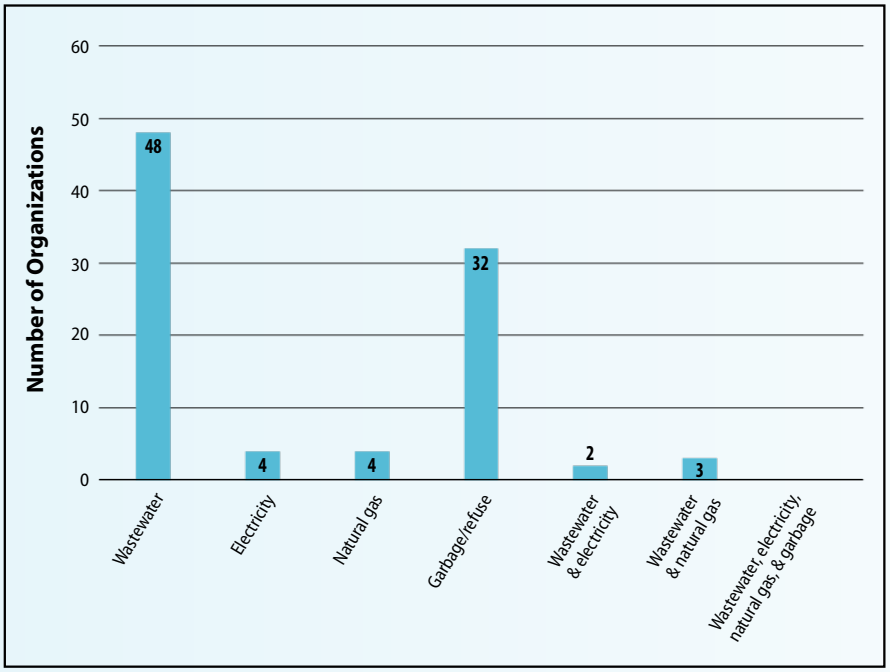

Figure 2. Additional services provided.

[2] Class A organizations are those organizations having surface water treatment, lime softening, or coagulation and filtration for the removal of constituents other than iron or manganese. Class B organizations are those organizations having two or more Class C treatment facilities or organizations with iron and/or manganese removal facilities. Class C organizations are organizations with aeration, pH adjustment, corrosion control, or closed pressure type facilities. Class D organizations provide no treatment to the water other than chlorination, fluoridation, or direct chemical feed. Class E organizations purchase all finished water from other systems. (Source: *Recommended Minimum Performance Guidelines for Certified Waterworks Operators in the State of Mississippi, Mississippi Department of Health.*)

The survey also asked whether the organizations impose a tap/connection fee and a late fee. One hundred forty-four (93.5 percent) of the responding organizations indicated that they charge a residential tap/connection fee. One hundred eighteen organizations (76.6 percent) indicated that they charge a flat fee for a new connection and did not specify if connection size affected the fee. Thirty-six organizations (23.4 percent) reported variable fees based on the size of the line being installed or actual cost. The residential tap/connection fee, as reported by these organizations, ranged from $0 to $1,500; the average fee collected is $367 (using the lowest fee reported by the organization).

Forty-four of the responding organizations (28.6 percent) reported charging an agricultural connection fee between $0 and $1,500 with an average of $365. Eighty-nine of the organizations (57.8 percent) reported charging a commercial connection fee that ranged from $15 to $1,500 with an average of $379. Thirty organizations (19.5 percent) reported an industrial connection fee between $25 (connection size unknown) and $51,000 for a 6-inch connection.

One hundred forty-nine organizations (96.8 percent) reported charging a late fee. While 39 of these organizations charged a fixed dollar amount late fee, 108 organizations charged a late fee based on a percentage of the water bill or a combination of a percentage amount and a fixed amount. The fixed late fees ranged from $2 to $50. The late fees assessed as a percentage of the total bill ranged from 1.5 percent to 30 percent.

Thirty-nine of the responding organizations (25.3 percent) planned to implement capital improvements. Seventeen organizations that planned to make capital improvements also expected to adjust water rates in the near future to generate additional revenue to fund those improvements.

RATE STRUCTURES

Organizations were asked to report the type of rate structure used to generate revenue from the sale of water. Most of the responding organizations charged a minimum fee for a specified number of gallons plus a flow rate for the amount of water used in excess of the number of gallons covered by the minimum fee. The number of gallons covered in the flow rate is divided into units, or blocks, of customer usage called *price blocks*. For example, an organization may charge $25 (*base minimum fee*) for the first 2,000 gallons of water consumed and an additional charge or *flow rate* of $4 for every 1,000 gallons (price block) consumed after the initial 2,000 gallons. As customer water usage increases, the dollar amounts charged for each additional price block can remain the same, increase, or decrease. These types of pricing structures are referred to as uniform block rate, increasing block rate, and decreasing block rate, respectively.[3]

Organizations often implement the same rate structure for all individual water systems governed by the organization's board or responsible party; therefore, the data reported in the survey is expected to reflect the organization as a whole. By comparing the type of rate structure reported by the systems to the answers that were given for the questions regarding the minimum fee, minimum gallons, and charge per block, it was apparent that many of the organizations do not have a full understanding of the various types of rate structures. One of the more common mistakes made by organizations was reporting a flat or increasing block rate when the rate structure was actually a uniform block rate structure.

Figure 3 shows that only one organization used a flat rate structure. This type of rate structure charges customers a fixed amount for an unlimited number of gallons of water consumed during the billing cycle. For example, an organization using a flat rate structure may charge each customer $20 per billing cycle regardless of the amount of water consumed.

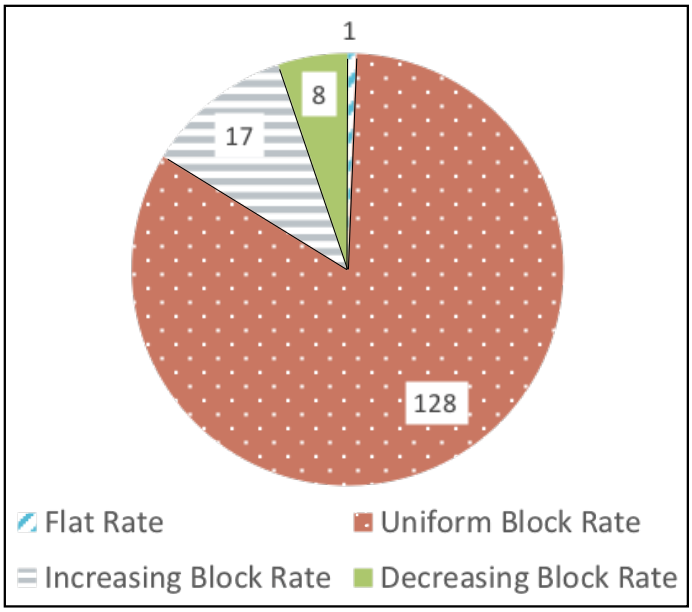

Figure 3. Rate structures (number of organizations).

[3] A uniform block rate structure consists of a base minimum charge for a specified base minimum number of gallons plus an additional flow rate charge for customer use in excess of the base minimum gallons. The flow rate does not change (increase or decrease) as the usage increases. Example: A customer may be charged $25 for the first 2,000 gallons of usage and $4 for every 1,000 gallons consumed in addition to the base minimum (2,000) gallons.

An increasing block rate structure consists of a base minimum charge for a specified base minimum number of gallons plus an additional flow rate charge for customer use in excess of the base minimum gallons. The flow rate increases as customer usage increases. Example: A customer may be charged $25 for the first 2,000 gallons of usage, $4 for the next 1,000 gallons consumed (gallons 2,001 through 3,000), $4.50 for the next 1,000 gallons consumed (gallons 3,001 through 4,000), etc.

A decreasing block rate structure consists of a base minimum charge for a specified base minimum number of gallons plus an additional flow rate charge for customer use in excess of the base minimum gallons. The flow rate decreases as customer use increases. Example: A customer may be charged $25 for the first 2,000 gallons of usage, $5 for the next 1,000 gallons consumed (gallons 2,001 through 3,000), $4.50 for the next 1,000 gallons consumed (gallons 3,001 through 4,000), etc.

The remaining 153 organizations responding to the survey charge for water based on the number of gallons consumed. The most common rate structure among survey respondents was the uniform rate structure that was used by 128 of the responding organizations (83.1 percent). This was followed by 17 organizations (11.0 percent) using the increasing block rate structure and eight organizations (5.2 percent) using the decreasing block rate structure.

It is often assumed that the more complicated rate structures (increasing block rate or decreasing block rate) are used by larger systems. The organizations responding to the survey tell a different story. As shown in **Table 1**, all of the responding large organizations and an overwhelming majority of the medium, small, and very small systems use a uniform block rate structure for residential billing. While small systems are the most diverse in terms of rate structures, some medium and very small systems also use an increasing block rate structure or a decreasing block rate structure.

Table 1. Rate structures by organization size.

	# reporting	% reporting	Organization size			
			# of very small organizations	# of small organizations	# of medium organizations	# of large organizations
Flat	1	0.7%	0	1	0	0
Uniform	128	83.1%	15	76	28	9
Increasing	17	11.0%	1	11	5	0
Decreasing	8	5.2%	0	7	1	0

The same type of analysis can be applied with regard to treatment classes. While all treatment classes primarily use the uniform block rate structure, the more complicated treatment classes (Class A and Class B) use this rate structure as a group more consistently than do the less complicated treatment classes. **Table 2** provides information on the type of rate structure used by organizations in each treatment class.

Table 2. Number of organizations using rate structures by treatment class.

	# reporting	% reporting	Treatment class				
			Class A	Class B	Class C	Class D	Class E
Flat	1	0.7%	0	0	1	0	0
Uniform	128	83.1%	3	19	29	73	4
Increasing	17	11.0%	0	0	2	14	1
Decreasing	8	5.2%	0	2	1	5	0

Since the price blocks for organizations using a uniform rate structure are constant, this type of structure is typically considered to have one pricing block. Responding organizations using an increasing rate structure used an average of two price blocks, while responding organizations with a decreasing rate structure had an average of three price blocks. **Figure 4** shows the number of organizations using the various numbers of price blocks in their rate structure.

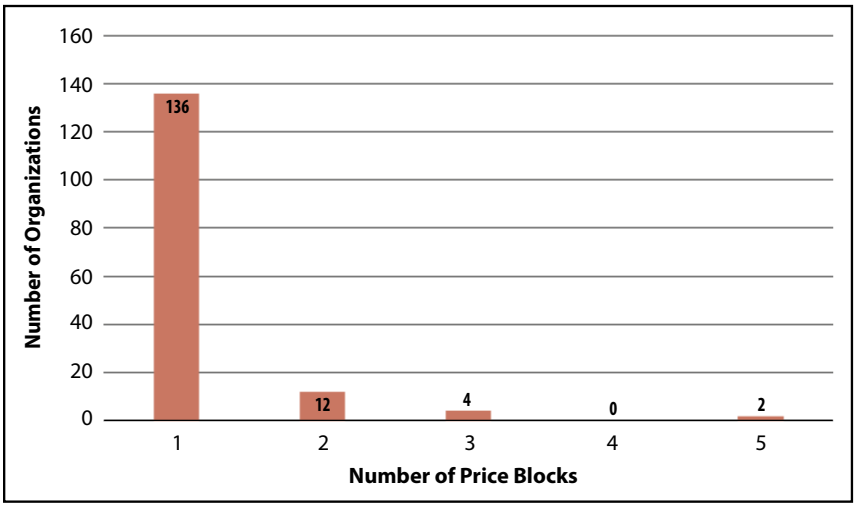

Figure 4. Number of organizations by number of price blocks.

RESIDENTIAL DRINKING WATER RATES

The base minimum rate and accompanying gallons are quite varied across the responding organizations. The base minimum gallons ranged from zero gallons (eight organizations) to 5,000 gallons (one organization), with the most common usage being 2,000 gallons (103 organizations). The organizations used 12 unique levels as base minimums; groupings of these levels in 1,000-gallon increments by organization population size and treatment class are shown in **Tables 3** and **4**.

Table 3. Base minimum gallons by organization size.

Gallons	# reporting	% reporting	Organization size			
			# of very small organizations	# of small organizations	# of medium organizations	# of large organizations
0	8	5.2%	0	5	1	2
1–999	0	0.0%	0	0	0	0
1,000–1,999	11	7.2%	3	6	2	0
2,000–2,999	110	71.9%	11	73	23	3
3,000–3,999	21	13.7%	1	11	6	3
4,000–4,999	2	1.3%	0	0	2	0
5,000 or more	1	0.1%	0	0	0	1

Table 4. Base minimum gallons by treatment class.

Gallons	# reporting	% reporting	Treatment class				
			Class A	Class B	Class C	Class D	Class E
0	8	5.2%	1	0	1	6	0
1–999	0	0.0%	0	0	0	0	0
1,000–1,999	11	7.2%	0	0	5	6	0
2,000–2,999	110	71.9%	0	16	20	69	5
3,000–3,999	21	13.7%	1	4	7	9	0
4,000–4,999	2	1.3%	0	1	0	1	0
5,000 or more	1	0.1%	1	0	0	0	0

As one might expect, the base minimum charge for this initial block of customer usage varies widely, as well. As it is very difficult to compare dollar charges for varying amounts of water, we have adjusted the reported base minimum rates to be based on 2,000 gallons of customer water usage (the most common base minimum customer usage level) for all observations except those observations that had a base minimum charge for zero gallons of customer usage.

Table 5 presents the number of organizations by treatment class and the mean base minimum rate normalized to a 2,000-gallon base for each treatment class. There are two findings of great interest to those interested in the determination of system/organization water rates. First, the mean base minimum rate decreases as the size of the organization increases. This seems to indicate that the typical water organization realizes economies of scale in water production. Second, the normalized mean base minimum rate tends to increase as the complexity of water treatment increases. This seems to confirm the conventional wisdom that more complex water treatment methods result in increased water treatment costs and, therefore, higher rates.

Table 5. Base minimum rate (2,000 gallons) by organization size and treatment class.

	# reporting	% reporting	Organization size			
			# of very small organizations	# of small organizations	# of medium organizations	# of large organizations
Class A	3	1.9%	0	0	1 $10.83*	2 $4.30
Class B	21	13.6%	0	13 $21.10	8 $17.81	0
Class C	33	21.4%	0	20 $19.53	10 $16.88	3 $8.68
Class D	92	59.7%	16 $22.93	57 $16.82	15 $15.13	4 $15.28
Class E	5	3.2%	0	5 $24.24	0	0

The dollar amounts contained within this table represent the average charge of those responding organizations of each class and size.

Of the 145 organizations that reported their block rate customer usage levels and associated charges, 139 organizations (95.9 percent) use 1,000 gallons as the block customer usage level. The customer usage block levels for the remaining organizations were reported as 100 gallons, 748 gallons (two organizations bill on a cubic-foot basis instead of on a gallon basis; 100 cubic-feet equals 748 gallons), 2,000 gallons (two organizations), and 5,000 gallons.

As a result of the varied block sizes, it is necessary to normalize the charges per customer usage block in the same manner as the base minimum amounts above.

Given the overwhelming prevalence of the 1,000-gallon block size, all responses are normalized to this block size. **Table 6** provides the number of responding organizations and the mean of the first 1,000-gallon flow rate block.

Table 6. Flow rate (1,000 gallons) for uniform block systems by organization size and treatment class.

	# reporting	% reporting	Organization size			
			# of very small organizations	# of small organizations	# of medium organizations	# of large organizations
Class A	3	2.4%	0	0	1 $3.00*	2 $3.73
Class B	20	15.0%	0	12 $4.75	8 $5.31	0
Class C	29	22.8%	0	18 $4.69	8 $4.41	3 $3.48
Class D	72	56.7%	14 $3.09	43 $3.94	11 $3.92	4 $3.05
Class E	4	3.1%	0	4 $6.63	0	0

The dollar amounts contained within this table represent the average charge of those responding organizations of each class and size.

Flow rates for uniform block systems ranged from $1 to $12 per 1,000 gallons of customer usage, and the general trends seem to hold for system size and treatment complexity. Larger organizations tend to have lower flow rates than smaller organizations. More complex treatment techniques tend to have higher flow rates than simpler treatment techniques.

While comparing the base minimum rates and flow rates among different sizes and classifications of systems is certainly beneficial, applying these rates to a specific number of gallons is more illuminating. **Table 7** provides the number of responding organizations and the average charge for 10,000 gallons of residential water.

As **Table 7** shows, the charge for 10,000 gallons of residential customer usage is quite varied and doesn't always decline as water organizations get smaller or water treatment complexity decreases. This variation is also found in the minimum and maximum charges for this level of residential customer usage. For large organizations, the minimum charge for 10,000 gallons is reported to be $28 and the maximum charge is $53.50, both for Class A treatment.

For medium-size organizations, the minimum charge was $25 and the maximum charge was $94.50, both for Class B treatment organizations. For small organizations, the minimum charge was $21.20 for a Class D organization and $130.25 for a Class E organization. The minimum charge for a very small organization was $29.16 and the maximum charge was $58, both for Class D treatment organizations.

Table 7. Charge for 10,000 residential gallons by organization size and treatment class.

	# reporting	% reporting	Organization size			
			# of very small organizations	# of small organizations	# of medium organizations	# of large organizations
Class A	3	2.4%	0	0	1 $37.25*	2 $40.75
Class B	19	15.0%	0	11 $59.33	8 $61.09	0
Class C	29	22.8%	0	18 $54.88	8 $51.41	3 $36.59
Class D	72	56.7%	14 $45.85	43 $48.21	11 $47.12	4 $41.74
Class E	4	3.1%	0	4 $76.31	0	0

The dollar amounts contained within this table represent the average charge of those responding organizations of each class and size.

NONRESIDENTIAL DRINKING WATER RATES

Forty of the responding organizations (25.9 percent) charge a separate rate to nonresidential customers such as agricultural, industrial, or commercial customers. For those systems charging a separate rate to nonresidential users, the monthly charge for 10,000 gallons of water for agricultural customers ranged from $28 to $97.32, with an average of $62.42. The monthly charge for commercial users ranged from $24 to $5,202, with an average of $211.96. The monthly charge for 10,000 gallons of water for industrial users ranged from $42.14 to $530, with an average of $212.20.[4]

RATE SETTING

Water organizations vary not only in rates and rate structures, but also in the method used to determine whether to increase or adjust rates. Of the 154 organizations that responded to this question, 143 organizations (92.9 percent) indicated that the board reviewed rates on an annual basis. (This practice has long been considered a prime indicator that a board is governing the water organization effectively.) When considering whether a rate adjustment needed to be implemented as well as the size of the adjustment, water organizations used several methods, and many used more than one method.

One hundred nine of the responding organizations (70.8 percent) indicated that the organizations' board members analyze the fixed and variable costs, budgets, revenues and expenditures, changes in customer base, and future renovations and expansions of the organization when making rate decisions. Thirty-nine of the responding organizations (25.3 percent) indicated that they contacted a technical assistance provider to conduct a comprehensive rate analysis to determine potential revenue increases of various rate structures.

Twenty-seven (17.5 percent) of the organizations set rates that are comparable to the rates of neighboring water systems, while nine (5.8 percent) of the organizations adjusted rates by a fixed amount at a routine time. One of the responding organizations (0.5 percent of respondents) indicated that it did not adjust rates, and eleven (7.1 percent) of the organizations did not respond to this question. **Figure 5** shows the percentage of water systems using various methods for determining rates.

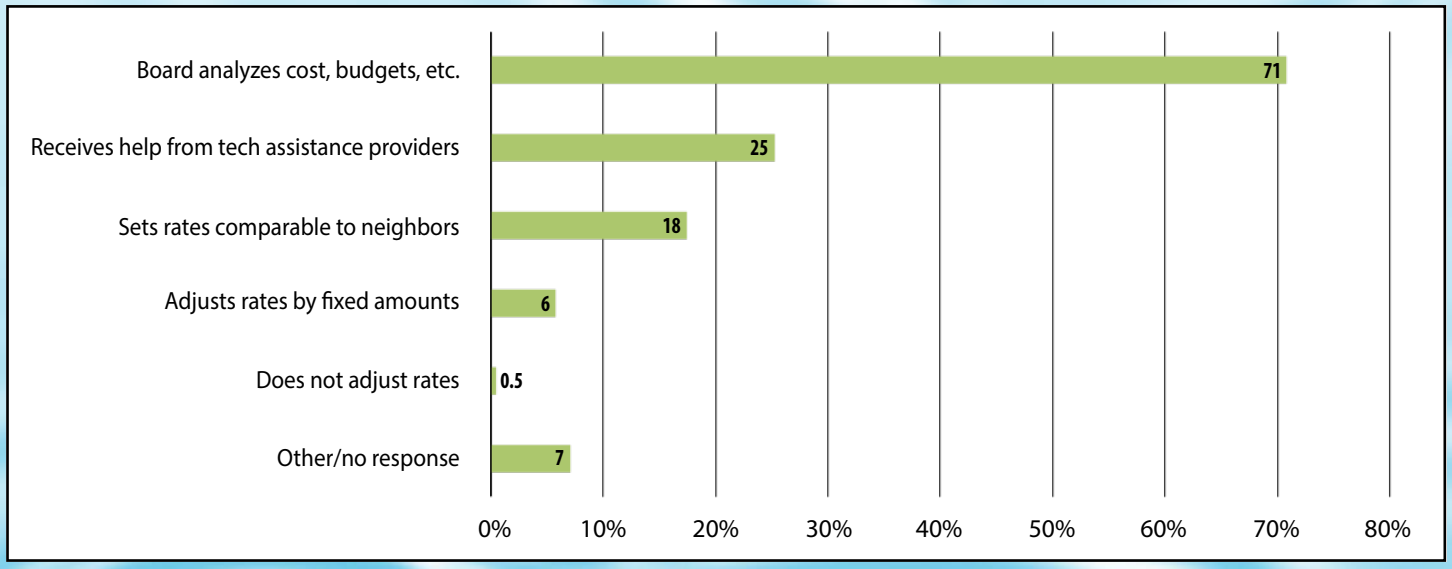

Figure 5. Method of adjusting rates.

[4] Industrial rates are typically constructed in a manner to recuperate the substantial investment in the infrastructure required to deliver very large quanties of water to the customer. This large investment suggests that the customer's cost for small water quantities will be higher than the cost for other types of customers.

Of the 154 organizations included in the survey results, 142 responded to questions regarding rate adjustments. Of these, 113 organizations (79.6 percent) indicated that rates had been increased within the past 5 years. This number is potentially greater since the surveys were completed midyear 2018 and rates may have been adjusted since that time for some organizations. Twenty-three organizations (16.2 percent) indicated that their rates had remained constant for the past 6 to 10 years, and six organizations (4.2 percent) indicated that their rates had remained constant for more than 10 years.

Sixty-two of the responding organizations (40.3 percent) indicated that they are planning to increase or adjust their rates in the near future. Of these, six organizations (9.7 percent) expected a rate increase in the latter half of 2018, 21 organizations (33.9 percent) expected to implement a rate increase in 2019, and two organizations (3.2 percent) expected to implement a rate increase in 2020 or later.

Eighty-seven of the responding water organizations (56.5 percent) underwent a comprehensive water rate analysis, with 38 of these analyses (43.7 percent) conducted since 2016. The remaining rate analyses were conducted for 2015 and prior. These analyses were completed by a variety of entities including Communities Unlimited, Mississippi Rural Water Association, Mississippi State University Extension Service, system personnel, and others. **Figure 6** shows the number of rate analyses performed by various entities for the responding systems.

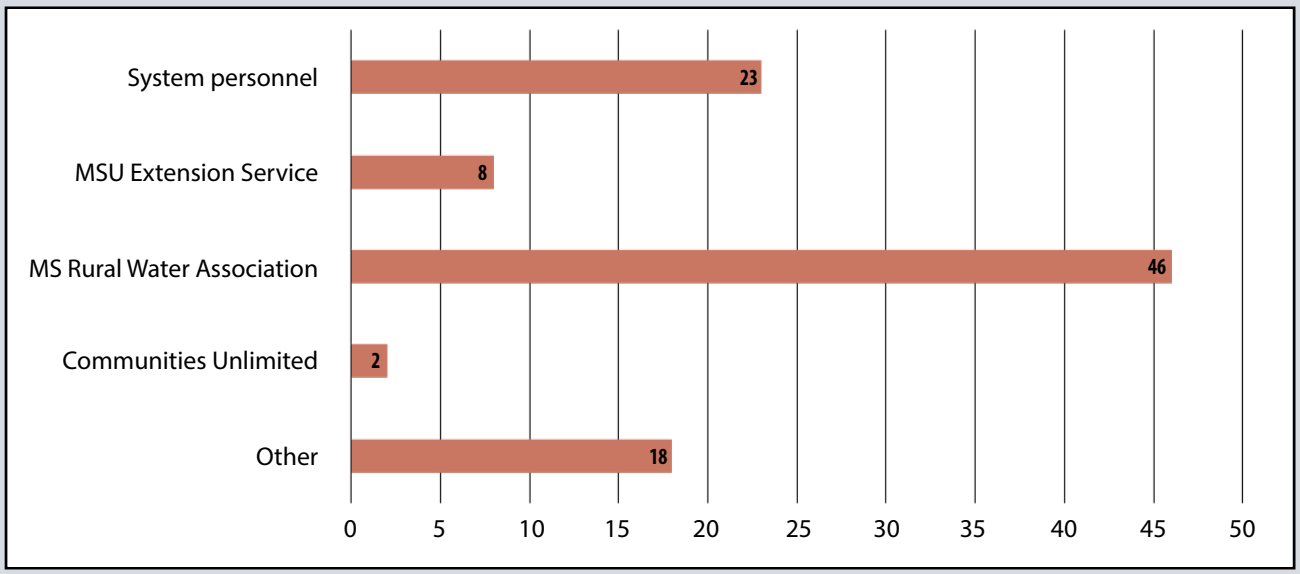

Figure 6. Technical assistance providers conducting rate studies.

ADDITIONAL SURVEY FINDINGS

Several other findings regarding water rates were identified from analysis of the responses. These findings relate to the organizations' size, number of other services provided, location, and type of organizational structure.

Size

A water organization's size was determined by the number of connections and the population served by the organization. The average residential minimum fee (the reported minimum fee was converted to a 2,000-gallon basis) and monthly charge for 10,000 gallons of drinking water for residents living inside the county/city limits were compared to size indicators to detect any trends. The average residential minimum fee tended to decrease as the organization's population increased (see **Table 8**).

Table 8. Comparison of population size and fee structure.

EPA class size	Average residential minimum monthly fee (2,000-gal basis)	Average monthly charge for 10,000 gallons
Very small	$21.63	$48.19
Small	$18.71	$52.86
Medium	$16.46	$50.33
Large	$13.30	$39.80
Average	**$17.53**	**$47.80**

The commonly accepted purpose of the base minimum fee has historically been to cover the fixed costs incurred by the water organizations. The average residential base minimum fee for very small and small organizations was greater than the average minimum fee when taking all organizations into consideration. Statistical analyses of the averages of the minimum fee for each organizational size revealed that there was no statistical difference between the very small and small, the small and medium, and the medium and large pairs. This indicated that an organization with a relatively large number of customers would be able to charge a lower minimum fee than an organization with a smaller number of connections since the fixed costs of the organization could be dispersed among a greater number of customers. This appears to be the case for municipal organizations since population density is relatively high and purported to be more constant across organizations than would be the case for organizations established as nonprofit associations.

Table 8 also presents the average monthly residential charges for 10,000 gallons. While the averages tend to trend downward slightly as water organizations get larger (with the exception of the very small organizations), statistical analyses of these charges using organizational size class as the analysis factor indicates no statistical difference in the average charges between any system size. This is reaffirmed by the small variations shown in the table.

Of the 154 total reporting organizations, only one organization did not report the residential billing rate for 10,000 gallons of drinking water. For the purposes of this analysis, the state was divided into five regions: Hills, Pines, Delta, Capital/River, and Coastal as shown in **Figure 7**.

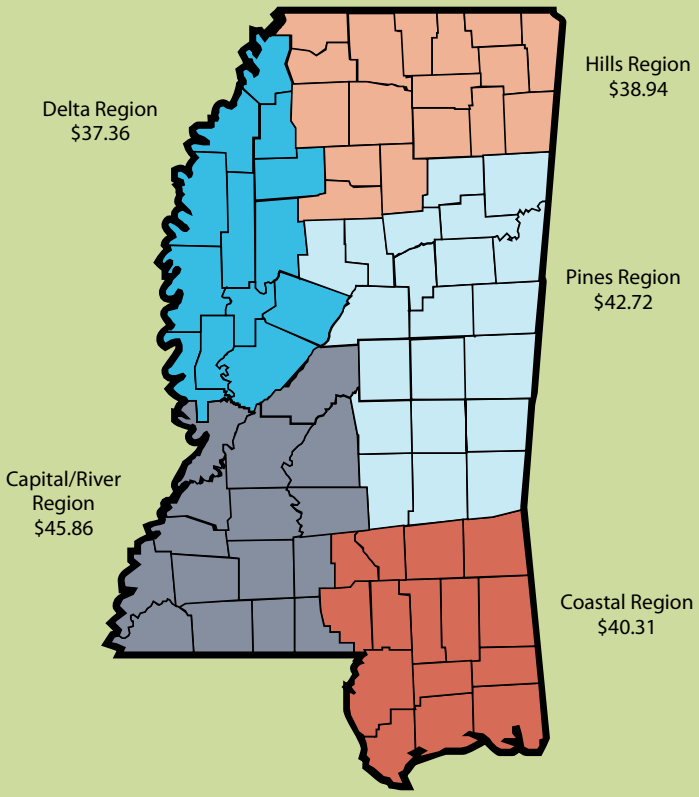

Figure 7. Regional average charge for 10,000 gallons.

Table 9 compares the average minimum rates and billing charges for 10,000 gallons of residential water for treatment classes and locations within the state. Statistical analyses show that, while there is a significant difference between the average effective minimum charges between regions when using treatment class as the analysis factor, there is no significant difference in the average charge for 10,000 gallons when using the same analysis scenario.

Table 9. Average billing rates by organization treatment class and location.

		Region				
		Hills	Delta	Capital River	Pines	Coastal
Class A	# of organizations reporting	2	0	0	0	1
	# of systems contained in reporting organizations	4	0	0	0	2
	Average minimum rate (2,000 gal)	$6.42	N/A	N/A	N/A	$6.60
	Average billing charge for 10,000 gal	$45.38	N/A	N/A	N/A	$28.00
Class B	# of organizations reporting	4	1	4	11	1
	# of systems contained in reporting organizations	5	1	4	13	1
	Average minimum rate (2,000 gal)	$18.95	$8.17	$24.70	$20.43	$9.33
	Average billing charge for 10,000 gal	$52.95	$29.75	$68.45	$63.30	$54.25
Class C	# of organizations reporting	8	0	10	5	10
	# of systems contained in reporting organizations	12	0	15	5	12
	Average minimum rate (2,000 gal)	$15.55	N/A	$20.07	$16.89	$17.58
	Average billing charge for 10,000 gal	$44.47	N/A	$51.50	$59.99	$50.58
Class D	# of organizations reporting	26	15	13	23	15
	# of systems contained in reporting organizations	32	16	14	26	17
	Average minimum rate (2,000 gal)	$15.05	$23.03	$19.02	$18.08	$14.25
	Average billing charge for 10,000 gal	$45.70	$40.21	$50.07	$55.66	$46.87
Class E	# of organizations reporting	1	0	2	2	0
	# of systems contained in reporting organizations	1	0	3	2	0
	Average minimum rate (2,000 gal)	$18.00	N/A	$27.10	$24.50	N/A
	Average billing charge for 10,000 gal	$46.00	N/A	$90.13	$73.50	N/A

Table 10 shows the average billing rate reported by organizations based on size. Statistical analyses show that neither the average minimum fee for 2,000 gallons nor the charge for 10,000 gallons is the same across the size classes. This is confirmed by examining the relatively large variations in the average charges contained in **Table 10**.

Table 10. Average billing rates by organization size and location.

		Region				
		Hills	Delta	River	Capital Pines	Coastal
Very small	# of organizations reporting	2	0	0	0	1
	# of systems contained in reporting organizations	4	0	0	0	2
	Average minimum rate (2,000 gal)	$6.42	N/A	N/A	N/A	$6.60
	Average billing charge for 10,000 gal	$45.38	N/A	N/A	N/A	$28.00
Small	# of organizations reporting	4	1	4	11	1
	# of systems contained in reporting organizations	5	1	4	13	1
	Average minimum rate (2,000 gal)	$18.95	$8.17	$24.70	$20.43	$9.33
	Average billing charge for 10,000 gal	$52.95	$29.75	$68.45	$63.30	$54.25
Medium	# of organizations reporting	8	0	10	5	10
	# of systems contained in reporting organizations	12	0	15	5	12
	Average minimum rate (2,000 gal)	$15.55	N/A	$20.07	$16.89	$17.58
	Average billing charge for 10,000 gal	$44.47	N/A	$51.50	$59.99	$50.58
Large	# of organizations reporting	26	15	13	23	15
	# of systems contained in reporting organizations	32	16	14	26	17
	Average minimum rate (2,000 gal)	$15.05	$23.03	$19.02	$18.08	$14.25
	Average billing charge for 10,000 gal	$45.70	$40.21	$50.07	$55.66	$46.87

Figure 8 indicates that the average monthly charge for 10,000 gallons of drinking water and the residential minimum fee both decrease as the number of service connections increases (with the exception of organizations with 3,000 or more connections). This, again, could be due to economies of scale that occur as fixed costs are spread over a larger number of connections and as population (connection) density increases for the water organization's service area.

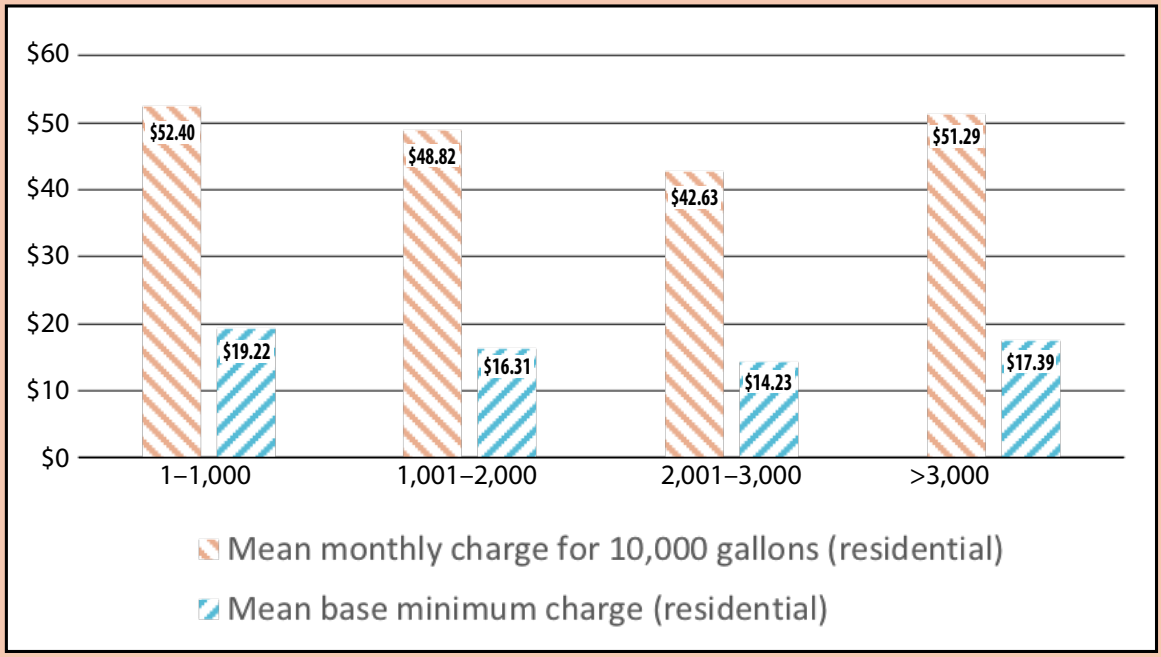

Figure 8. Average monthly charge for 10,000 gallons by number of connections.

Additional Services Provided

When comparing the number of services provided with the monthly charge of 10,000 gallons of residential drinking water, the average monthly charge tended to decrease as the number of services increased. As previously noted, the average monthly charge for 10,000 gallons of residential water for municipal systems and rural associations was reported to be $51.56. Rural associations typically sold only drinking water, although four rural associations reported providing wastewater services, as well. Municipal systems tended to be much more varied because of the mission of the municipal utility service. **Figure 9** provides an overview of a 10,000-gallon charge for municipal systems and rural associations given the number of additional services offered by the utility.

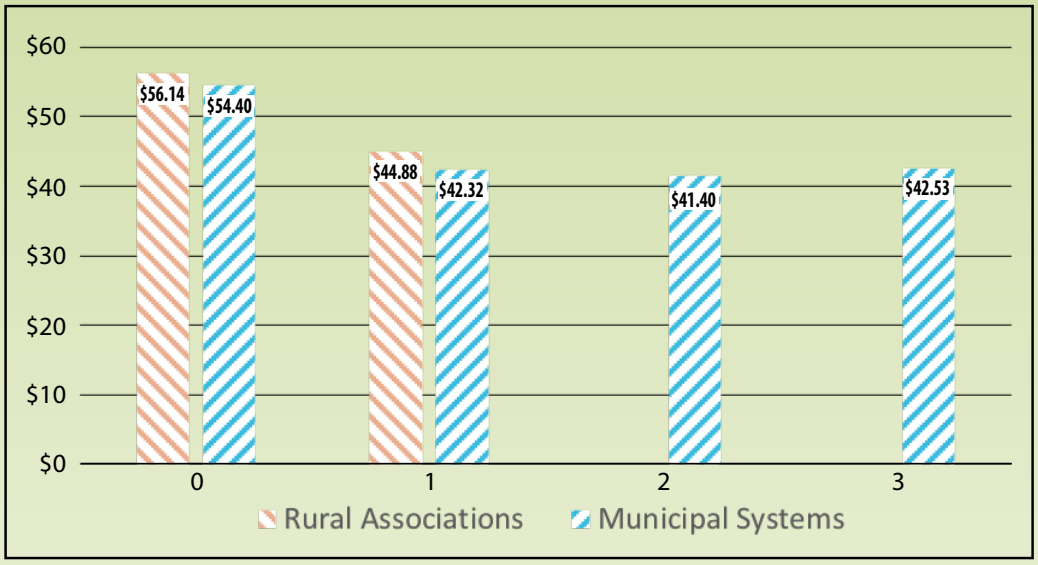

Figure 9. Mean residential charge for 10,000 gallons by number of additional services offered.

Location

The charge for 10,000 gallons of residential drinking water was further analyzed with respect to the various regions of the state. The Delta Region had the fewest responses in total. The Capital/River Region had the one organization reporting a flat rate structure. The Hills Region had the most organizations reporting increasing rate structures and uniform rate structures. The Pines Region reported the most decreasing block rate structures. The average cost for 10,000 gallons of drinking water for each region ranged from $39.56 to $59.11, with an average cost of $51.06 (**Figure 10**). Analyses show that there are statistical differences between the average charges when using regional location as the critical factor.

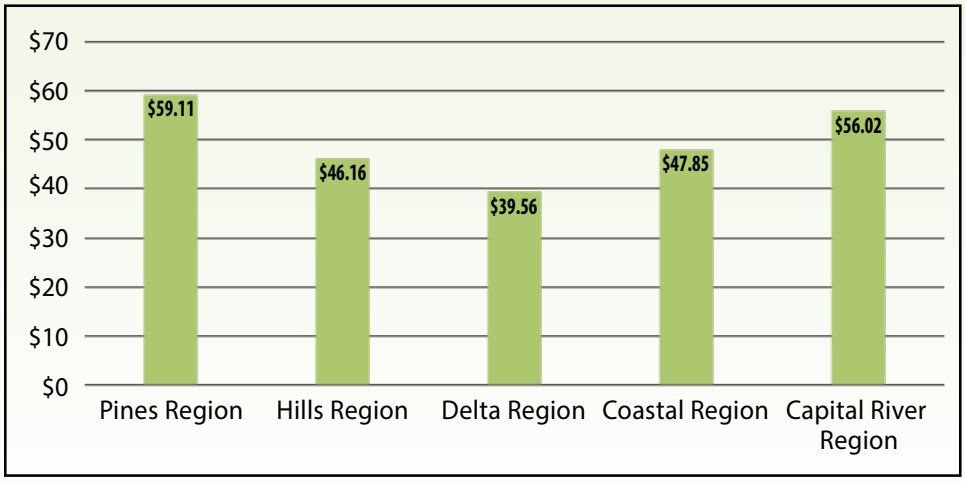

Figure 10. Average monthly charge for 10,000 gallons by region.

Comparison of Rural and Municipal Organizations

The overwhelming majority of the organizations (148 organizations or 96.1 percent) completing the survey were either water associations or municipalities. When analyzing the data for water associations and municipal organizations only, the average effective minimum fee paid for water was $18.26 per 2,000 gallons. The average effective minimum fee charged by rural water associations was $19.68 per 2,000 gallons and was 28 percent higher than the average fee charged by municipalities ($15.33).

The mean base minimum fee for municipalities was $15.33, while the mean minimum fee for water associations was $19.68. The mean minimum charge when considering both types of organizational structures was $18.26.

Association and municipal organizations were also analyzed regarding their monthly charge for 10,000 gallons for residents living inside the county or city limits. The average charge for 10,000 gallons for rural water organizations ($55.69) was 29.4 percent greater than the average amount charged by municipal organizations ($43.04). The average monthly charge for the two types combined was $51.56.

Another measure of central tendency is the median, or the midpoint between the maximum and minimum reported observation. The median for the 10,000-gallon charge for the two types of organizations combined was $50. The median 10,000-gallon fee was $52.50 for customers of rural water associations and $43.10 for municipal customers. This measure also indicated that customers of rural water organizations tend to pay more for their water usage.

A variety of factors could contribute to the effective minimum fee and the 10,000-gallon monthly charge appearing greater for rural organizations than for municipal organizations. The average monthly charge for organizations providing at least one additional service was less than the charge for organizations providing only drinking water. Forty-three of the 48 responding municipalities (89.6 percent) provided at least one additional utility service, while only four of the 99 responding water associations (4.0 percent) provided other utility services.

Organization size may contribute to the average rural association customer paying more for water. The 2,000-gallon monthly charge for large organizations was less than that of the systems that were classified as very small, small, or medium **(Table 11)**. Six of the 48 (12.5 percent) responding municipal organizations were classified as large, while only one of the 100 (1.0 percent) association organizations was in this size category.

Population density is another probable contributing factor. While the survey did not obtain any information regarding the population density of the water organizations, towns and cities tend to be more densely populated than rural communities. Water organizations in more densely populated areas appear to have more cost advantages with regards to facility and maintenance costs. This leads to lower costs being passed to the customers.

More research is needed to identify the factors that are critical in determining billing rates. While many of these factors are necessarily related to water production (well depth, distribution terrain, treatment requirements, etc.), others are likely to be related to management and governing body issues.

Table 11. Comparison of municipal and water association organizational structures.

	Municipalities			Associations		
	# orgs reporting	Avg min fee for 2,000 gal	Avg charge for 10,000 gal	# orgs reporting	Avg min fee for 2,000 gal	Avg charge for 10,000 gal
Very small	3	$20.55	$41.89	11	$21.57	$49.06
Small	29	$15.98	$44.81	65	$20.09	$57.01
Medium	10	$13.20	$38.83	23	$17.94	$56.08
Large	6	$13.18	$42.08	1	$13.00	$35.00

APPENDIX

The Appendix exhibits selected information collected through the survey for each responding organization. Although the names of the organizations are not revealed, the organizations are sorted according to region and population served. **Figure 7** can be used as a guide to determine the counties in each region. When interpreting this information, it is important to remember that the data contained in this analysis was reported for organizations as a whole, which often contain more than one Public Water System Identification Number, though, in some cases, one organization may represent only one Public Water System Identification Number.

SUMMARY

A wide variety of information regarding Mississippi's community water organizations was collected through the water rate survey. Most of the responding community water organizations were either very small or medium, serving a population between 500 and 10,000. Most organizations charged a minimum fee and a block rate (with a majority using a uniform block rate), while only one organization had a flat rate. The average charge for 10,000 gallons of drinking water for residential accounts for customers living inside the county or city limits for all types of organizations was $51.06. This average charge tended to be greater for rural water organizations than municipal organizations, and larger water organizations tended to charge less for water. Generally, as the size of water organizations increased, the average minimum fee and the average charge for 10,000 gallons of water both decreased.

Approximately 30 percent of the organizations surveyed provided additional services other than drinking water. Those organizations providing at least one other service to customers charged less for drinking water than those organizations providing only drinking water. Water rates and average monthly charges varied for different regions of the state.

FOR MORE INFORMATION

For further information or analysis regarding this study or to obtain assistance in analyzing the water rates for your system, please contact MSU Extension Economist Alan Barefield at (662) 325-7995 or alan.barefield@msstate.edu.

	Region	Connections	Other services provided	Planning capital improvements in next 5 years?	Rate structure	Different fee outside county/city limits?	Residential minimum fee	Residential minimum gallons	Average block price	Monthly charge for 10,000 gallons
1	Capital/River	136	0	No	Uniform	No	$18.00	2000	$3.25	$44.00
2	Capital/River	175	0	No	Uniform	No	$17.00	2000	$4.00	$49.00
3	Capital/River	222	0	No	Uniform	No	$22.00	2000	$3.50	$50.00
4	Capital/River	358	0	No	Uniform	No	$25.00	0	$4.50	$70.00
5	Capital/River	385	0	Yes	Uniform	No	$25.00	2000	$4.50	$61.00
6	Capital/River	490	0	Yes	Uniform	No	$20.00	2000	$5.00	$60.00
7	Capital/River	502	0	No	Uniform	No	$32.00	2000	$4.00	$64.00
8	Capital/River	530	0	No	Uniform	No	$20.00	1000	$5.00	$65.00
9	Capital/River	602	0	Yes	Uniform	No	$22.00	2000	$5.00	$62.00
10	Capital/River	687	0	Yes	Uniform	No	$35.00	3000	$5.40	$72.80
11	Capital/River	706	2	No	Uniform	No	$21.68	2000	$3.79	$51.98
12	Capital/River	763	0	No	Uniform	No	$20.00	2000	$4.75	$58.00
13	Capital/River	846	0	No	Uniform	No	$40.25	2500	$12.00	$130.25
14	Capital/River	897	0	No	Uniform	No	$19.00	2000	$5.50	$63.00
15	Capital/River	911	2	Yes	Uniform	Yes	$17.79	2000	$3.09	$42.51
16	Capital/River	1040	2	No	Uniform	Yes	$11.30	1500	$3.00	$36.80
17	Capital/River	1122	0	Yes	Uniform	No	$16.00	2000	$3.00	$40.00
18	Capital/River	1295	0	No	Flat	No	$20.00	2000	N/A	$20.00
19	Capital/River	1345	0	No	Uniform	No	$23.00	2000	$4.00	$55.00
20	Capital/River	1474	0	No	Increasing	No	$20.00	2000	$3.25	$46.00
21	Capital/River	1507	0	Yes	Uniform	No	$20.00	2000	$4.00	$52.00
22	Capital/River	2073	0	No	Uniform	No	$38.50	3000	$8.00	$94.50
23	Capital/River	2107	2	Yes	Uniform	Yes	$12.00	0	$2.95	$41.50
24	Capital/River	2359	1	Yes	Increasing	No	$16.50	2000	$2.25	$34.50

	Region	Connections	Other services provided	Planning capital improvements in next 5 years?	Rate structure	Different fee outside county/city limits?	Residential minimum fee	Residential minimum gallons	Average block price	Monthly charge for 10,000 gallons
25	Capital/River	2757	0	Yes	Uniform	No	$14.00	2500	$3.50	$40.25
26	Capital/River	3513	0	Yes	Uniform	No	$20.00	2000	$5.00	$60.00
27	Capital/River	6411	2	Yes	Uniform	Yes	$18.70	3000	$2.37	$35.22
28	Capital/River	10723	2	No	Uniform	Yes	$15.14	2244	$4.06	$46.63
29	Capital/River	11383	2	Yes	Uniform	Yes	$20.56	0	$2.20	$42.56
30	Coastal	69	1	Yes	Uniform	No				
31	Coastal	162	2	Yes	Uniform	No	$12.00	2000	$4.00	$44.00
32	Coastal	310	0	No	Uniform	No	$17.00	2000	$9.19	$90.51
33	Coastal	380	0	Yes	Uniform	No	$16.00	2000	$5.00	$56.00
34	Coastal	416	0	Yes	Uniform	No	$19.00	2500	$1.87	$33.00
35	Coastal	426	2	Yes	Uniform	No	$17.50	3000	$4.50	$49.00
36	Coastal	446	0	Yes	Uniform	No	$18.00	2000	$5.00	$58.00
37	Coastal	455	0	Yes	Uniform	No	$16.00	1000	$1.00	$25.00
38	Coastal	573	0	No	Uniform	No	$23.00	1500	$7.00	$82.50
39	Coastal	637	0	Yes	Decreasing	No	$15.00	2000	$4.40	$50.20
40	Coastal	686	0	No	Uniform	No	$15.75	2000	$6.00	$63.75
41	Coastal	716	2	Yes	Uniform	No	$14.00	1000	$5.00	$59.00
42	Coastal	988	1	No	Uniform	No	$10.00	2000	$1.40	$21.20
43	Coastal	998	2	No	Uniform	No	$10.20	3000	$2.40	$27.00
44	Coastal	1027	0	No	Uniform	No	$22.25	2500	$3.75	$50.38
45	Coastal	1052	0	No	Uniform	No	$22.00	2000	$5.00	$62.00
46	Coastal	1057	3	Yes	Uniform	No	$14.00	3000	$3.35	$37.45
47	Coastal	1332	2	Yes	Uniform	Yes	$8.00	2000	$2.00	$24.00
48	Coastal	1412	0	No	Uniform	No	$21.68	2000	$5.90	$68.88

	Region	Connections	Other services provided	Planning capital improvements in next 5 years?	Rate structure	Different fee outside county/city limits?	Residential minimum fee	Residential minimum gallons	Average block price	Monthly charge for 10,000 gallons
49	Coastal	1666	2	No	Increasing	Yes	$17.00	2000	$8.18	$38.20
50	Coastal	1675	0	Yes	Uniform	No	$16.50	5000	$2.30	$28.00
51	Coastal	1724	0	Yes	Increasing	No	$15.00	2000	$8.20	$81.50
52	Coastal	1991	0	No	Uniform	No	$15.00	3500	$2.25	$29.63
53	Coastal	2343	1	No	Uniform	No	$15.00	2000	$2.25	$33.00
54	Coastal	2344	0	Yes	Uniform	No	$14.00	3000	$5.75	$54.25
55	Coastal	6225	0	Yes	Uniform	No	$13.00	2000	$2.85	$35.00
56	Coastal	9730	1	Yes	Uniform	Yes	$21.12	3000	$3.09	$42.75
57	Delta	45	0	Yes	Uniform	No	$23.00	2000	$1.00	$31.00
58	Delta	54	0	Yes	Uniform	No	$28.50	2000	$3.00	$52.50
59	Delta	140	0	No	Uniform	No	$16.00	2000	$2.00	$32.00
60	Delta	141	0	No	Uniform	No	$22.00	1000	$4.00	$58.00
61	Delta	173	0	Yes	Uniform	No	$18.50	2000	$2.50	$38.50
62	Delta	182	2	No	Uniform	No	$21.16	2000	$1.00	$29.16
63	Delta	186	0	No	Uniform	No	$25.50	2000	$4.00	$57.50
64	Delta	233	1	Yes	Uniform	Yes	$42.40	0	$4.20	$46.60
65	Delta	315	1	No	Uniform	Yes	$10.25	2000	$2.00	$26.25
66	Delta	411	0	No	Uniform	No	$26.77	1000	$2.15	$46.16
67	Delta	430	0	No	Uniform	No	$20.00	2000	$4.00	$52.00
68	Delta	607	2	Yes	Uniform	Yes	$14.00	2000	$3.75	$44.00
69	Delta	887	2	No	Uniform	Yes	$12.25	3000	$2.50	$29.75
70	Delta	941	2	Yes	Uniform	Yes	$19.00	3000	$2.50	$36.50
71	Delta	1198	0	Yes	Uniform	Yes	$10.00	2000	$2.00	$26.00
72	Delta	1787	2	Yes	Uniform	Yes	$12.00	4000	$2.50	$27.00

	Region	Connections	Other services provided	Planning capital improvements in next 5 years?	Rate structure	Different fee outside county/city limits?	Residential minimum fee	Residential minimum gallons	Average block price	Monthly charge for 10,000 gallons
73	Hills	201	0	No	Uniform	No	$15.00	1500	$3.75	$46.88
74	Hills	227	0	No	Increasing	No	$14.00	2000	$3.00	$38.00
75	Hills	270	0	No	Uniform	No	$20.00	2000	$3.00	$44.00
76	Hills	321	0	No	Uniform	No	$12.00	2000	$4.00	$44.00
77	Hills	334	0	No	Uniform	No	$15.75	3000	$4.00	$43.75
78	Hills	350	0	No	Uniform	No	$15.00	2000	$3.00	$39.00
79	Hills	367	0	No	Uniform	No	$18.00	2000	$4.00	$46.00
80	Hills	430	0	No	Uniform	No	$18.00	2500	$6.00	$63.00
81	Hills	435	0	No	Decreasing	Yes	$25.00	2000	$4.50	$61.00
82	Hills	439	0	Yes	Uniform	No	$20.00	2000	$3.75	$50.00
83	Hills	464	0	Yes	Uniform	No	$18.50	2000	$2.65	$39.70
84	Hills	483	2	Yes	Uniform	No	$13.80	2000	$3.75	$43.80
85	Hills	498	0	Yes	Decreasing	No	$24.00	2000	$2.80	$44.75
86	Hills	518	0	Yes	Uniform	No	$25.00	2000	$4.50	$61.00
87	Hills	536	0	No	Uniform	No	$20.00	2000	$5.00	$60.00
88	Hills	560	1	No	Uniform	No	$18.00	2000	$3.50	$46.00
89	Hills	624	0	No	Uniform	No	$14.00	2000	$3.25	$40.00
90	Hills	645	0	Yes	Uniform	No	$20.00	2000	$4.00	$52.00
91	Hills	658	0	No	Uniform	No	$15.00	2000	$4.50	$51.00
92	Hills	668	0	Yes	Uniform	No	$12.00	2000	$5.00	$52.00
93	Hills	675	0	No	Uniform	No	$16.00	2000	$2.50	$36.00
94	Hills	760	0	No	Increasing	No	$19.00	3000	$3.60	$45.00
95	Hills	763	0	No	Increasing	No	$20.00	2000	$4.10	$54.00
96	Hills	913	0	No	Increasing	No	$14.00	2000	$3.25	$41.00

	Region	Connections	Other services provided	Planning capital improvements in next 5 years?	Rate structure	Different fee outside county/city limits?	Residential minimum fee	Residential minimum gallons	Average block price	Monthly charge for 10,000 gallons
97	Hills	935	2	Yes	Uniform	No	$13.50	2000	$5.65	$58.70
98	Hills	967	1	No	Increasing	No	$15.00	2000	$4.25	$49.00
99	Hills	998	0	Yes	Uniform	No	$15.75	2000	$3.75	$45.75
100	Hills	1010	3	Yes	Uniform	Yes	$14.00	3000	$4.41	$44.87
101	Hills	1025	1	No	Increasing	No	$14.00	2000	$3.00	$38.00
102	Hills	1190	2	No	Increasing	Yes	$7.00	0	$1.50	$24.25
103	Hills	1256	1	No	Uniform	Yes	$14.45	2000	$4.00	$46.45
104	Hills	1472	2	No	Uniform	Yes	$12.00	2000	$2.00	$28.00
105	Hills	1668	0	No	Uniform	No	$16.25	3000	$3.00	$37.25
106	Hills	1862	0	Yes	Uniform	No	$18.00	2000	$4.50	$54.00
107	Hills	2489	0	Yes	Uniform	No	$14.00	1000	$3.25	$43.25
108	Hills	2490	0	Yes	Uniform	No	$17.00	2000	$5.00	$57.00
109	Hills	2532	1	Yes	Uniform	Yes	$10.43	2000	$4.15	$43.63
110	Hills	3720	3	No	Uniform	No	$9.50	2000	$5.35	$52.30
111	Hills	6200	2	Yes	Uniform	No	$12.10	3740	$4.51	$39.06
112	Hills	7653	1	Yes	Uniform	No	$2.00	0	$5.15	$53.50
113	Hills	15031	3	Yes	Uniform	Yes	$7.10	2000	$3.55	$35.50
114	Pines	110	0	No	Uniform	No	$25.00	2000	$4.00	$57.00
115	Pines	163	0	No	Uniform	No	$23.63	3000	$4.64	$56.13
116	Pines	182	0	No	Increasing	No	$29.00	2000	$6.50	$81.00
117	Pines	194	0	No	Uniform	No	$23.00	2000	$7.00	$79.00
118	Pines	204	0	Yes	Uniform	No	$20.00	0	$3.25	$52.50
119	Pines	239	0	Yes	Uniform	No	$24.00	2000	$4.50	$60.00
120	Pines	284	0	Yes	Uniform	No	$23.00	0	$10.00	$103.00

	Region	Connections	Other services provided	Planning capital improvements in next 5 years?	Rate structure	Different fee outside county/city limits?	Residential minimum fee	Residential minimum gallons	Average block price	Monthly charge for 10,000 gallons
121	Pines	305	0	No	Increasing	No	$26.00	2000	$5.25	$68.00
122	Pines	323	1	No	Uniform	No	$22.00	2000	$3.60	$50.80
123	Pines	330	0	Yes	Decreasing	Yes	$21.00	2000	$3.80	$78.50
124	Pines	333	2	No	Uniform	Yes	$12.00	2000	$5.00	$52.00
125	Pines	354	0	No	Decreasing	No	$24.00	2000	$4.25	$58.00
126	Pines	381	0	No	Increasing	No	$18.00	2000	$2.60	$40.00
127	Pines	423	0	No	Uniform	No	$24.20	3000	$5.00	$59.20
128	Pines	441	0	No	Uniform	No	$18.00	2000	$4.63	$55.00
129	Pines	452	0	No	Uniform	No	$15.50	2000	$4.00	$47.50
130	Pines	476	2	Yes	Uniform	No	$5.50	1000	$5.50	$55.00
131	Pines	510	0	No	Decreasing	No	$29.00	2500	$5.00	$66.50
132	Pines	521	0	No	Increasing	No	$26.00	2000	$9.40	$101.00
133	Pines	540	0	Yes	Uniform	No	$17.50	2000	$3.00	$41.50
134	Pines	563	0	No	Uniform	No	$8.00	3000	$4.00	$36.00
135	Pines	585	0	Yes	Uniform	No	$17.00	2000	$3.50	$45.00
136	Pines	639	2	No	Uniform	No	$26.00	2000	$5.60	$70.80
137	Pines	653	0	No	Decreasing	No	$18.00	2000	$4.25	$51.25
138	Pines	753	0	Yes	Uniform	No	$16.00	2000	$4.13	$49.00
139	Pines	840	0	No	Uniform	No	$25.00	2000	$9.00	$97.00
140	Pines	891	0	No	Uniform	No	$24.50	2000	$6.00	$72.50
141	Pines	1061	0	Yes	Increasing	Yes	$13.00	2000	$3.63	$42.00
142	Pines	1210	1	Yes	Uniform	No	$18.00	2000	$6.00	$66.00
143	Pines	1300	1	No	Uniform	Yes	$15.00	2000	$4.00	$47.00
144	Pines	1330	0	Yes	Uniform	No	$17.00	3000	$5.00	$52.00

	Region	Connections	Other services provided	Planning capital improvements in next 5 years?	Rate structure	Different fee outside county/city limits?	Residential minimum fee	Residential minimum gallons	Average block price	Monthly charge for 10,000 gallons
145	Pines	1340	0	Yes	Uniform	No	$23.00	3000	$6.00	$65.00
146	Pines	1370	2	Yes	Uniform	Yes	$17.00	2000	$5.00	$57.00
147	Pines	1676	0	Yes	Uniform	No	$20.00	2000	$4.50	$56.00
148	Pines	1720	0	Yes	Uniform	No	$28.00	2000	$6.00	$76.00
149	Pines	1759	2	No	Increasing	Yes	$13.55	1870	$1.44	$25.25
150	Pines	1977	1	Yes	Decreasing	No	$12.50	2000	$2.21	$30.00
151	Pines	2087	2	Yes	Uniform	No	$18.00	2000	$3.00	$42.00
152	Pines	2264	0	No	Uniform	No	$22.00	2000	$7.00	$78.00
153	Pines	3654	1	No	Uniform	Yes	$13.00	4000	$2.00	$25.00
154	Pines	3857	0	No	Uniform	No	$21.00	2000	$7.25	$79.00

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