A Twenty-Year Review: Revisiting the Drinking Water and Wastewater Infrastructure Funding Needs and Gaps in the Appalachian Region

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UNC SCHOOL OF GOVERNMENT Environmental Finance Center

VIRGINIA TECH.

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The Environmental Finance Center at UNC-Chapel Hill

The School of Government Environmental Finance Center (SOG EFC) is committed to helping governmental units deliver environmental programs and services that are fair, effective, and financially sustainable. To achieve this, the SOG EFC offers applied training programs and technical assistance, develops resources and interactive tools, and conducts in-depth research on emerging and established practices. To maximize its impact, the SOG EFC collaborates with various partners, including federal and state agencies, academic institutions, and nonprofit organizations, to support sustainable environmental finance solutions.

Virginia Tech

Virginia Tech is a land-grant university with a trifold mission of research, teaching, and extension. Faculty and students on this project represent two colleges and home departments: Biological Systems Engineering within the College of Agriculture and Life Sciences and Population Health Sciences within the College of Veterinary Medicine. In keeping with the broader university missions, both colleges aim to improve the lives of the citizens through the promotion of economic prosperity and life quality, the stewardship and health of land, water, and air, and the provision of student learning through diverse, hands-on, experiential opportunities.

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Executive Summary

Drinking water provision and wastewater removal are critical services that require substantial costs to build, maintain, and upgrade the necessary underlying infrastructure. Despite significant recent federal investment, funding gaps remain, though their full scope is not well defined. This is particularly true for Appalachia, given its challenging environment of rugged terrain, dispersed populations, and limited financial resources.

The last review of Appalachia's infrastructure was completed 20 years ago by a team from the School of Government Environmental Finance Center (SOG EFC) at the University of North Carolina-Chapel Hill. To help understand the complex landscape of water and wastewater infrastructure throughout Appalachia, a team of researchers from SOG EFC and Virginia Tech undertook an in-depth analysis using both quantitative and qualitative approaches. The results address six key questions to inform both the current state of water and wastewater infrastructure and future opportunities throughout the region.

What is the current state of water and wastewater infrastructure in Appalachia?

Appalachian communities rely on both centralized and decentralized (e.g., onsite private wells or septic tanks) systems for drinking water access and wastewater treatment. Centralized systems, managed by governments, non-profits, or private companies, are subject to federal service quality regulations. In contrast, decentralized systems are maintained by individual owners and face fewer regulatory requirements.

Overall, the results suggest that more Appalachian households appear to be connected to centralized drinking water services compared to the early 2000s. The total number of systems has declined while both the percentage of population served by larger systems and the overall population coverage by centralized systems have increased slightly (approximately six percentage points and four percentage points, respectively). These results point to regionalization or consolidation of smaller systems into larger ones, consistent with national trends. However, the percentage of the Appalachian population served by larger systems (73%) still lags behind the U.S. as a whole (84%), and a slightly larger percentage of the population relies on smaller systems, which tend to have higher costs. A higher percentage of the Appalachian population (more than 80%) also relies on community water systems with surface water sources, which require more treatment and are often associated with higher costs.

Aging and inadequate infrastructure remain a primary concern for surveyed operators throughout the region. Health-based Safe Drinking Water Act (SDWA) violations occur at similar rates in Appalachia and in non-Appalachian areas. The project team also found evidence that Appalachian systems are able to address changes in regulatory requirements. Rates of monitoring and reporting violations, however, are higher within Appalachia. Comparisons of bottled water sales and SDWA violations suggest that Appalachian households may turn to bottled water during times that centralized water systems are out of compliance, regardless of the type of violation.

Assessing centralized wastewater infrastructure was difficult due to limited data. Up to 76% of the population lives within three miles of a centralized wastewater system, but proximity does not guarantee service, particularly in mountainous terrain.

For both water and wastewater, complete coverage is unlikely anywhere in the U.S. as some areas will always be too rugged, remote, and/or economically challenged to effectively and efficiently serve with traditional centralized systems. Private wells and septic systems, along with the practices of water hauling and releasing untreated wastewater, still exist in parts of the region. However, the proportion of the remaining population that could feasibly be connected to centralized water or wastewater service is unclear. Most Appalachian states have assistance programs to provide education and water quality testing for private well owners, but programs for septic systems do not exist, despite concerns that onsite wastewater failure is a likely source of well water contamination.

What are the critical infrastructure needs in the region?

Using the most recent EPA Clean Watershed and Drinking Water Needs Surveys, the project team estimated at least $55 billion in documented water and wastewater infrastructure needs: $32.5 billion for wastewater and $22.5 billion for drinking water. These total needs translate to about $2,500 per capita across the region. Metro areas account for about 75% of the total needs with rural areas only accounting for about 10%.

For wastewater, infrastructure needs for conventional, centralized services account for about $25 billion. Broadly, these types of needs address issues related to traditional wastewater treatment, infiltration and inflow, sewer replacement and rehabilitation, wastewater transfer to facilities for treatment, and sewer overflow. Adding needs related to water reuse and decentralized systems increases the total by about $7 billion. Importantly, this category only captures needs related to the rehabilitation, replacement, or new installation of onsite or clustered community systems. Needs related to connecting decentralized users are captured in the more conventional categories. The drinking water infrastructure needs estimate of $22.5 billion only includes surveyed systems, about 7% of all systems in Appalachia. Extrapolating surveyed data to all systems increases the estimate to about $55 billion. Including extrapolated data increases the total combined need (drinking water and wastewater) to approximately $87 billion.

What capital funding sources are currently available to meet those needs?

Funding for water and wastewater projects is available through federal, state, non-profit, and private financing sources. Between fiscal years 2021 and 2024, federal investments in Appalachian water and wastewater infrastructure totaled about $1.1 billion, with the largest funding sources being Community Development Block Grants and the EPA's State Revolving Fund Programs. State governments and non-profit organizations also offer funding opportunities, though the types of programs and funding available vary widely between states. Private financing tools, such as revenue or green bonds, are typically accessible only to larger systems, limiting their usefulness for much of the region. However, innovative financing solutions, such as state bond banks, can increase the accessibility of private financing to smaller systems. Five states in the Appalachian Region (Kentucky, New York, Ohio, Virginia, and West Virginia) offer this option to water and wastewater utilities.

What types of funding gaps exist, and what is the capacity to bridge them in communities across Appalachia?

Despite substantial recent federal investment, significant funding gaps remain, as evidenced by an estimated minimum of $55 billion in infrastructure needs compared to about $1.1 billion in recent disbursements. State, non-profit, and private financing sources provide additional funding, but external funding sources cannot currently cover all water and wastewater infrastructure needs. Some capital costs will ultimately need to be covered by customer rates. Although average annual customer bills tend to be higher in Appalachia relative to the non-Appalachian areas of Appalachian states, combined costs are generally 2% or less of median household income. This percentage is well below the conventional affordability threshold of 4.5% for combined water and wastewater services. However, it should not be assumed that all customers can easily absorb higher rates throughout the region or that the funding gap can be closed with rate increases alone.

In addition to a gap in the amount of funding available, there are also gaps in the capacity to access funding. Application processes can be arduous, putting additional strain on utility staff that may already be over-capacity. The less conventional approaches that may be the most feasible in the rural landscape of Appalachia may fall outside current funding priorities, making applications for those projects less competitive. However, local development districts (LDDs) provide support for grant and/or loan applications and administration. LDD staff also often serve as liaisons between utilities and either state or regional funding agencies, making them important partners for utilities in accessing funding for critical infrastructure projects.

What financial management and funding strategies are likely to have the biggest impact on service in the region?

Many traditional financial management practices hold true for Appalachia, such as long-term planning, setting appropriate rates, and data-driven decision-making. However, small innovations to these traditional approaches can make a big difference to communities throughout the region. For example, the benefits of economies of scale are well-known but can be hard to realize in more rural areas. However, the City of Cullman (Alabama) adopted a unique approach of not marking up the cost of its wholesale water to encourage wholesale customers to join the system and create an economy of scale. Cullman also financed a regional reservoir by securing long-term agreements requiring each town served to purchase water until project costs were recovered. Fostering a culture of collaboration was key to Cullman's success in obtaining these agreements.

Long-term planning may be of particular importance in Appalachia. Though many utilities create asset management plans, the City of Ironton (Ohio) views its plan as a living document. Constantly updating the document requires time investment from city staff, but they leverage external partnerships to expand their capacity because the benefits of having a regularly updated plan are substantial. Newly elected officials can quickly get up to speed and utility staff can capitalize on short funding windows, knowing there is an up-to-date list of high-priority projects available. This ultimately reduces the staff time and effort required to apply for funding. Planning ahead can also position a utility to take advantage of future growth opportunities with less financial investment. The Town of Mars Hill (North Carolina) used the opportunity of building an interconnection with a neighboring town to also install infrastructure that will enable the town to expand service to an area primed for growth.

Expanding funding program options could also have a significant impact. Many utilities lack the financial resources to maintain new or updated infrastructure, leading to avoidable degradation and repeated major investments in the same infrastructure. Ideally, costs for ongoing maintenance would be covered by ratepayers, though this outcome may never be achievable for smaller systems in Appalachia. Creating funding opportunities for ongoing maintenance may ultimately result in long-term cost savings and a more efficient use of funds. Appalachia also offers a promising testing ground for innovative solutions aimed at closing service gaps in some of the most rural and rugged areas of the U.S. Providing financial incentives and development grants to support the exploration of emerging technologies in remote areas may not only benefit local residents but also potentially serve as a model for other rural regions across the nation.

Finally, given the importance of LDDs as utility partners, funding LDD outreach and capacity building may be an efficient avenue to increase access to funding and indirectly increase the capacity of utility staff. Expanded in-person outreach by LDD staff may expand their reach and enable them to connect with more utilities throughout their districts. Annual, state-specific trainings for LDD staff covering available funding programs, application processes, and common pitfalls could help promote consistent knowledge across LDDs. Further, funding training on key topics such as long-term planning, project implementation, or regionalization options may prove an efficient mechanism to increase utility capacity rather than training utility staff directly. LDD staff can then disseminate the information learned throughout their districts based on localized needs.

What steps can funding agencies and technical assistance providers take to improve and expand service across Appalachia?

In addition to expanding funding options, a few changes to program administration could have a positive impact on the ability of Appalachian utilities to access infrastructure funding. As previously noted, conventional approaches to infrastructure are not always the most feasible in Appalachia. Adjusting funding program priorities to reflect the constraints of working within the Appalachian landscape could make less conventional, but more practical, projects more competitive. Further, streamlining funding processes, such as one application for multiple programs, can also reduce the time burden of applying for funding on utility staff.

Providing targeted technical assistance would also be impactful. Specific assistance to ensure compliance with SDWA monitoring and reporting (MR) requirements may reduce MR violations, improving the public's perception of centralized water system quality and potentially reducing the use of bottled water resources. Providing specialized support for the most distressed systems, which also typically struggle with reduced funding options, could improve the capacity of these systems to access much-needed financial support. Lastly, given that full coverage by centralized services is highly unlikely in the rugged terrain of

Appalachia, expanding support for users of private wells and septic systems would help owners ensure the integrity of their systems and reduce environmental and health hazards caused by ineffective onsite infrastructure.

Technical assistance roundtables could promote knowledge sharing across providers, particularly LDDs. The varying circumstances throughout Appalachia means that no single strategy, or even suite of strategies, will be effective throughout the entire region. However, many innovative strategies for both centralized systems and decentralized users already exist and are replicable. Though directly assembling utility staff across Appalachia may not be feasible, creating opportunities to bring LDD staff together could facilitate more effective sharing of lessons learned and innovative strategies across the Appalachian Region.

Overall, the future of Appalachian water and wastewater service will depend on a unique combination of traditional investment, innovative solutions, and collaborative approaches tailored to a range of local conditions. The region faces significant challenges, but also substantial opportunities. By expanding funding opportunities, increasing targeted technical assistance, and facilitating peer learning—while recognizing that one-size-fits-all strategies rarely work—funders and partners can help utilities extend safe, reliable, and affordable centralized service and support decentralized users throughout the region for decades to come.

1. Introduction

1.1 Project Background

Drinking water provision and wastewater removal are critical services that require substantial costs to build, maintain, and upgrade the necessary underlying infrastructure. In recent years, a significant amount of capital funding has been allocated to water and wastewater infrastructure through the American Rescue Plan Act (ARPA) and the Infrastructure Investment and Jobs Act (IIJA), in addition to pre-existing public and private funding sources. Despite these significant investments, infrastructure needs and funding gaps persist. Compounding these issues, the breadth of these infrastructure needs and funding gaps remains unclear, particularly in Appalachia, where the infrastructure landscape is notably complex.

The last review of Appalachia's infrastructure was completed 20 years ago by a team from the SOG EFC (Hughes et al., 2005). Their main finding was that a lower percentage of Appalachia had access to centralized water and wastewater services than elsewhere in the country. Hughes et al. (2005) also found that more people were served by smaller systems, which tend to have higher costs and higher risks for incomplete or unsatisfactory service. Appalachia's infrastructure needs accounted for about 8.5% of the total needs throughout the U.S., though this was likely a significant underestimation. Many smaller utilities lacked sufficient revenues to cover future cash-flow requirements, and households in many counties throughout Appalachia were already paying a higher proportion of their income for water and wastewater services.[1]

Recently published analyses based on U.S. Census data provide further evidence that regional rates of complete household plumbing in Appalachia still lag behind the national average, particularly in Central Appalachia.[2] Homes not served by community water systems are generally reliant on private drinking water sources, primarily household groundwater wells, as well as improved spring water sources (piped directly to homes), and, less commonly, rainwater cisterns that rely on roof catchments. These private systems are not regulated under the Safe Drinking Water Act; the responsibility for testing and treatment falls on the owner.[3] Households not connected to centralized wastewater disposal services rely on individual septic systems or, less commonly, dispose of untreated water via "straight-piping" (discharging waste directly into a stream), which can have negative impacts on downstream water sources.[4]

The findings that Appalachia lags in terms of the percentage of households connected to centralized services do not imply that households that rely on decentralized systems completely lack access to adequate water and sanitation. Centralized water services may not always be the most efficient solution to decentralized issues and do not guarantee service quality, particularly if the centralized system is small, underfunded, and/or serves particularly rugged communities with long service lines. For example, Mueller and Gasteyer's (2021) national geospatial examination of Safe Drinking Water Act (SDWA) violations specifically highlighted Central Appalachia as home to higher numbers of SDWA "serious violator" community water systems.[5] Innovative solutions are needed to ensure safe drinking water and appropriate sanitation.

This project, conducted by a team of researchers from the School of Government Environmental Finance Center (SOG EFC) and Virginia Tech (henceforth referred to as the project team), serves as an updated review of water and wastewater needs in the Appalachian Region. The project team has significant experience in the region's water and wastewater sector. As a technical assistance provider and applied research group in the water and wastewater infrastructure space, the SOG EFC regularly supports local governments in applying for funding and addressing affordability, financial health, and rate-related challenges. SOG EFC staff commonly encounter capacity-related issues that prevent utilities from applying for or accessing available funding sources. The Virginia Tech team has conducted extensive research on the potential health impacts associated with inadequate water infrastructure in the Central Appalachian Region and supports the local water workforce through collaborative regional training efforts.

1.2 About Appalachia

As defined by the Appalachian Regional Commission (ARC), Appalachia consists of 423 counties across 13 states.[6] The percentage of a state's land area within Appalachia ranges from 14% (South Carolina) to 100% (West Virginia). As of 2022, the overall population in Appalachia has increased by about 15% over the last twenty years, to roughly 26.4 million, though growth patterns have varied across the region. Pennsylvania still makes up the largest proportion of the region's population (21%), though that figure is slightly lower than in 2000 (25%). Since 2000, the Appalachian portions of four states have experienced minor population decreases (5% or less) while another four states have experienced population growth exceeding 30% (Table 1.2.1).[7]

Table 1.2.1: Population in Appalachia, 2022 Compared to 2000

Geographic Area	Population within Appalachia			% of State Population within Appalachia		% of State Area in Appalachia
	2000	2022	% Change	2022	PPT Change (2000-2022)	
Alabama	2,837,224	3,276,927	15%	65%	1%	51%
Georgia	2,207,531	3,479,640	58%	32%	5%	20%
Kentucky	1,141,511	1,161,263	2%	26%	-2%	46%
Maryland	236,699	251,436	6%	4%	0%	16%
Mississippi	615,452	606,434	-1%	21%	-1%	26%
New York	1,072,786	1,018,524	-5%	5%	-1%	25%
North Carolina	1,526,207	2,050,171	34%	19%	0%	26%
Ohio	1,455,313	1,968,186	35%	17%	4%	39%
Pennsylvania	5,819,800	5,666,710	-3%	44%	-3%	81%
South Carolina	1,028,656	1,399,877	36%	26%	0%	14%
Tennessee	2,479,317	3,031,001	22%	43%	-1%	49%
Virginia	665,177	731,887	10%	8%	-1%	28%
West Virginia	1,808,344	1,775,156	-2%	100%	0%	100%
Appalachia	**22,894,017**	**26,417,212**	**15%**	**25%**	**1%**	**40%**

Source: (2022) Srygley et al., The Appalachian Region: A Data Overview from the 2018-2022 American Community Survey Chartbook; Comparisons calculated using data from Hughes et al., Drinking Water and Wastewater Infrastructure in Appalachia: An Analysis of Capital Funding and Funding Gaps

As a federal and state partnership funding entity focused on economic development, ARC assigns a designation of economic distress to each county annually. This designation is meant not only to understand how Appalachia compares to the rest of the nation but also to determine match requirements for ARC grants, research topics, and investment strategies to target the most distressed areas (Table 1.2.2). The designation is determined by comparing three economic indicators (i.e., three-year average unemployment rates, per capita market income, and poverty rates) calculated at the county level against the nation's averages.[8]

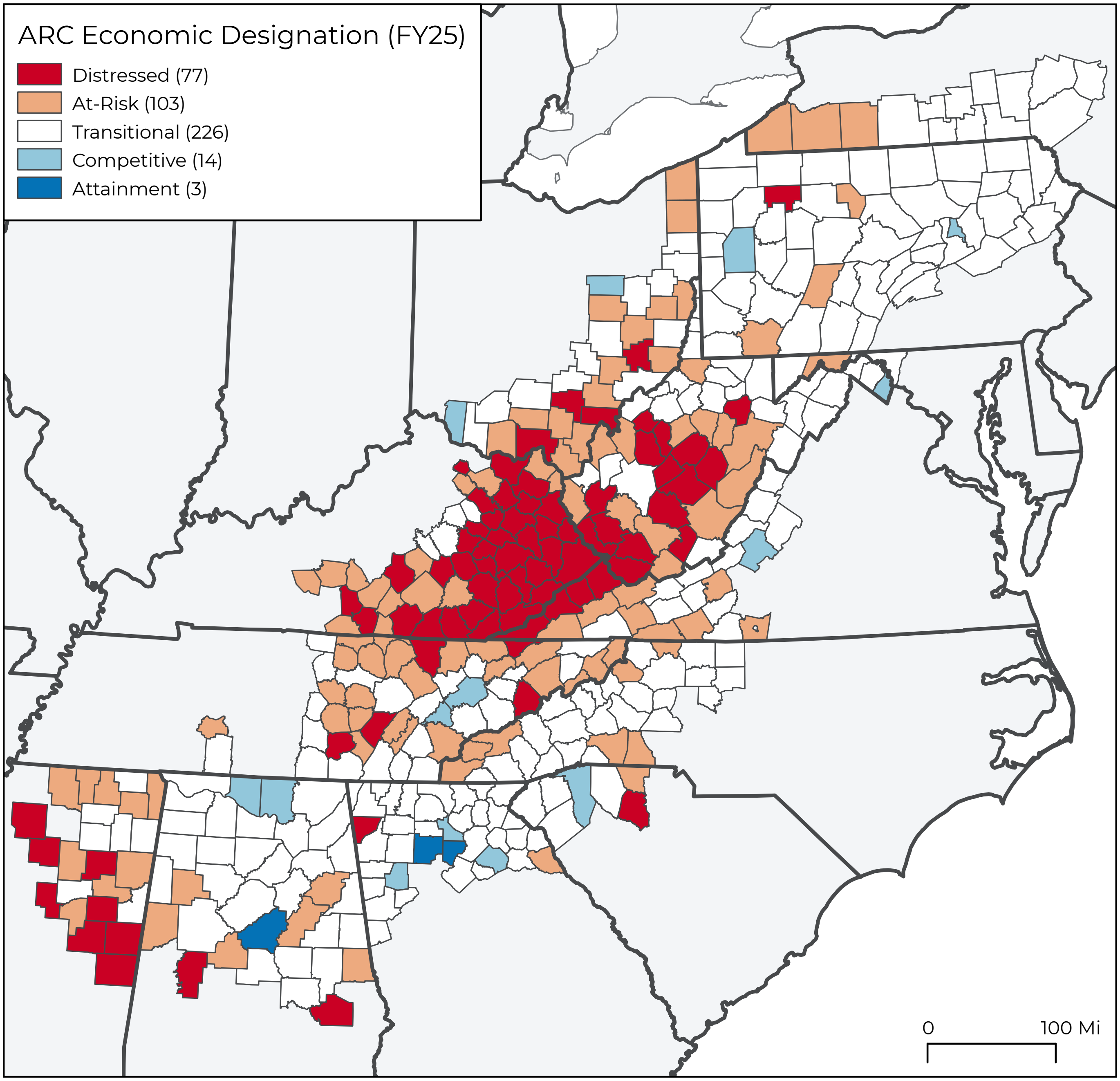
Table 1.2.2: ARC Economic Designations for FY25

Economic Designation	Definition	Number of Counties
Distressed	Distressed counties are the most economically depressed counties. They rank in the worst 10% of the nation's counties.	77
At-Risk	At-Risk counties are those at risk of becoming economically distressed. They rank between the worst 10% and the worst 25% of the nation's counties.	103
Transitional	Transitional counties are those transitioning between strong and weak economies. They make up the largest economic status designation. Transitional counties rank between the worst 25% and the best 25% of the nation's counties.	226
Competitive	Competitive counties are those that are able to compete in the national economy but are not in the highest 10% of the nation's counties. Counties ranking between the best 10% and the best 25% of the nation's counties are classified competitive.	14
Attainment	Attainment counties are the economically strongest counties. Counties ranking in the best 10% of the nation's counties are classified attainment.	3

Source: Appalachian Regional Commission, ARC County Economic Designation, Retrieved January 2025
Notes: The project team did not include a comparison to 2005 because ARC changed the method for classifying counties in 2007. See Distressed Designation and County Economic Status Classification System for more information on ARC's methodology and definitions.

Most at-risk and distressed counties fall in Central Appalachia (Figure 1.2.1). Srygley et al. (2024) estimates the 2018-2022 poverty rate for the Appalachian Region at 14.3%, 1.8 percentage points higher than the U.S.[9] The median household income (MHI) for Appalachia is about 82% of that of the U.S. for 2018-2022.[10]

Figure 1.2.1: ARC Economic Designation by County for FY25



Source: Appalachian Regional Commission, ARC County Economic Designation, Retrieved January 2025

1.3 The Purpose of this Report

Research Questions

The combination of rural landscapes, difficult terrain, and generally lower incomes creates unique challenges to providing access to centralized water and wastewater services. Understanding the current state of water and wastewater infrastructure, the existing funding landscape, and capacity gaps that limit access to infrastructure dollars can help practitioners, funding agencies, and policymakers address Appalachia's unique combination of needs and challenges today.

This project specifically aims to "provide policy makers and local officials with a comprehensive overview of the current state of water and wastewater infrastructure in Appalachia, as well as detailed information on the investment requirements and financial strategies needed to address gaps in service throughout Appalachia, given the limited fiscal capacity of many communities throughout the region," as requested in the Appalachian Regional Commission's (ARC) Request for Proposals (RFP) in 2024.

Building upon Hughes et al. (2005), the project team used a mixed-methods approach to address the following six questions:

1. What is the current state of water and wastewater infrastructure in Appalachia?
2. What are the critical infrastructure needs in the region?
3. What capital funding sources are currently available to meet those needs?
4. What types of funding gaps exist, and what is the capacity to bridge them in communities across Appalachia?
5. What financial management and funding strategies are likely to have the biggest impact on service in the region?
6. What steps can funding agencies and technical assistance providers take to improve and expand service across Appalachia?

General Methods

Building upon Hughes et al. (2005), the project team used a mixed-methods approach to address the above questions. The suite of methods included reviewing gray literature; collecting, inventorying, and analyzing secondary data sources; developing and implementing surveys; conducting interviews; and writing case studies. Broadly, the analyses compare Appalachia and the non-Appalachian U.S. In some cases, the analyses include comparisons between Appalachia and the rest of the U.S., between Appalachian subregions, or by economic or metro area designation. When possible, the project team assessed trends or drew comparisons to the findings of Hughes et al. (2005).

Each chapter (described below) includes a description of methods and challenges (e.g., data limitations) that impact the interpretation of results. Additional technical information is provided in appendices as needed. For each analysis, the team chose the best datasets available, summarized in Appendix A. Notably, Safe Drinking Water Act (SDWA) violation and public water system data are uploaded regularly to the national Safe Drinking Water

Information System (SDWIS) database; as a result, the number of active systems and other information for counties or regions varies depending on when data are downloaded. Further, a lack of available data impacted the project team's proposed analyses, leading to modifications in implementation. An advisory council consisting of water and wastewater funding experts reviewed proposed methods and advised on project implementation.

Report Structure

The project team organized the analyses according to five broad tasks (Chapters 2-6).

The Current State of Water and Wastewater Infrastructure in Appalachia (Chapter 2)
This chapter describes the landscape of water and wastewater system characteristics and trends in centralized system access. The project team expanded the approach used by Hughes et al. (2005) through consideration of Safe Drinking Water Act (SDWA) violation data and bottled water purchase data. This analysis also includes qualitative approaches to explore support for decentralized users and innovative solutions in areas where traditional centralized approaches are not feasible.

Critical Infrastructure Needs in Appalachia (Chapter 3)
This chapter describes financial, operational, and managerial infrastructure needs throughout Appalachia. Following the approach of Hughes et al. (2005), the project team analyzed data from the most recent EPA Drinking Water and Clean Water Needs Surveys to quantify the current financial investment needed to support centralized services in Appalachia. The team also conducted surveys of water and wastewater operators to gain additional insight into operational and managerial needs.

Water and Wastewater Financing Sources (Chapter 4)
The chapter highlights various funding sources available to support water and wastewater projects in Appalachia. The project team cataloged federal, state, regional, and private financing programs, providing program and application information as well as the amount of funding provided in FY23 (when publicly available). The team also analyzed federal award data to understand how much of the financial need identified in Chapter 3 might be covered by federal funding sources. Additionally, this chapter includes a discussion of the accessibility of private financing solutions (e.g., bond financing) to utilities in Appalachia.

Addressing Financial, Operational, and Managerial Capacity Gaps (Chapter 5)
This chapter explores options for addressing the financial, managerial, and operational gaps identified in Chapter 3. Grant and loan funding, while substantial, cannot fully cover all infrastructure costs. Therefore, the project team explored how much funding might be invested in water and wastewater infrastructure projects in Appalachia through direct appropriations in state budgets. Regardless, external funding sources will never fully cover all infrastructure costs; utilities will always need to cover some capital costs through customer charges. Concerns about affordability were a major finding from Hughes et al. (2005). To assess the extent to which affordability remains a concern, this analysis leverages rate and financial data collected by SOG EFC to evaluate the affordability of existing utility rates for customers in Appalachian states. Finally, because local development districts (LDDs) can be important resources and partners for utilities in their districts, the project team surveyed

LDD staff to understand how LDDs may fill managerial and operational capacity gaps for utilities as well as internal capacity needs and barriers to providing that support.

Exploring Strategies (Chapter 6)
This chapter explores additional strategies and opportunities to improve access to both infrastructure funding and service throughout Appalachia (beyond addressing capacity gaps) via three approaches. First, the team conducted semi-structured interviews with ARC state funding managers to understand current funding practices, identify systemic challenges, and highlight opportunities for program enhancement. Second, because water and wastewater funding and regulation involve many diverse entities at the state level, the team created governance profiles for each Appalachian state to clarify roles, responsibilities, and relationships between these entities. The profiles capture the nuances of these complex landscapes and highlight efficiencies in funding administration. Finally, case studies of Appalachian utilities feature successful financial management strategies replicable in the region.

Key takeaways and considerations are highlighted at the beginning of each chapter. Each subsection within a chapter includes a brief introduction, key findings, methods, and detailed results. Data limitations and other information relevant to the interpretation of results are also provided. The appendices provide a list of data sources, additional technical explanation of methods (when needed), survey language, additional data or analysis results, and the full text of case studies and governance profiles.

Together, the results provide an updated understanding of infrastructure needs and opportunities to bridge funding and capacity gaps that inform Chapter 7: Opportunities to Improve or Expand Service. Chapter 8: Conclusions includes a discussion of lessons learned.

2. The Current State of Infrastructure in Appalachia

As in Hughes et al. (2005), the project team assessed centralized service characteristics for both drinking water and wastewater, including estimates of service coverage. However, service coverage does not necessarily translate to quality services, particularly in the context of drinking water (Mueller and Gasteyer, 2021).[11] Though households generally rely on alternative sources when centralized services are unavailable, there is also evidence that households rely on alternative sources (e.g., bottled water and roadside springs) even when centralized drinking water services are available due to issues of trust.[12]

To generate a more comprehensive understanding of current infrastructure needs throughout Appalachia, this analysis considers a broad array of data to capture potential concerns about water quality. These include both U.S. Safe Drinking Water Act (SDWA) violation data from the Safe Drinking Water Information System (SDWIS) and bottled water purchase data. Homes not served by centralized systems typically rely on onsite systems. However, onsite drinking water systems are not subject to regulation; therefore, they may be more vulnerable to changes in source water quality. Improper maintenance of onsite septic systems can contribute to drinking water contamination. Given the potential health impacts of reliance on decentralized service, this analysis also includes an expanded discussion of decentralized users, including surveys of Cooperative Extension-based well water program directors and information about pilot programs as alternatives to traditional centralized systems.

2.1 Key Takeaways and Considerations

- Overall, Appalachia has fewer water systems and more of its population served by larger systems compared to the early 2000s. The overall population coverage is estimated at 78%, an increase of roughly four percentage points since 1995. Together, these results suggest regionalization and/or consolidation of smaller systems into larger ones, consistent with national trends.
- The percentage of the Appalachian population served by large water systems remains lower than the U.S. as a whole (73% and 84%, respectively). Small systems—which generally have higher costs—still dominate the landscape and serve a slightly higher portion of the population compared to the nation (approximately 10% and 7%, respectively).
- Another potential source of higher costs is drinking water source. Surface water sources, which generally require more treatment, support over 80% of the population in Appalachia compared to 69% of the non-Appalachian U.S.
- Comparisons of bottled water sales and Safe Drinking Water Act violations suggest that Appalachian households may turn to bottled water during times that centralized water systems are out of compliance. Importantly, rates of health-based violations are similar to those in the non-Appalachian U.S., though regulatory reporting (i.e.,

monitoring and reporting) violations are higher. Overall, Appalachian systems may benefit from additional support in meeting monitoring and reporting needs. Investments in outreach and trust-building following the resolution of compliance issues may reduce bottled water reliance.

- Understanding the landscape of centralized wastewater sources was difficult due to data limitations. Broadly, there are more permitted facilities per county in Northern Appalachia compared to Southern Appalachia, the same trend as with water systems. Up to 76% of the population lives within three miles of a centralized wastewater system, but proximity does not guarantee service, particularly in mountainous areas.
- Importantly, complete coverage is unlikely anywhere in the U.S. as some areas will always be too rugged, remote, and/or economically challenged to effectively and efficiently serve with traditional centralized systems. However, the proportion of the remaining population that could feasibly be connected to centralized service, water or wastewater, is unclear.
- Households relying on private wells or septic systems could benefit from increased support for education or water quality testing from Cooperative Extension or similar efforts. Currently, these programs only support wells; analogous programs for septic systems do not yet exist, despite evidence that onsite wastewater failure is a likely source of well water contamination.

2.2 Landscape of Water System Characteristics

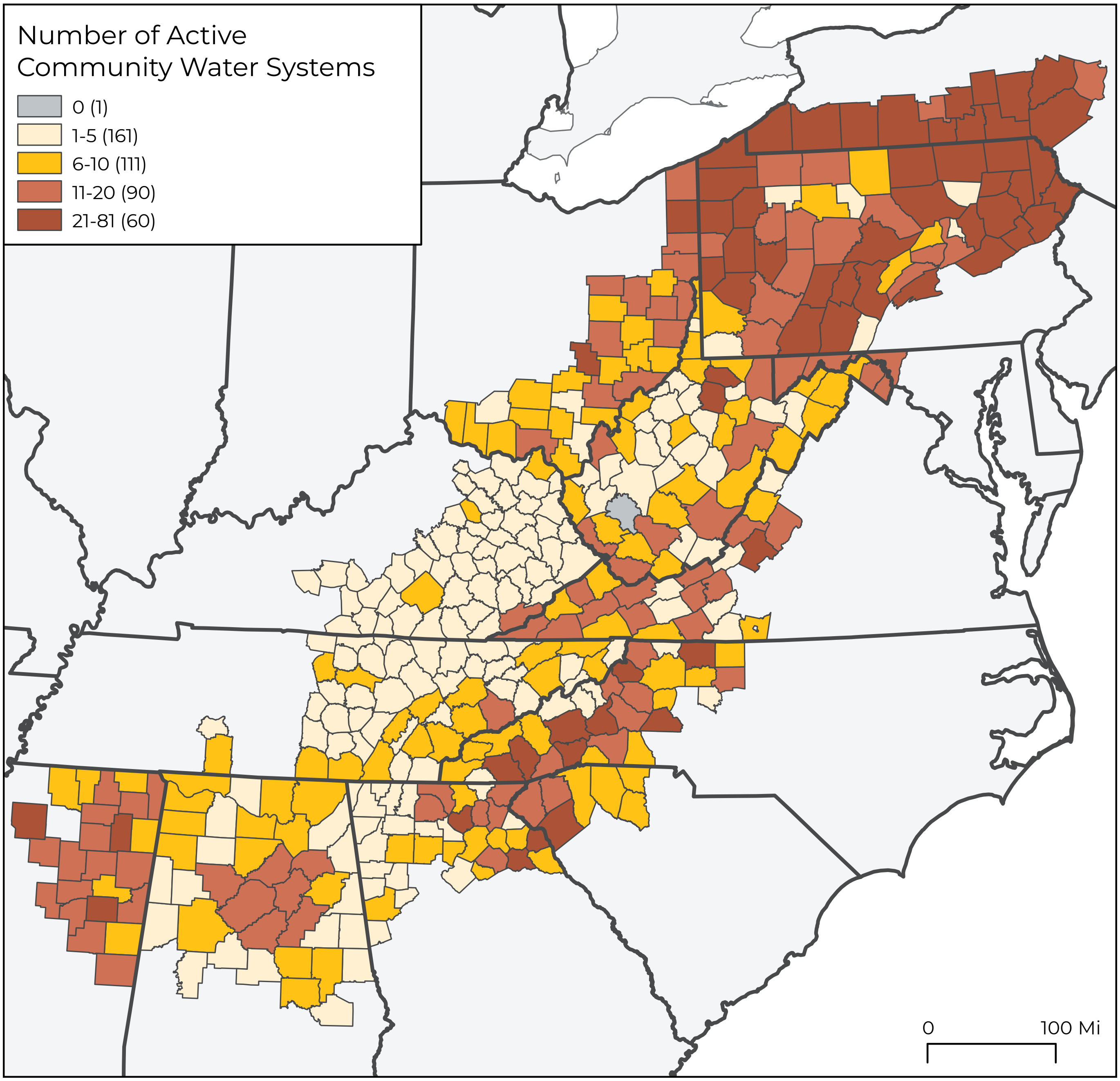
Most Appalachian homes are served by community water systems (CWS) that provide centralized ("municipal") treatment of ground or surface water followed by distribution directly to homes via a networked pipe system. These systems are subject to minimum treatment techniques, monitoring and reporting requirements, and the provision of water that meets federal health-based Maximum Contaminant Levels (MCLs) for nearly 100 water quality measures in accordance with the SDWA. The project team explored CWS characteristics using SDWIS data, comparing information for Appalachia against the non-Appalachian U.S. When possible, the team compared the results against the findings of Hughes et al. (2005).[i]

[i] Detailed methods are provided in Appendix B.

Analysis Results

There are currently nearly 4,700 active CWS within the Appalachian Region. Counties in Pennsylvania and New York tend to have more systems than counties in other Appalachian states (Figure 2.2.1).

Figure 2.2.1: Number of Active Community Water Systems Per Appalachian County, 2024



Source: U.S. EPA, Safe Drinking Water Information System (SDWIS), Retrieved January 2025

Nearly half of these systems (45%) are classified as “very small” (<500 connections). These very small systems serve less than 1.5% of the total Appalachian population. This reflects national trends: although more than half of CWS in the country are very small (54%), they collectively serve less than 1.5% of the country’s population. Roughly equivalent portions of the Appalachian and non-Appalachian population of the United States are served by a system with >10,000 connections (i.e., “large or very large”): 73.4% of the Appalachian population versus 83.8% of the U.S. (Table 2.2.1).

Table 2.2.1: Active Community Water Systems by Size in 2024, Appalachia and the U.S.

Metric	Very Small (<=500)	Small (501-3,300)	Medium (3,301-10,000)	Large (10,000-100,000)	Very Large (>100,000)	Total
Appalachia						
Number	2,132	1,423	678	437	28	4,698
% of All CWS in Appalachia	45.4%	30.3%	14.4%	9.3%	0.6%	100%
% of CWS-Served Population	1.4%	8.9%	16.3%	45.0%	28.4%	100%
U.S.						
Number	25,804	12,953	4,901	4,004	469	48,131
% of All CWS in the U.S.	53.6%	26.9%	10.2%	8.3%	1.0%	100%
% of CWS-Served Population	1.4%	5.9%	9.0%	36.2%	47.6%	100%
% of U.S. CWS in Appalachia	**8.3%**	**11.0%**	**13.8%**	**10.9%**	**6.0%**	**9.8%**

Source: U.S. EPA, Safe Drinking Water Information System (SDWIS), Retrieved January 2025
Notes: Percentages may not add up to 100% because of rounding.

The proportion of system sizes and population served varies by state. However, Mississippi is the only state where the majority of the Appalachian population is not served by large or very large systems (Table 2.2.2).

Table 2.2.2: Community Water Systems and Population Served in Appalachian Portions of Each State, 2024

State	Very Small		Small		Medium		Large		Very Large	
	% of Systems	% of Pop. Served	% of Systems	% of Pop. Served	% of Systems	% of Pop. Served	% of Systems	% of Pop. Served	% of Systems	% of Pop. Served
Alabama	6%	0.1%	30%	4%	36%	15%	27%	55%	1%	26%
Georgia	56%	1%	18%	3%	13%	8%	11%	33%	2%	56%
Kentucky	7%	0.2%	30%	7%	38%	32%	25%	61%	0%	0%
Maryland	55%	2%	28%	13%	11%	16%	6%	68%	0%	0%
Mississippi	21%	3%	64%	42%	13%	35%	2%	20%	0%	0%
New York	70%	7%	23%	22%	4%	15%	3%	56%	0%	0%
North Carolina	71%	4%	16%	8%	7%	15%	5%	38%	0.4%	36%
Ohio	30%	1%	41%	13%	17%	21%	11%	49%	1%	16%
Pennsylvania	57%	2%	27%	10%	9%	13%	5%	35%	1%	40%
South Carolina	35%	0.4%	20%	3%	21%	11%	21%	45%	2%	41%
Tennessee	11%	0.2%	22%	3%	33%	15%	32%	61%	2%	21%
Virginia	56%	5%	28%	20%	13%	35%	3%	40%	0%	0%
West Virginia	27%	1%	50%	22%	16%	23%	6%	40%	0.2%	14%

Source: U.S. EPA, Safe Drinking Water Information System (SDWIS), Retrieved January 2025

Rural areas account for approximately 18% of all community water systems in Appalachia and have the fewest average number of systems per county (Table 2.2.3). In terms of ARC economic designation, distressed counties have the fewest average number of systems per county (Table 2.2.4, page 32).

Table 2.2.3: Community Water Systems in 2024 by ARC Metro Designation

Metro Designation	Number of Counties	Number of Systems			
		Total	% of Total	Average	Maximum
Large Metros (pop. 1 million +)	37	450	10%	12	43
Small Metros (pop. <1 million)	117	1,604	34%	14	81
Nonmetro, Adjacent to Large Metros	45	625	13%	14	54
Nonmetro, Adjacent to Small Metros	117	1,170	25%	10	44
Rural (Nonmetro, Not Adj. to a Metro)	107	849	18%	8	38

Source: (Systems) U.S. EPA, Safe Drinking Water Information System (SDWIS), Retrieved January 2025; (Metro Designation) Appalachian Regional Commission, ARC Metro Status Designation, Received June 2025

Table 2.2.4: Community Water Systems in 2024 by ARC Economic Designation

Economic Designation	Number of Counties	Number of Systems			
		Total	% of Total	Average	Maximum
Distressed	77	434	9%	6	24
At-Risk	103	900	19%	9	51
Transitional	226	3,178	68%	14	81
Competitive	14	154	3%	11	43
Attainment	3	32	1%	11	16

Source: (Systems) U.S. EPA, Safe Drinking Water Information System (SDWIS), Retrieved January 2025; (Economic Designation) Appalachian Regional Commission, ARC County Economic Designation, Retrieved January 2025

The number of permitted CWS in Appalachia fell by almost 35% in the last 20 years, which is larger than the decrease for the non-Appalachian U.S. (20% decrease) (Table 2.2.5). One potential explanation is that this may reflect trends in consolidation—very small and small systems merging with larger systems to take advantage of economies of scale and/or shared management and operational responsibilities. This interpretation would be consistent with Hughes et al.'s (2005) finding that one-third of the Appalachian population relied on systems serving fewer than 10,000 people compared to the current results indicating that 73.4% are now reliant on systems serving more than 10,000 people.

Table 2.2.5: Active Community Water Systems in 2024, Appalachia and Non-Appalachian U.S.

Year	Appalachia	Non-Appalachian U.S.
2005	7,168	42,635
2024	4,698	34,289
% Change	**-34%**	**-20%**

Source: U.S. EPA, Safe Drinking Water Information System (SDWIS), Retrieved January 2025
Notes: Accurately comparing the number of systems in Appalachia versus non-Appalachia required the use of SDWIS data for both years, rather than the previously reported number of systems. The estimates computed for 2005 are higher than the estimates provided in Hughes et al. (2005) because it is not possible to determine when systems became inactive in SDWIS.

While the majority (63%) of Appalachian *water systems* are dependent on groundwater (either directly or purchased), the majority (83%) of the *population served* by a CWS receives water from CWS that are dependent on surface water sources (either directly or purchased). This result aligns with national findings as groundwater-sourced systems are generally smaller and serve fewer customers. The trend for the non-Appalachian U.S. is similar: the majority (79%) of CWS are groundwater-sourced, but the majority of the population (69%) is reliant on CWS that are surface-water-sourced. Surface water sources tend to require more treatment than groundwater sources, and therefore, those systems have higher costs. Appalachia has a higher proportion of surface-water systems compared to the non-Appalachian U.S. (37% and 21%, respectively) (Table 2.2.6).

Table 2.2.6: Source Water Types for Active Community Water Systems in 2024, Appalachia and Non-Appalachian U.S.

Source Water	Appalachia				Non-Appalachian U.S.			
	# of Systems	% of Systems	Pop. Served	% of Pop. Served	# of Systems	% of Systems	Pop. Served	% of Pop. Served
Groundwater (GW)	2,596	55.3%	3,440,946	13.8%	31,558	72.7%	84,550,694	28.7%
Purchased Groundwater (GWP)	220	4.7%	269,477	1.1%	2,293	5.3%	3,266,774	1.1%
Groundwater Directly Influenced by Surface Water (GU)	120	2.6%	373,714	1.5%	389	0.9%	2,466,966	0.8%
Purchased Groundwater Directly Influenced by Surface Water (GUP)	36	0.8%	37,349	0.2%	71	0.2%	145,347	0.0%
Groundwater (Total)	**2,972**	**63.3%**	**4,121,486**	**16.6%**	**34,311**	**79.0%**	**90,429,781**	**30.7%**
Surface Water	733	15.6%	16,106,940	64.7%	3,116	7.2%	132,973,667	45.1%
Purchased Surface Water	992	21.1%	4,647,322	18.7%	5,999	13.8%	71,238,065	24.2%
Surface Water (Total)	**1,725**	**36.7%**	**20,754,262**	**83.4%**	**9,115**	**21.0%**	**204,211,732**	**69.3%**
Total	**4,697**	**100.0%**	**24,875,748**	**100.0%**	**43,426**	**100.0%**	**294,641,513**	**100.0%**

Source: U.S. EPA, Safe Drinking Water Information System (SDWIS), Retrieved January 2025
Notes: A small number of systems did not have a water source listed, so they were excluded from this table.

Slightly more than half of the CWS in Appalachia are owned by federal, state, or local governments (54% total). Ownership trends in Appalachia are essentially equivalent to those in the rest of the country: in the non-Appalachian U.S., 53% of CWS are owned by federal, state, or local governments (Table 2.2.7). Ownership has implications for management, regulation, and funding access. Privately-owned systems are not always eligible for the same funding programs as publicly-owned systems.

Table 2.2.7: Ownership for Active Community Water Systems in 2024, Appalachia and Non-Appalachian U.S.

Owner Type	Appalachia		Non-Appalachian U.S.	
	Number of Systems	% of Systems	Number of Systems	% of Systems
Federal Government (F)	11	0.2%	220	0.6%
State Government (S)	35	0.7%	306	0.9%
Local Government (L)	2,474	52.7%	17,512	51.1%
Public/Private (M)	250	5.3%	457	1.3%
Private (P)	1,928	41.0%	15,704	45.8%
Native American (N)	0	0.0%	90	0.3%
Total	**4,698**	**100%**	**34,289**	**100.0%**

Source: U.S. EPA, Safe Drinking Water Information System (SDWIS), Retrieved January 2025

Caveats and Limitations

The analysis is based on SDWIS data, which are continuously “overwritten” each quarter and may include data from presently inactive systems. Because historical data are not retained, historical estimates are challenging.

2.3 Drinking Water: Centralized versus Decentralized Access

As with many rural areas throughout the U.S., not all households in Appalachia have access to centralized water services. These households primarily rely on private wells, bottled water, or hauling water. There are no public datasets describing the prevalence of such systems, but subtracting the percent served by centralized systems from 100 can be a proxy. The project team calculated this proxy using U.S. Geological Survey (USGS) freshwater use data.

Analysis Results

The percent coverage by centralized systems ranges from 90% (Appalachian Alabama) to 68% (Appalachian Pennsylvania), for an estimated overall coverage of 78% in the region (Table 2.3.1). This finding is only a modest increase from that of Hughes et al. (2005) (74% population coverage in Appalachia by CWS in 1995).[ii] As a proxy, this result would suggest that 22% of the Appalachian population is potentially served by a decentralized system. Though quantification of coverage at a national scale is difficult, Hernandez and Pierce's (2023) in-depth analysis of non-centralized water systems estimates national coverage by centralized systems at 89%, which is significantly higher.[13] However, that study uses a newer dataset.[iii]

Table 2.3.1: Estimated Percentage of Appalachian Population Served by CWS, 2015

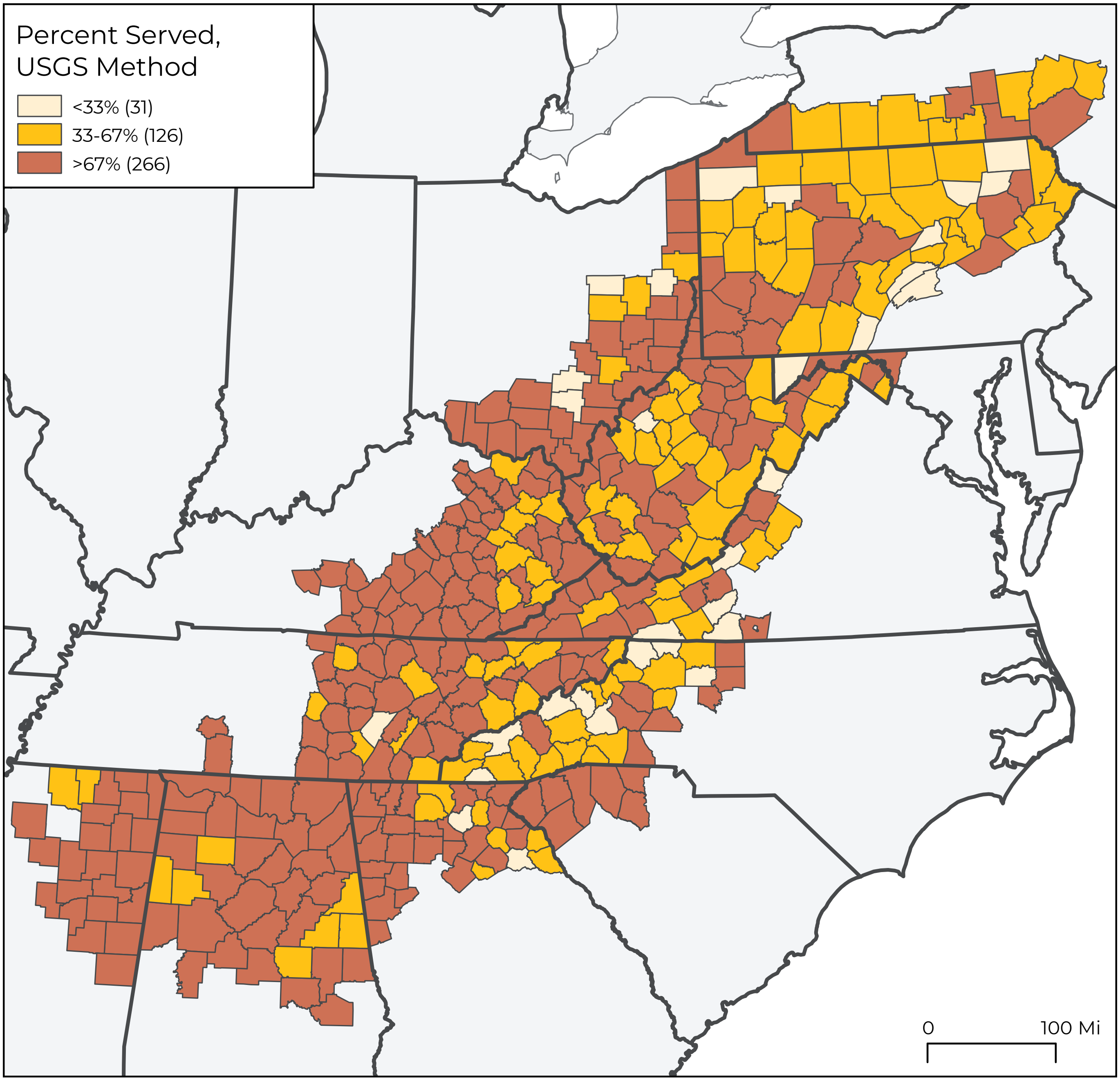
Geographic Area	% of Appalachian Population Served by CWS	Est. % of Appalachian Population Not Served by CWS
Appalachian Portion of State		
Alabama	90%	10%
Georgia	88%	12%
Kentucky	83%	17%
Maryland	71%	29%
Mississippi	84%	16%
New York	68%	32%
North Carolina	64%	36%
Ohio	80%	20%
Pennsylvania	68%	32%
South Carolina	86%	14%
Tennessee	89%	11%
Virginia	69%	31%
West Virginia	79%	21%
Appalachia	**78%**	**22%**

Source: U.S. Geological Survey, Estimated Use of Water in the United States County-Level Data for 2015, Retrieved January 2025
Notes: The estimated percentage of the Appalachian population not served by CWS is calculated as 100% minus the percentage of the population served by CWS.

[ii] The footprint of the Appalachian Region has changed over time. Therefore, these values are not necessarily directly comparable.
[iii] The project team also conducted this analysis using SDWIS data, which yielded a percent coverage closer to the estimation by Hernandez and Pierce. However, using that dataset also had significant limitations, so the team opted to focus on a replication of the method used by Hughes et al. (2005).

At the county level, percent coverage tends to be higher in Southern Appalachia compared to Northern Appalachia (Figure 2.3.1).

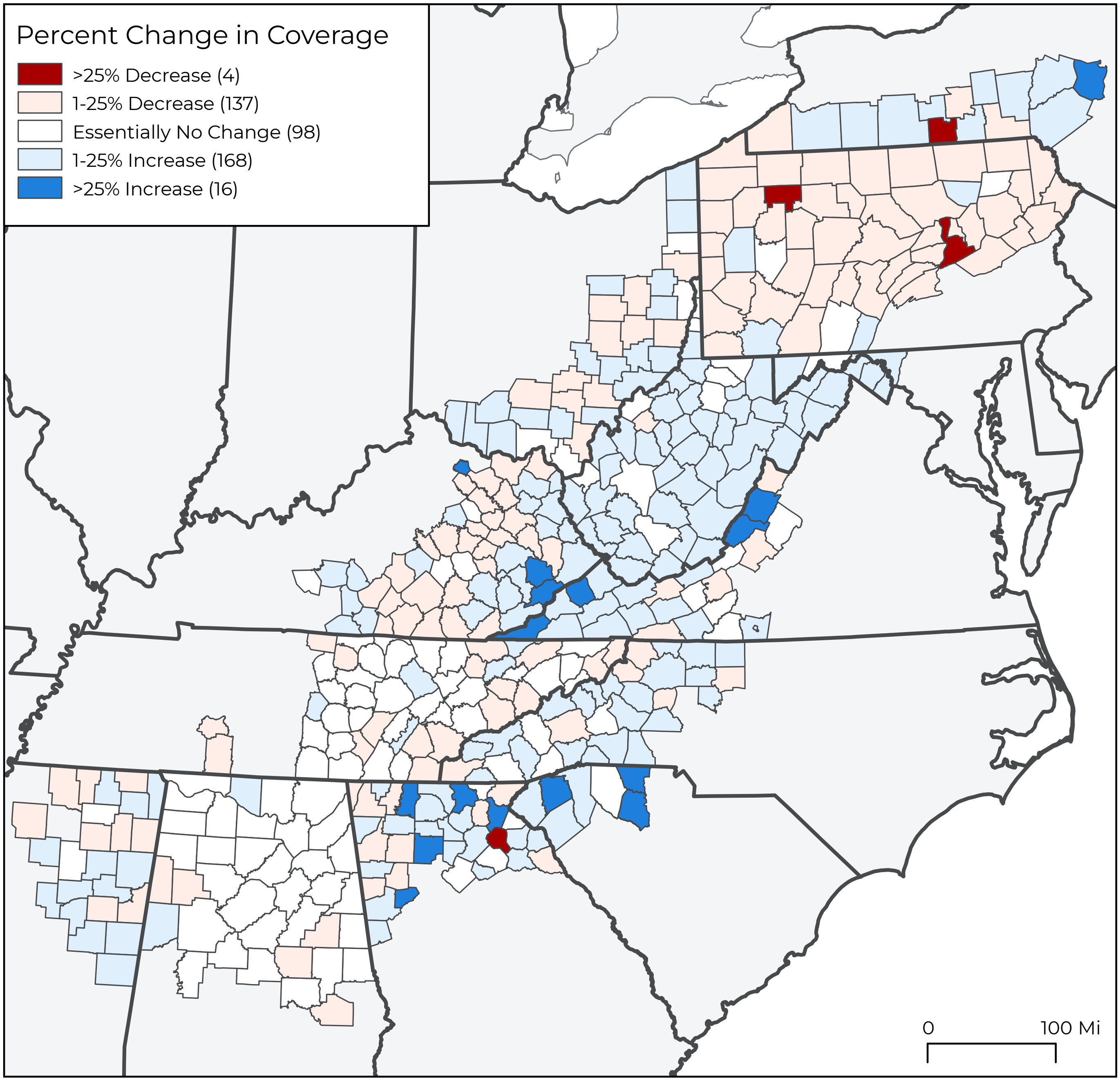
Figure 2.3.1: Percentage of Population Served by Community Water Systems, 2015



Source: U.S. Geological Survey, Estimated Use of Water in the United States County-Level Data for 2015, Retrieved January 2025

Based on direct comparison of USGS data at the county level in 1995 and 2015, about 43% of counties in Appalachia have seen some increase in percent coverage (Figure 2.3.2).

Figure 2.3.2: Percentage Change in Community Water System Coverage Between 1995 and 2015



Source: (2005) Hughes et al., Drinking Water and Wastewater Infrastructure in Appalachia: An Analysis of Capital Funding and Funding Gaps; (2015) U.S. Geological Survey, Estimated Use of Water in the United States County-Level Data for 2015, Retrieved January 2025

Full coverage by centralized systems is highly unlikely given the rural nature and rough terrain throughout Appalachia. Accordingly, determining how much of the remaining population can feasibly be connected to centralized services is difficult. Assessing percent coverage by ARC-defined metro designation can shed light on potential opportunities. Although metro areas have the highest percent coverage, they still fall under 80%. Areas adjacent to metro areas have the lowest average coverage by county, at under 70% (Table 2.3.2). Though there is some variation in the percentage of the population covered by a CWS by ARC-defined economic designations, it is notable that counties that have reached attainment (i.e., the economically strongest counties) have an average population coverage of about 95% (Table 2.3.3).

Table 2.3.2: Average Percentage of Population Covered by CWS in 2015, Aggregated by ARC Metro Designation

Metro Designation	Number of Counties	Average of % Population Covered Per County
Large Metros (Pop. 1 million +)	37	79%
Small Metros (Pop. <1 million)	117	75%
Nonmetro, Adjacent to Large Metros	45	69%
Nonmetro, Adjacent to Small Metros	117	65%
Rural (Nonmetro, Not Adj. to a Metro)	107	73%

Source: (Coverage) U.S. Geological Survey, Estimated Use of Water in the United States County-Level Data for 2015, Retrieved January 2025; (Metro Designation) Appalachian Regional Commission, ARC Metro Status Designation, Received June 2025

Table 2.3.3: Average Percentage of Population Covered by CWS in 2015, Aggregated by ARC Economic Designation

Economic Designation	Number of Counties	Average of % Population Covered Per County
Distressed	77	73%
At-Risk	103	76%
Transitional	226	68%
Competitive	14	72%
Attainment	3	95%

Source: (Coverage) U.S. Geological Survey, Estimated Use of Water in the United States County-Level Data for 2015, Retrieved January 2025; (Economic Designation) Appalachian Regional Commission, ARC County Economic Designation, Retrieved January 2025

To support onsite (i.e., household well) users, many states throughout the country, including nine in Appalachia, have Cooperative Extension-based outreach programs focused on well stewardship, and often offer subsidized testing for basic water quality parameters for private system samples (Table 2.3.4).[14] However, North Carolina and West Virginia provide well water information and testing (for a fee) through local health departments, while New York requires the use of state-certified labs.[iv,15] Tennessee has a nonprofit entity, the Tennessee Well Water Association, to support onsite users.

Table 2.3.4: Decentralized Water Supply Cooperative Extension Outreach Programs

State	Program Name	Home University	Website
Alabama	Alabama Private Well Program	Auburn University	https://aub.ie/wellwater
Georgia	N/A; Cooperative Extension	University of Georgia	https://aesl.ces.uga.edu/water.html
Kentucky	Kentucky Well Education Program	University of Kentucky	https://water.ca.uky.edu/downwell
Maryland	Well Water and Septic Homeowner Education Project	University of Maryland	https://extension.umd.edu/programs/environment-natural-resources/program-areas/wells-septic-systems-and-water-quality/
Mississippi	Mississippi State Well Owner Network	Mississippi State University	https://extension.msstate.edu/natural-resources/water/mswon
New York	None	N/A	N/A
North Carolina	None	N/A	N/A
Ohio	Know Your Well Water	Ohio State University	https://ohiowatersheds.osu.edu/knowyour-well-water
Pennsylvania	Master Well Owner Network	Penn State	https://extension.psu.edu/programs/mwon
South Carolina	Be Well Informed	Clemson University	https://www.clemson.edu/extension/water/programs/be-well-informed.html
Tennessee	(Nonprofit program)	N/A	N/A
Virginia	Virginia Household Water Quality Program	Virginia Tech	https://www.wellwater.bse.vt.edu/
West Virginia	None	N/A	N/A

To understand the role of Cooperative Extension-based programs, the project team interviewed representatives of programs in four states: Alabama, Maryland, Mississippi, and Virginia. Programs are supported by a combination of continuous ("hard funded") state allocations, as well as grants from foundations, federal research and outreach programs, and private donations. They all provide well/private system outreach and education. Three provide regular water quality testing; one provides well testing only when funded by

[iv] Additional information about the role of state and local government entities in supporting onsite users is discussed in 6.3 State-Level Governance Structures.

extramural grants (Maryland). The team also asked about key contaminant concerns and other challenges. All reported that the detection of fecal indicator bacteria (e.g., coliform, *E. coli*) in private wells is of primary concern in the Appalachian portion of their states. Two also identified septic pumpouts as a primary need. Other common contaminant issues are arsenic, nitrate, and lead. All identified access to testing and awareness of necessary maintenance as key challenges.

There are also some emerging pilot-level programs to provide alternative, monitored decentralized water programs. Dig Deep, Inc.'s Appalachian Water Project has funded a novel household-scale rainwater collection project in McDowell County, West Virginia. Runoff from an existing roof structure (no extension was needed) is funneled into a cistern designed to cultivate a treatment biofilm. Water passes through three filters before arriving at the point of use (sediment, large microorganism, and UV). This pilot system has been so successful that at least six other homes are interested in installing a similar system (see Appendix C for more information). Another example is the Red Bird Water Kiosk in Beverly, Kentucky developed by the University of Tennessee. The kiosk allows community members to haul water from a safely managed and monitored source.[16]

Caveats and Limitations

Because the most recent USGS data is from 2015, the project team also explored calculating population coverage using SDWIS data. However, this method yielded a significant number of counties (144 of 423) where the percentage served by CWS exceeded 100% of the county's 2023 population. Therefore, the project team presented results from the USGS to provide a comparison point to Hughes et al. (2005).

2.4 Functionality of Drinking Water Systems: Safe Drinking Water Act Violations

Access to centralized systems does not necessarily ensure that homes are served by adequate quantities of water that reliably meet applicable health-based standards. Mueller and Gasteyer (2021) conducted a national geospatial examination of SDWA violations. This study specifically highlighted Central Appalachia as home to higher numbers of SDWA "serious violator" community water systems (CWS) nationally.[17] To gain a more holistic picture of drinking water access in Appalachia, the project team analyzed SDWA monitoring and reporting (MR) and health-based (HB) violation data. Hughes et al. (2005) did not include an examination of patterns of CWS violations to allow for direct comparisons. To identify potential trends over time, the project team examined the sum of MR and HB violations for three time periods: 2005-2007, 2014-2016 (midway between the two analyses), and 2021-2023 (immediately preceding the current analysis).[v] The earlier period is meant to roughly be congruent with Hughes et al. (2005).

[v] Detailed methods are provided in Appendix B.

Analysis Results

Analysis of 2024 Data

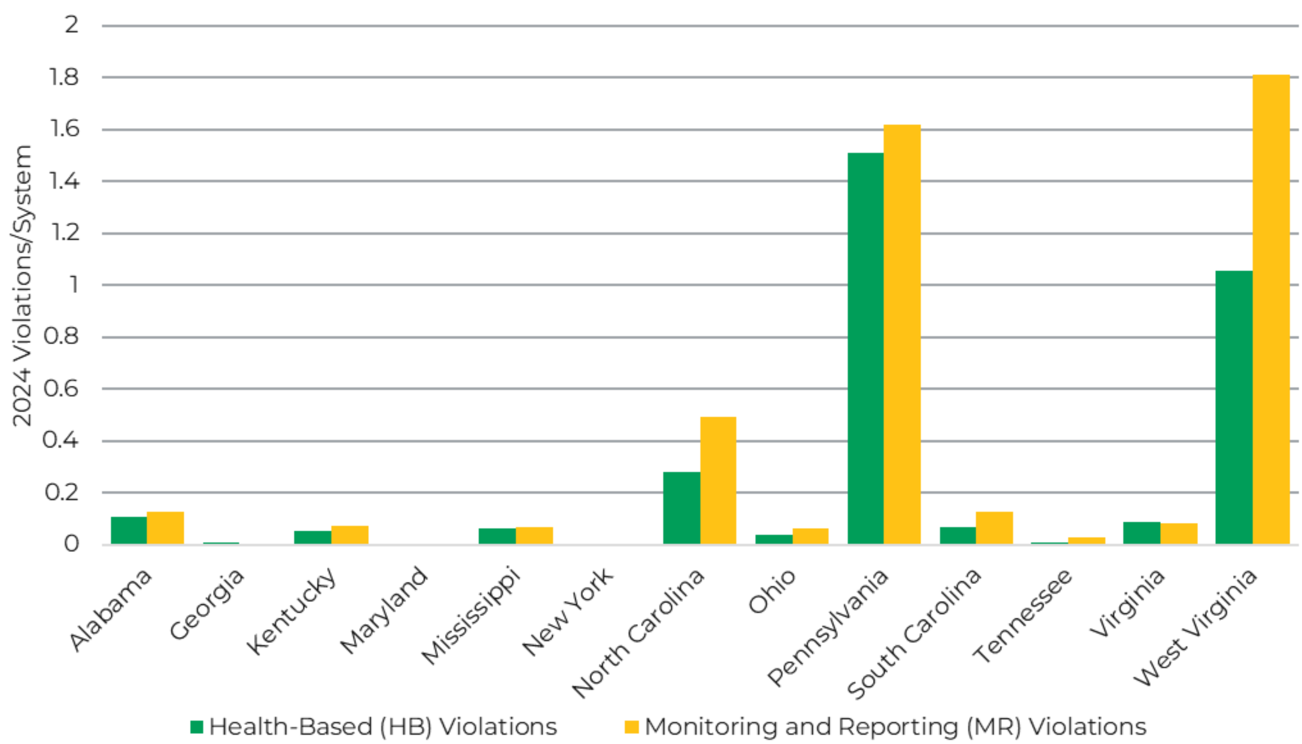
In 2024, the rate of monitoring and reporting (MR) violations in Appalachia was twice as high as the non-Appalachian U.S. For health-based (HB) violations, however, the rate of violations in Appalachia is only slightly higher when compared to the non-Appalachian U.S. (Table 2.4.1). Violation rates also vary by state within Appalachia (Figure 2.4.1).

Table 2.4.1: Comparison of Safe Drinking Water Act Violations for Active Community Water Systems in 2024, Appalachia and Non-Appalachian U.S.

Geographic Area	System Information		Total Violations		Violations Per System	
	Number	Pop. Served	MR	HB	MR	HB
Appalachia	4,698	24,875,798	3,119	524	0.66	0.11
Non-Appalachian U.S.	34,289	218,930,254	11,970	2,900	0.35	0.08

Source: U.S. EPA, Safe Drinking Water Information System (SDWIS), Retrieved January 2025
Notes: MR = Monitoring and Reporting violations; HB = Health-Based violations

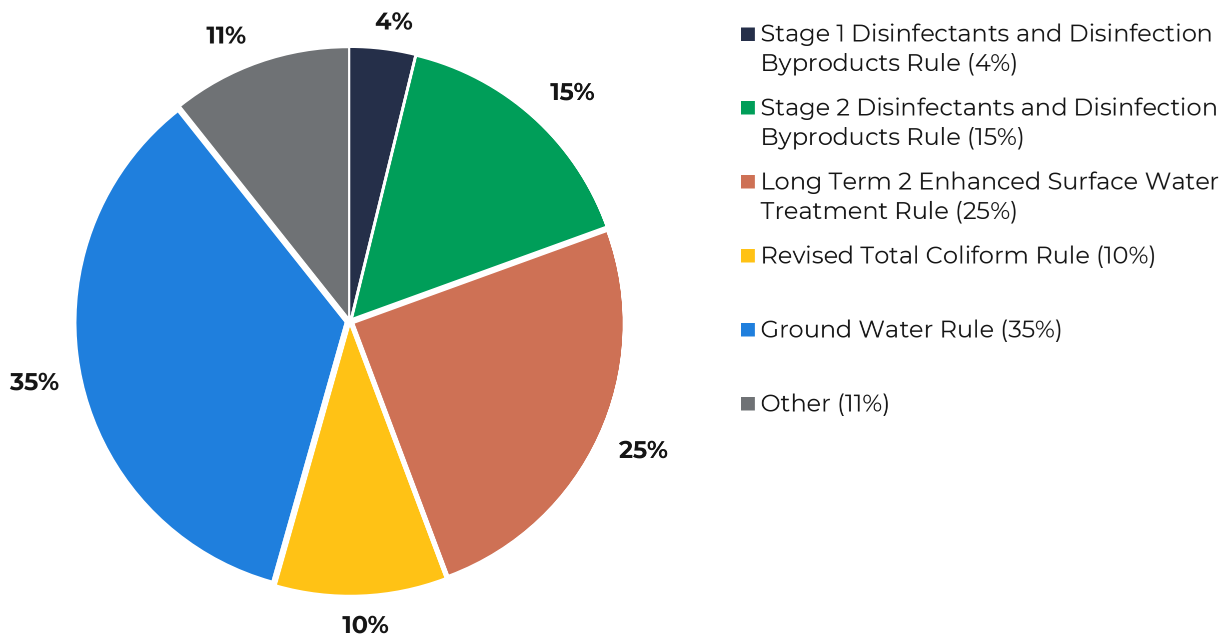
Figure 2.4.1: Safe Drinking Water Act Violations in 2024 within Appalachia by State



Source: U.S. EPA, Safe Drinking Water Information System (SDWIS), Retrieved January 2025

Ground Water Rule violations were responsible for one-third of HB violations, while Long Term 2 Enhanced Surface Water Treatment Rule violations made up 25% (Figure 2.4.2). Both of these particular regulations involve enhanced sanitary surveys or targeted monitoring (e.g., for Cryptosporidium in surface water) in order to reduce the risk of microbial contamination in drinking water systems.

Figure 2.4.2: Types of Health-Based Safe Drinking Water Act Violations in Appalachia (2024)



Source: U.S. EPA, Safe Drinking Water Information System (SDWIS), Retrieved January 2025
Notes: “Other” includes Lead and Copper Rules, Long Term 1 Enhanced Surface Water Treatment Rule, Surface Water Treatment Rule, Volatile Organic Chemicals, Inorganic Chemicals, Radionucleides, Arsenic, and Nitrates.

Trend Analysis

For Appalachia, the overall number of MR violations is greater for 2021-2023 than 2005-2007 while the overall number of HB violations for 2021-2023 is lower than 2005-2007. However, because the number of systems also decreased, the rate of HB violations is essentially equivalent in both periods. The number of MR violations per system in Appalachia has increased overall.

For the non-Appalachian U.S., the rate of MR violations is lower in 2021-2023 than in 2005-2007 while the rate of HB violations is largely constant. MR violation rates are consistently higher in Appalachia. HB violations are higher for 2021-2023 in the non-Appalachian U.S. compared to Appalachia. Increases in violations may reflect worsening challenges related to operation and maintenance and/or increasing SDWA complexities. Notwithstanding, the inclusion of inactive systems in historical analyses complicates interpretation because some systems may have consolidated in later years (Table 2.4.2).

Table 2.4.2: Comparison of Safe Drinking Water Act Violations Over Time

Years	Number of Systems	Population Served	Number of MR Violations	MR Violations/ System	Number of HB Violations	HB Violations/ System
Appalachia						
2005 - 2007	7,168	27,742,575	20,306	2.83	1,252	0.17
2014 - 2016	6,922	27,556,766	26,492	3.83	1,411	0.20
2021 - 2023	6,708	27,450,850	22,713	3.39	1,053	0.16
Non-Appalachian U.S.						
2005 - 2007	42,635	225,479,157	91,615	2.15	11,040	0.26
2014 - 2016	41,858	225,782,001	47,507	1.13	11,206	0.27
2021 - 2023	41,173	225,478,990	49,459	1.20	9,609	0.23

Source: U.S. EPA, Safe Drinking Water Information System (SDWIS), Retrieved January 2025
Notes: MR = Monitoring and Reporting; HB = Health-Based; For this analysis, the number of systems was averaged over the three-year period and the number of violations was summed. Inactive systems are included because the date of inactive designation cannot be determined and removing inactive systems would remove violations that were experienced.

Moreover, analyzing historical trends in SDWA Health-Based violations is complicated because of changes to SDWA and classifications. For example, in the earliest time period (2005-2007), 16% of HB violations in Appalachia were attributed to the Total Coliform Rule. In the more recent time period (2021-2023), 11% of HB violations were attributed to the Revised Total Coliform Rule; the Revised Total Coliform Rule replaced the Total Coliform Rule in 2016. Though disinfection byproducts (DBPs) remain a concern, there is evidence of a decrease. In both 2005-2007 and 2014-2016, half of the HB violations were attributable to DBPs; in 2021-2023, a quarter (25%) of HB violations were related to DBPs (Table 2.4.3). Whereas the shift from the Total Coliform Rule to the Revised Rule highlights water systems' ability to adapt to regulatory changes, the reduction in DBP violations more likely reflects evolving technical and operational capacity to address persistent water quality concerns.

Table 2.4.3: Causes of Health-Based Safe Drinking Water Act Violations Over Time in Appalachia

Rule Name	2005-2007	2014-2016	2021-2023
Total Coliform Rule	206	107	0
Surface Water Treatment Rule	124	41	60
Long Term 1 Enhanced Surface Water Treatment Rule	51	34	40
Long Term 2 Enhanced Surface Water Treatment Rule	0	42	123
Filter Backwash Rule	0	0	0
Ground Water Rule	0	329	315
Stage 1 Disinfectants and Disinfection Byproducts Rule	624	71	62
Stage 2 Disinfectants and Disinfection Byproducts Rule	0	615	259
Total Trihalomethanes	0	0	0
Volatile Organic Chemicals	4	4	2
Nitrates	5	8	10
Arsenic	104	23	16
Inorganic Chemicals	9	9	3
Synthetic Organic Chemicals	2	1	0
Radionuclides	56	39	6
Lead and Copper Rule	67	67	36
Public Notice Rule	0	0	0
Consumer Confidence Rule	0	0	0
Miscellaneous	0	0	0
Not Regulated	0	0	0
Revised Total Coliform Rule	0	21	121
Total	**1,252**	**1,411**	**1,053**

Source: U.S. EPA, Safe Drinking Water Information System (SDWIS), Retrieved January 2025

Caveats and Limitations

The analysis is based on SDWIS data, which is continuously "overwritten," rendering estimates of historical data more difficult and less precise. Numbers may not exactly reflect historical situations and Hughes et al. (2005) did not include an examination of SDWA violation patterns to provide a clear comparison point. The trend analysis also includes inactive systems, which may have consolidated into other systems in later years, and changes in inactive/active designation can be especially challenging. Further, both the number of MCLs regulations and types of violations have increased substantially in recent years.

2.5 Alternative Drinking Water Sources: Bottled Water Consumption in Appalachia

Several studies conducted over the last 15 years have shown that distrust of utility-supplied tap water quality is associated with increased consumption of bottled water as a primary drinking water source.[18] Use of, and reliance on, bottled water is hypothesized to be growing. Based on self-reported bottled-water use data, Marion (2023) found that Appalachian households in Kentucky are also associated with higher levels of bottled water use compared with those living in non-Appalachian counties.[19] Cohen et al. (2024) identified reliance on bottled water for drinking, as well as (to a lesser extent) cooking, in rural areas of Appalachian Virginia.[20] Finally, in West Virginia, Whelton et al.'s (2015) work suggests that rebuilding trust in water utilities may take considerable time, even following significant improvements, which can result in hesitancy to rely on piped in-home sources.[21]

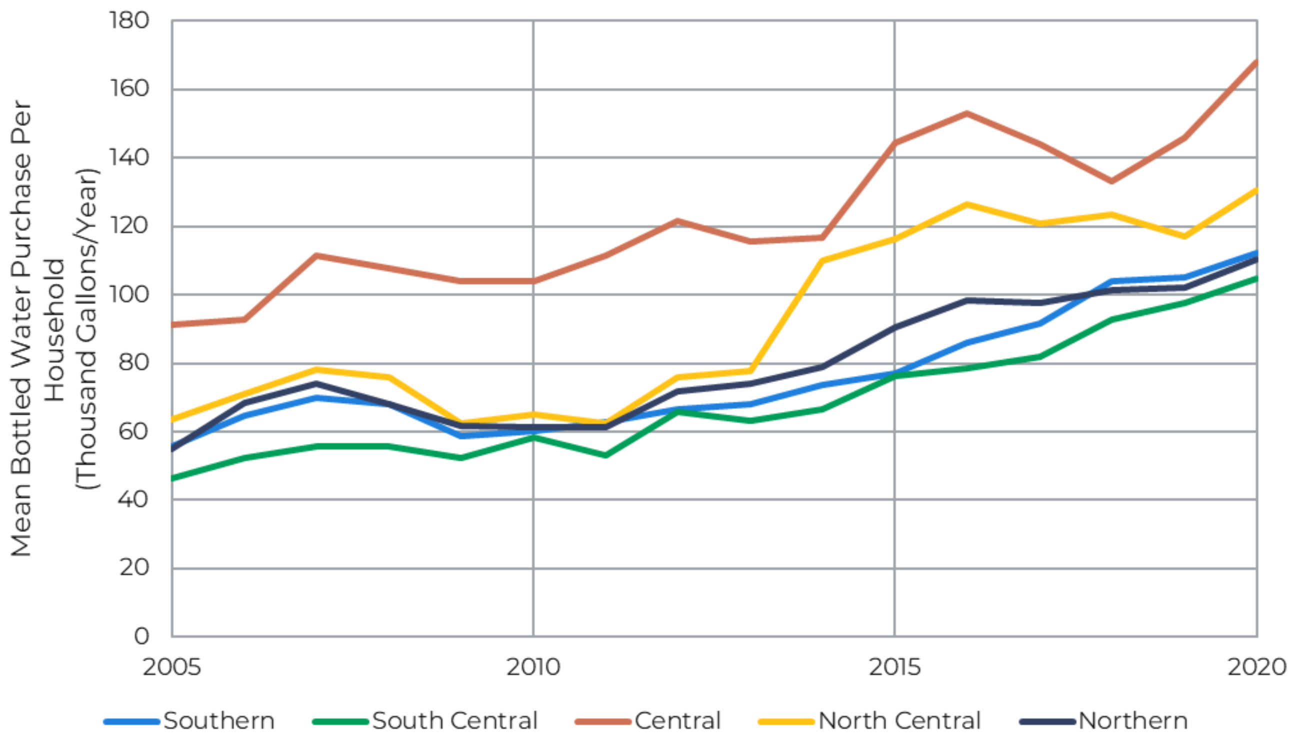
To more comprehensively analyze bottled water use trends, the project team used NielsenIQ bottled water purchasing data to analyze and characterize bottled water use trends across the Appalachian Region from 2005 to 2020 (ending just before the start of the COVID-19 pandemic, which disrupted consumption and other trends). The team also analyzed associations between SDWA violations and bottled water use and U.S. Census demographic data.[vi]

[vi] Detailed methods are provided in Appendix B.

Analysis Results

Looking across the Appalachian Region overall, bottled water consumption increased at a relatively steady rate in all five subregions. Although the highest rates of bottled water sales (in absolute terms) were observed in Northern Appalachia, followed by North Central and Central Appalachia, when bottled water sales are adjusted to a per-Nielsen-household basis, the highest rates of bottled water use were observed in Central Appalachia. Bottled water use rates, in terms of gallons per household, were comparatively lower in Southern Appalachia, and lowest overall in South Central Appalachia. These relative differences in use by subregion were generally consistent over the time period measured (Figure 2.5.1).

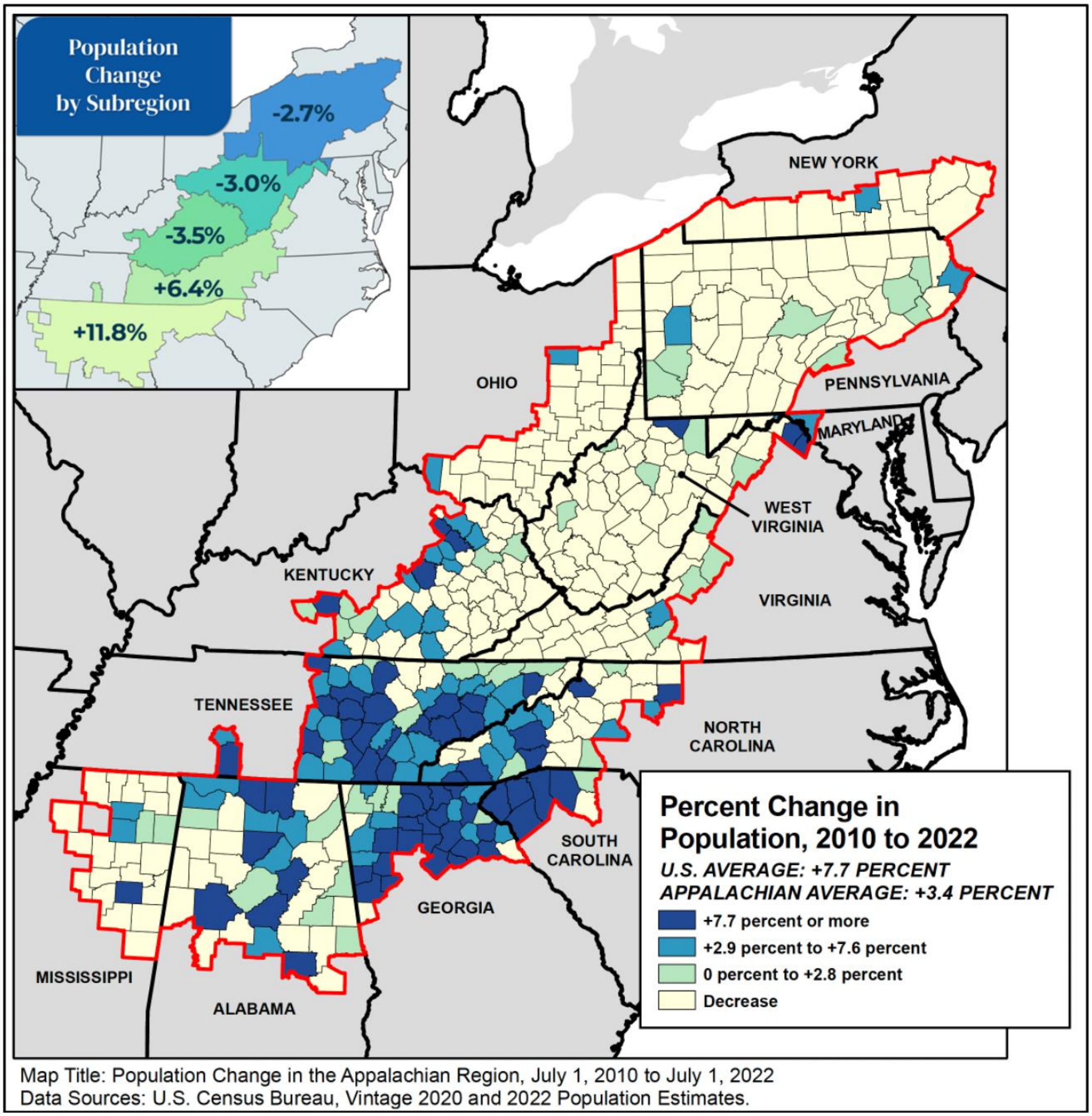
Figure 2.5.1: Bottled Water Consumption Trends Over Time by ARC Subregion, 2005-2020



Source: Nielsen IQ, 2021
Notes: Authors' calculations based in part on data reported by NielsenIQ for participating households through its Homescan Services for all food categories, including beverages and alcohol, across the U.S. market. The conclusions drawn from the data are those of SOG EFC and do not reflect the views of NielsenIQ. NielsenIQ is not responsible for and had no role in, and was not involved in, analyzing and preparing the results reported herein.

Given that the three subregions with the highest rates of bottled water use by household also experienced some degree of overall population decline since 2010, these overall increasing rates of bottled water use are noteworthy. Conversely, the two subregions with the lowest bottled water use (South Central and Southern) were also the only two subregions to experience considerable population growth over approximately the same time period (Figure 2.5.2).

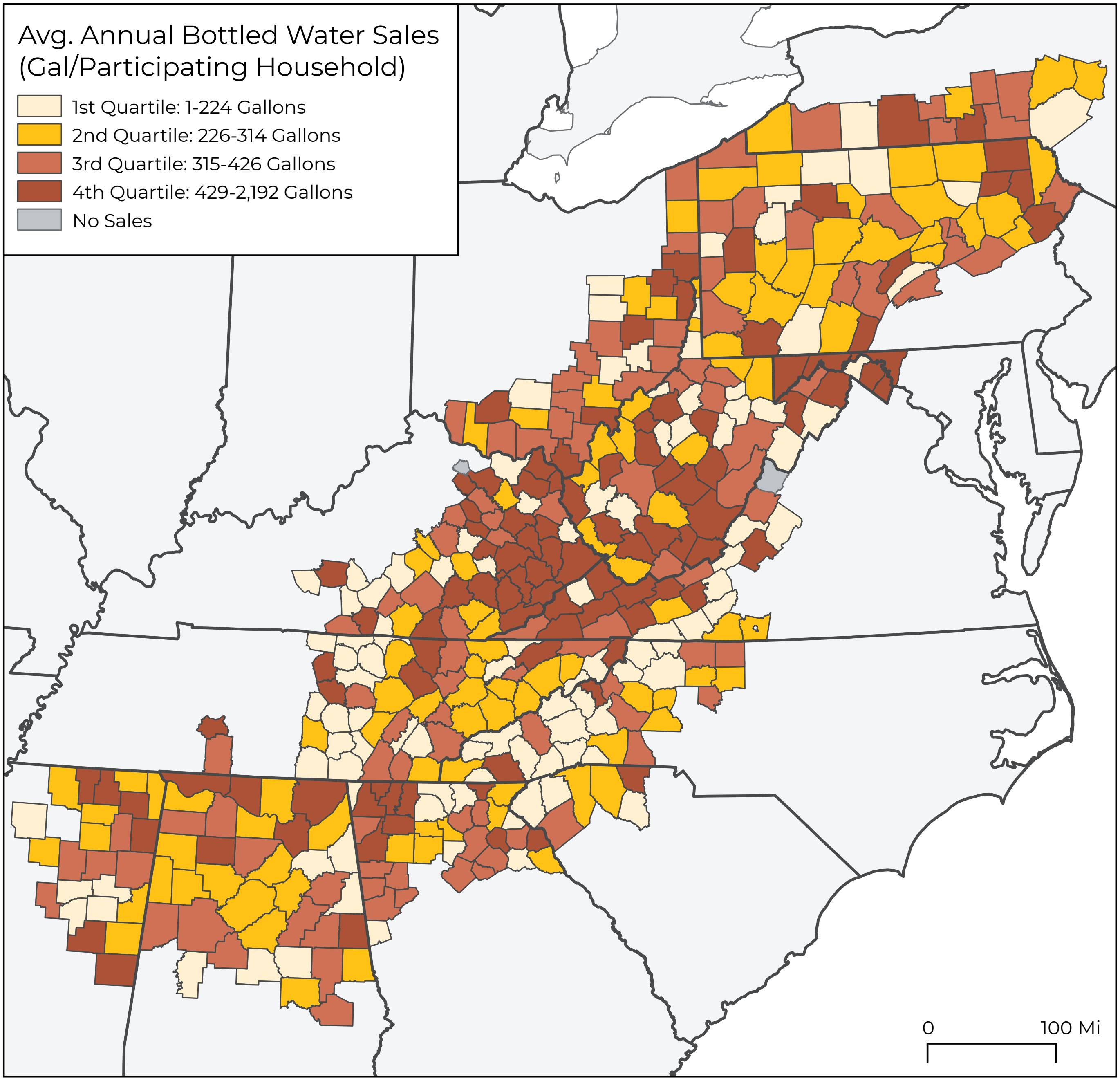
Figure 2.5.2: Population Change in Appalachia, 2010 to 2022



Source: Srygley et al., The Appalachian Region: A Data Overview from the 2018-2022 American Community Survey Chartbook

At both the subregional and county levels, the analysis suggests an association between higher rates of SDWA violations and higher rates of bottled water sales in a number of areas. This is especially the case in Northern Appalachia (Figure 2.5.3 and Figure 2.5.4, page 49).

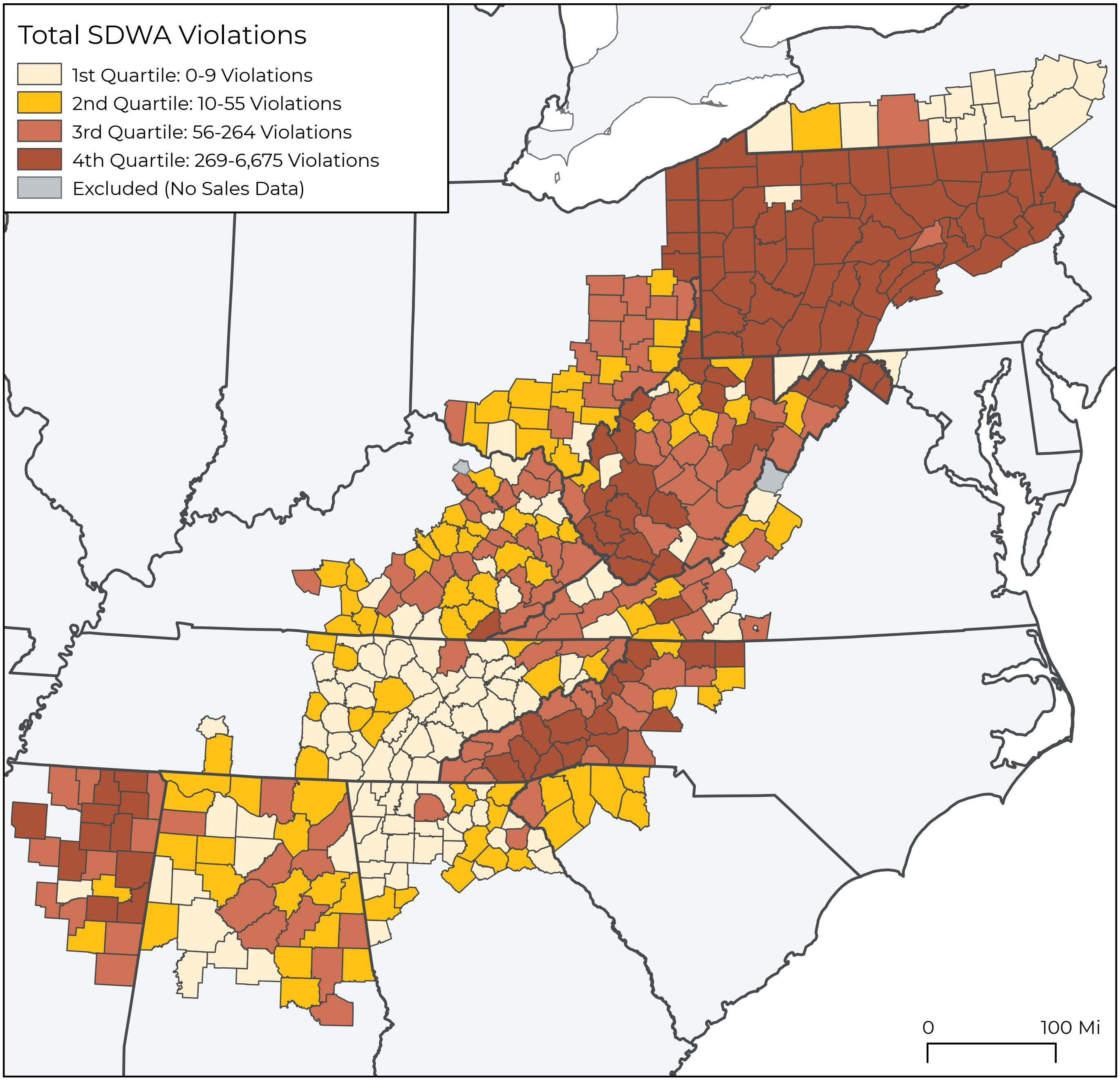
Figure 2.5.3: Average Annual Bottled Water Sales (Gallons Per Participating Household), 2005-2020



Source: NielsenIQ, 2021

Notes: Authors' calculations based in part on data reported by NielsenIQ for participating households through its Homescan Services for all food categories, including beverages and alcohol, across the U.S. market. The conclusions drawn from the data are those of UNC and do not reflect the views of NielsenIQ. NielsenIQ is not responsible for and had no role in, and was not involved in, analyzing and preparing the results reported herein.

Figure 2.5.4: Total SDWA Violations by Quartile, 2005-2020



Source: U.S. EPA, Safe Drinking Water Information System (SDWIS), Retrieved January 2025

When using fixed effects regression analyses (with >6,000 observations in the models), the project team observed a statistically significant association between bottled water use (gallons per participating household by county) and health-based SDWA violations (county level). Overall, as the number of health-based SDWA violations increased by county, so too did the volume of bottled water purchased (positive and statistically significant association at $p<0.05$). This association was observed even after controlling for other related variables such as median household income, educational achievement of the head of the household (4-year college degree or higher), and county-level population counts. Overall, the project team found that counties with more college-educated households were significantly less likely to use bottled water ($p < 0.05$). The project team also observed an association with county-level populations. Notably, counties with relatively larger populations were associated with relatively higher rates of bottled water use, though the association was not statistically significant. The team did not observe a statistically significant association between median household income and bottled water consumption. Taken together, these results indicate that the relative frequency of health-based SDWA violations may impact perceptions of tap water quality, which may in turn increase bottled water consumption. However, other factors such as the smell and taste of tap water, the number of boiled water advisories, the number of water main breaks, and other unobserved factors may also contribute to differences in bottled water sales.

Caveats and Limitations

Reported findings and associations are based on county-level comparisons that may not accurately represent underlying trends. The NielsenIQ data are not necessarily representative of households at a county or sub-regional level, and other factors for which the project team lacks data also contribute to differences in bottled water sales.

2.6 Landscape of Wastewater System Characteristics

As with drinking water systems, installing and maintaining the infrastructure required to support centralized disposal of wastewater can be challenging given the terrain throughout the Appalachian Region, leaving some residents to rely on individualized wastewater treatment via home septic systems or discharging untreated wastewater (e.g., "straight-piping"). Poorly maintained septic systems and untreated wastewater can have negative impacts on the surrounding environment, including impairment of drinking water sources. To understand the prevalence of centralized wastewater service, the project team analyzed the EPA ECHO Facility Demographics Dataset and the Integrated Compliance Information System National Pollutant Discharge Elimination System (ICIS-NPDES) National Dataset, as these were determined to provide the most complete data for the goals of this analysis.[vii] This dataset contains information on NPDES permitted facilities (i.e., facilities that have legal authorization to discharge pollutants into waters of the United States, such as wastewater treatment facilities).

[vii] Detailed methods are provided in Appendix B.

Analysis Results

On average, there are 10 facilities permitted for wastewater discharge per county throughout the Appalachian Region. Pennsylvania has the highest average, with 34 systems per county, and Kentucky has the lowest, with two systems per county (Table 2.6.1).

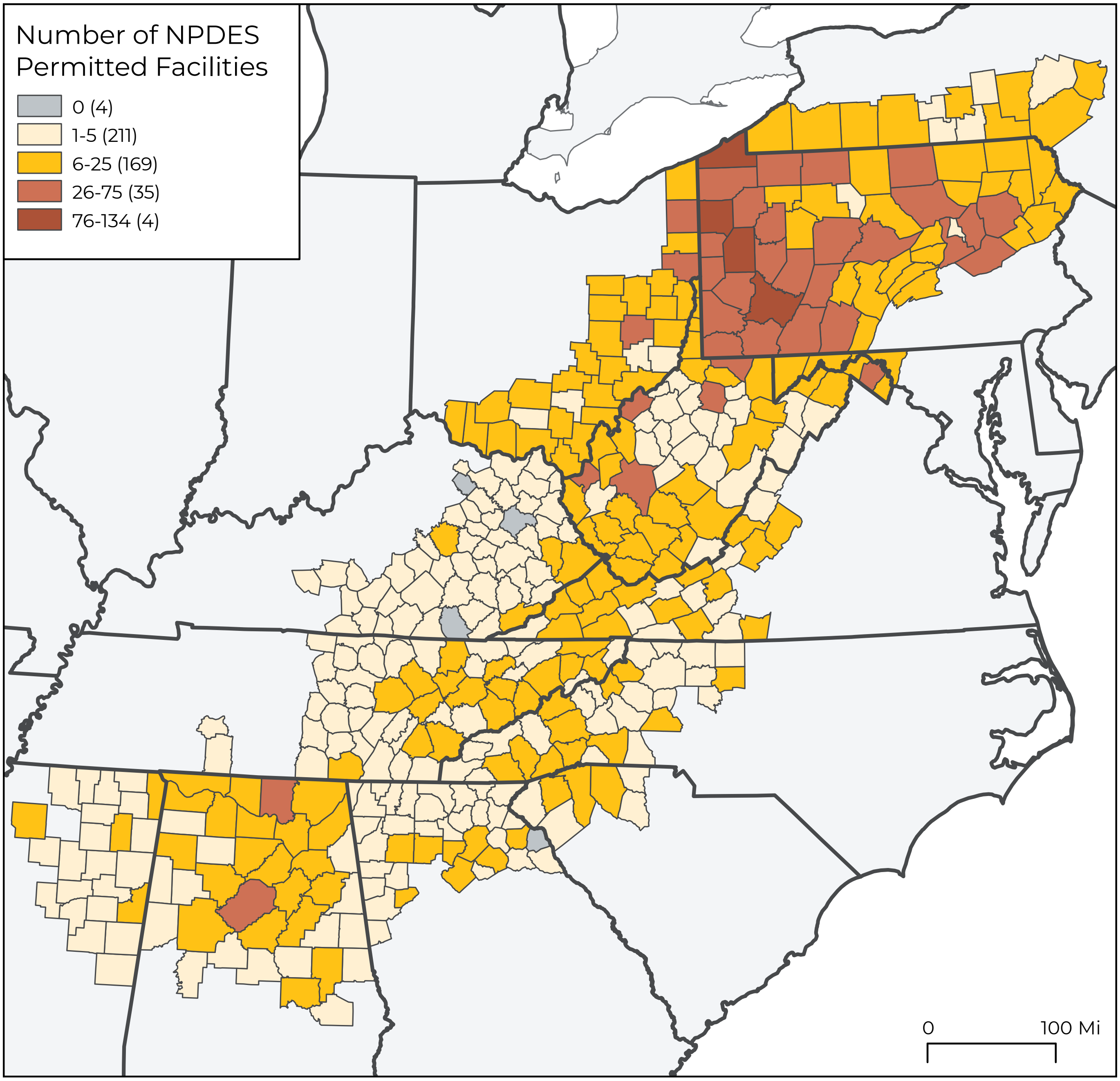
Table 2.6.1: Average Number of NPDES Wastewater Discharging Systems Per County, 2024

Geographic Area	NPDES Permitted Facilities	
	Total Number	Average/County
Appalachian Portion of States		
Alabama	345	9
Georgia	124	3
Kentucky	113	2
Maryland	50	17
Mississippi	99	4
New York	123	9
North Carolina	172	6
Ohio	413	13
Pennsylvania	1,774	34
South Carolina	51	7
Tennessee	224	4
Virginia	172	7
West Virginia	619	11
Appalachia	**4,279**	**10**

Source: U.S. EPA, Integrated Compliance Information System National Pollutant Discharge Elimination System, Retrieved January 2025

Within the Appalachian Region, Northern Appalachia generally has higher average numbers of facilities (Figure 2.6.1), a similar pattern to that of CWS illustrated in Figure 2.2.1 (page 29).

Figure 2.6.1: Number of NPDES Wastewater Discharging Facilities Per County, 2024



Source: U.S. EPA, Integrated Compliance Information System National Pollutant Discharge Elimination System, Retrieved January 2025

In Appalachia, 55% of NPDES-permitted facilities are publicly owned (Table 2.6.2). As with water systems, ownership has implications for how facilities are managed and regulated along with eligibility for funding programs.

Table 2.6.2: Ownership of NPDES Wastewater Discharging Systems in Appalachia, 2024

Geographic Area	Total Number of Facilities	Publicly Owned Facilities		Privately Owned Facilities	
		Number	% of Total	Number	% of Total
Appalachia	4,279	2,347	55%	1,932	45%

Source: U.S. EPA, Integrated Compliance Information System National Pollutant Discharge Elimination System, Retrieved January 2025

The ECHO dataset calculates population covered by a facility using fixed radial distances of one, three, and five miles, assuming everyone within each radius is served by the facility. This method is clearly a rough estimate, with relatively low percent coverage for a one-mile radius and nearly universal coverage at a five-mile radius. To benchmark the numbers available, the project team compared the percent coverage for Appalachia against non-Appalachian counties within Appalachian states. The results suggest that Appalachian counties have similar or slightly higher coverage. Using the three-mile radius, estimates suggest that the percent coverage for Appalachia is around 76% compared to approximately 64% for non-Appalachian counties in Appalachian states (Table 2.6.3).

Table 2.6.3: Comparison of Percent Wastewater Coverage for Three Radius Distances in Appalachia, 2024

State	% Population Coverage					
	One-Mile Radius		Three-Mile Radius		Five-Mile Radius	
	Outside Appalachia	Appalachia	Outside Appalachia	Appalachia	Outside Appalachia	Appalachia
Alabama	6%	9%	51%	75%	100+%	100+%
Georgia	6%	8%	49%	60%	100+%	100+%
Kentucky	9%	8%	69%	52%	100+%	100+%
Maryland	9%	23%	68%	100+%	100+%	100+%
Mississippi	9%	9%	68%	56%	100+%	100+%
New York	12%	18%	100+%	97%	100+%	100+%
North Carolina	5%	7%	46%	59%	100+%	100+%
Ohio	15%	22%	100+%	100+%	100+%	100+%
Pennsylvania	23%	31%	100+%	100+%	100+%	100+%
South Carolina	4%	6%	33%	54%	82%	100+%
Tennessee	4%	6%	37%	48%	94%	100+%
Virginia	7%	9%	52%	81%	100+%	100+%
West Virginia	N/A	46%	N/A	100+%	N/A	100+%
Average	**9%**	**16%**	**64%**	**76%**	**98%**	**100%**

Source: U.S. EPA, ECHO Facility Demographics, Retrieved January 2025

Caveats and Limitations

ECHO data calculates the attributable population based on radial distance and the encompassed population. Therefore, interpretation is complicated because it is unlikely that sewerage catchment systems are aligned within perfect radial distances. Moreover, it raises the potential for significant double-counting (e.g., two small plants might "double count" the same radially encompassed distance). Also, site discharges are not provided for each facility.

2.7 Wastewater: Centralized vs. Decentralized Access

Homes not dependent on centralized household wastewater collection and treatment (i.e., sewerage connections) must rely on onsite wastewater disposal and treatment, primarily septic systems. As noted in Hughes et al. (2005), homes without access to sewerage systems sometimes rely on "straight pipes" (i.e., household wastewater is pumped directly to nearby ditches or creeks with minimal or no treatment prior to discharge). Representatives of Cooperative Extension-based programs, operators, and other utility staff interviewed by the project team mentioned straight pipes as a potential ongoing issue, but the extent of its occurrence is difficult to quantify as many of these homes are fully plumbed.[22] Interviewees also noted that other common issues include failing septic systems, inadequate siting, and a lack of support for regular maintenance and timely pumpouts. Septic failure likely contributes to the prevalence of fecal indicator bacteria observed in private well samples submitted to these programs.

Although the project team did not visit any household-scale alternative systems, the project team conducted a case study on Walnut Cove, a small town in North Carolina that invested in a wetlands-based wastewater system in 1996 as an alternative to a conventional plant. This alternative system was more expensive at the time than a conventional plant. Water flows from two aerated lagoons into wastewater treatment cells with a contact time of five days before flowing into a final contact basin. The effluent is then treated with chlorine gas, followed by sulfur dioxide neutralizing gas, before finally being discharged into a nearby creek. Through this system, the town of Walnut Cove has been able to maintain compliance with nitrogen and phosphorus discharge limits. Though maintenance of the lagoons has been an ongoing challenge, the town continues to explore options to improve lagoon functionality through a partnership with NC State University (see Appendix C for more details).

3. Critical Infrastructure Needs in Appalachia

Understanding the financial investment required to support water and wastewater services throughout Appalachia is necessary to estimate any potential gap between funding needs and availability. In alignment with Hughes et al. (2005), the project team generated estimates of infrastructure financial needs based on the most recent EPA Drinking Water and Clean Water Needs Surveys. While these surveys have limitations, they remain the most comprehensive assessment of infrastructure needs available. However, financial needs are only one aspect of long-term utility viability. The project team expanded the approach of Hughes et al. (2005) to also capture operational and managerial needs via interviews with water and wastewater operators.

3.1 Key Takeaways and Considerations

Key Takeaways: Financial Needs

- The project team estimated at least $55 billion in drinking water and wastewater infrastructure needs: $32.5 billion for wastewater and $22.5 billion for drinking water in Appalachia.
- Needs for conventional, centralized wastewater systems account for approximately $25.3 billion (7% of total nationwide needs). These types of needs address issues related to traditional wastewater treatment, infiltration and inflow, sewer replacement and rehabilitation, wastewater transfer to treatment facilities, and sewer overflow.
- Needs related to water reuse and decentralized wastewater systems add approximately $7.2 billion ($0.2 billion and $7 billion, respectively).
- As a single category, decentralized wastewater systems represents the largest share of overall wastewater needs (22%). This category includes rehabilitation, replacement, or installation of new onsite systems. Needs related to connecting decentralized users to centralized systems are captured in other categories.
- Replacement and refurbishment of water distribution and/or transmission lines account for the majority of the documented drinking water needs in Appalachia, which is similar to the U.S. as a whole.
- There is substantial geographic variation in the amount of financial need. Southern Appalachia accounts for over 40% of combined (water and wastewater) infrastructure needs.

Key Takeaways: Operational and Managerial Needs

- The primary concern expressed by operators across Appalachia, regardless of system size, is the need for replacement and/or refurbishment of aging water and wastewater infrastructure. A close secondary concern is the recruitment and retention of qualified operators. Both of these findings echo national concerns.
- Most of the surveyed operators noted extreme weather events as an emerging concern, with flooding and extreme cold mentioned most frequently.

- Utility operators are limited by a lack of time, expertise, and accurate, up-to-date system data. These challenges are especially acute for smaller, disadvantaged utilities, making it harder for them to secure financial assistance. Operator knowledge about technical assistance providers also varies.
- As a utility's financial condition deteriorates, the options available for financial support become increasingly limited.
- Future priorities include infrastructure upgrades as well as expansion/preparing for growth in some communities, which is notable given the common perception of widely declining populations throughout the region.

3.2 Financial Needs

The EPA Clean Watershed and Drinking Water Needs Surveys are regularly conducted, nationwide assessments of infrastructure needs and cost estimates for community water and wastewater systems. These surveys represent the most robust sources of this information. To estimate current financial needs for water and wastewater infrastructure in Appalachia, the project team examined data from the 2022 Clean Watershed Needs Survey (CWNS) and the Seventh Drinking Water Needs Survey (DWNS) (conducted in 2021). The CWNS attempts to capture information for all wastewater systems nationwide. In contrast to the CWNS, the DWNS uses a stratified sampling method to model state-level results. Regarding drinking water needs, the analysis in this report includes an estimate for all community water systems based on an extrapolation of the survey results. However, the results primarily focus on the needs as reported by survey respondents only. All values are adjusted to 2024 dollars unless otherwise noted. For per capita calculations, the project team used population data as reported within the survey results. Additional information about sub-state variation is provided in Appendix D.

Analysis Results

Based only on information provided by CWNS and DWNS respondents, the project team estimated combined wastewater and drinking water infrastructure needs of at least $55 billion: $32.5 billion for wastewater and $22.5 billion for drinking water. Georgia has the highest percent of overall documented needs (about 21% of the region's overall needs), followed by Pennsylvania at 14%. On average across Appalachia, combined estimated per capita needs exceed $2,500. West Virginia and Virginia have the highest per capita needs, more than $5,000 per person, and Tennessee has the lowest, about $1,500 per person (Table 3.2.1).

Table 3.2.1: Combined Minimum Wastewater (Clean Water) and Drinking Water Needs

Appalachian Portion of State	Total Need (Millions)				Per Capita Need		
	WW	DW	Total	% of Total	WW	DW	Total
Alabama	$1,560	$4,668	$6,228	11%	$478	$1,345	$1,823
Georgia	$8,147	$3,572	$11,719	21%	$2,377	$1,388	$3,765
Kentucky	$1,351	$957	$2,308	4%	$1,160	$1,181	$2,341
Maryland	$330	$239	$569	1%	$1,313	$1,581	$2,894
Mississippi	$37	$488	$525	1%	$60	$1,714	$1,774
New York	$920	$114	$1,034	2%	$902	$925	$1,827
North Carolina	$2,536	$1,722	$4,258	8%	$1,243	$1,882	$3,125
Ohio	$1,788	$1,082	$2,870	5%	$904	$1,657	$2,561
Pennsylvania	$3,178	$4,507	$7,685	14%	$559	$1,060	$1,619
South Carolina	$3,307	$1,989	$5,296	10%	$2,399	$1,483	$3,882
Tennessee	$714	$2,738	$3,452	6%	$238	$1,278	$1,516
Virginia	$2,248	$293	$2,541	5%	$3,423	$1,853	$5,276
West Virginia	$6,342	$212	$6,554	12%	$3,554	$1,721	$5,275
Appalachia	**$32,458**	**$22,583**	**$55,039**	**100%**	**$1,236**	**$1,328**	**$2,564**

Source: (Wastewater) U.S. EPA, 2022 Clean Watershed Needs Survey; (Drinking Water) U.S. EPA, Drinking Water Infrastructure Needs Survey and Assessment: 7th Report to Congress; (Population) U.S. Census Bureau, 2023 American Community Survey, Retrieved April 2025
Notes: Table excludes extrapolated data for the drinking water needs analysis. For wastewater per capita calculations, the analysis uses population data from the 2023 American Community Survey. For drinking water per capita calculations, the analysis uses population values as reported in the drinking water needs survey and excludes extrapolated data for drinking water.

Clean Water (Wastewater) Infrastructure Needs

The CWNS analysis includes information on conventional needs for centralized systems (Categories I-V), needs related to water reuse (Category X), and needs for decentralized systems (Category XII) (Table 3.2.2). The latter two categories are new additions to the needs survey relative to the version conducted in 2000. The values for all categories are based on actual reported values by survey respondents when appropriate accompanying documentation is provided. In cases of insufficient documentation, the EPA may apply cost estimation tools.[23]

Table 3.2.2: Categories Included in the 2022 CWNS Analysis

Category Number	Category Name	Brief Description
I	Secondary Wastewater Treatment	Seeks to attain or maintain secondary treatment criteria
II	Advanced Wastewater Treatment	Seeks to attain or maintain a level of treatment that is more stringent than secondary treatment or produce a significant reduction in nonconventional or toxic pollutants in the wastewater treated by a facility
III-A	Infiltration / Inflow (II) Correction	Addresses infiltration/inflow issues
III-B	Sewer Replacement / Rehabilitation	Maintenance, reinforcement, or reconstruction of structurally deteriorating sanitary or combined sewers
IV-A	New Collector Sewers and Appurtenances	New pipes used to convey wastewater from a sanitary or industrial wastewater source a to a treatment facility
IV-B	New Interceptor Sewers and Appurtenances	New interceptor sewers and pumping stations to convey wastewater from collection sewer systems to a treatment facility or to another interceptor sewer
V	Combined Sewer Overflow (CSO) Correction	Prevent or control the periodic discharges of mixed stormwater and untreated wastewater (CSOs) that occur when system capacity is exceeded during a weather event
X	Water Reuse	Conveyance of treated wastewater being reused
XII	Decentralized Wastewater Treatment Systems	Rehabilitation, replacement, or new installation of on-site wastewater treatment systems or clustered (community) systems; also includes the treatment portion of other decentralized sewage disposal technologies

Source: U.S. EPA, 2022 Clean Watershed Needs Survey
Notes: A detailed description of the categories is provided in Appendix E.

The 2022 CWNS includes responses from 2,418 facilities in Appalachia. The number of facilities per state ranges from 12 (Mississippi) to 454 (West Virginia) (Table 3.2.3 and Figure 3.2.1, page 60). Generally, the percentage of participating facilities in Appalachia with no documented needs is lower in 2022 compared to 2000 (Table 3.2.3). However, there are two important caveats to this finding. First, "no documented needs" may include facilities that attempted to report a need but did not provide sufficient documentation for the EPA to include that need in the survey results. Therefore, this designation does not necessarily mean that a facility actually has no infrastructure needs. Second, participation is also generally lower in 2022. It could be that more facilities with no documented needs in 2000 simply chose not to participate in 2022 for reasons that are unknown. It is possible they lack the capacity to sufficiently document their needs and/or participate in the survey rather than truly having no infrastructure needs. Overall, the reduction in the percentage of facilities with no documented needs should not necessarily be interpreted as a reduction in need.

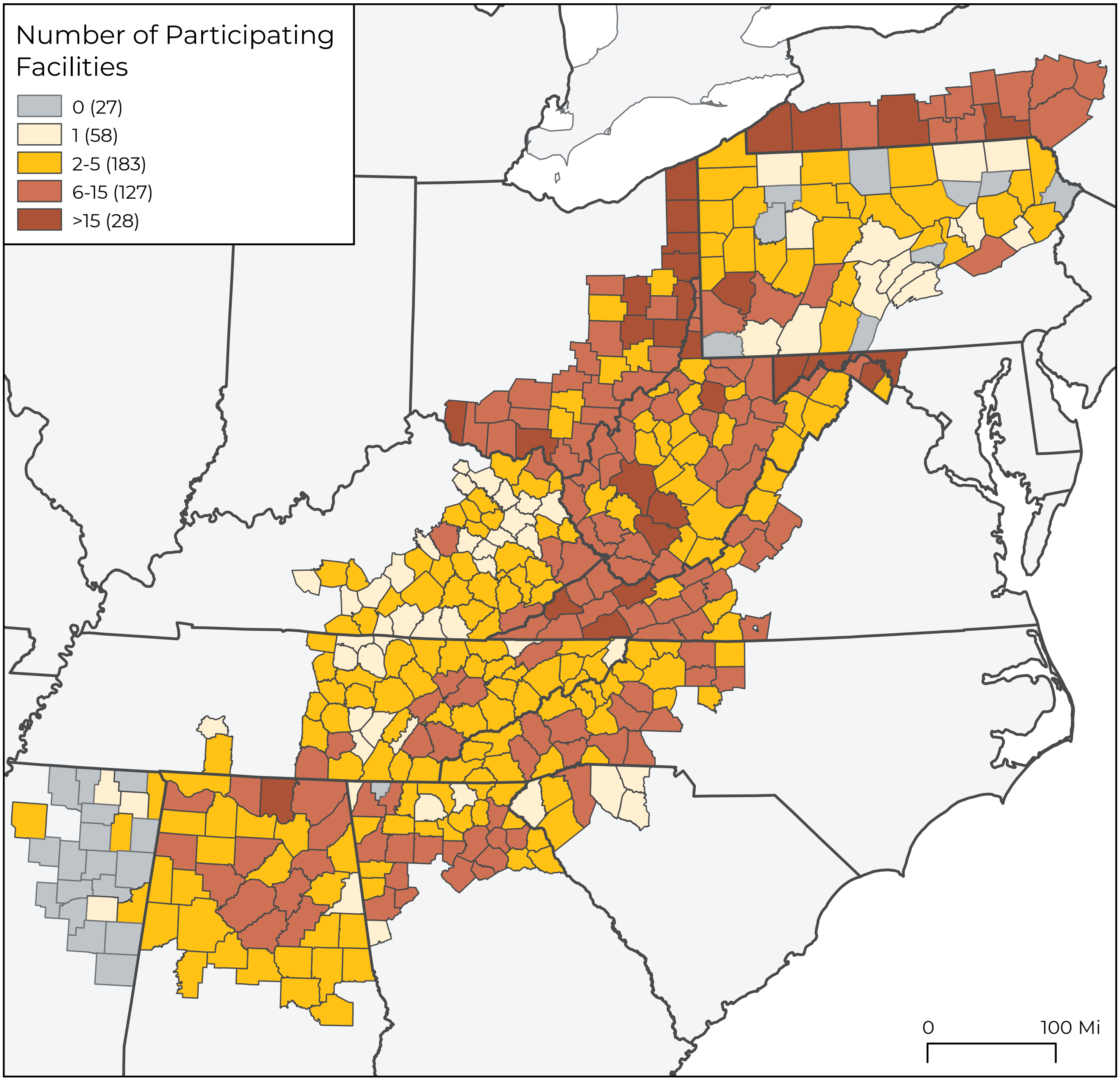
Table 3.2.3: Appalachian Facility CWNS Participation, 2000 vs 2022

Appalachian Portion of State	Number of Participating Facilities		% of Facilities with No Documented Needs		
			Cat I-V		All Cat.
	2000	2022	2000	2022	2022
Alabama (37)	171	211	49%	11%	10%
Georgia (37)	90	197	80%	43%	38%
Kentucky (54)	187	137	20%	15%	10%
Maryland (3)	67	57	39%	51%	44%
Mississippi (24)	211	12	70%	0%	0%
New York (14)	202	185	63%	57%	57%
North Carolina (31)	181	170	62%	49%	31%
Ohio (32)	371	405	63%	65%	61%
Pennsylvania (52)	1,559	142	69%	51%	50%
South Carolina (7)	67	24	66%	29%	0%
Tennessee (52)	164	172	92%	77%	77%
Virginia (25)	156	252	37%	45%	25%
West Virginia (55)	684	454	55%	42%	30%
Appalachia	**4,110**	**2,418**	**62%**	**47%**	**39%**

Source: (2000) Hughes et al., Drinking Water and Wastewater Infrastructure in Appalachia: An Analysis of Capital Funding and Funding Gaps; (2022) U.S. EPA, 2022 Clean Watershed Needs Survey
Notes: The number of counties within Appalachia is shown in parentheses next to the state name.

Considering all categories, all states with higher participation from Appalachian facilities in 2022 also have a lower percentage of facilities with no documented needs (Table 3.2.3, above). This could indicate an increase in actual infrastructure needs, but it could also indicate an overall increased capacity to document needs. It is also possible that facilities participating in 2000 without documented needs in Categories I-V would have reported needs in Categories X and XII, had those categories existed.

Figure 3.2.1: Number of Participating Facilities Per County for the 2022 CWNS



Source: U.S. EPA, 2022 Clean Watershed Needs Survey

Conventional wastewater system needs (Categories I-V) total an estimated $25 billion in Appalachia, about 7% of the nation's overall wastewater system needs. This value is slightly lower compared to the 2000 survey: Appalachia accounted for about 9% of the overall needs in the U.S. in 2000 (about $26 billion in 2024 dollars).[24] Within these more traditional categories, sewer Replacement/Rehabilitation (Category III-B) and Advanced Wastewater Treatment (Category II) account for almost 45% of the total need in Appalachia. These two categories also have the highest percent need for the U.S. overall (Table 3.2.4, page 61).

Table 3.2.4: Wastewater Infrastructure Needs in Appalachia by Category in 2022

Geographic Area	I	II	III-A	III-B	IV-A	IV-B	V	I-V Total	X	XII	All Categories Total
Appalachian Portion of State											
Alabama ($M)	530	28	87	600	67	48	0	1,361	0	199	1,560
Georgia ($M)	152	2,372	32	1,059	1,053	372	0	5,039	157	2,951	8,147
Kentucky ($M)	407	0.2	140	228	467	55	30	1,327	1	23	1,351
Maryland ($M)	9	148	44	13	19	4	84	322	0	9	330
Mississippi ($M)	7	10	0	16	4	0	0	37	0	0	37
New York ($M)	365	127	40	71	235	80	2	920	0	0	920
North Carolina ($M)	154	217	38	625	31	87	0	1,152	1	1,383	2,536
Ohio ($M)	685	66	36	187	196	22	107	1,299	0	489	1,788
Pennsylvania ($M)	292	73	42	484	77	10	2,195	3,173	0	4	3,178
South Carolina ($M)	19	1,191	0	1,279	181	19	0	2,689	0	618	3,307
Tennessee ($M)	38	248	237	115	14	62	0	713	0	1	714
Virginia ($M)	100	108	129	190	1,174	165	0	1,864	0	384	2,248
West Virginia ($M)	998	160	420	1,399	543	72	1,773	5,364	0	977	6,342
Appalachia											
Total Need ($M)	3,755	4,747	1,244	6,266	4,061	996	4,192	25,261	158	7,037	32,456
% of Total Need	12%	15%	4%	19%	13%	3%	13%	N/A	0%	22%	100%
U.S.											
Total Need ($M)	71,412	89,573	13,546	104,417	29,405	14,594	39,128	362,075	8,291	80,037	450,403
% of Total Need	16%	20%	3%	23%	7%	3%	9%	N/A	2%	18%	100%
Appalachia % of U.S. Needs	**5%**	**5%**	**9%**	**6%**	**14%**	**7%**	**11%**	**7%**	**2%**	**9%**	**7%**

Source: U.S. EPA, 2022 Clean Watershed Needs Survey

Including water reuse (Category X) and decentralized treatment systems (Category XII) adds about $7 billion to the total need in Appalachia but the percent of total U.S. need within Appalachia does not change. Decentralized Wastewater Treatment Systems (Category XII) represents the highest proportion of need within Appalachia. This can be explained by the predominantly rural nature of the landscape. In contrast, this category ranks third for the U.S. as a whole (Table 3.2.4, previous page).

When considering only needs for centralized wastewater systems (Categories I–V), Sewer Replacement and Rehabilitation (Category III-B) ranked first in total needs for 2022, whereas Combined Sewer Overflow Correction (Category V) ranked first in 2000 (Table 3.2.5).

Table 3.2.5: Comparison of Category Ranks Between the 2022 and 2000 CWNS Surveys for Appalachia

Category Number	Category Name	2000 Rank	2022 Rank
I	Secondary Wastewater Treatment	3	5
II	Advanced Wastewater Treatment	4	2
III-A	Infiltration / Inflow (II) Correction	7	6
III-B	Sewer Replacement / Rehabilitation	5	1
IV-A	New Collector Sewers and Appurtenances	2	4
IV-B	New Interceptor Sewers and Appurtenances	6	7
V	Combined Sewer Overflow (CSO) Correction	1	3

Source: (2000 CWNS) Hughes et al., Drinking Water and Wastewater Infrastructure in Appalachia: An Analysis of Capital Funding and Funding Gaps; (2022 CWNS) U.S. EPA, 2022 Clean Watershed Needs Survey
Notes: Rank is determined as the total documented needs per category. Categories X and XII are excluded as they were added after 2000.

In both 2000 and 2022, the same six states in Appalachia reported needs for combined sewer overflow correction (Category V)—overflows caused by flood events. In 2000, it was the highest need category for five of these states; by 2022, it remained the highest for only two, Appalachian Pennsylvania and West Virginia, accounting for over 65% of Pennsylvania's total need in both years (Table 3.2.6).

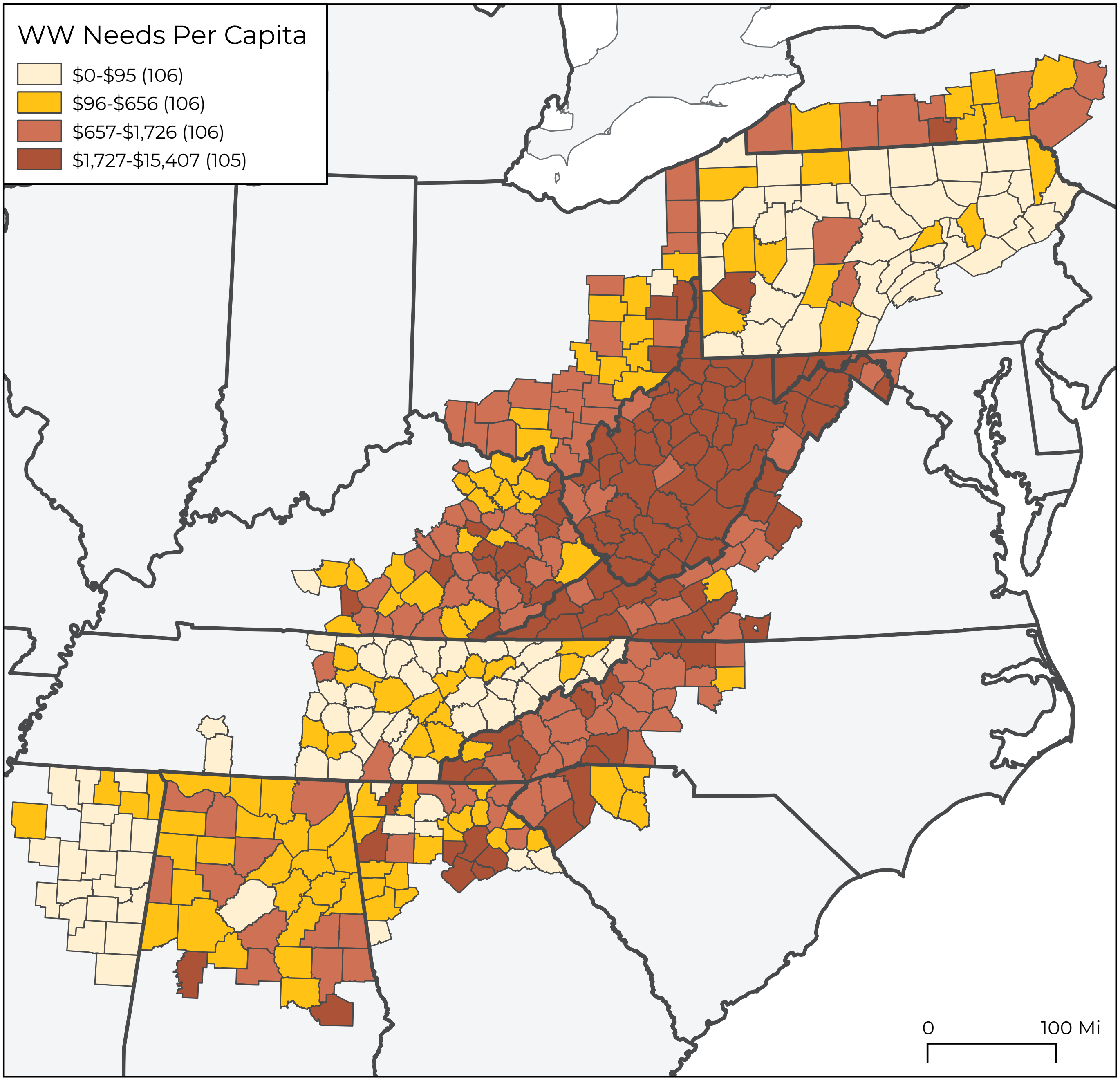
Table 3.2.6: Highest Wastewater Need Category (of I-V) in Appalachia by State, 2000 and 2022

Appalachian Portion of State	CWNS Category						
	I	II	III-A	III-B	IV-A	IV-B	V
Alabama				Both			
Georgia		Both					
Kentucky					Both		
Maryland		2022					2000
Mississippi				2022	2000		
New York	2022						2000
North Carolina				2022	2000		
Ohio	2022						2000
Pennsylvania							Both
South Carolina	2000			2022			
Tennessee		2022			2000		
Virginia					Both		
West Virginia							Both

Source: (2000) Hughes et al., Drinking Water and Wastewater Infrastructure in Appalachia: An Analysis of Capital Funding and Funding Gaps; (2022) U.S. EPA, 2022 Clean Watershed Needs Survey
Notes: The highest category for 2022 is highlighted in orange. The highest category for 2000 is highlighted in gold.

The project team also investigated per capita needs in terms of quartiles across the Appalachian Region. At the county level, per capita estimates vary, though they tend to be higher in Central Appalachia (Figure 3.2.2).

Figure 3.2.2: Documented Needs Per Capita for All 2022 CWNS Categories, As Quartiles



Source: U.S. EPA, 2022 Clean Watershed Needs Survey

Per capita wastewater needs vary substantially throughout Appalachia, from less than $250 (Tennessee) to over $3,500 (West Virginia) (Mississippi excluded because of low participation). Overall, per capita needs in Appalachia in 2022 were only slightly lower than the U.S., whereas the need was slightly higher in 2000 (Table 3.2.7).

Table 3.2.7: Documented Wastewater Infrastructure Needs in Appalachia Per Capita, 2000 and 2022

Geographic Area	Per Capita Needs Categories I-V		Per Capita Needs Categories I-V, X, XII
	2000	2022	2022
Appalachian Portion of State			
Alabama	$1,638	$417	$478
Georgia	$155	$1,470	$2,377
Kentucky	$1,224	$1,140	$1,160
Maryland	$2,336	$1,279	$1,313
Mississippi	$281	$60	$60
New York	$1,055	$902	$902
North Carolina	$1,225	$565	$1,243
Ohio	$1,062	$657	$904
Pennsylvania	$1,692	$558	$559
South Carolina	$911	$1,951	$2,399
Tennessee	$38	$238	$238
Virginia	$1,084	$2,838	$3,423
West Virginia	$2,548	$3,006	$3,554
Aggregated Geographies			
Appalachia	$1,217	$962	$1,236
U.S.	$1,173	$1,089	$1,355

Source: (2000 CWNS) Hughes et al., Drinking Water and Wastewater Infrastructure in Appalachia: An Analysis of Capital Funding and Funding Gaps; (2022 CWNS) U.S. EPA, 2022 Clean Watershed Needs Survey; (Population) U.S. Census Bureau, 2023 American Community Survey, Retrieved April 2025
Notes: For Categories I-V, values for both the 2000 and the 2022 surveys are shown. The 2000 values are adjusted to 2024 dollars. Population data is from 2023 American Community Survey data (also used to calculate per capita at the county level).

Drinking Water Needs

EPA's 2021 Drinking Water Needs Survey surveyed 3,629 state public water systems nationwide and garnered a 97% response rate, resulting in a sample that covers approximately 4.6% of all systems nationally.[25] The survey captures information across five general categories (Table 3.2.8).[26]

Table 3.2.8: Categories in the EPA Drinking Water Needs Assessment, 2021

Category	Description
Distribution and Transmission	Replacement or refurbishment of aging or deteriorating pipelines and appurtenances
Treatment	Construction, expansion, or rehabilitation of water treatment infrastructure to reduce contamination
Storage	Construction, rehabilitation, or coverage of water storage reservoirs
Source	Construction or rehabilitation of water intake structures and wells, or purchase water rights
Other	Other needs not captured

Source: U.S. EPA, Drinking Water Infrastructure Needs Survey and Assessment: 7th Report to Congress (webpage)

Of the systems surveyed, 337 systems across the 13 Appalachian states were included in the sample. This represents approximately 7% of all systems in the Appalachian Region. According to the 2021 survey, the **documented** drinking water needs are approximately $22.5 billion in 2024 dollars, with an overall per capita estimated at $1,328 (Table 3.2.9).

Table 3.2.9: Surveyed Drinking Water Infrastructure Needs for Appalachia, 2021

Appalachian Portion of State	Systems Surveyed		Total Surveyed DW Needs			Per Capita Surveyed DW Needs	
	Number	% of Total Systems	$M	% Rep. by Large Systems	Rank	$	Rank
Alabama	68	23%	$4,668	45%	1	$1,345	9
Georgia	25	8%	$3,572	83%	3	$1,388	8
Kentucky	34	22%	$957	0%	8	$1,181	11
Maryland	14	27%	$239	0%	11	$1,581	6
Mississippi	24	8%	$488	0%	9	$1,714	4
New York	18	4%	$114	0%	13	$925	13
North Carolina	4	1%	$1,722	59%	6	$1,882	1
Ohio	27	8%	$1,082	31%	7	$1,657	5
Pennsylvania	34	3%	$4,507	85%	2	$1,060	12
South Carolina	20	19%	$1,989	59%	5	$1,483	7
Tennessee	51	22%	$2,738	34%	4	$1,278	10
Virginia	7	3%	$293	0%	10	$1,853	2
West Virginia	11	3%	$212	70%	12	$1,721	3
Appalachia	**337**	**7%**	**$22,583**	**55%**	**N/A**	**$1,328**	**N/A**

Source: U.S. EPA, Drinking Water Infrastructure Needs Survey and Assessment: 7th Report to Congress
Notes: Per capita is calculated based on population data included in the DWNS. Because all large systems are included in the survey, the percentage of total need represented by large systems is noted. Individual states are ranked from highest to lowest surveyed need.

Almost three-quarters of the documented needs in Appalachia are for the replacement or refurbishment of water distribution and/or transmission lines, slightly higher than the U.S. as a whole. Overall, Appalachia accounts for about 6% of the total documented drinking water infrastructure needs in the nation (Table 3.2.10).

Table 3.2.10: Documented Drinking Water Needs by Category in Millions in 2021, Appalachia and the U.S.

Geographic Area	Distribution and/or Transmission	Source	Storage	Treatment	Other	Total
Appalachian Portion of State						
Alabama	$3,521	$26	$347	$671	$103	$4,668
Georgia	$2,578	$145	$151	$603	$95	$3,572
Kentucky	$714	$1	$103	$126	$13	$957
Maryland	$153	$3	$14	$66	$3	$239
Mississippi	$270	$38	$37	$131	$13	$488
New York	$72	$5	$15	$18	$4	$114
North Carolina	$1,374	$37	$77	$214	$20	$1,722
Ohio	$832	$25	$86	$108	$30	$1,082
Pennsylvania	$3,276	$103	$356	$634	$138	$4,507
South Carolina	$1,309	$80	$125	$423	$53	$1,989
Tennessee	$2,128	$13	$204	$390	$3	$2,738
Virginia	$209	$4	$32	$33	$14	$293
West Virginia	$173	$0	$9	$22	$8	$212
Appalachia						
Total	$16,612	$480	$1,557	$3,438	$496	$22,583
% of Total	74%	2%	7%	15%	2%	100%
U.S.						
Total	$243,378	$12,142	$26,051	$63,923	$7,644	$353,138
% of Total	69%	3%	7%	18%	2%	100%
Appalachia % of U.S. Needs	**7%**	**4%**	**6%**	**5%**	**6%**	**6%**

Source: U.S. EPA, Drinking Water Infrastructure Needs Survey and Assessment: 7th Report to Congress

To estimate total infrastructure needs, the project team largely followed the EPA's approach. Each community water system was grouped by population size and water source (ground or surface), since surface water typically requires more extensive—and costly—treatment than groundwater.

- For small systems, average needs are summarized for each group. These values are multiplied by the total number of small systems in each group nationally and adjusted to 2024 dollars.
- For medium systems, averages were calculated for each state instead of nationally.
- For large systems, most were included in the survey, so no additional estimates were necessary (Table 3.2.11, page 68).

Table 3.2.11: Number of Systems Surveyed Versus Not Surveyed in Appalachian States, 2021

Strata	Number of Systems Surveyed		Number of Systems Not Surveyed	
(Size, Water Source)	Non-Appalachian	Appalachian	Non-Appalachian	Appalachian
Large, Ground	10	0	0	0
Large, Surface	88	27	0	1
Medium, Ground	220	71	5,868	2,253
Medium, N/A	0	0	5	1
Medium, Surface	262	213	1,210	1,196
Small, Ground	26	8	1,000	489
Small, Surface	17	18	403	425
Overall	**623**	**337**	**8,486**	**4,365**

Source: Systems Sampled) U.S. EPA, Drinking Water Infrastructure Needs Survey and Assessment: 7th Report to Congress; (Total Number of Systems, System Size, System Water Source) U.S. EPA, Safe Drinking Water Information System (SDWIS), Retrieved May 2025
Notes: The SDWIS data did not contain information on water source for six systems ("N/A" in the table).

Using the above method, the **extrapolated** estimated need for drinking water infrastructure in Appalachia is about $55 billion (Table 3.2.12).

Table 3.2.12: Extrapolated Drinking Water Needs for Community Water Systems in Appalachia, 2021

Appalachian Portion of State	Number of Appalachian Systems	Drinking Water Needs (In Millions)			Rank
		Small/Med. Systems	Large Systems	Total	
Alabama	291	$6,969	$2,086	$9,055	2
Georgia	312	$3,643	$2,959	$6,602	4
Kentucky	158	$2,391	$0	$2,391	8
Maryland	52	$393	$0	$393	13
Mississippi	304	$2,062	$0	$2,062	9
New York	505	$1,898	$0	$1,898	10
North Carolina	510	$2,996	$1,010	$4,006	5
Ohio	332	$3,220	$340	$3,560	6
Pennsylvania	1,224	$8,547	$3,834	$12,381	1
South Carolina	104	$1,804	$1,168	$2,972	7
Tennessee	236	$5,950	$944	$6,894	3
Virginia	260	$1,524	$0	$1,524	12
West Virginia	414	$1,584	$148	$1,732	11
Appalachia	**4,702**	**$42,981**	**$12,489**	**$55,470**	**N/A**

Source: (Systems Sampled) U.S. EPA, Drinking Water Infrastructure Needs Survey and Assessment: 7th Report to Congress; (Total Number of Systems, System Size, System Water Source) U.S. EPA, Safe Drinking Water Information System (SDWIS), Retrieved May 2025
Notes: Small and medium-sized needs are extrapolated. Large system needs are surveyed.

Hughes et al. (2005) estimated total drinking water needs to be about $11 billion, or $21.3 billion adjusted to 2024 dollars.[27] These results suggest a significant increase in overall drinking water needs since that time. However, there are significant differences between the two extrapolation methods.[viii] Because Hughes et al. (2005) did not include a value for the needs of surveyed systems only, the project team is unable to make a direct comparison. However, it is notable that Pennsylvania and Alabama are the top two states in terms of drinking water needs in both analyses. The project team estimated needs of $1,328 per capita compared to $934 per capita of extrapolated needs by Hughes et al. (2005).

Infrastructure Needs by ARC Subregion

Analysis at the subregional scale may offer nuanced insight into variation in needs within the region. Southern Appalachia accounts for more than 40% of combined drinking water and wastewater needs. Total needs are lowest in Central Appalachia (8%). North Central and Central Appalachia combined make up only 10% of the total drinking water infrastructure needs, which is interesting as those areas also have higher levels of bottled water consumption (Table 3.2.13).

Table 3.2.13: Wastewater and Drinking Water Infrastructure Needs by ARC Subregion

Subregion	Wastewater			Drinking Water (Surveyed)			Combined	
	Number of Systems	Total Needs (Millions)	% of Total	Number of Systems	Total Needs (Millions)	% of Total	Total Needs (Millions)	% of Total
Northern	599	$5,388	17%	67	$5,307	23%	$10,695	19%
North Central	597	$6,628	20%	23	$848	4%	$7,476	14%
Central	323	$3,050	9%	46	$1,441	6%	$4,491	8%
South Central	455	$4,338	13%	64	$4,269	19%	$8,607	16%
Southern	444	$13,051	40%	137	$10,718	47%	$23,769	43%

Source: (Systems Sampled, Drinking Water) U.S. EPA, Drinking Water Infrastructure Needs Survey and Assessment: 7th Report to Congress; (Systems Sampled, Wastewater) U.S. EPA, 2022 Clean Watershed Needs Survey; (ARC Subregions) Appalachian Regional Commission, ARC Subregions, Retrieved June 2025
Notes: Only surveyed drinking water needs are included.

[viii] In the 2000 DWNS, "large systems" served more than 40,000 people whereas they serve more than 100,000 people in the 2022 survey. In both survey methodologies, all large systems are included in the sample. Therefore, in Hughes et al. (2005), the needs of systems serving between 40,000 and 100,000 people were directly surveyed but they must be extrapolated in this analysis. Further, Hughes et al. (2005) multiplied the national average of infrastructure needs for all small and medium system strata by the number of systems in each stratum. For this analysis, the team used the national average for small systems, but state averages for medium systems to replicate the EPA's extrapolation approach.

On a per capita basis, the need for both wastewater and drinking water is highest in North Central Appalachia and lowest in Northern Appalachia (Table 3.2.14).

Table 3.2.14: Per Capita Needs by ARC Subregion

Subregion	Wastewater			Drinking Water		
	Number of Facilities	Avg. Population Served per Facility	Per Capita Needs	Number of Facilities	Avg. Population Served per Facility	Per Capita Needs
Northern	563	7,590	$1,261	67	72,633	$1,090
North Central	529	3,025	$4,143	23	18,948	$1,945
Central	294	2,562	$4,049	46	23,089	$1,357
South Central	360	7,957	$1,515	64	46,323	$1,440
Southern	412	10,495	$3,018	137	55,991	$1,397

Source: (Systems Sampled, Drinking Water) U.S. EPA, Drinking Water Infrastructure Needs Survey and Assessment: 7th Report to Congress; (Systems Sampled, Wastewater) U.S. EPA, 2022 Clean Watershed Needs Survey; (ARC Subregions) Appalachian Regional Commission, ARC Subregions, Retrieved June 2025
Notes: Documented needs only. Per capita was calculated using population values as reported in the Clean Watershed and Drinking Water Needs Surveys and excludes extrapolated data for drinking water. Net Treated Population refers to the current net population treated by the facility, taking into account sewershed networks. Wastewater includes all categories (I-V, X, and XII).

Infrastructure Needs by Metro Designation

Assessing needs by ARC-defined metro designation (assigned at the county level) can provide useful context for interpreting water infrastructure needs. Though metro areas account for about 75% of documented wastewater and drinking water needs, this partly reflects the fact that large systems (more common in metro areas) are more likely to be directly surveyed (Table 3.2.15). For example, in states with major metro centers such as Atlanta (GA) and Pittsburgh (PA), documented needs are disproportionately concentrated. By contrast, rural areas account for only 10% of documented wastewater needs and 7% of surveyed drinking water needs (Table 3.2.15). However, because rural systems are smaller and less frequently surveyed, these figures may understate the true scale of needs in nonmetro areas.

Table 3.2.15: Needs by ARC Metro Designation

Metro Designation	Wastewater		Drinking Water		Combined	
	Total ($M)	% of Total	Total ($M)	% of Total	Total ($M)	% of Total
Large (Pop. 1 million +)	$8,854	27%	$8,044	36%	$16,698	31%
Small (Pop. <1 million)	$14,487	45%	$9,354	41%	$23,841	44%
Nonmetro, Adjacent to Large Metros	$1,447	4%	$1,799	8%	$3,241	6%
Nonmetro, Adjacent to Small Metros	$4,294	13%	$1,897	8%	$6,131	11%
Rural (Nonmetro, Not Adj. to a Metro)	$3,378	10%	$1,490	7%	$3,866	7%

Source: (Wastewater) U.S. EPA, 2022 Clean Watershed Needs Survey; (Drinking Water) U.S. EPA, Drinking Water Infrastructure Needs Survey and Assessment: 7th Report to Congress; (Metro Designation) Appalachian Regional Commission, ARC Metro Status Designation, Received June 2025
Notes: Extrapolated drinking water infrastructure needs estimates are excluded.

Caveats and Limitations

Clean Watershed Needs Survey (CWNS)

The CWNS attempts to survey all wastewater systems throughout the U.S. The overall number of participating facilities in Appalachia for the CWNS is much lower in 2022 compared to 2000. For some states, such as Pennsylvania and Mississippi, this may reflect significantly reduced participation rates. However, for other states with relatively small reductions, the change may reflect a decrease in the number of systems because of regionalization or consolidation efforts. Regardless, the number of participating facilities is an important consideration when interpreting analysis results.

Drinking Water Needs Survey (DWNS)

Unlike the CWNS, the DWNS does not attempt to survey all systems; instead, it uses a stratified sampling process to model state-level totals via a nationally representative sample. The EPA surveys all large utilities and samples medium and small systems.[ix] Though both are sampled via a stratified random sampling approach, medium systems are sampled by state whereas small systems are sampled nationally.

To extrapolate needs, the project team generated estimates of the total need for small and medium systems within Appalachia based on the EPA's sampling and extrapolation approaches. For medium-sized systems, needs for systems not included in the survey are estimated using other medium-sized systems with similar characteristics (e.g., population stratum and water source) from the same state, *though not necessarily the same region*. The latter is of particular importance for Appalachia, where the economic and topographic landscape may be very different from other parts of the state, yielding potentially very different needs. For small systems, needs are extrapolated using the sample of small systems *from across the country*.[28] Though this approach represents the best possible use of the data in the DWNS, the estimates for substate geographies, such as Appalachia, rely on strong assumptions of similarities within types of systems. Further, the DWNS only surveyed 7% of all systems in Appalachia and less than 1% of all systems in Appalachia serve more than 100,000 people. As such, the approach may not accurately depict spatial variation and may mask needs in areas not sampled.

Finally, only 3% of systems were surveyed in West Virginia, which makes up the majority of North Central Appalachia. Therefore, drinking water needs are likely significantly underestimated for that subregion.

Overall

Only projects eligible for funding under the state revolving funds programs (clean water and drinking water) are captured by these surveys. Further, significant portions of Appalachia were affected by natural disasters in 2024 and 2025 (primarily flooding) that have impacts on water and wastewater infrastructure not captured in this analysis.

[ix] For the DWNS, the EPA defines large systems as those serving more than 100,000 people, medium systems as those serving between 3,300-100,000 people, and small systems as those serving less than 3,300 people.

3.3 Operational and Managerial Needs

Though nationwide efforts such as the Drinking Water Needs Survey attempt to quantify infrastructure needs in dollar amounts, water and wastewater systems also face numerous operational and managerial challenges, which can vary greatly by system size. Over a quarter of Appalachians reliant on centralized drinking water infrastructure are served by small and very small systems (Section 2.2).

To capture the specific challenges associated with operations and management, as well as typical sources of grants and financial assistance, the project team conducted a phone survey of regional utility operators and/or managers using an iterative, randomized, and stratified selection method. Each iteration involved the random selection of three active CWS systems from each Appalachian state. Once the team attempted to contact all systems at least twice, a new list of 39 systems was generated for contact until there was sufficient coverage for each state and size category as well as theme saturation. For a few contacts, the system asked to complete the survey via email, and the team honored those requests. This strategy enabled the team to speak directly with utility managers and/or operators from every state, including from very small and small utilities, which are frequently not included in similar analyses like the national Drinking Water Needs Survey. It is worth noting that the participant answering the survey might represent a head operator, utility manager, or both; particularly for very small/small utilities, a single employee might be responsible for technical, engineering, and managerial operations (in addition to other local responsibilities). The project team drafted survey questions (Appendix F) based on previous research experience and revised them based on feedback from ARC staff and the advisory council. The suite of questions captures basic utility information, operational and staffing challenges, experience applying for grants, and opinions on emerging needs and priorities.

Analysis Results

The team contacted a total of 256 systems: 13% completed the survey (32 responses), 18% were the wrong number/contact, and 69% declined to answer. Note that the 69% includes systems where the operator was repeatedly unavailable/declined to call back or answer emails after two contacts. Over one-third of the responses were from small or very small utilities, and all represented distressed, at-risk, or transitional counties (Table 3.3.1). Survey results included at least one respondent from every Appalachian state. Just over half of the contacts (56%) were drinking water only operations; the remainder were both water and wastewater utilities.

Table 3.3.1: Profile of Respondent Systems by Size and FY25 ARC County Economic Designation

System Size (number of connections)	Number of Respondents by ARC Economic Designation					Total
	Distressed	At-Risk	Transitional	Competitive	Attainment	
Very Small (<500)	2	1	4	0	0	7
Small (500-3,300)	0	0	6	0	0	6
Medium (3,301-10,000)	3	2	3	0	0	8
Large (10,001-100,000)	2	3	6	0	0	11
Very Large(>100000)	0	0	0	0	0	0
Overall	**7**	**6**	**19**	**0**	**0**	**32**

Source: (Participation Data) Operator survey data collected by Virginia Tech researchers in March-April 2025; (Economic Designation) Appalachian Regional Commission, ARC County Economic Designation, Retrieved January 2025

Respondents ranked the level of challenge posed by 13 potential operational and/or managerial challenges on a scale of one to four ("not a challenge" to "a serious challenge that limits your ability to serve the community") (Table 3.3.2).

Table 3.3.2: Average Levels of Concern Presented by Potential Operational Challenges

Potential Challenge	Average Response
Inadequate/Aging Infrastructure	2.79
Water Loss/Leakage	2.37
Recruiting Staff	2.32
Retirement/Aging Workforce	2.20
Deferred Maintenance	2.09
Retaining Staff/Employee Turnover	1.98
Regulatory Compliance	1.73
Stakeholder Support	1.70
Inadequate User Rates (Customer Base Charges)	1.63
Educational Opportunities for Staff	1.56
Shutoff/Discontinuation of Service	1.54
Inadequate Staff Training	1.50
Poor Source Water Quality	1.33

Source: Operator survey data collected by Virginia Tech researchers in March-April 2025
Notes: 1=Not a Challenge; 2=Minor Challenge; 3=Moderate Challenge; 4=Serious Challenge

On average, “inadequate/aging infrastructure” was ranked as the *most* challenging option while “poor source water quality” was ranked as the *least* challenging (Table 3.3.2, above). The survey included an open-ended question about additional challenges not listed. Most respondents either did not have anything to add or repeated one of the challenges presented for emphasis (e.g., “workforce shortage” or “raising money to fix problems”). However, three systems cited pressure to expand water quality testing to meet new standards and in two of those cases, respondents specifically identified per- and polyfluoroalkyl substances (PFAS) as the cause for this additional testing need.

Eleven respondents (about 33%) identified “aging infrastructure” as the single biggest challenge facing their utility. Some shared specific examples of their challenges. For example, a very small utility in Mississippi commented that the “community [is] not growing [enough] to support updates” and that the town is too small to afford full-time staff for the utility. A very small utility in Alabama explained that “[a] varying-sized water line makes maintenance hard.” When asked about any other concerns or challenges they would like to discuss, this respondent emphasized “[We] want to provide top quality water [and] want to upgrade to reduce maintenance costs and lower user costs.”

Seven respondents highlighted recruiting and/or retaining staff, especially in light of an aging workforce, as their biggest challenge. This result is not surprising as “recruiting staff” was ranked third in the list of potential challenges (Table 3.3.2, above). A medium-sized utility in Kentucky stated that “worker pay” was a challenge as “small utilities don't have money for operators,” which resulted in significant turnover for the utility. Staff loss also occurs due to retirement, as noted by a small utility in Maryland that expects to see three staff members retire in the next 2-3 years. Importantly, staff retirement can lead to the loss of critical technical, managerial, and community knowledge; a large system in North Carolina noted they are experiencing challenges resulting from “very young crew/staff.” Recruiting new employees on a timeline that allows for sufficient training by experienced staff may help alleviate historical knowledge loss.

Seven respondents specifically identified funding as their biggest challenge. Some of the respondents emphasized that the funding was needed to repair and update aging infrastructure. Respondents named a wide variety of local, state, and federal sources when asked about past or present sources of financial support (Table 3.3.3, page 75). However, a quarter of respondents had not applied for any grants or other financial assistance, and three-quarters had not received or sought assistance from their local development district (LDD). This finding was surprising. Though the underlying reasons for this cannot be ascertained without repeating the survey, a medium-sized utility in Kentucky expressed general skepticism about assistance from regional or federal authorities. They stated, “A lot of people in charge are not in the trenches.” Of those who had received assistance from their LDD, the most common type of assistance was financial (seven utilities).

Table 3.3.3: Current or Past Sources of Financial Assistance (Grants) Identified by the Participating Utilities

1	American Rescue Plan
2	Appalachian Regional Commission
3	Army Corps of Engineers
4	Clean Water Act Funds (state)
5	Coalfield Development Grants
6	Community Development Block Grants (HUD)
7	Department of Environmental Conservation (state)
8	Department of Environmental Quality (state)
9	Department of Health (state)
10	Environmental Finance Center
11	Infrastructure Investment Authority (state)
12	Lead and Copper Rule Funds (state)
13	Planning Commission (local)
14	United States Department of Agriculture
15	World Development

Source: Operator survey data collected by Virginia Tech researchers in March-April 2025
Notes: Sources are listed alphabetically.

In response to the question about potential barriers to grant assistance, seven utilities discussed challenges related to financial and/or size issues. For example, a very small utility in Alabama that has received funds from local sources and ARC, stated that obtaining further grants would be hard because “our town is too small for fund matching.” This challenge was also noted by several other respondents to the project’s Local Development District survey. After applying for grant funding four or five times, a very small Mississippi utility determined that they would never qualify because “Debt can't be paid because we’re a small community and we can’t join larger communities because of our debt” (i.e., they believed their utility’s current finances made them an unattractive partner for consolidation or partnership with other utilities).

While some respondents believe their precarious financial status makes them unattractive to granting agencies, others believe they no longer qualified due to their past success. For example, a small utility in Georgia that previously received ARPA funding observed that they were in a “very fiscally responsible county, which makes us a lower priority for funding.” A small West Virginian utility that had received USDA funds remarked that their “median income is high so it’s hard to qualify.”

Nine utilities cited the grant development process itself as a barrier to submission. Three utilities (a very small system in Ohio, a large system in New York, and a very small system in New York) said they were unaware of grant availability and process. One of these systems stated: “I have no idea what to do.” Other respondents were aware of grant opportunities but struggled to obtain all the necessary components, such as user agreements, income surveys, and easements, to be successful. For example, a medium-sized utility in Virginia explained that “We do not have adequate staff that we can spare to spend time in the field collecting these critical documents." Similarly, a very small utility in Pennsylvania expressed hesitation with the grant process because it was "very complex and it takes months."

Given recent high-profile weather events in the region (e.g., Hurricane Helene in September 2024 and February 2025 flooding in Kentucky and West Virginia), the survey asked about concern with extreme weather events. Of the 32 respondents, 19 (60%) said "yes," though their level of concern varied from "occasionally, nothing major" to "we have just dealt with two historical floods." Some utilities specified the type of extreme weather that was of concern, with eight mentioning flooding. For example, a large utility in Virginia reported struggling with "high [inflow and infiltration] due to flooding" at the time of the survey. A medium-sized utility in Kentucky mentioned the impacts of flooding on source water quality, which challenged its water treatment plant's effectiveness in addition to the direct impact floods can have on infrastructure and operations. Interestingly, seven utilities mentioned extreme cold, with a very small utility in Ohio noting that recent subzero temperatures caused several line breaks.

Infrastructure upgrades are a high future priority for most utilities (22 respondents), with responses ranging from the general ("upgrading infrastructure") to the highly specific (e.g., "grading the system," "replacing meters with radio transmitters," and "update treatment pond"). Although outmigration is frequently mentioned as a chronic issue in Appalachia, expansion and growth also surfaced as priorities for some utilities. Two facilities stated that expansion to unserved communities was a priority, and five utilities stated that expansion to support growing populations was a priority.

Caveats and Limitations

The response rate is relatively low, but this outcome is in alignment with a general trend in survey responses across many sectors.

4. Water and Wastewater Financing Sources

Water and wastewater systems are in a unique position of being infrastructure-heavy, publicly-regulated entities that provide an essential service. Maintaining, replacing, and upgrading infrastructure can be incredibly expensive. Pay-go funding, or tapping into reserve funds, to pay the full cost of the project up-front, is one financing option. This funding is relatively quick to access and interest-free but is better suited for smaller maintenance projects or emergency projects. Saving up enough capital for larger planned projects takes time, and many utilities simply will not be able to bring in enough revenue to pay for all (or even just one) of their larger capital projects up-front, limiting their ability to address multiple issues simultaneously. Often, utilities need to access external funding sources to cover the high costs of capital projects. Utilities have several options, and the choice they make largely depends on their location, size, financial health, and debt-service capacity, as well as the project size and their values as a public entity. These external sources can be public or private and in the form of grants, loans, or bonds.

4.1 Key Takeaways

- Water and wastewater infrastructure funding is available through federal, state, nonprofit, and private financing sources.
- Approximately $1.1 billion ($42 per capita) was spent from federal funding sources within Appalachia in FY 2021–2024.
- In recent years, the largest portion of federal investments in water and wastewater infrastructure has flowed through the Community Development Block Grant program (66%). The EPA's Drinking Water State Revolving Fund (DWSRF) is the second largest, accounting for about 15%.
- Revenue and green bonds are more accessible to medium or large-sized systems. However, innovative solutions, such as pooled bond banks, increase the accessibility of the bond market to the smaller systems, providing a valuable funding stream.

4.2 Catalog of Current Public Funding Programs

Some public funding programs are national, available to all states in the Appalachian Region, while others are state-specific, driven by state priorities. The project team created a catalog of public grant and loan programs by state as a resource for utilities seeking funding from these types of sources. For each program, the tables capture the administering agency, program purpose, eligible entities, application information, program contact, and, if publicly available, the total amount available in FY23. PDFs of the tables are available as a companion to this final report.

4.3 Federal Funding Infrastructure Investment in Appalachia

To assess how much federal funding has been invested in water and wastewater infrastructure in Appalachia, the Project Team used information from USASpending, a database consisting of reported federal funding obligation records from 2001 to 2024. The database requires information on outlays (i.e., disbursements) to be reported starting in

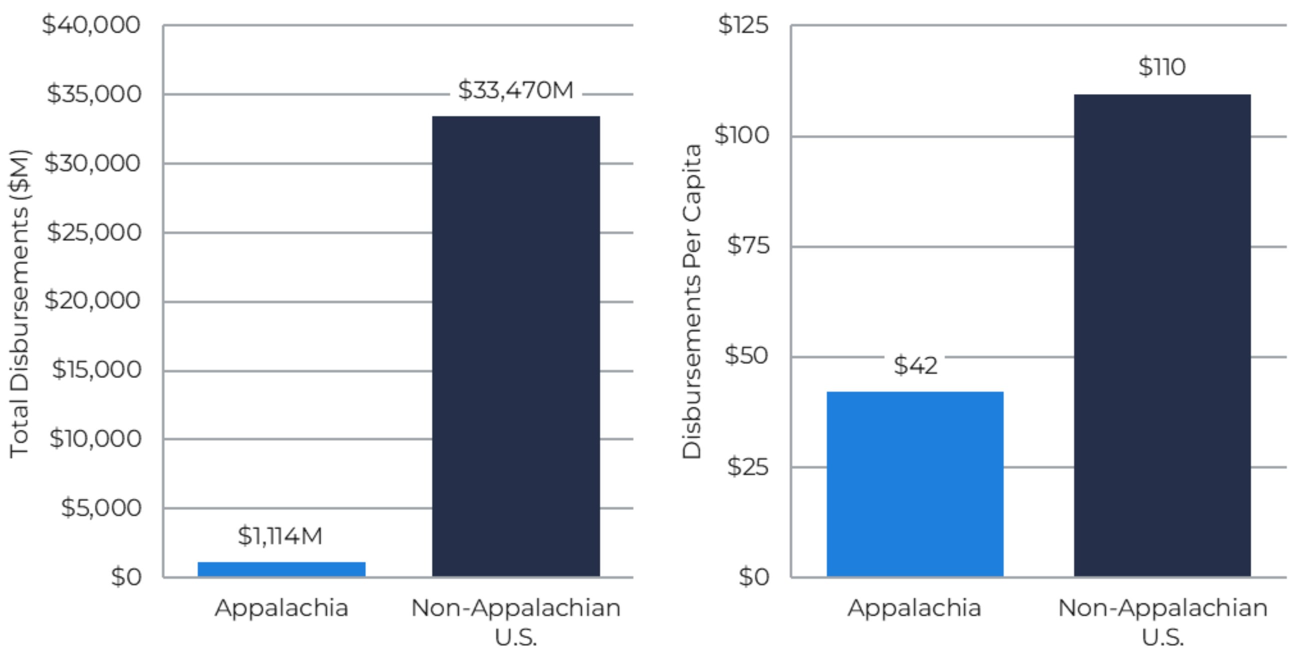
FY22. However, the database also includes information on disbursements for FY21. The project team used these data to provide a comparison point to Hughes et al. (2005). To ensure that the funds were relevant to the analysis, the project team restricted the dataset to records that indicated that the primary place of performance was in the 13 Appalachian states. Funds disbursed within the Appalachian Region are identified using the primary place of performance county. A list of all funding programs in USASpending considered for this analysis is provided in Appendix G.

Analysis Results

The USASpending database includes information on two types of funding: assistance listings and contracts.[x] Funding information is broken down by transaction: each transaction line item includes information such as the program ID, fiscal year, amount obligated, amount disbursed, recipient address, primary place of performance address, awarding agency, awarding subagency, awarding office, funding agency, funding subagency, and the funding office. The database is designed to facilitate analysis at the agency level and to analyze geographic trends (e.g., state, county, city, etc.).

The total amount of federal awards disbursed in Appalachia between FY21-24 was about $1.1 billion, compared to about $33.5 billion for the non-Appalachian U.S. Appalachia accounts for about 3% of all funding disbursed nationwide. Per capita investment in Appalachia is less than half of the per capita investment in the non-Appalachian U.S. (Figure 4.3.1).

Figure 4.3.1: Total and Per Capita Federal Funding Disbursements, FY21-24



Source: (Federal Funding) U.S. Department of the Treasury, USAspending.gov Database, Retrieved August 2025; (Population) U.S. Census Bureau, American Community Survey 5-Year Data (2019-2023), Retrieved March 2025
Notes: Per capita calculations rely on population estimates derived from ACS Census 5-year 2019-2023 data.

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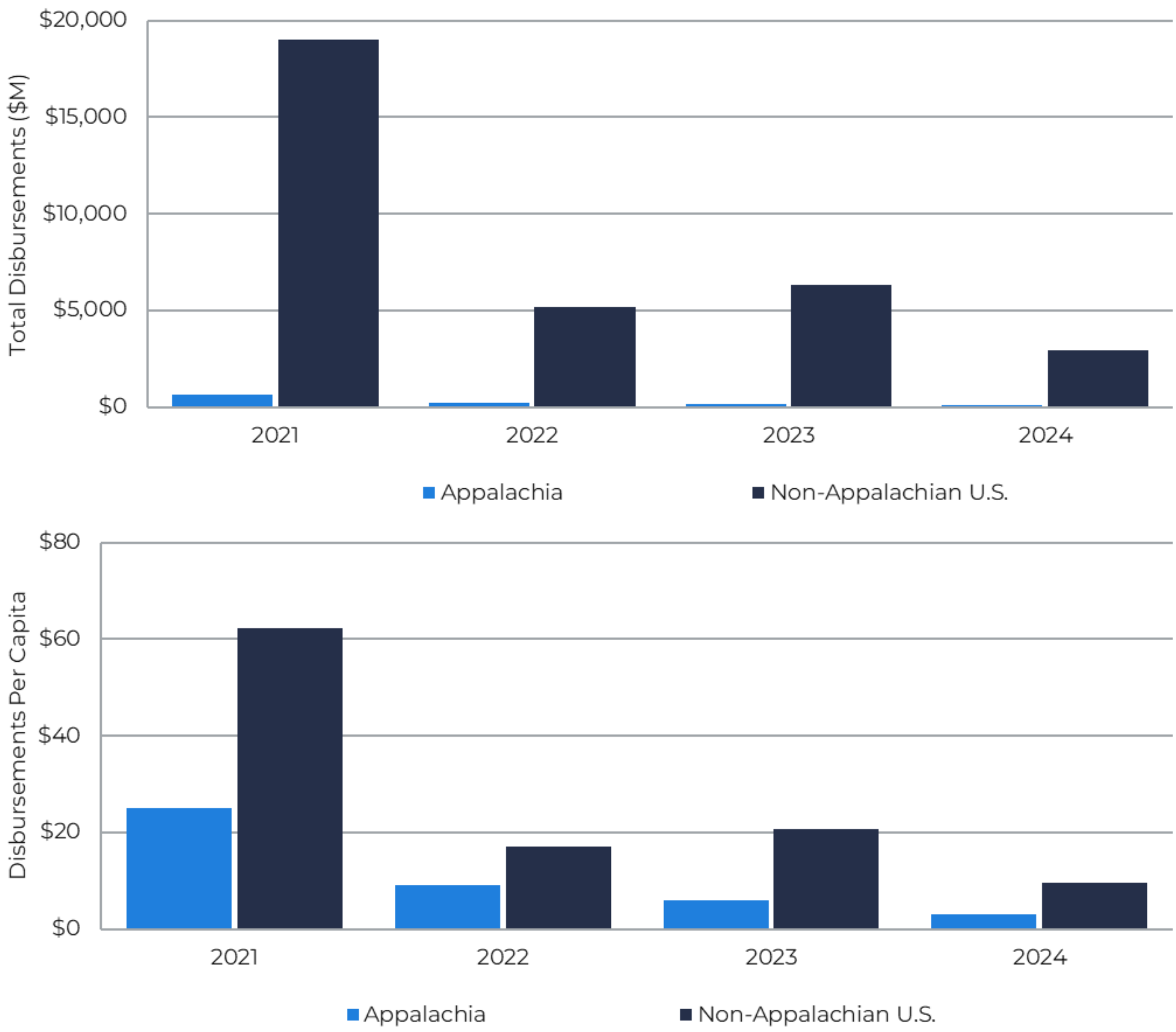
[x] To most closely align with Hughes et al. (2005), the project team only analyzed funding from assistance listings, previously known as Catalog of Federal Domestic Assistance (CFDA) programs.

Within Appalachia, the amounts disbursed have consistently decreased since FY21 and vary between about 2.5% and 4.5% of disbursements in the non-Appalachian U.S. Per capita investment in Appalachia has declined from approximately $25 in FY21 to approximately $3 in FY24 and ranges from 30-50% of the per capita investment in the non-Appalachian U.S. (Figure 4.3.2).

Figure 4.3.2: Annual Total and Per Capita Federal Funding Disbursements, FY21-24



Source: (Federal Funding) U.S. Department of the Treasury, USAspending.gov Database, Retrieved August 2025; (Population) U.S. Census Bureau, American Community Survey 5-Year Data (2019-2023), Retrieved March 2025
Notes: Per capita calculations rely on population estimates derived from ACS Census 5-year 2019-2023.

By state, there is substantial variation in the amounts of federal funding disbursed to Appalachia, ranging from $12 million (Kentucky) to $396 million (Pennsylvania). Overall, 10% of funding received by states in Appalachia was directed towards the Appalachian Region in FY21-24. On a per capita basis, investment within Appalachia ranges from $11 in Kentucky to $138 in Virginia. The per capita investment in Appalachia is $42 compared to $100 in Appalachian states overall (Table 4.3.1).

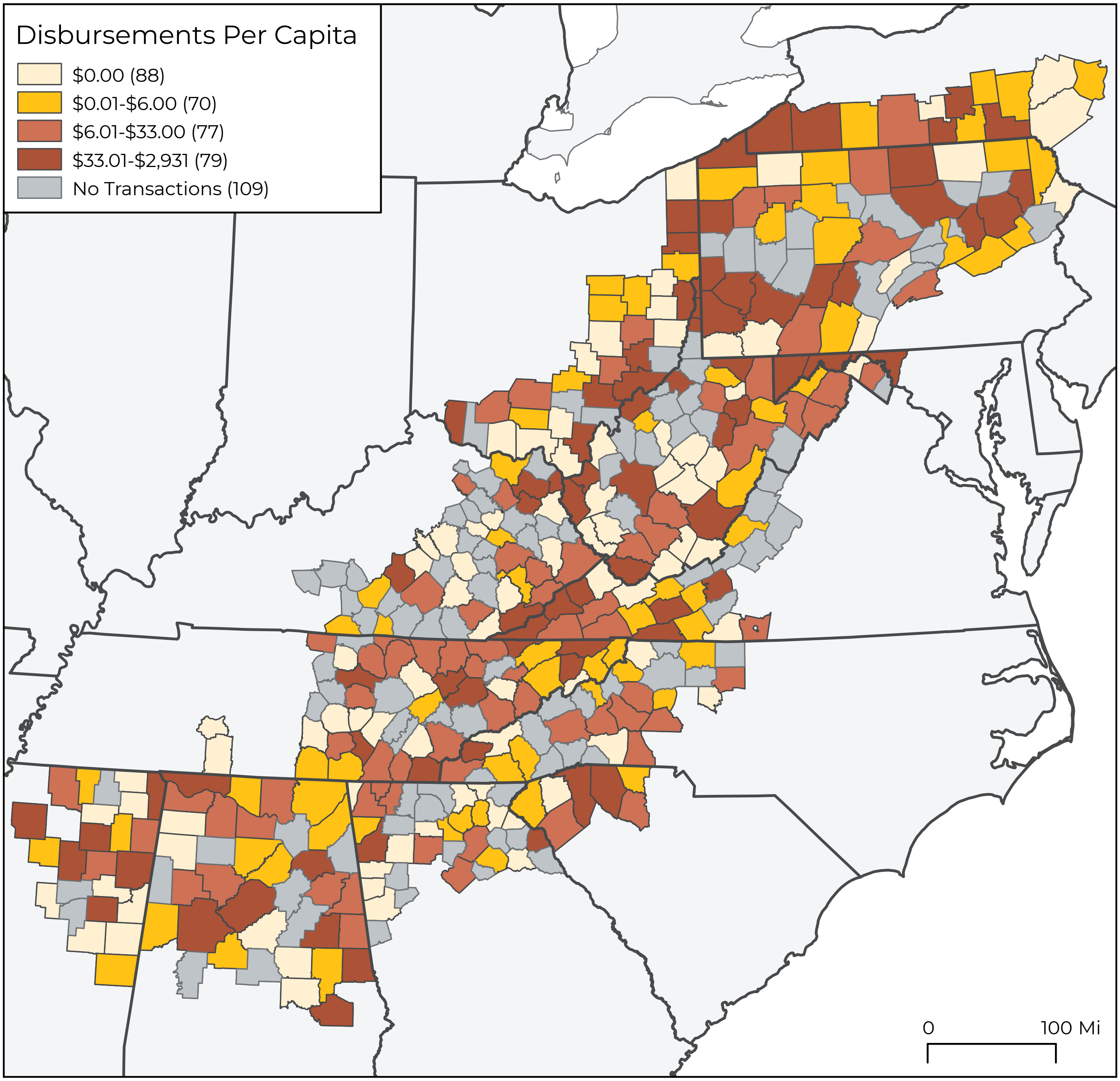
Table 4.3.1: Summary of Federal Funding Disbursements by State, FY21-24

Geographic Area	Funding in Appalachia		Per Capita	
	Total (Millions)	% of State Funding	Appalachia	Overall
Alabama	$109	11%	$33	$195
Georgia	$49	6%	$14	$77
Kentucky	$12	5%	$11	$55
Maryland	$13	3%	$51	$73
Mississippi	$14	7%	$23	$70
New York	$54	1%	$53	$182
North Carolina	$27	7%	$13	$37
Ohio	$56	5%	$28	$92
Pennsylvania	$396	29%	$70	$106
South Carolina	$45	11%	$33	$81
Tennessee	$65	17%	$22	$54
Virginia	$91	16%	$138	$66
West Virginia	$183	100%	$103	$103
All States	**$1,114**	**10%**	**$42**	**$100**

Source: (Federal Funding) U.S. Department of the Treasury, USAspending.gov Database, Retrieved August 2025; (Population) U.S. Census Bureau, American Community Survey 5-Year Data (2019-2023), Retrieved March 2025
Notes: Per capita calculations rely on population estimates derived from ACS Census 5-year 2019-2023.

Spatially, there is no discernible pattern in terms of per capita investment at the county level throughout the region (Figure 4.3.3).

Figure 4.3.3: Per Capita Disbursements of Federal Funds by County in Appalachia, FY21-24

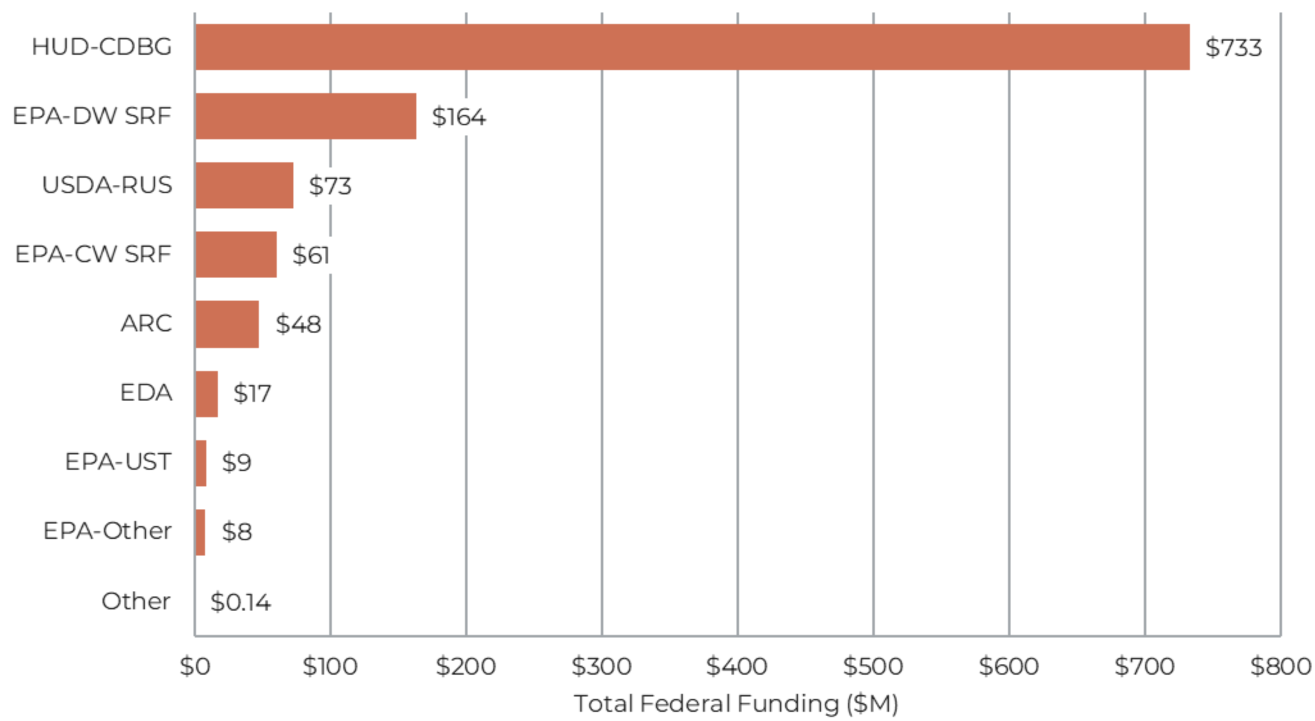


Source: (Federal Funding) U.S. Department of the Treasury, USAspending.gov Database, Retrieved August 2025; (Population) U.S. Census Bureau, American Community Survey 5-Year Data (2019-2023), Retrieved March 2025
Notes: Per capita calculations rely on population estimates derived from ACS Census 5-year 2019-2023. Values of $0 represent either an administrative transaction where $0 was obligated or outlayed but an administrative change was made to the award, or a federal action obligation >$0 was reported but no outlays were reported. No transactions means that county was not represented in the awards dataset at all.

Federal funding programs are generally directly administered by state government agencies, though they could be managed by other entities. For example, EPA's CWSRF and DWSRF, the U.S. Department of Housing and Urban Development's (HUD) Community Development Block Grants (CDBG), and some of ARC's programs are primarily federal programs that are administered by state agencies.

Figure 4.3.4 overviews the major categories of funding for funds disbursed in Appalachia, grouped by the awarding agency and sub-agency. Over the past several years, CDBG has been the largest water and wastewater infrastructure program in the region, accounting for $733 million (66%) of the water and wastewater investments by public programs. EPA's DWSRF is the second largest at approximately $164 million (15%) of overall investments. The U.S. Department of Agriculture's Rural Utility Systems (RUS), consisting of eight different funding programs, ranks third ($73 million). EPA's CWSRF accounts for $61 million in investments.

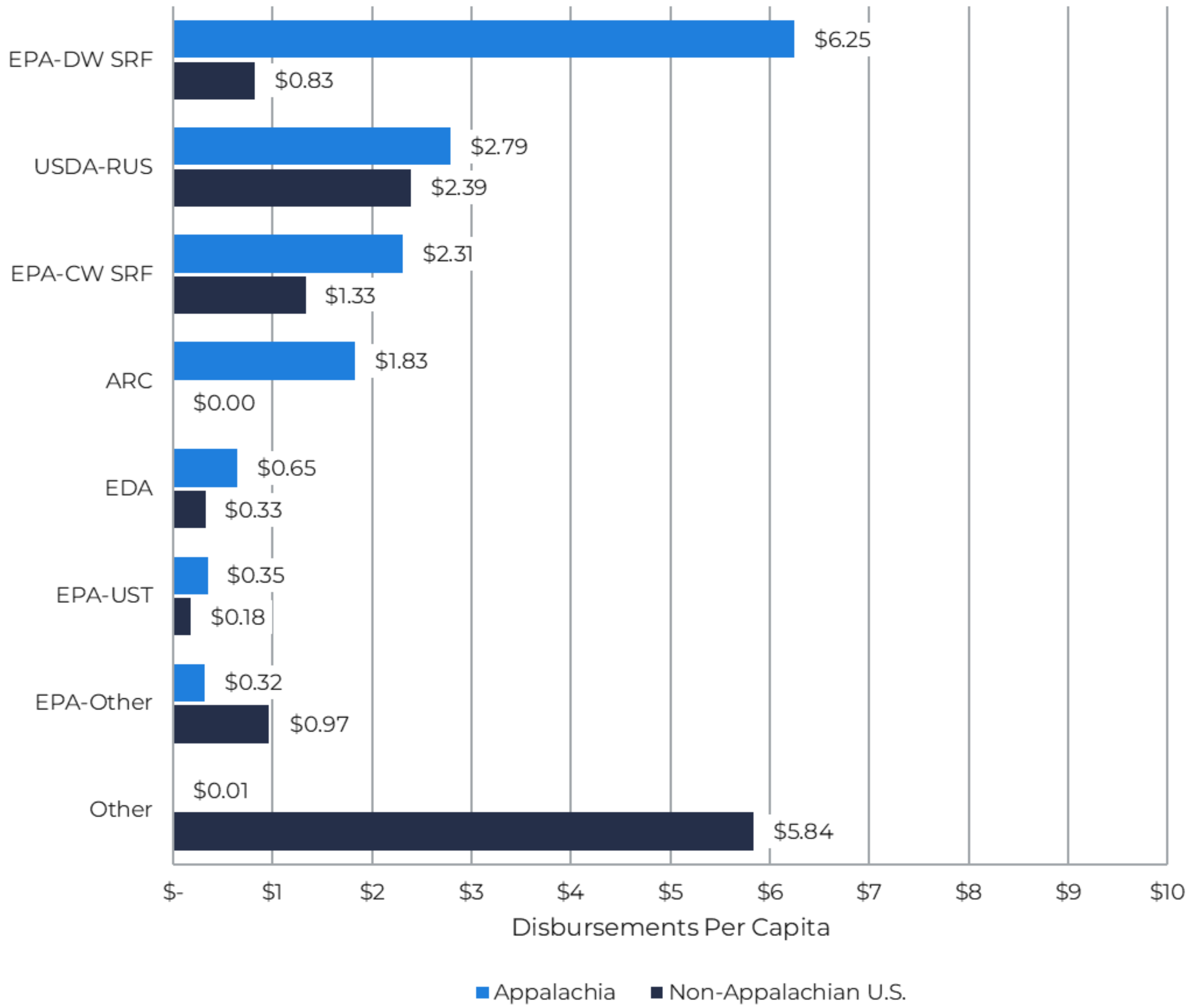
Figure 4.3.4: Disbursements by Major Infrastructure Funding Programs, FY21-24 in Appalachia



Source: U.S. Department of the Treasury, USAspending.gov Database, Retrieved August 2025

As the largest source of funding for water and wastewater utilities in Appalachia, CDBG yielded a per capita investment of about $28 within Appalachia, roughly a quarter of the investment per capita throughout the non-Appalachian U.S. ($113). However, the opposite is true for most other funding programs, wherein per capita investment in Appalachia exceeds that of the non-Appalachian U.S. The two exceptions are broad "other" categories that capture multiple programs not nested under one of the major funding program umbrellas (Figure 4.3.5).

Figure 4.3.5: Per Capita Disbursements by Major Infrastructure Funding Programs, FY21-24



Source: (Federal Funding) U.S. Department of the Treasury, USAspending.gov Database, Retrieved August 2025; (Population) U.S. Census Bureau, American Community Survey 5-Year Data (2019-2023), Retrieved March 2025
Notes: Per capita calculations rely on population estimates derived from ACS Census 5-year 2019-2023. CDBG is not shown because the per capita investment is so much higher than all other programs, making the variation between other programs difficult to visualize.

Caveats and Limitations

There are several caveats relevant to the analysis presented in this section. First, it is not entirely clear how disbursements reported in the USASpending database compare to the data collected in 2005. Notwithstanding, it is reasonable to assume that USASpending provides a more comprehensive accounting than the earlier data requests (including Freedom of Information Act letters). Second, USASpending only includes information on federal grants. Third, the USASpending database only tracks the primary place of performance. There may be secondary places of performance that are not tracked. Lastly, federal funding programs do not necessarily exclusively rely on federal funds. For example, the EPA SRF programs require states to contribute a 20% capital match. It is unclear whether USASpending tracks only federal components of funds disbursed or all components.

4.4 Private Financing Solutions for Water and Wastewater Utilities

With more than $4 trillion in outstanding bonds on the U.S. municipal bond market, private financing can be an important source of funds for water and wastewater infrastructure projects across the country.[29]

Revenue bonds are one of the most commonly issued bond types for infrastructure projects. These bonds are long-term funding solutions that are often used to finance utility infrastructure projects that are tax-exempt.[30] Revenue bonds can be particularly attractive to utilities since they can be executed quickly after being sold and they give utilities more control over their finances. Revenue bonds are backed by user fees, not by the infrastructure they are funding. This structure can provide utilities the flexibility to take on multiple projects simultaneously and work with multiple investors. Conversely, these bonds can require more middlemen, financial strength and creditworthiness, and capacity. To issue a bond, utilities need to work with several outside partners, including underwriters, financial advisors, and a legal team. Paying for their time and services can add up to 3% or more of the total bond cost.[31]

Like revenue bonds, green bonds can also be used for infrastructure projects, but the utility needs to meet Green Bond Principals (GBP) standards to be considered for this funding. Green projects for water and wastewater utilities include projects that incorporate energy efficiency or sustainable and innovative water and wastewater techniques.[32] While the upfront cost of these projects is often higher (e.g., requiring newer technology, additional treatment steps, or more time invested in learning new processes) than their traditional counterparts, they may have a longer useful life. Since they are more environmentally friendly by nature, they have additional draws that may attract investors, potentially resulting in a lower interest rate (i.e., a “greenium”) and a diverse investor market.[33] Green bonds can also help utilities align their priorities with climate resiliency, which could drive additional customer investment into these systems.[34]

As with any financing mechanism, a utility’s debt service and annual revenues are important determining factors in what the utility can afford. In the case of issuing debt via the bond market, the interest rate is another factor, which is determined by the bond buyer (not the utility) and influenced by credit ratings. Rating agencies in the private bond market (e.g., Moody's, Standard & Poor's, and Fitch) determine a utility's rating by considering several financial factors related to the utility's overall financial health. These factors include debt service, reserve funds, and rate management. They distill these metrics down to one score that measures a utility's financial risk. Though a utility's bond rating is ultimately only one of several pieces that informs the interest rate a utility is offered for its bond, it can have a significant impact.[35]

Within Appalachia, only 52 utilities, spread over 45 counties, had a rating from Moody's in 2024. The majority of utilities with 2024 credit ratings are located in counties designated as "transitional" (67%) (Table 4.4.1).

Table 4.4.1: Number of Rated Utilities by ARC County Economic Designation, 2024

Geographic Area	Number of Rated Utilities by ARC Economic Designation (FY25)					Total
	Distressed	At-Risk	Transitional	Competitive	Attainment	
Appalachian Portions of State						
Maryland	0	0	0	0	0	0
Mississippi	0	0	0	0	0	0
Virginia	0	0	0	0	0	0
Kentucky	0	1	0	0	0	1
New York	0	1	0	0	0	1
Ohio	0	0	1	0	0	1
West Virginia	0	0	1	1	0	2
North Carolina	0	0	3	0	0	3
Tennessee	0	2	0	2	0	4
South Carolina	0	0	4	2	0	6
Georgia	0	0	6	1	1	8
Alabama	0	0	7	5	1	13
Pennsylvania	0	0	13	0	0	13
Appalachia	**0**	**4**	**35**	**11**	**2**	**52**

Source: (Credit Ratings) Moody's Investors Service, Inc., Retrieved April 2024; (Economic Designation) Appalachian Regional Commission, ARC County Economic Designation, Retrieved January 2025

Nearly half of the utilities with ratings are combined water and sewer enterprises (Table 4.4.2). A detailed list of rated utilities is provided in Appendix H.

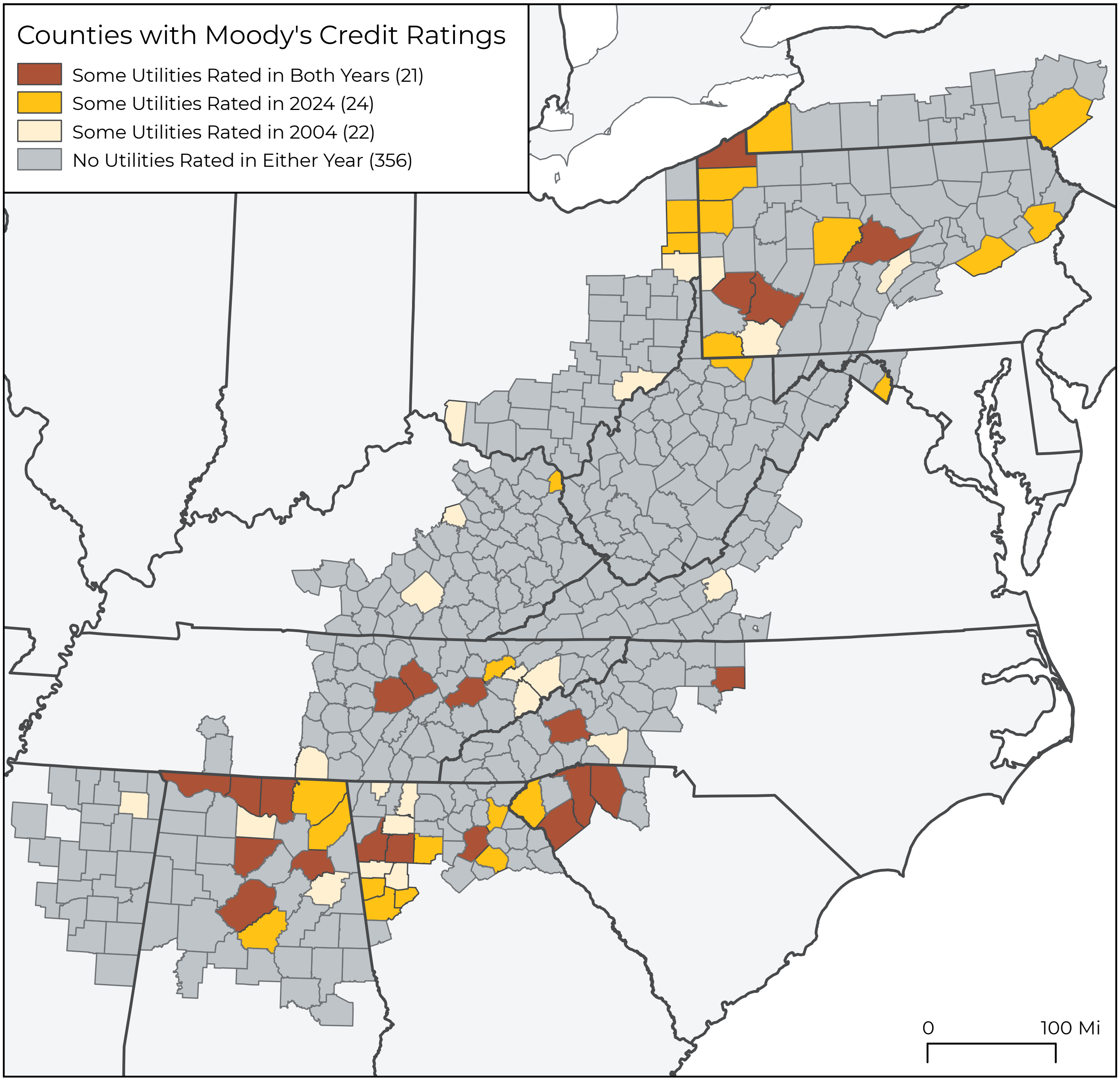
Table 4.4.2: Number of Rated Utilities by Utility Type, 2024

Geographic Area	Combined Water & Sewer Enterprise	Sewer Enterprise	Water Enterprise	Total
Appalachian Portions of State				
Maryland	0	0	0	0
Mississippi	0	0	0	0
Virginia	0	0	0	0
Kentucky	1	0	0	1
New York	1	0	0	1
Ohio	0	1	0	1
West Virginia	2	0	0	2
North Carolina	1	0	2	3
Tennessee	0	1	3	4
South Carolina	2	1	3	6
Georgia	7	0	1	8
Alabama	7	1	5	13
Pennsylvania	4	5	4	13
Appalachia	**25**	**9**	**18**	**52**

Source: (Credit Ratings) Moody's Investors Service, Inc., Retrieved April 2024

Since 2004, there appears to be a slight increase in the number of utilities that have gained access to the credit market, but utilities are clustered in Northern and Southern Appalachia. Eighty-four percent of counties had no utilities rated in either 2004 or 2024 (Figure 4.4.1).

Figure 4.4.1: Counties Containing Utilities with Moody's Credit Ratings, 2004 and 2024



Source: (2024 Credit Ratings) Moody's Investors Service, Inc., Retrieved April 2024; (2004 Credit Ratings) Hughes et al., Drinking Water and Wastewater Infrastructure in Appalachia: An Analysis of Capital Funding and Funding

Rating agencies often frame their criteria such that the larger utilities that enjoy greater economies of scale are more able to benefit. Often, utilities receiving the highest rating have large customer bases, high MHIs, and large debt capacity, on top of having additional funding to pay for a rating and several services related to developing, posting, and choosing a bond.[36] Utilities do not have to pay for a rating to post a bond, but unrated bonds are often seen as riskier investments and may be offered higher interest rates, which raises the total cost of the bond.[37] Because of the added cost, many smaller utilities—which comprise the majority of Appalachian utilities—do not have bond ratings.

Another challenge in securing bond financing for small-to-medium-sized utilities is related to rate requirements. Regardless of whether or not a utility has a credit rating, some bonds may require utilities to have a rate covenant or keep their rates at a certain level to maintain enough revenue to pay for debt service.[38] However, population decline, loss of a large customer, outside market conditions, and commercial divestment are all events that can decrease revenue for a utility regardless of customer rates. Generally, the smaller the utility, the more susceptible it will be to these types of disruptions. Utilities can always raise rates to compensate for such changes, but significant increases could result in a decrease in demand or an increase in nonpayment, still resulting in overall reduced revenue.[39]

One way smaller systems can access debt while also keeping interest rates low is by using a bank-qualified bond. Bank-qualified bonds allow revenue bonds to flow directly through local banks rather than large investment firms. The bank assumes responsibility for liaising with investors, allowing utilities to bypass the lengthy and expensive underwriting and transaction process. Bank-qualified bonds, like revenue bonds, offer low interest rates to utilities and tax-exempt status to banks if the utility issues less than $10 million in bonds per year. Because of the relatively low cap, these bonds may be better suited to small utilities, smaller projects, or phased projects.[40] However, bank-qualified bonds, like any other bond, are heavily subject to current market conditions. Treasury yields, tax rates, and other economic events can have a significant impact on their profitability. Since these bonds are smaller than many privately issued bonds for larger systems, investors are quick to change interest rates associated with these bonds in response to major market events.[41] Overall, while these bonds can help smaller utilities access the revenue bond market in a less expensive and more streamlined way, they are subject to a yearly cap, dynamic interest rates, and overall market conditions that can affect their availability.

Innovative financing options, such as pooled bond banks, offer another option to help smaller utilities access the private financing market. Bond banks essentially take one large bond out on behalf of several utilities, which utilities may then use to issue debt to complete infrastructure projects.[42] Utilities can approach the bond bank before the issue deadline with a request for a certain amount of funding to be added to the pooled bond. The bond bank will then perform an internal credit analysis to ensure the utility will be able to take on the additional debt it requested. This step of the process is often much faster than if a utility were to apply for subsidized funding or post a bond on the private market.[43] Once the utility's debt is approved, it can be added to the pooled bond. The pooled bond is then posted by the bond bank on behalf of the utilities.

This avenue is beneficial to both investors and utilities. Investors can purchase a larger bond with a highly reputable issuer, and utilities can access the bond bank's attractive interest rates for smaller project costs that they may not have been able to achieve if they issued the bond on their own.[44] The bond bank also handles all the additional steps it takes to issue the bond by charging a fee to participating utilities. Utilities can skip the added costs and paperwork associated with issuing a bond themselves, including getting a credit rating.

Some bond banks are run by states. State bond banks are common in the transportation sector, though many also offer bonds to water and wastewater utilities. Although they are established at a state level, their credit rating and loaning power are independent from the state. This often means that they have the same or higher rating than the state does, and they maintain this rating by spreading risk over multiple borrowers on one large bond.[45] Of the 13 states in the Appalachian Region, five have a state bond bank that offers pooled bond services to water and wastewater utilities (Kentucky, New York, Ohio, Virginia, and West Virginia).

The Virginia Pooled Financing Program (VPFP), housed within the Virginia Resources Authority (which also houses the state's SRF programs), is one of the oldest in the country and maintains an AAA rating for revenue bonds.[46] Since 2003, the VPFP has issued over $4 billion in pooled financing to water and wastewater utilities, including refinancing debt. Utilities can apply for pooled issue bonds starting at $500,000 with terms up to 30 years based on the useful life of the project. Bonds issued by the VPFP are also callable after 10 years, allowing utilities flexibility for prepayments on bonds.[47] Bonds are issued in the fall and spring, but the VPFP has also been offering a summer issue to meet demand. Bonds issued through the VPFP are often ready for disbursement about three months from application, compared to two years from application if a utility were to apply to their state SRF program. Administrative costs are similar to closing costs on SRF loans, with 0.125% of the unpaid principal going towards administrative fees on each semi-annual payment.[48]

The West Virginia Infrastructure and Jobs Development Council (IJDC) was established in 1994 and acts as a pooled bond bank for water and wastewater utilities across West Virginia. The bond bank is housed under the West Virginia Water Development Authority (WDA), which issues the pooled bond.[49] IJDC will review all applicants on a year-round basis and recommend projects to the pooled bond. Since the pooled bond is not taken out for specific utilities, it is allocated to utilities on a first-come, first-served basis with a fixed 3.00% interest rate.[50] Need is monitored on a 24-month basis, where WDA will then reassess and issue another pooled bond. There is no maximum or minimum loan amount, and loans can range from 20 to 40 years, with some loans being callable after 10 years.[51]

The Ohio Water Development Authority's (OWDA) Fresh Water Program is an AA-rated bond bank that offers pooled bond options for both planning and construction loans.[52] The board meets once a month and determines which projects are eligible for funding. Interest rates are based on the previous 8-week average plus an additional 0.3%.[53] Similar to OWDA, the Fresh Water Program offers loans on a first-come, first-served basis, but OWDA will issue loans at the end of each month rather than two or three times a year. To maintain sufficient levels of funding in the program, OWDA will issue pooled bonds as needed rather than at specific times during the year.[54]

The Municipal Bond Bank Agency (MBBA) in New York and the Kentucky Bond Corporation (KBC), established in 2010, also offer highly rated, pooled financing options to water and wastewater utilities.[55]

Although not a state bond bank, the Tennessee Municipal Bond Fund (TMBF) is another type of innovative financing solution. Housed under the Tennessee Municipal League (TML), it helps utilities across the state access loans, bonds, and other financing options at the lowest interest rates available. Since its inception in 1985, it has helped municipalities across the state access $5 billion in funding.[56]

From traditional bond financing to more innovative approaches, each method has merits that target a certain group of systems, whether that be the number of customers, financial elasticity, or project size. However, the efficacy of these methods is highly dependent on the current capacity and financial state of the system.

5. Addressing Financial, Operational, and Managerial Capacity Gaps

The analysis in Chapter 3 highlights potential gaps in financial, operational, and managerial capacity. From a funding perspective, the analysis provided in this section suggests a total of $55 billion in water and wastewater infrastructure capital needs. Given disbursements in recent years, available federal funding is only covering a small fraction of those needs. Other grant and loan sources—state, nonprofit, and private—supplement federal funds, but the gap is still significant. However, external funding sources will never fully cover all infrastructure costs; utilities will always need to cover some capital costs through customer charges. Given the economic challenges in the region, affordability may be an important factor to consider. Regarding operational and managerial capacity, LDDs can be important resources and partners for utilities in their districts, as highlighted in this chapter. Notably, they are only one of many technical assistance providers to support utilities in Appalachia. A more comprehensive list of providers is provided in Appendix I.

5.1 Key Takeaways and Considerations

Key Takeaways: Affordability

- Average annual bills tend to be higher in the Appalachian portions of all states relative to the non-Appalachian portions, exceptions being Mississippi and North Carolina.
- On average, annual water and wastewater bills in all counties of the 13 Appalachian states are generally lower than 1% of the communities' MHI, though the project team found evidence of bills up to 4.6% and 14% of MHI for water and wastewater, respectively.
- Seven of the ten Appalachian counties with the highest residential water bill levels at 4,000 gallons are classified as distressed by ARC.

Key Takeaways: LDDs as Resources and Partners

- Local development districts (LDDs) can be an important partner for utilities, particularly in terms of funding access and management. Grant and/or loan writing and administration are the most commonly offered and utilized services. Many LDDs also act as intermediaries between local governments and state or regional EPA offices for funding opportunities.
- Workforce development is less commonly offered by LDDs and is overall in low demand as a program area. Given that an ageing workforce is a known concern across the water and wastewater sector nationwide, this finding may merit further exploration.
- Though most LDDs promote regional collaboration, few have played a lead role in establishing such partnerships in the past decade. Adding staff capacity could shift LDDs from promoters to facilitators.

- LDD survey respondents pointed to financial concerns, including rising costs of construction materials and affordability, as barriers for utilities in undertaking capital projects.

5.2 Affordability Analysis

As noted above, a significant portion (42%) of counties in Appalachia are considered economically distressed or at-risk. Moreover, previous findings by Hughes et al. (2005) suggested that Appalachian communities pay a higher proportion of their income for water and wastewater services compared to the rest of the U.S. To understand the capacity for customers to absorb additional capital costs, this analysis leverages previous data collection efforts on water and wastewater rates by the SOG EFC in seven Appalachian states to evaluate the affordability of existing utility rates for customers. In addition to these data, the project team sampled an additional 611 utilities from the Appalachian Region in 2024.

Analysis Results

The affordability analysis discussed in this section provides descriptive evidence on the distribution of water and wastewater bills, both in terms of absolute dollar amounts and in terms of the burden they represent for households in Appalachian communities. As part of this analysis, the project team assessed the residential cost of water for a total of 4,377 utilities. Bills are computed at 4,000 gallons of consumption. This quantity threshold is selected to be consistent with previous studies that examine the affordability of water services to capture the amount of water needed for basic necessities for a household size of approximately 3-4 people (e.g., El-Khattabi et al., 2023[57]).

Across the 13 Appalachian states, the majority of the utilities charged under $5,700 annually for either water or wastewater services for 4,000 gallons of monthly consumption (i.e., 48,000 gallons annually); however, one system in Alabama charged $9,276 annually for wastewater services alone. As shown in Table 5.2.1, the average annual cost of water services from a centralized system is approximately 18% higher for systems within the Appalachian portions of states ($491) compared to systems in the non-Appalachian portions ($417); the difference for wastewater is less substantial, only about 6% higher in Appalachian portions of states on average compared to the non-Appalachian portions.

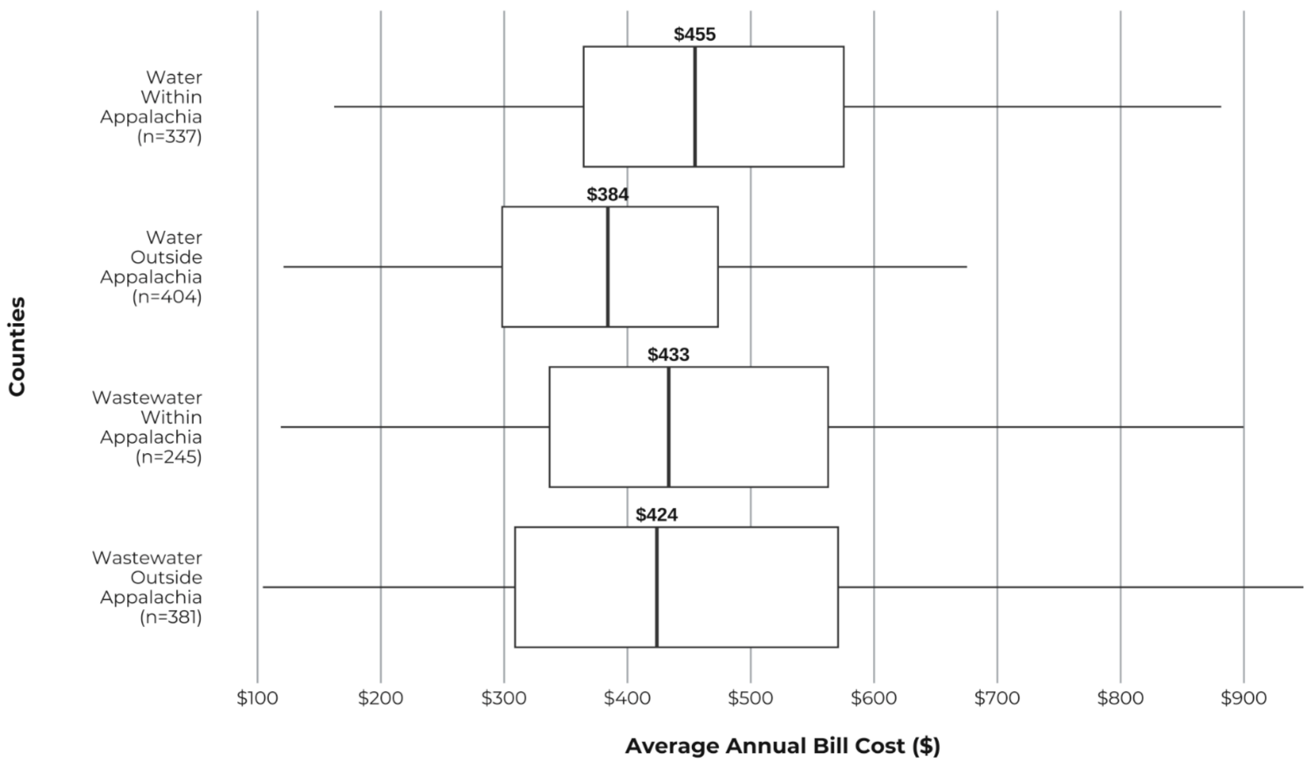
Table 5.2.1: Basic Statistics for Annual Water and Wastewater Bills, Twelve Appalachian States

Geographic Area	Sample Size	Mean	Median	Min	Max	Range
Water Bills						
Within Appalachia	1,241	$491	$463	$26	$2,710	$2,684
Outside Appalachia	1,445	$417	$373	$58	$5,625	$5,567
Wastewater Bills						
Within Appalachia	625	$505	$440	$31	$9,554	$9,523
Outside Appalachia	1,066	$478	$437	$32	$1,989	$1,957

Source: Utility rate data collected by SOG EFC staff between 2018 and 2024
Notes: Data are calculated at a consumption rate of 4,000 gallons per month. There is no data for Maryland.

Summarizing average annual bills at the county level across the Appalachian Region, the cost of both water and wastewater services appears to be higher in Appalachian portions of states relative to the non-Appalachian portions, $455 vs $384 for water and $433 vs $424 for wastewater, respectively (Figure 5.2.1).

Figure 5.2.1: Boxplots of Annual Water and Wastewater Bills at the County Level, Twelve Appalachian States



Source: Utility rate data collected by SOG EFC staff between 2018 and 2024
Notes: Outliers are not shown and there is no data for Maryland. N represents the number of counties included in each service-region category. Data are calculated at a consumption rate of 4,000 gallons per month.

There also appear to be differences by state (Table 5.2.2). West Virginia has the highest average annual bills, with roughly 80% exceeding $500 annually, while only 18% of all bills in Appalachia exceed $500. Mississippi is the only Appalachian state without any annual bills exceeding $600 in the dataset. Ohio stands out as having the most variation in both its water and wastewater bills. Boxplots showing the variation in the cost of residential water and wastewater services within each state are available in Appendix J.

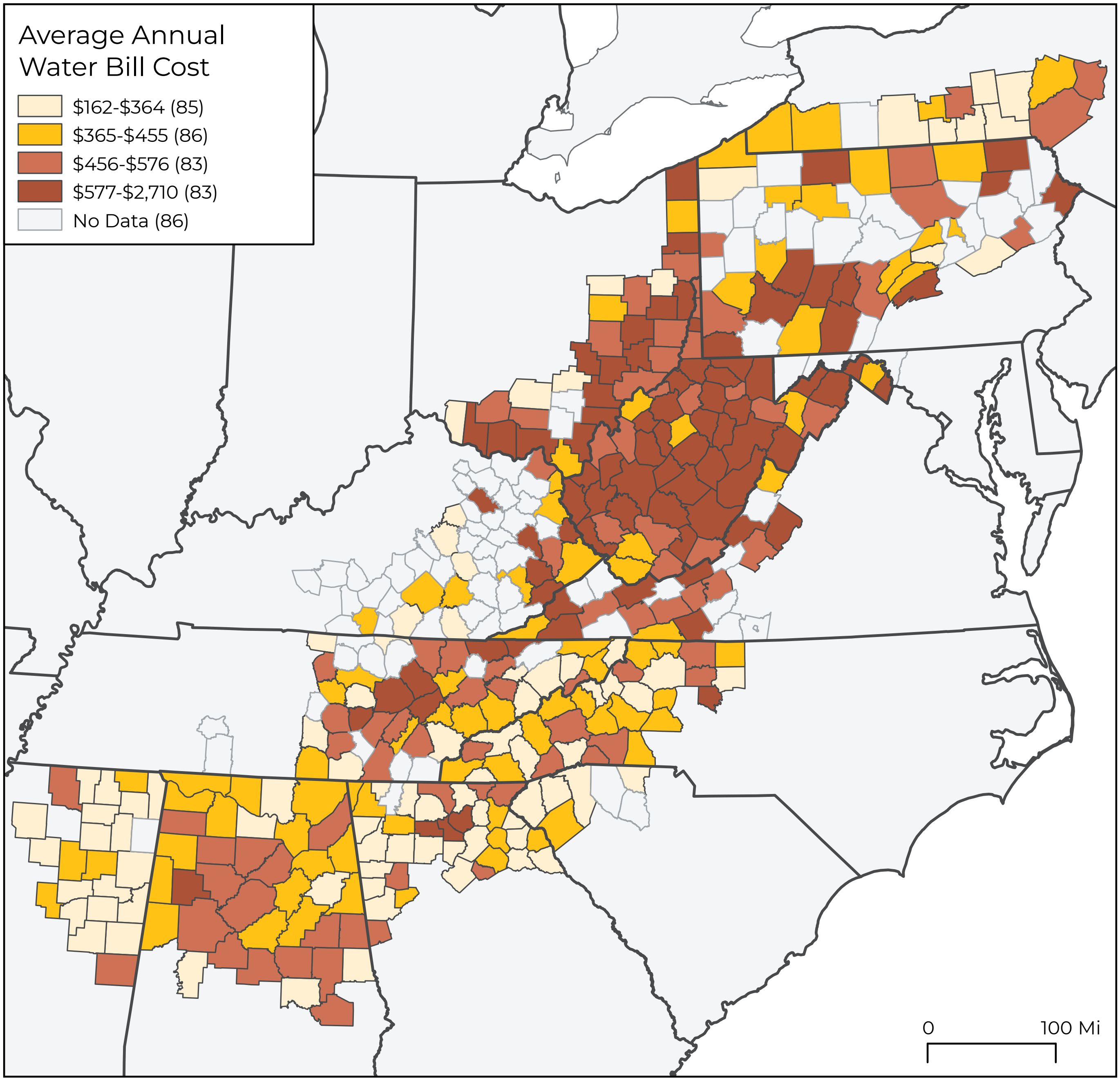
Table 5.2.2: Average Annual Water and Wastewater Bills, Appalachian States

State	Average Bill		Difference of Average Bills	
	Appalachia	Non-Appalachia	$ (App. - Non-App)	% ($ Diff./$ Non-App)
Water				
Alabama	$451	$401	$50	12%
Georgia	$386	$314	$72	23%
Kentucky	$520	$567	-$47	-8%
Maryland	No Data	No Data	No Data	No Data
Mississippi	$331	$331	$0	0%
New York	$364	$274	$90	33%
North Carolina	$410	$457	-$47	-10%
Ohio	$573	$585	-$12	-2%
Pennsylvania	$580	$528	$52	10%
South Carolina	$325	No Data	No Data	No Data
Tennessee	$447	$418	$29	7%
Virginia	$523	$406	$117	29%
West Virginia	$616	N/A	N/A	N/A
Wastewater				
Alabama	$404	$336	$68	20%
Georgia	$423	$353	$70	20%
Kentucky	$458	No Data	No Data	No Data
Maryland	No Data	No Data	No Data	No Data
Mississippi	$235	$264	-$29	-11%
New York	$429	No Data	No Data	No Data
North Carolina	$465	$573	-$108	-19%
Ohio	$634	$553	$81	15%
Pennsylvania	$616	No Data	No Data	No Data
South Carolina	$373	No Data	No Data	No Data
Tennessee	$507	$275	$232	84%
Virginia	$595	$608	-$13	-2%
West Virginia	No Data	No Data	No Data	No Data

Source: Utility rate data collected by SOG EFC staff between 2018 and 2024
Notes: Bills are calculated at a consumption rate of 4,000 per month.

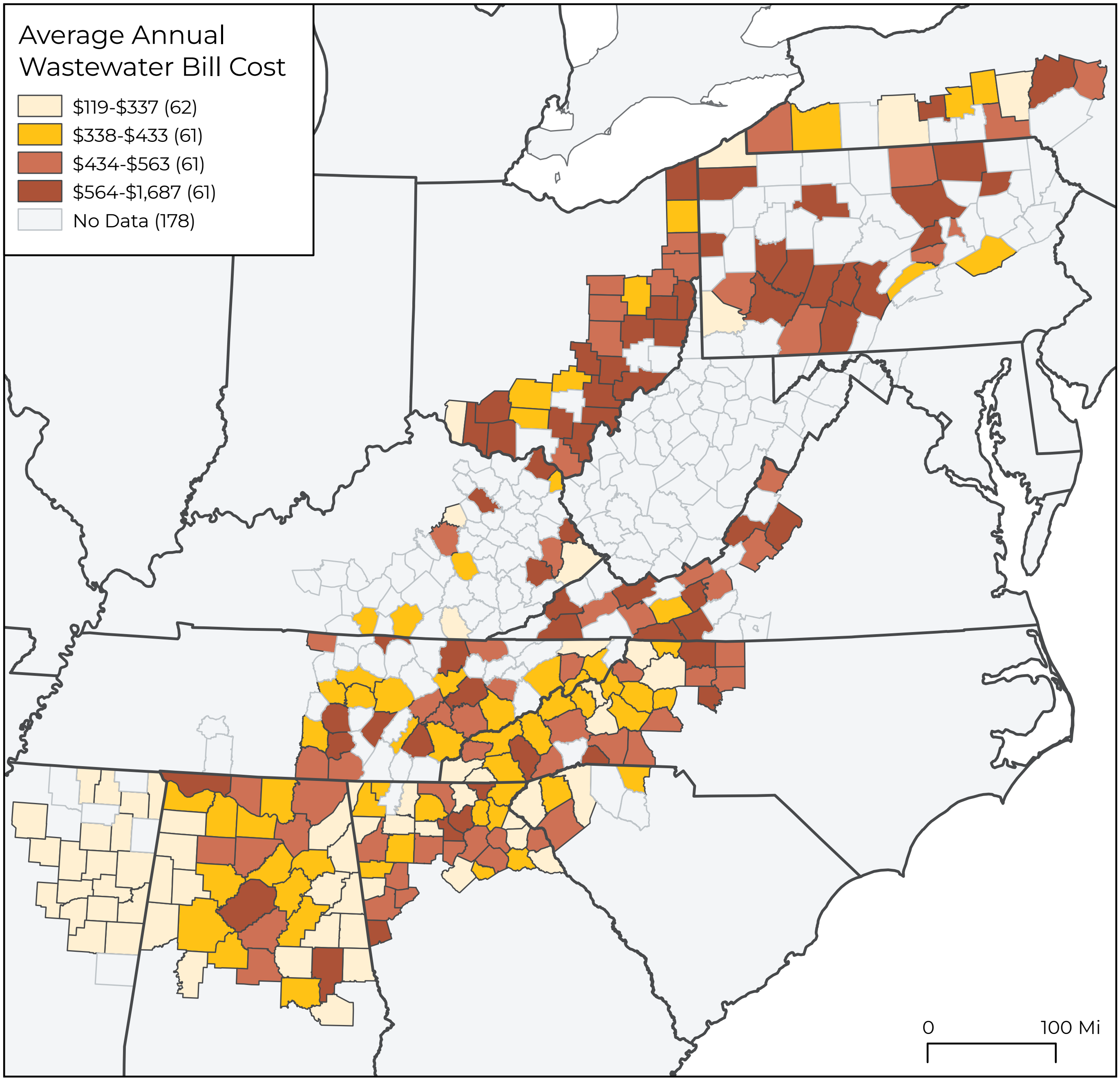
Figures 5.2.2 and 5.2.3 (page 96) show the cost of water and wastewater bills at the county level across Appalachia. Generally, counties in more northern and central states have higher average annual bills compared to counties in southern states.

Figure 5.2.2: Average Annual Water Bills in Appalachia



Source: Utility rate data collected by SOG EFC staff between 2018 and 2024
Notes: The value for each county was calculated by taking the average of the annual bills for the rates available in the county. Data are shown as quartiles. All bills adjusted to 2024 dollars using the CPI inflator.

Figure 5.2.3: Average Annual Wastewater Bills in Appalachia

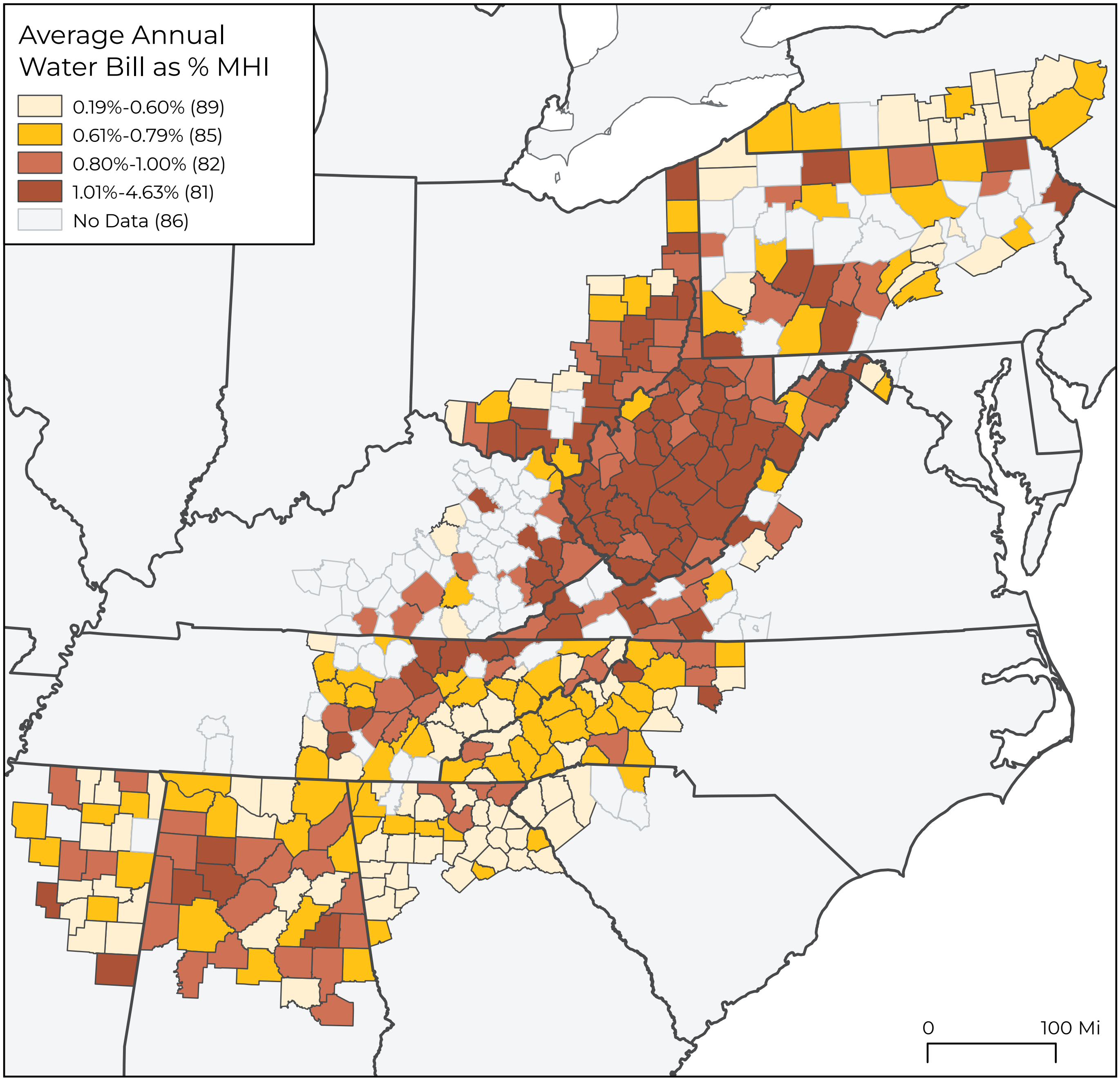


Source: Utility rate data collected by SOG EFC staff between 2018 and 2024
Notes: The value for each county was calculated by taking the average of the annual bills for the rates available in the county. Data are shown as quartiles. All bills adjusted to 2024 dollars using the CPI inflator.

A common approach used to evaluate affordability is to calculate the cost of service as a percentage of median household income (MHI). This approach is supposed to reflect the bill burden that the cost of water and wastewater services represents for a typical household in a community. Lower percentages suggest that a typical household in the community is more easily able to pay for water and/or wastewater services. Though there is no official standard for defining water affordability, a commonly used convention suggests that services may be considered unaffordable when households spend more than 2.5% of their income on water, more than 2% on wastewater, or over 4.5% on both combined.

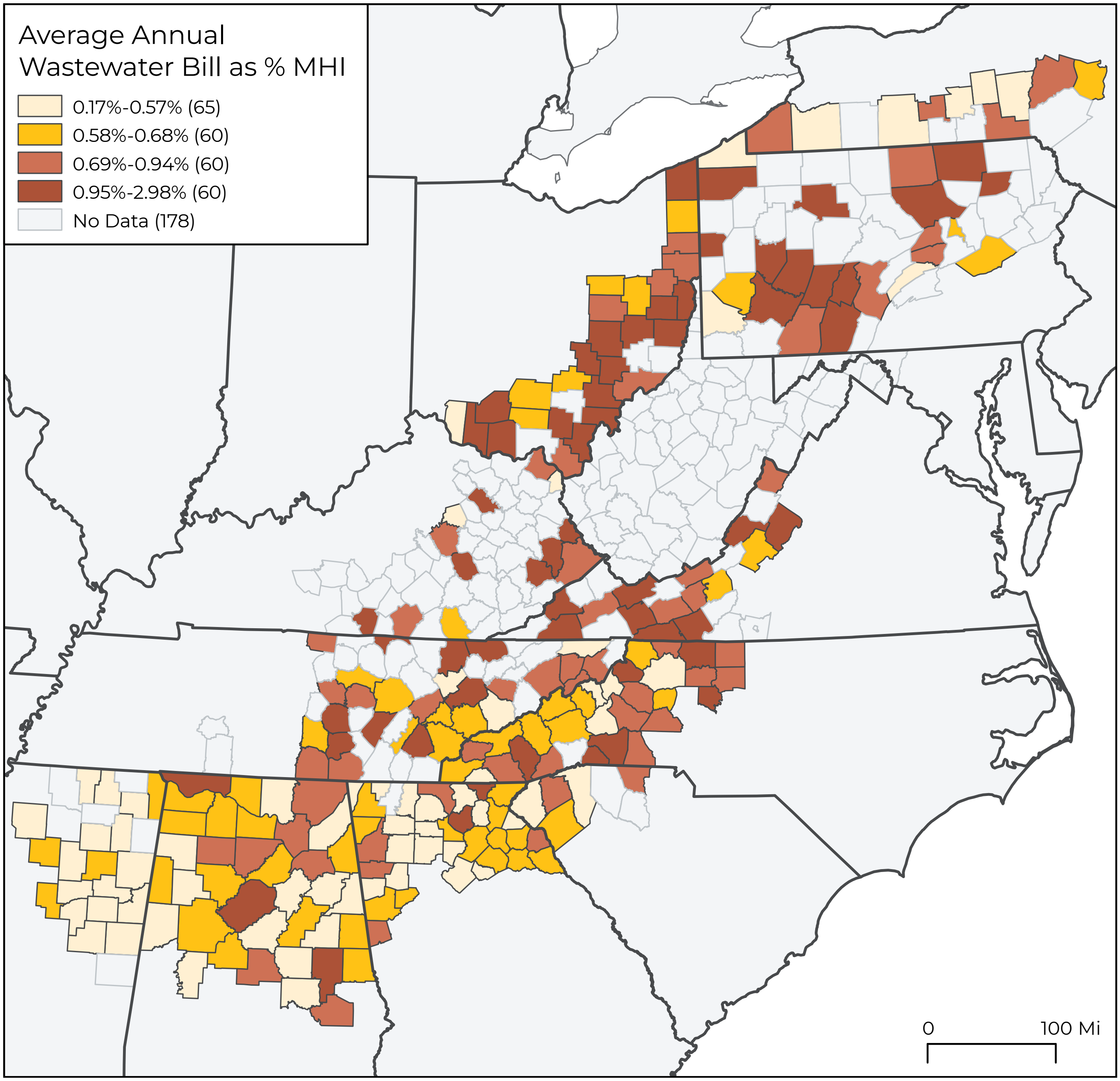
Using this approach, the average percentage of MHI spent on annual water and wastewater bills is shown in Figures 5.2.4 (page 98) and 5.2.5 (page 99). On average, bills represent approximately 0.85% of MHI within Appalachia and 0.71% of MHI for non-Appalachian portions of Appalachian states. In the figures, the shade of the county represents the proportion of annual income devoted to water and wastewater bills (shown as quartiles). This measure is calculated by averaging the bills associated with the available rates for each county and dividing that value by the median household income.

Figure 5.2.4: Annual Water Bill Costs as the Percentage of Median Household Income in Appalachia



Source: (Bill Information) Utility rate data collected by SOG EFC staff between 2018 and 2024; (MHI) U.S. Census Bureau, American Community Survey Data (2018, 2020, 2022, 2023)
Notes: The value for each county was calculated by taking the average of the annual bills for the rates available in the county and dividing it by the county's respective median household income from the year in which the rate was collected. Data are shown as quartiles. All bills adjusted to 2024 dollars using the CPI inflator.

Figure 5.2.5: Annual Wastewater Bill Costs as the Percentage of Median Household Income in Appalachia



Source: (Bill Information) Utility rate data collected by SOG EFC staff between 2018 and 2024; (MHI) U.S. Census Bureau, American Community Survey Data (2018, 2020, 2022, 2023)
Notes: The value for each county was calculated by taking the average of the annual bills for the rates available in the county and dividing it by the county's respective median household income from the year in which the rate was collected. Data are shown as quartiles. All bills adjusted to 2024 dollars using the CPI inflator.

In Table 5.2.3, the percentage of MHI spent on water and wastewater is aggregated to the state level. Kentucky has at least one county with a high water bill burden (4.63%) whereas both Alabama and North Carolina have at least one county with a high wastewater bill burden (14.37% and 5.35%, respectively). On average, however, bills in all Appalachian states are generally lower than 1% of the communities' MHI.

Table 5.2.3: Percentage of MHI for Annual Water and Wastewater Bills in Appalachia

Appalachian Portion of State	Avg. Annual Bill		Avg. Annual Bill as % MHI		Max. Annual Bill as % MHI	
	Water	Wastewater	Water	Wastewater	Water	Wastewater
Alabama	$457	$477	0.76%	0.76%	1.83%	14.37%
Georgia	$381	$424	0.55%	0.60%	1.16%	1.28%
Kentucky	$493	$444	1.06%	0.92%	4.63%	2.25%
Maryland	No Data	No Data	No Data	No Data	No Data	No Data
Mississippi	$331	$242	0.65%	0.46%	1.34%	0.95%
New York	$383	$439	0.58%	0.66%	0.87%	1.04%
North Carolina	$421	$517	0.71%	0.85%	2.02%	5.35%
Ohio	$560	$627	0.95%	1.05%	2.63%	2.93%
Pennsylvania	$538	$628	0.80%	0.95%	3.32%	1.78%
South Carolina	$317	$370	0.51%	0.60%	0.77%	0.81%
Tennessee	$447	$509	0.77%	0.86%	2.23%	2.98%
Virginia	$537	$600	0.97%	1.08%	1.72%	2.21%
West Virginia	$598	No Data	1.08%	No Data	2.90%	No Data

Source: (Bill Information) Utility rate data collected by SOG EFC staff between 2018 and 2024; (MHI) U.S. Census Bureau, American Community Survey Data (2018, 2020, 2022, 2023)
Notes: All dollar amounts are represented in 2024 terms using the CPI inflator.

In Table 5.2.4, the top ten most expensive counties for water and wastewater services, respectively, are provided. The majority of these counties are either designated by ARC as being distressed or at-risk.

Table 5.2.4: Top Ten Most Expensive Bills by County as Percent MHI in Appalachia

State	County	FY25 ARC Economic Designation	Number of Utilities	Avg. Annual Bill Cost	Max. Annual Bill as % MHI
Water					
Kentucky	Knott	Distressed	1	$1,799	4.63%
Pennsylvania	Pike	Transitional	1	$2,710	3.32%
West Virginia	McDowell	Distressed	10	$398	2.90%
West Virginia	Mingo	Distressed	6	$712	2.82%
Ohio	Meigs	Distressed	4	$868	2.63%
West Virginia	Roane	Distressed	5	$628	2.40%
West Virginia	Greenbrier	At-Risk	8	$707	2.35%
West Virginia	Pocahontas	At-Risk	2	$639	2.26%
Tennessee	Hancock	Distressed	1	$736	2.23%
Ohio	Athens	At-Risk	7	$694	2.15%
Wastewater					
Alabama	Jefferson	Transitional	9	$1,687	14.37%
North Carolina	Davie	Transitional	5	$1,573	5.35%
Tennessee	Grundy	Distressed	1	$1,397	2.98%
Ohio	Harrison	At-Risk	3	$1,211	2.93%
Ohio	Athens	At-Risk	6	$687	2.72%
Ohio	Meigs	Distressed	2	$1,141	2.62%
Kentucky	Knott	Distressed	1	$873	2.25%
Virginia	Wise	Distressed	6	$775	2.21%
North Carolina	Rutherford	At-Risk	5	$551	2.17%
Ohio	Morgan	At-Risk	4	$856	2.11%

Source: (Bill Information) Utility rate data collected by SOG EFC staff between 2018 and 2024; (MHI) U.S. Census Bureau, American Community Survey Data (2018, 2020, 2022, 2023)

Caveats and Limitations

The project team did not have access to comprehensive information on water and wastewater bills for each state. Instead, the project team leveraged previous data collection efforts by SOG EFC. However, not all of these data were collected in the same year: Alabama (2023), Georgia (2023), Mississippi (2022), North Carolina (2023), Ohio (2020), Virginia (2018), and West Virginia (2022). Of these, 65 utilities were removed from consideration because it was not possible to link them to a county. Further, wastewater data were not collected for all states. Though an additional 611 rates from the remaining states were sampled to supplement existing data, these rates were collected from within Appalachia. Some states, therefore, do not have non-Appalachian comparison points. The project team was unable to collect any rate data from Maryland, which has three counties within Appalachia. To compare the annual cost of water and wastewater services, all bill levels are converted to

2024 dollars using the US Consumer Price Index from the Bureau of Labor Statistics (series ID CUUR0000SA).

5.3 Survey of Local Development Districts

As multi-county organizations, LDDs play a crucial role in local efforts regarding planning, infrastructure development, and economic growth.[xi] LDDs provide technical assistance to local governments within their district and help them access funding and other solutions to meet local needs. In 2024, the project team conducted a survey of LDD staff to assess how LDDs support the technical, managerial, and financial capacity of water and wastewater systems throughout Appalachia. The survey captures information in three main areas: LDD administration and governance, investment in water and wastewater issues, and capacity needs and barriers. Given the length of the survey, this section focuses on overall findings to highlight strengths and opportunities for LDDs in supporting water and wastewater systems.[xii] The results may help inform ARC, LDDs, and local governments about strategies to enhance LDD capabilities to benefit water and wastewater system viability and sustainability throughout Appalachia.

Analysis Results

The project team achieved an overall response rate of 58%, 36 respondents to the long survey and seven to the shortened survey. A majority of respondents are either the director or executive director of their LDD. Community and economic development and/or planning are the most common areas of personal expertise. About 40% consider water, wastewater, and/or stormwater to be an area of expertise. About half have also been at their respective LDD for more than ten years and 42% are over the age of fifty.

[xi] Depending on their location, LDDs may also be called Area Development Districts (ADDs), Councils of Governments (COGs), or Regional Planning Commissions.
[xii] Appendix K details the survey methods and questions.

Annual budgets for LDDs in Appalachia range from an average of $1,001,236 in West Virginia to $22,125,000 in North Carolina. Overall, West Virginia LDDs allocate the highest average percentage of their budgets to water and/or wastewater issues. However, reported spending on these issues varies widely, from 15% to 75%, and not all respondents answered this question. Across Appalachia, LDDs dedicate about 16% of their annual budgets to water and/or wastewater issues, on average (Table 5.3.1).

Table 5.3.1 Local Development District Finances

Appalachian LDDs in State	Average Annual Budget ($)	Approximate % of Budget Spent Specifically on Water and/or Wastewater Issues
Alabama	$6,975,000	26%
Georgia	No Data	No Data
Kentucky	$11,499,533	5%
Maryland	$1,200,000	0%
Mississippi	$8,250,000	0%
New York	$1,050,000	9%
North Carolina	$22,125,000	17%
Ohio	$1,844,000	37%
Pennsylvania	No Data	No Data
South Carolina	$4,050,000	11%
Tennessee	$14,360,504	18%
Virginia	$4,215,272	6%
West Virginia	$1,001,236	43%
Appalachian LDDs	**$7,556,323**	**16%**

Source: LDD survey data collected by SOG EFC researchers in June-October 2024
Notes: The respondents provided their annual budget and approximate percentage of budget spent on water and/or wastewater issues. The project team calculated averages by state. In terms of response rate, 33 provided annual budget information and 32 provided an approximate percentage spent on water and/or wastewater issues.

A majority of respondents—86% (37/43)—stated that water and/or wastewater issues are important or very important to the work of their respective LDDs. Sixty percent have at least one staff member focused on water and/or wastewater issues. The majority of the participating LDDs reported that their staff assist water and/or wastewater systems at least once a month (36 of 43 responses), with almost 40% report providing support daily (17/43).

Of the participating LDDs, 70% provide support to most local governments in their districts (30/43 responses), suggesting their reach is widespread. All of these LDDs report engaging with their local member governments through a variety of outreach methods. The most commonly cited methods are periodic meetings and in-person visits, each cited by 35 respondents (81%).

Grant and/or loan writing and administration are the most common types of assistance that LDDs report providing to water and wastewater utilities (91%, 39 responses, and 81%, 35 responses, respectively). These forms of assistance are also those most frequently reported as being used by local member governments (26 of 43 LDDs responded to this question). Project implementation and GIS/mapping support are also frequently provided (70%, 30 responses, and 58%, 25 responses, respectively). Slightly less than half of respondents report assisting with asset management and capital improvement planning or sustainability/resiliency planning. The few LDDs that offer workforce development assistance report low participation rates in those programs and a relatively low proportion of LDDs (30%) identified needing additional capacity to improve workforce development assistance. This may have implications for succession planning and long-term system resiliency and may warrant further exploration. Only 35% (15/43) of LDDs assist private well and septic users; primary methods of assistance are helping access funding for servicing these onsite systems and/or connecting to public utilities.

Many water and wastewater systems seek to expand capacity through partnerships and regional collaboration to take advantage of potential economies of scale. Of the 43 LDDs surveyed, 34 (79%) report promoting partnerships and regional solutions among systems. However, only 14 respondents (33%) indicate that their LDD has played a key role in establishing a new wastewater partnership or regional solution within the past ten years.

This gap between promoting and implementing partnerships and regional collaboration suggests an opportunity to strengthen LDD capacity in this area. Because water and wastewater systems are constantly evolving due to population growth, decline, and regionalization efforts, one potential solution would be to maintain up-to-date inventories of candidate systems, which can help LDDs better understand shifting needs and target their support effectively. Across the Appalachian Region, 22 LDDs (51%) report maintaining an inventory of water and wastewater systems, while 10 (23%) do not. This practice is more common in Central Appalachia—Kentucky, Tennessee, Virginia, and West Virginia—where more than half of the LDDs report keeping such inventories. LDDs cite supporting grant and loan applications as the most common reason for maintaining system inventories; therefore, infrequent updates to these inventories may limit their usefulness.

Given that LDDs are just one of several technical assistance (TA) providers for water and wastewater systems in Appalachia, the survey explored their collaboration with other entities in their states. Sixteen respondents (37%) report that their LDD partners with other TA providers on water and wastewater issues, while nine (21%) say they do not. LDDs also often have established relationships with EPA regional offices and state environmental agencies and can act as an important liaison between local governments and these entities. According to the survey results, LDDs facilitate information more often between their member governments and state environmental agencies than with their regional EPA office. LDDs most commonly serve as a liaison for grant/loan application assistance between local governments and both state environmental agencies (thirty respondents) and regional EPA offices (twenty respondents).

Respondents identified a range of barriers—both real and perceived—that limit the implementation of water and wastewater infrastructure improvements in their districts. Financial challenges were the most frequently cited, including the high cost of infrastructure projects and concerns about user affordability due to rising or already high rates. Several respondents also highlighted the added expense of constructing and maintaining infrastructure in mountainous, rural areas, which further complicates project feasibility.

Caveats and Limitations

To bolster the response rate, the team distributed a shortened version of the survey consisting of ten questions most critical to understanding capacity gaps. Incomplete surveys were accepted for both the full and the short version, so the number of responses varies by question. Generally, percentages are reported using the total number of respondents regardless of whether all LDDs provided answers to the question.

6. Exploring Strategies

Improving access to funding and service throughout the Appalachian Region extends beyond addressing utility capacity needs. The project team also sought to identify additional strategies and opportunities to increase access via three avenues. Interviews with ARC state funding managers clarified current practices and systemic challenges while highlighting opportunities for program enhancement. A deep dive into state-level governance of water and wastewater management to understand roles, responsibilities, and relationships captured the nuances of these complex landscapes and efficiencies in funding management. Finally, case studies of Appalachian utilities feature successful financial management strategies replicable for other utilities throughout the region.

6.1 Key Takeaways and Considerations

- Though ARC funding has played a pivotal role in advancing economic development throughout Appalachia, many smaller and under-resourced communities continue to face structural challenges that may make development more difficult.
- Streamlining application processes, such as one application for multiple programs, may reduce the time utility staff need to dedicate to applying for funding.
- Several states in Appalachia offer examples of state-run programs that improve access to funding for participating communities that may be replicable. Benefits include reduced interest rates, extra application points, and/or eligibility for additional funding programs.
- State revolving fund (SRF) ranking criteria offer insights into state-level funding priorities. Most states in Appalachia specifically include regionalization and/or consolidation projects and long-term planning (as the presence of asset management or capital improvement plans). All Appalachian states include some consideration of affordability in their Drinking Water SRF and many in their Clean Water SRF as well. Only Mississippi and West Virginia do not explicitly include connecting some onsite users (private well and/or septic users) in their SRF ranking systems.
- Both traditional and innovative strategies can help Appalachian utilities build financial, managerial, and operational capacity, improving their long-term sustainability.

6.2 State Funder Interviews

Based on in-depth interviews with 13 state funding managers responsible for reviewing and approving ARC applications, this analysis evaluates current practices, identifies systemic challenges, and outlines opportunities to strengthen ARC's program. The research was conducted in consultation with ARC staff and the project's advisory council to ensure alignment with organizational goals.

The results are organized into four sections. The first explores the evolving funding priorities of Appalachian states, with particular attention to the influence of temporary funding streams (e.g., ARPA). The second section focuses on the role of LDDs in the ARC ecosystem, highlighting their essential functions and current capacity challenges. The third outlines key obstacles encountered by funding managers, including limited financial resources, administrative complexity, and staffing shortages. The final section offers examples of effective strategies and recommendations to amplify ARC's regional impact.

Analysis Results

Funding Priorities and Evolution

Funding priorities vary across states, reflecting local needs and context. Basic infrastructure, such as access to potable water, remains a fundamental focus for many states. However, some have shifted toward workforce development initiatives, a trend influenced in part by ARPA funding, which has temporarily offset the need for infrastructure investment and opened space for other priorities.

Because ARC grants tend to be relatively modest, they are rarely the sole source of funding for a project. Instead, they are often used as gap financing to supplement funds from sources such as CDBG, USDA, and various state programs. This collaborative model helps complete funding packages and increases the likelihood of project success.

The Critical Role of Local Development Districts

In alignment with the results of the LDD survey, state funders confirmed that LDDs play a central role in ARC's funding operations. They noted that LDDs often provide technical assistance, application review, training for local officials, and sometimes direct grant administration. Overall, LDDs provide essential local knowledge that helps funding managers assess applicant capacity and the viability of proposed projects.

However, interviewees also noted that capacity among LDDs varies considerably. Some focus primarily on communities where they have longstanding relationships, which may result in less outreach to other areas that are underrepresented. High staff turnover in some LDDs contributes to inconsistent performance and creates knowledge gaps that hinder equitable access to funding. Some LDDs are well-versed in federal grants, while others have limited experience and fewer resources to offer technical support (see 5.3 Survey of Local Development Districts).

Challenges in the Funding Landscape

Repeat Applicants and Access Disparities

Generally, there are no restrictions on the number of times that a community can submit an application for ARC funding. This flexibility enables communities with ongoing needs to pursue support whenever it is needed. In practice, however, communities with more experience and greater resources are typically better situated to apply for and receive funding. Smaller or less-resourced communities may lack awareness of opportunities or lack the capacity to apply. To address this imbalance, a few states impose restrictions on the number of times a community can be awarded ARC funding.

Rising Costs and Funding Shortfalls

One of the most urgent challenges is the widening gap between community infrastructure needs and the available funding. Costs for critical projects—particularly water and sewer infrastructure—have risen dramatically, making it difficult for small, rural communities to move forward even with grant assistance. As a result, some projects are broken into phases and stretched over many years, which can delay outcomes and increase total costs.

In many cases, these communities also lack the long-term financial and human resources needed to maintain new infrastructure, leading to repeated funding requests and further strain on ARC resources.

Administrative and Operational Barriers

There are several administrative barriers cited by ARC funding managers. In some cases, simply identifying qualified agencies to administer ARC grants is a challenge. In others, potential agencies that would be good candidates for administering ARC grants are unwilling. As a result, several promising projects have stalled.

Second, not all funding managers systematically track project outcomes beyond the initial application goals. Though ARC collects and updates performance measures (outputs and outcomes) and conducts routine programmatic evaluations beyond a project's lifecycle, state-level tracking practices vary. While some states maintain robust tracking and evaluation efforts, not all do, which can then limit the ability to assess a project's impact and guide improvements.

Lastly, state agencies, LDDs, and local governments sometimes struggle to attract and retain staff, partly due to salary limitations and inflexible pay structures. Staff turnover may reduce institutional memory and complicate ongoing grant management. In some areas, a shrinking pool of contractors has contributed to higher project costs and longer implementation timelines.

Successes and Effective Strategies

Despite these hurdles, many ARC funding managers have adopted strategies to enhance ARC's effectiveness. Strategic partnerships with other funders—such as USDA, CDBG, and state initiatives like Golden LEAF or PENNVEST—have enabled ARC funding to leverage larger investments. In addition, collaborations with technical assistance providers, particularly state Rural Water associations, have extended support to communities that would otherwise struggle to implement complex infrastructure projects.

ARC itself also fills a crucial gap in the funding landscape by supporting projects that may not meet the eligibility or competitiveness criteria for other major funding programs. This makes it a valuable resource for communities that might otherwise be left behind.

Opportunities for Improvement

Strengthening the capacity of LDDs presents a key opportunity for enhancing ARC's impact. While some states benefit from highly capable LDDs, the level of support varies across states. Bridging this divide through targeted training and resource development could yield more consistent outcomes across the region.

Regionalization of small water systems has also emerged as a potentially promising strategy. Consolidating operations could improve efficiency and service quality, particularly for small utilities that struggle to sustain operations independently. Several states already prioritize regional approaches in their funding decisions, but a more widespread adoption could accelerate this trend.

As ARPA funding phases out by the end of 2026, ARC should anticipate increased demand for infrastructure support. Proactively planning for this shift is important for maintaining momentum and addressing unmet needs. Similarly, developing tools and programs to support infrastructure maintenance, long-range planning, and asset management could reduce repeated funding requests and improve sustainability.

By addressing these areas for improvement, ARC can expand its reach, enhance program efficiency, and further its mission of promoting sustainable economic development throughout Appalachia.

6.3 State-Level Governance Structures

Different governance structures can influence water and wastewater utility management, particularly funding administration and oversight. Understanding these differences can provide helpful context for both funders and state staff when comparing processes between states.

Analysis Results

Water and Wastewater Project Funding Administration[xiii]

The total number of entities involved in funding administration ranges from two to five. All 13 Appalachian states administer some water and/or wastewater infrastructure funding programs through their state environmental agency, which always plays some role in SRF program administration.[xiv] Twelve of thirteen states also administer water and/or wastewater infrastructure funding through their state economic/community affairs agency (Kentucky being the exception) (Table 6.3.1). State economic/community affairs agencies are the most common administering agency of ARC and/or CBDG funding. When involved in funding administration, state health agencies support DWSRF funding. All the different types of authorities help support SRF program administration. Some of these authorities also administer other programs, directly provide grants/loans, and/or serve as state bond banks.

[xiii] See funding tables for details of funding programs.

[xiv] Georgia administers funding through its Department of Natural Resources, which has been included as a state environmental agency because it does not have a second agency related to the environment (in contrast to Ohio and Maryland which have both environmental and natural resource agencies).

Table 6.3.1: Distribution of Water and Wastewater Funding Administration Across Appalachian States

Type of Entity	Number of States
State Agencies	
Environmental	13
Economic and/or Community Affairs	12
Health	3
Other State Agency/Office	4
Other Type of Entity	
Finance, Development, and/or Infrastructure Authority	8
Utility Commission	1

Source: Sources are detailed within the individual governance profiles (Appendix L).

Most state agency staff are competitively hired. In contrast, membership of non-agency entities involved in funding administration can be attained via multiple pathways. Some members are defined by their role in the government, but those roles may be directly elected by the public, appointed by an elected official or other entity (such as an oversight board), or competitively hired. Other members may be appointed by elected officials or another entity, but their participation is not related to any other position they may hold (Table 6.3.2).

Table 6.3.2: Membership of Non-Agency Entities Involved in Funding Administration

State	Entity	Part of Role			Appointed (by)		
		Elected	Appointed	Hired	Governor	Legislature	Other
Georgia	Environmental Finance Authority	0	3	0	8	0	0
Kentucky	Infrastructure Authority	0	4	1	6	0	0
New York	Environmental Facilities Corporation (Board)	0	3	0	4	0	0
Ohio	Water Development Authority	0	3	0	5	0	0
Ohio	Public Works Commission	0	5	0	0	7	0
Pennsylvania	Infrastructure Investment Authority	5	5	0	3	0	0
South Carolina	Rural Infrastructure Authority	0	1	0	0	0	6
Tennessee	Local Development Authority	1	4	0	0	2	0
Virginia	Resources Authority	0	4	0	7	0	0
West Virginia	Water Development Authority	1	0	2	4	0	0

Source: Sources are detailed within the individual governance profiles (Appendix L). Note that Ohio has two entities.

Potential Efficiencies in Funding Administration

The number of agencies involved in funding administration is not necessarily related to the number of programs or the total amount of funding available. However, fewer agencies could indicate that application processes are more streamlined. Further, utility staff may find it more efficient to only need to learn the requirements of fewer entities. Several states have entities with a single application for multiple funding programs: the North Carolina Division of Water Infrastructure, the Georgia Environmental Finance Authority (GEFA), Pennsylvania's PENNVEST, and the South Carolina Rural Infrastructure Authority.[58]

Several Appalachian states have special programs that can increase access to funding. In Georgia, GEFA manages the WaterFirst program. Participants in the program are eligible for additional SRF priority ranking system points, a lower interest rate on SRF loans, and priority consideration for funding programs administered by other state agencies, including the Georgia Department of Community Affairs (DCA). DCA administers the PlanFirst program and participants are eligible for additional SRF priority points.[59] North Carolina's Viable Utilities program offers communities it designates as distressed access to additional funding programs administered by the Division of Water Infrastructure.[60] In Pennsylvania, the Community Action Team (comprised of representatives from several state agencies and other entities) selects communities on which to focus financial and technical resources. Projects serving CAT communities are awarded additional points for SRF.[61] In 2024, Kentucky launched the Water and Wastewater Assistance for Troubled or Economically Restrained Systems Program (WWATERS), which provides a pathway for eligible systems to seek funding directly from the state general assembly.[62]

Finally, some states, such as Mississippi, allow SRF funds to be used as matching funds for federal programs.[63]

Financial and/or Funding Oversight[xv]

Eleven of thirteen states rely on a state agency to provide financial or funding oversight of water and wastewater utilities, the exceptions being Alabama and Maryland. The project team only identified one financial or funding oversight entity for four states: Alabama, Ohio, Pennsylvania, and South Carolina. West Virginia, in contrast, has four entities. Five states have some type of financial authority or board. The utility commission (or public works/service commission) has a role in financial/funding oversight in four states (Table 6.3.3).

Table 6.3.3: Types of Entities Involved in Financial and/or Funding Oversight of Water and Wastewater Utilities in Appalachian States

State	Entity Type						Total Number
	State Agency Under the Governor	State Agency Not Under the Governor	Legislative Department	Financial Authority/ Board	Utility/ Public Works Commission	Other Council	
Alabama			1				1
Ohio		1					1
Pennsylvania	1						1
South Carolina		1					1
Kentucky	1				1		2
Maryland			1		1		2
New York		1		1			2
Tennessee		1		1			2
Virginia	1		1				2
Georgia	1		1			1	3
Mississippi		1		1	1		3
North Carolina	1	1		1			3
West Virginia		1		2	1		4
Appalachia	**5**	**7**	**4**	**6**	**4**	**1**	

Source: Sources are detailed within the individual governance profiles (Appendix L).
Notes: "Agency" may also include departments or offices.

As with funding administration, non-agency or departmental entities responsible for financial or funding oversight may have members elected or appointed to their membership. Only the Maryland Board of Public Works lacks appointments by the governor. However, it is a unique entity consisting of the governor (elected), state comptroller (elected), and treasurer (appointed by the state legislature) (Table 6.3.4, page 114).

[xv] The Project Team only included entities relevant to the financial and/or funding oversight of water and wastewater utilities. Full details of oversight roles are in the individual governance profiles (Appendix L).

Table 6.3.4: Membership of Non-Agency Entities Involved in Financial and Funding Oversight in Appalachian States

State	Entity	Part of Role			Appointed (by)		
		Elected	Appointed	Hired	Governor	Legislature	Other
Maryland	Board of Public Works	2	0	0	0	1	0
Mississippi	Local Gov. and Rural Water Systems Impv. Board	0	4	4	1	0	0
New York	Financial Restructuring Board	2	2	0	6	0	0
North Carolina	Local Government Commission	3	1	0	3	2	0
North Carolina	State Water Infrastructure Authority	0	1	2	2	4	0
North Carolina	Rural Infrastructure Authority	0	1	0	8	8	0
Tennessee	Board of Utility Regulation	0	0	0	6	2	3
West Virginia	Infrastructure & Jobs Development Council	1	6	0	6	0	0
West Virginia	Public Service Commission	0	0	0	3	0	0
West Virginia	Municipal Bond Commission	2	1	0	2	0	0

Source: Sources are detailed within the individual governance profiles (Appendix L).

Regulation of Water and Wastewater Utility Rates and Services

Twelve of thirteen states have a commission that provides rate and service oversight of at least some water and wastewater utilities. Georgia is the exception. The depth and breadth of the role these entities play are highly variable. The Public Service Commissions in Alabama and Mississippi are directly elected by the general public. For all other states, members are appointed.

State Revolving Fund Management

Four Appalachian states have sole administration of SRF programs through their state's environmental agency: Alabama, Maryland, North Carolina, and Tennessee. Of these states, three have a separate entity that approves funding awards for water and wastewater projects. Mississippi has split administration, with the state environmental agency administering CWSRF and the state public health agency administering DWSRF. The remaining states have joint administration between at least one state agency and an authority-type entity (Table 6.3.5). The application process is generally the same across the Appalachian Region. However, LDDs play a direct role in Kentucky. Utilities first submit applications to their LDD, which in turn submits a priority list to the Kentucky Infrastructure Authority for review.[64]

Table 6.3.5: Entities Involved in the Administration of SRF Programs in Appalachian States

State	Admin Structure	Admin: State Agency		Admin: Other		Financial Oversight
		CWSRF	DWSRF	CWSRF	DWSRF	
Alabama	Sole	Env.	Env.	N/A	N/A	
Maryland	Sole	Env.	Env.	N/A	N/A	Board of Public Works approves all funding
North Carolina	Sole	Env.	Env.	N/A	N/A	State Water Infrastructure Authority approves/awards all funding
Tennessee	Sole	Env.	Env.	N/A	N/A	TN Local Development Authority approves all loans
Georgia	Joint	Env.	Env.	GEFA	GEFA	Regional Water Councils guide funding decisions
Kentucky	Joint	Env.	Env.	KIA	KIA	
Ohio	Joint	Env.	Env.	WDA	WDA	
Pennsylvania	Joint	Env.	Env.	PENNVEST	PENNVEST	
South Carolina	Joint	Env.	Env.	RIA	RIA	
West Virginia	Joint	Env.	Env.	WDA	WDA	Infrastructure & Jobs Development Council may approve some loans
New York	Joint/Split	Env.	Health	EFC	EFC	
Virginia	Joint/Split	Env.	Health	VRA	VRA	
Mississippi	Split	Env.	Health	N/A	N/A	

Source: Sources are detailed within the individual governance profiles (Appendix L).
Notes: Env. – State Environmental Agency; GEFA – Georgia Environmental Finance Authority; KIA – Kentucky Infrastructure Authority; WDA – Water Development Authority (both states); PENNVEST – Pennsylvania Infrastructure Investment Authority; RIA – Rural Development Authority; EFC – NY Environmental Facilities Corporation; VRA – Virginia Resources Authority

SRF programs award funding based on state-defined priority ranking criteria. Criteria are diverse and detailed in the individual governance profiles (Appendix L). However, four criteria are particularly relevant to this overall project.

- Eleven states award points for regionalization-type projects (including consolidation and interconnections), though five only include this in their DWSRF ranking system.
- Nine states award points for having an asset management plan or capital improvement plan, though four only include this in the DWSRF ranking system.
- Nine states incorporate affordability into both the DWSRF and CWSRF ranking systems.
- Eleven states include connecting decentralized (i.e., onsite) users in their priority ranking systems, though some states limit eligibility to failing systems or those with known water quality issues (Table 6.3.6).

Table 6.3.6: Inclusion of Specific Criteria in SRF Program Priority Ranking Systems in Appalachian States

State	Regionalization	Asset Management and/or Capital Improvement Plans	Affordability	Connecting Decentralized Users
Alabama	DW	Both	DW	Both
Georgia	Both	Both	Both	CW
Kentucky	Both	Both	Both	Both
Maryland	DW	DW	DW	Both
Mississippi	DW	DW	Both	Neither
New York	DW	Neither	Both	DW
North Carolina	Both	Both	Both	CW
Ohio	Both	Neither	CW	Both
Pennsylvania	Both	Both	Both	DW
South Carolina	Both	Neither	DW	Both
Tennessee	Neither	Neither	Both	CW
Virginia	DW	DW	Both	Both
West Virginia	Neither	DW	Both	Neither

Source: Sources are detailed within the individual governance profiles (Appendix L).

Support for Onsite Systems

The majority of the responsibility for onsite system management falls on either the property owner directly or on local health departments. State environmental agencies approve permits for wells in four states while only two offer well testing by state agencies. Local health departments will test well water in most other Appalachian states, though a couple require the use of a state-certified lab or university extension service. Only three states have involvement from state agencies in septic system permitting and inspection (Table 6.3.7, page 117).

Table 6.3.7: Summary of Responsibilities for Onsite System Management in Appalachian States

State	Private Wells			Septic Systems
	Permits: Submission	Permits: Approval	Testing: Conducting	Permitting and Inspection
Alabama	Driller	State environmental agency	Local health dept.	Local health dept.
Georgia	Driller	Local health dept.	Local health dept.	Local health dept.
Kentucky	Driller	State environmental agency	State-certified labs	Local health dept.
Maryland	Driller	Local health dept.	Local health dept.	Local health dept.
Mississippi	Owner OR Driller	State environmental agency	State health agency or state-certified labs	State health agency
New York	Driller	Local health dept.	State-certified labs	Local health dept.
North Carolina	Owner	Local health dept.	Local health dept.	Local health dept.
Ohio	Owner OR Driller	Local health dept.	Not specified	Local health dept.
Pennsylvania	Not Required	Not Required	University extension	Local health dept. OR municipality
South Carolina	Owner OR Driller	State environmental agency	State environmental agency	State environmental agency
Tennessee	Owner AND Driller	Local health dept.	None	State environmental agency or local gov.
Virginia	Owner	Local health dept.	University extension or state-certified labs	Local health dept.
West Virginia	Owner	Local health dept.	Local health dept.	Local health dept.

Source: Sources are detailed within the individual governance profiles (Appendix L).
Notes: State-level involvement is highlighted in orange.

Throughout Appalachia, states issue licenses for well drillers, and owners are responsible for ensuring their well water is tested (though states generally provide guidelines on when and how to test). While the direct involvement of state-level agencies is relatively low, nine of thirteen states have agencies that at least provide some oversight of onsite systems. Of the four remaining states, Mississippi and South Carolina have direct agency involvement. New York and Ohio are the only two states where state-level agencies essentially play no role in onsite systems management (Table 6.3.7, above).

Caveats and Limitations

The governance profiles created for this project represent the project team's best understanding of entities involved in the governance of water and wastewater utilities and/or private wells and septic systems. Notwithstanding, they may not be exhaustive. The primary focus of these profiles is on state-level structures, though there are many instances where state entities may intersect with local government bodies.

6.4 Case Studies of Successful Financial Management Strategies

Given the unique combination of physical landscape and economic challenges throughout Appalachia, the project team developed a series of case studies highlighting successful strategies for water and wastewater utility management that may be replicable in the region. With guidance from ARC staff and the advisory council, the team created a suite of base questions to guide semi-structured interviews. Most interviews were conducted virtually. The team identified potential case study subjects primarily through the interviews conducted with state funders (Section 6.2), but also chose some utilities based on Hughes et al. (2005) and Hughes et al. (2018).[65] The team sought diversity in challenges faced, geographic location, and types of strategies. This section highlights unique approaches that may be replicable in other areas as well as key, and sometimes unexpected, benefits of more traditional options. The full text for all case studies is provided in Appendix M.

Analysis Results

The project team interviewed staff of 10 utilities across nine states in the Appalachian Region. While each case study offers a unique central topic, the suite has several cross-cutting themes pertaining to potentially replicable strategies (Table 6.4.1 and Table 6.4.2, page 119).

Table 6.4.1: Case Study Subjects and Central Topics

State	Community/Utility	Central Topic
Alabama	City of Cullman	Completion of a major capital project (new reservoir) to plan for future growth
Kentucky	Letcher County Water and Sewer	Improving (and extending) services by adding centralized infrastructure
Maryland	Allegany County	Strategies for both securing and spending funding
Mississippi	Starkville Utilities	Cultivating consistent investment in infrastructure from local government leaders and customers
North Carolina	Yadkin Valley Sewer Authority	How regionalization improved managerial and operational capacity, ultimately increasing success in obtaining
North Carolina	Mars Hill	Leveraging local partnerships in response to extreme weather events
Ohio	Ironton Public Utilities	Asset management plans as living documents
Tennessee	City of Baxter	Balancing planning for growth with maintaining viability
Virginia	Wise County Public Service Authority	The foundations for consolidation
West Virginia	Mercer County Public Service District	Strategies for connecting decentralized systems in extremely rural areas

Table 6.4.2: Cross-Cutting Case Study Themes

State	Community/ Utility	Securing Funding	Economies of Scale	Partnerships/ Collaboration	Planning Ahead	Incorporating Growth	Local Support	Unique Solutions
Alabama	City of Cullman	x	x	x	x	x	x	
Kentucky	Letcher Co. Water and Sewer	x						x
Maryland	Allegany County	x					x	
Mississippi	Starkville Utilities	x			x	x	x	
North Carolina	Yadkin Valley Sewer Authority	x	x				x	
North Carolina	Mars Hill			x		x		
Ohio	Ironton Public Utilities	x		x	x		x	
Tennessee	City of Baxter			x	x	x		
Virginia	Wise Co. Public Service Authority		x	x				
West Virginia	Mercer Co. Public Service District		x					x

Securing Funding

Several case studies offer nuanced strategies for obtaining water and wastewater infrastructure funding. For example, the City of Cullman, Alabama funded the Duck River Reservoir through long-term agreements with each town the reservoir serves. This arrangement commits these towns to buying water from the utility until the cost of the reservoir is recovered. For Letcher County Water and Sewer (Kentucky), emphasizing the potential to attract new industries and jobs to an area proved an effective strategy to secure funding for a new water treatment plant. Both Starkville Utilities (Mississippi) and Yadkin Valley Sewer Authority (North Carolina) rely on gathering and maintaining high-quality data to garner support for regular rate increases and investment in capital projects, not only from the utilities' governing bodies but also from their customer bases. The staff of Allegany County, Maryland cultivate long-term relationships with funders and understand their priorities. They are particularly skilled at piecing together funding via multiple sources based on applications designed to align with varying priorities. Finally, maintaining a living asset management plan that is regularly reviewed and updated positions Ironton Public Utilities (Ohio) to capitalize on short funding application windows.

Building Economies of Scale

Larger utilities can benefit from increased financial, managerial, and operational capacity. Regionalization and consolidation are both strategies that may lead to economies of scale. Both options, however, can be time-consuming and complicated to execute. A foundation of sound financial management practices—such as those employed by Wise County Public Service Authority (Virginia, Wise PSA)—can help position a utility to successfully integrate small or struggling systems into its service area. Wise PSA's practices include capital planning, asset management, and a full-cost recovery model.

Larger utilities may also have increased capacity to obtain funding. The towns of Elkin, Jonesville, and Ronda in North Carolina increased the managerial and operational capacity of their wastewater services by creating a regional entity, the Yadkin Valley Sewer Authority. The Authority was better positioned to recruit staff with the expertise needed to identify competitive projects, submit applications, and secure funding for capital improvements. However, consolidation and regionalization are not the only strategies available to expand systems. For example, the City of Cullman (Alabama) does not mark up the cost of water it sells wholesale, which encourages wholesale customers to join the system. This increased participation spreads out costs and creates economies of scale.

Fostering Regional Collaboration and Leveraging Partnerships

Collaboration and partnerships offer diverse benefits. The wholesale water cost-sharing approach of the City of Cullman (Alabama) is part of a larger ecosystem that promotes collaboration with neighboring towns. City staff share economic development leads with other jurisdictions and the county's tax structure distributes revenues across all municipal entities within the county. This culture of collaboration made garnering support for the Duck River Reservoir project much easier. Partnerships with technical assistance providers can expand a utility's managerial capacity, particularly for long-term planning efforts. The City of Baxter, Tennessee has been able to balance seeking funding for projects to maintain system viability and projects to support future growth in part through long-standing relationships with their local engineer and LDD, who play significant roles in identifying funding opportunities and prioritizing projects. Ironton Public Utilities (Ohio) works closely with an engineering firm and a local nonprofit to create and maintain its asset management plan. It also works with its LDD and the same nonprofit to address concerns about affordability, connecting struggling customers with programs that promote long-term financial stability.

Regional collaboration can also build system resiliency. For example, Wise PSA (Virginia) receives multiple benefits from regional collaboration, including shared technical and management assistance, mutual aid for repairs, and the coordinated use of interconnections. The staff's willingness to request help when they lack the internal expertise for a given task has been key to their success. Another example of regional collaboration came out of a pre-existing interlocal agreement between Mars Hill and Weaverville, North Carolina. After a major drought in 2007, Mars Hill, North Carolina sought an interconnection with Weaverville to ensure an adequate water supply in times of extreme drought (Weaverville supplying Mars Hill). This interconnection, designed and implemented in 2011, proved critical in the wake of Tropical Storm Helene, which heavily damaged Weaverville's plant. Using the interconnection, Mars Hill was able to quickly restore flowing water to Weaverville, removing debris from the plant and rapidly restoring functionality.

Planning Ahead and Incorporating Growth

Maintaining an updated asset management or capital improvement plan offers diverse benefits, including better financial planning, strengthened communications, and retention of institutional knowledge through local leadership changes—all advantages realized by Ironton Public Utilities (Ohio). This strategy also supports growth management. The City of Baxter (Tennessee) was able to quickly respond to unexpected development because it could easily incorporate growth-oriented projects into its existing capital improvement plan. Starkville Utilities (Mississippi) also plans for growth in its long-term strategy for system upgrades and improvements. Seeing the potential for growth can also position a city or utility to capitalize on those opportunities. Given the city's proximity to other major economic centers in Alabama, the City of Cullman's leadership undertook an ambitious capital improvement project to ensure the city could support significant future economic development. The Town of Mars Hill (North Carolina) installed infrastructure that would enable the town to easily expand service to an area primed for potential growth while constructing the interconnection with the Town of Weaverville. Planning ahead can also ensure funding is spent efficiently and effectively. Allegany County (Maryland) credits its history of successful project execution to detailed project planning, which includes widespread community engagement and hiring contractors to ensure projects are well-designed and have accurate cost estimates.

Garnering Local Support

Several case study interviewees touched on the importance of support from local leadership and their customer bases. For some utilities, local elected leaders come into office predisposed to thinking about quality water and sewer services as the foundation for economic development and see investments in these services as investments in economic growth. In other cases, however, utilities could benefit from developing strategies to cultivate consistent, long-term investment regardless of who is in office. Starkville Utilities

(Mississippi) offers several examples of doing this through maintaining quality data to support decision-making, delivering high-quality services, and constantly pursuing external funding sources. More broadly, Yadkin Valley Sewer Authority (North Carolina) and Ironton Public Utilities (Ohio) emphasized transparency in decision-making as key to garnering support from their customers. Further, Allegany County (Maryland) will not pursue funding for projects without first securing public support.

Unique Solutions

The rural landscape and rugged terrain of Appalachia often make conventional, centralized approaches to water and wastewater services impractical. Instead, many communities must look to decentralized or hybrid solutions. In Letcher County, Kentucky, the water and sewer utility is addressing operational challenges and improving efficiency not by consolidating into fewer plants, but by adding a new treatment facility and strategically rerouting customers. This approach expands access to areas without service while improving reliability for existing customers. Unlike the broader trend of consolidating into ever-larger systems, Letcher County's strategy highlights how decentralized infrastructure can be better suited to meet the unique geographic and service needs of rural regions. In West Virginia, Mercer County created a Public Service District (MCPSD) specifically tasked with finding solutions to fill service gaps. Because it is focused on finding solutions and not daily operations, MCPSD has been able to extend service in one of the most rural counties in Appalachia using a variety of approaches and securing funding from diverse sources.

7. Opportunities to Improve or Expand Service

Although the rural nature, rough terrain, and limited financial resources offer unique challenges for Appalachian water and wastewater systems, there are many opportunities for funding agencies and technical assistance providers to improve or expand water and wastewater service access throughout Appalachia. The project team has identified this suite of opportunities as potentially having the biggest impact on Appalachian systems given the findings of this report.

7.1 Funding Program Administration

Changes to funding program administration may offer opportunities to improve access to funding for some Appalachian communities.

Potential Opportunities

Adjusting Funding Program Priorities to Increase Competitiveness of Less Conventional Approaches

Given the unique landscape of Appalachia, traditional approaches to water and wastewater service are not always feasible. However, viable but less conventional approaches may fall outside current funding program priorities, rendering those applications less competitive. Adjusting how decisions are made to reflect local constraints that make conventional approaches prohibitive can help areas with limited infrastructure access needed funding.

Streamlining Funding Application Processes to Reduce Staff Time Investment

Finding the time to understand and navigate application processes can be a challenge for many utilities, particularly smaller entities with limited staff. Several states in Appalachia offer examples of streamlined application processes wherein a single application suffices for multiple programs. This approach reduces the time and financial investment needed to seek external funding.

7.2 Funding Program Options

Expanding funding options in some key areas could have a significant impact on the financial, managerial, and operational capacity of staff for centralized services as well as the accessibility of effective decentralized system solutions.

Potential Opportunities

Expanding Funding Options for Ongoing Maintenance

Many utilities (even those able to secure funding for capital improvements) lack the financial resources to maintain new or updated infrastructure. The lack of resources results in avoidable degradation and often requires repeated major investments to complete repairs. Though ideally costs for ongoing maintenance would be covered via ratepayers, this outcome may never be achievable for smaller systems in Appalachia, where attaining economies of scale through regionalization or consolidation is not practical. Creating funding opportunities for the ongoing maintenance of these types of systems may ultimately result in long-term cost savings and a more efficient use of funds.

Funding Outreach for Local Development District Staff

Though local development districts (LDDs) can serve as valuable partners for Appalachian utilities, the project team found that awareness of LDDs among utility staff may not be widespread. Though remote or virtual outreach is a potential option, in-person connection is likely to be more effective. However, the latter requires significantly more time and financial investment. Providing targeted funding to support LDD staff for conducting in-person outreach to all utilities in their districts may increase their value as a resource, especially as support for accessing funding.

Supporting Innovative Onsite Solutions

Ensuring safe drinking water and effective treatment and disposal of household wastewater through decentralized (onsite) technology is recognized as a national issue for rural communities. Because the rugged landscape makes conventional approaches difficult to implement technically or financially in many areas of Appalachia, the region offers a promising testing ground for innovative solutions aimed at closing service gaps. Providing financial incentives and development grants to support the exploration of emerging technologies in remote areas may not only benefit local residents but also potentially serve as a model for other rural regions across the U.S.

7.3 Capacity Development

Several approaches to technical assistance would potentially be efficient avenues to build the managerial and operational capacity of utility staff throughout the region and broaden support for decentralized users.

Potential Opportunities

Providing Technical Assistance for Monitoring and Reporting Violations

The project team found that rates of monitoring and reporting SDWA violations are higher throughout Appalachia while rates of health-based violations are more similar to the non-Appalachian U.S. Technical assistance focused on compliance with monitoring and reporting requirements could help ensure health-based issues are identified and addressed, which may improve the public's perception of centralized water system quality and lower use of bottled water sources.

Investing in Training for Local Development Districts

Local development districts can support utilities in many ways, but internal expertise and capacity varies among LDDs. Strengthening the ability of LDDs to provide better support may help address resiliency gaps throughout the region. Given turnover at LDDs and fluctuations in funding programs, providing annual, state-specific trainings covering available funding programs, application processes, and common pitfalls could help promote greater consistency across LDDs. Further, providing training for LDD staff on key topics such as long-term planning (i.e., developing asset management or capital improvement plans), project implementation, or regionalization options may prove an efficient mechanism to increase utility capacity rather than training utility staff directly. Covering travel costs could encourage participation.

Facilitating Roundtables to Promote Knowledge Sharing

The varying circumstances throughout Appalachia means that no single strategy, or even suite of strategies, will be effective throughout the entire region. However, as highlighted by 6.3 Case Studies of Successful Financial Management, many innovative strategies for both centralized systems and decentralized users already exist and are replicable. Though directly bringing utility staff across Appalachia together may not be feasible, leveraging local development districts offers an opportunity to facilitate knowledge-sharing. Creating opportunities to bring LDD staff together could facilitate more effective sharing of lessons learned and innovative strategies across the Appalachian Region. In particular, these events could provide opportunities to discuss strategies to build economies of scale, improve resiliency to extreme weather, and support users in extremely rural areas. LDD staff could then disseminate information and provide guidance to utilities based on the unique opportunities and challenges of their individual districts.

Specializing Support for the Most Stressed Systems

One finding from the operator survey is that respondents who commented about significant financial challenges facing their utilities also typically noted having reduced options for external funding. North Carolina's Viable Utilities Program and Kentucky's WWATERS Program provide examples of state-level investment in improving the outlook for the most distressed systems. These types of programs could be modified and implemented in other Appalachian states.

Expanding Onsite User Support

Although access to centralized drinking water and wastewater infrastructure in the Appalachian Region appears to have increased over the past twenty years, many communities are still wholly reliant on private drinking water wells and improved springs and onsite wastewater disposal and treatment through septic systems. Ensuring safe drinking water quality and proper septic functioning is a concern in all rural regions of the U.S. Targeted support for established Cooperative Extension well water programs and the development of similar programs in states without these programs appears to be an effective strategy to provide regular testing and assistance directly to these families. Support for analogous septic outreach programs providing baseline education and testing would further the impact of this effort.

8. Conclusions

The combination of low population density, rugged terrain, and limited financial resources throughout many parts of the Appalachian Region creates a uniquely complex environment for water and wastewater infrastructure, with communities relying on a combination of centralized and decentralized systems.

Overall, the reliance on centralized drinking water services appears to have increased over the last couple of decades. A decrease in the total number of systems coupled with slight increases in the population served by larger systems and overall population served by centralized systems suggests regionalization or consolidation, consistent with national trends. Still, a majority of Appalachian water systems are small, and a majority of the population relies on systems with surface water sources; both of these characteristics can contribute to higher costs. The percentage of the Appalachian population served by larger systems still lags behind the U.S. as a whole.

An analysis of Safe Drinking Water Act violations revealed that rates of health-based violations in Appalachia are similar to the rest of the country and that Appalachian systems can adjust to updated regulatory requirements. Monitoring and reporting violations are higher within the region, and there is some evidence that residents may rely on bottled water sources when systems are out of compliance. Bringing systems into compliance with baseline monitoring requirements is essential to confirm the safety of drinking water provided to homes and to build local trust in utilities, which may ultimately reduce the financial burden of purchasing bottled water on local households.

Assessing centralized wastewater infrastructure was difficult due to limited data. Up to 76% of the population lives within three miles of a centralized wastewater system, but proximity does not guarantee service, particularly in mountainous terrain.

For both water and wastewater, complete coverage is unlikely anywhere in the U.S., as some areas will always be too rugged, remote, and/or economically challenged to effectively and efficiently serve with traditional centralized systems. However, understanding the extent of reliance on private wells or septic systems is also very challenging given limited data. Because onsite systems are on private property, the creation of regional (e.g., Appalachian) or national datasets describing well water quality or septic failures is likely infeasible. Support for decentralized users is also limited, with some states offering resources for private well owners, such as well water testing through established Cooperative Extension programs. However, no analogous programs for septic users exist despite concerns that failing septic systems may contaminate water sources, including private wells. Most of the responsibility for maintaining decentralized systems, wells or septic, falls on individual property owners. Continued support for already embedded well water testing and support programs and adding septic programs would be beneficial. Further, these service-oriented programs can serve as sentinels to identify regional issues meriting assistance from state departments of health in the absence of widespread data.

Echoing the ongoing challenges throughout the entire country, aging and inadequate water and wastewater infrastructure remains a challenge throughout Appalachia. Because private financing is effectively only accessible to larger systems, many Appalachian water and wastewater systems likely rely on public grant and loan programs to supplement revenues from ratepayers and finance their operational and capital improvement needs. Applying for grant funding can be an arduous process, placing more strain on already overburdened utility staff. This can create a cycle where successful applicants keep succeeding, while the needs of those struggling remain unmet. Modifications to funding program administration could reduce the complexity of application processes or enable less conventional projects—sometimes the more feasible option in Appalachia—to be more competitive. Providing specialized technical assistance to the most distressed systems may also prove to be an impactful strategy to increase access to funding.

Challenges with staff retirement, recruitment, and retention complicate the management of water and wastewater systems throughout the region. Moreover, they are not limited to utilities. Turnover at state agencies and local development districts can affect institutional expertise and impact funding processes, administration, and technical assistance capacity. The recent influx of infrastructure funding at the federal level may have enabled a shift to funding workforce development by agencies more traditionally focused on infrastructure. However, that shift may be temporary.

For those systems able to secure funding for capital projects, successfully implementing projects, managing grant funding, and maintaining infrastructure long-term are still challenges, sometimes leading to repeat applications for funding to support the same infrastructure. Expanding funding options to support ongoing maintenance may be more cost-effective long-term. Further, funding operational and managerial capacity-building activities throughout the region may also improve long-term outcomes. Directly addressing capacity issues at the utility level may not be financially feasible. However, investments in capacity-building for local development district (LDD) staff, who are important partners for utilities, may prove an efficient avenue to indirectly increase the capacity of utility staff. Providing LDDs assistance to develop ongoing relationships with struggling utilities may also be a valuable investment, given that not all utilities may be aware of the resources LDDs can provide. Ultimately, leveraging LDDs as a resource may enable utilities to more effectively secure and manage funding for capital projects.

Even the recent major investments in water and wastewater infrastructure at the federal level are not enough to cover the estimated costs to address current infrastructure needs throughout the region. In the absence of further funding, future ratepayers will likely face significant rate increases in the coming years to close this gap, emphasizing continued affordability concerns in the region. Further, extreme weather events, such as flooding and extreme cold, are of growing concern to the maintenance of foundational infrastructure. Interconnections and agreements to share resources may prove vital to the resilience of Appalachian communities.

As with the U.S. as a whole, long-term financial sustainability for many Appalachian systems may be best secured by economies of scale. As mentioned above, some Appalachian systems may be undergoing regionalization and/or consolidation. As demonstrated by Yadkin Valley Sewer Authority (North Carolina), these efforts may result in the increased managerial capacity needed to secure additional funding. Regionalization and consolidation, however, are complicated processes, often requiring expertise outside the typical scope of knowledge for utility managers. LDDs already commonly promote regional solutions within their districts; improving staff capacity in this area could shift them to active facilitators. Importantly, regionalization and consolidation are not the only strategies available to expand systems. Two case studies—Cullman, Alabama and Mercer County Public Service District (West Virginia)—highlight alternative strategies to create economies of scale.

A primary lesson learned for the project team is that shortcomings in available data still limit attempts to generate a thorough understanding of the water and wastewater infrastructure landscape throughout Appalachia. The project team expanded the data available through qualitative surveys that provided valuable insights, but response rates were lower than desired despite using modified, shortened surveys or intensive outreach approaches (e.g., contacting more than 250 operators). Additionally, the project team originally sought to use some additional experimental approaches to create a more holistic and nuanced picture of Appalachia. The proposed review of state budgets to understand how much funding for water and infrastructure projects was potentially provided by direct state appropriations (as opposed to grant and loan programs) was unsuccessful, largely due to variation in budget structures and detail. For affordability, the project team sought to evaluate a few communities using the National Resource Defense Council's Water Affordability Business Case tool. However, identifying communities willing to share the data needed to run the tool was challenging. Further, the project team learned that some states in the Appalachian Region do not allow the tool's approach to be used in decision-making. Despite these limitations, the analyses generated a more expansive picture of the state of water and wastewater infrastructure in the region.

The future of Appalachia holds both challenges and opportunities. Though there are regional trends, many concerns are highly localized to the specific landscape and historical situation. For example, very small utilities in distressed counties may be flourishing, while recent events (e.g., floods, retirements) can cause larger, typically more stable, systems to struggle. And some Appalachian communities—large and small—are planning for expansion and growth. Both traditional and innovative strategies can help utilities build financial, managerial, and operational capacity to ultimately support thriving communities. Long-term planning via asset management or capital improvement plans and appropriate rate-setting practices will always be important strategies. However, as this report highlights, there are many examples of success stories and innovative strategies for water and wastewater management that could be replicated throughout the region. Forward-thinking approaches, like those of Mars Hill, North Carolina and Cullman, Alabama, may enable utilities to build for resilience and growth simultaneously. Overall, the unique landscape of the region is potentially an ideal testing ground for innovative solutions aimed at closing gaps in the most rugged communities, which could yield solutions not only for Appalachia but for other rural regions of the U.S. as well.

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https://files.dep.state.pa.us/Water/BPNPSM/InfrastructureFinance/StateRevolvFundIntendUsePlan/2024/2024_Attachment_1-Drinking_Water_Ranking_Framework.pdf.

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[63] Mississippi Commission on Environmental Quality, *Fiscal Year 2024 Intended Use Plan (IUP) for the Water Pollution Control Revolving Loan Fund Program* (Mississippi Department of Environmental Quality, 2024), https://www.mdeq.ms.gov/wp-content/uploads/2024/10/FY24-IUP_Final.pdf.

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Appendix A. Source Data

Dataset	Used For	Source	Link	Rationale
Safe Drinking Water Information System (SDWIS)	• Community Water System Characteristics Analysis • SDWA Violations Analysis • Bottled Water Use Analysis • Infrastructure Needs Analysis	U.S. EPA	https://echo.epa.gov/tools/data-downloads/sdwa-download-summary	The dataset contains all system characteristics (including location) and violations for all public water systems in the U.S.
Estimated Use of Water in the United States County-Level Data for 2015	• Community Water System Population Coverage	U.S. Geological Survey	https://www.sciencebase.gov/catalog/item/get/5af3311be4b0da30c1b245d8	The dataset contains USGS estimates of county total population and population using publicly supplied drinking water and aligns with the analysis conducted by Hughes et al. (2005)
Integrated Compliance Information System National Pollutant Discharge Elimination System	• Centralized Wastewater System Characteristics Analysis	U.S. EPA	https://echo.epa.gov/tools/data-downloads/icis-npdes-download-summary	ICIS-NPDES is an information management system maintained by the Office of Compliance to track permit compliance and enforcement status of facilities regulated by the National Pollutant Discharge Elimination System (NPDES) under the Clean Water Act (CWA). ICIS-NPDES is designed to support the NPDES program at the state, regional, and national levels.
ECHO Facility Demographics	• Centralized Wastewater System Coverage Analysis	U.S. EPA	https://echo.epa.gov/tools/data-downloads/demographic-download-summary	The dataset contains information on population served for wastewater facilities within 1, 3, and 5-mile radii
2000 Decennial Census	• Bottled Water Use Analysis	U.S. Census Bureau	https://www.census.gov/programs-surveys/decennial-census/decade/decennial-publications.2000.html	Best source for U.S. population demographic data prior to the availability of American Community Survey data
American Community Survey 5-year Estimates (2009-2023)	• Bottled Water Use Analysis (2009-2020) • Infrastructure Needs Analysis (2019-2023) • Disbursements Analysis (2019-2023)	U.S. Census Bureau	https://www.census.gov/data/developers/data-sets/acs-5year.html	Best source for U.S. population demographic data for 2009-2023, including income

Dataset	Used For	Source	Link	Rationale
American Community Survey Data (2018, 2020, 2022, 2023)	• Affordability Analysis	U.S. Census Bureau	https://www.census.gov/programs-surveys/acs/data.html	Best source for U.S. Median Household Income data for 2018-2024
Nielsen IQ Retail Scanner Data	• Bottled Water analysis	Nielsen IQ	Not publicly available	The dataset contains information on the volume of sales by household included in the Nielsen survey.
Operator Survey	• Operator Survey Analysis	Generated by the project team	N/A	Survey data collected by the project team
The Appalachian Region: A Data Overview from the 2018-2022 American Community Survey Chartbook	• 2022 Population Statistics (Introduction)	Srygley et al. (2024)	https://www.arc.gov/wp-content/uploads/2024/06/PRB_ARC_Chartbook_ACS_2018-2022_FINAL_2024-06.pdf	In some instances, using information from the most recent ARC-funded chartbook was the most logical source.
Drinking Water and Wastewater Infrastructure in Appalachia: An Analysis of Capital Funding and Funding Gaps	• Comparisons to Previous Results	Hughes et al. (2005)	https://www.arc.gov/wp-content/uploads/2020/06/DrinkingWaterandWastewaterInfrastructure.pdf	The last comprehensive assessment of water and wastewater infrastructure in Appalachia; used for comparison
2022 Clean Watershed Needs Survey	• Infrastructure Needs Analysis	U.S. EPA	https://sdwis.epa.gov/ords/sfdw_pub/r/sfdw/cwns_pub/about	The most recent nationwide assessment of wastewater infrastructure needs
Drinking Water Infrastructure Needs Survey and Assessment: 7th Report to Congress	• Infrastructure Needs Analysis	U.S. EPA	https://www.epa.gov/dwsrf/epas-7th-drinking-water-infrastructure-needs-survey-and-assessment	The most recent nationwide assessment of drinking water infrastructure needs
Inflation Indices	• Infrastructure Needs Analysis	U.S. Bureau of Labor Statistics	https://www.bls.gov/cpi/data.htm	Contains information on the consumer price index each year; Used to normalize dollar values to 2024
USAspending.gov Database	• Disbursements Analysis	U.S. Department of the Treasury	https://www.usaspending.gov/	The most comprehensive source of federal funding disbursement information publicly available
Assistance Listing Programs	• Disbursements Analysis	Sam.gov	https://sam.gov/	Comprehensive list of assistance programs

Dataset	Used For	Source	Link	Rationale
2024 Moody's Credit Ratings	• Moody's Credit Ratings Analysis	Moody's Investors Service, Inc.	https://www.moodys.com/researchandratings/region/north-america/united-states/0420B6/005003000001?tb=1	Moody's was chosen over other credit rating firms as a direct comparison point to the analysis by Hughes et al. (2005)
Water and Wastewater Bill Data	• Affordability Analysis	SOG EFC	https://efc.sog.unc.edu/dashboards/	SOG EFC-collected information on the cost of water and wastewater municipal services
Local Development District Survey	• LDD Survey Analysis	Generated by the project team	N/A	Survey data collected by the project team
ARC Economic Designation	• Various	Appalachian Regional Commission	Provided via email by ARC	ARC-source data for counties in the Appalachian Region with economic designation, LDD, metro-area status, and subregion
Local Development Districts	• Various	Appalachian Regional Commission	Provided via email by ARC	ARC-source data for counties in the Appalachian Region with economic designation, LDD, metro-area status, and subregion
Metro-Area Designations	• Various	Appalachian Regional Commission	Provided via email by ARC	ARC-source data for counties in the Appalachian Region with economic designation, LDD, metro-area status, and subregion
Appalachian Counties	• Various	Appalachian Regional Commission	Provided via email by ARC	ARC-source data for counties in the Appalachian Region with economic designation, LDD, metro-area status, and subregion
Appalachian Subregions	• Various	Appalachian Regional Commission	Provided via email by ARC	ARC-source data for counties in the Appalachian Region with economic designation, LDD, metro-area status, and subregion

Appendix B. Methods for the Current State of Infrastructure Analysis

Landscape of Water System Characteristics

Community water system (CWS), Safe Drinking Water Act (SDWA) violation, and other data were downloaded from the U.S. EPA's Safe Drinking Water Information System (SDWIS)'s public website.[1] SDWIS provides information on all permitted systems serving more than 25 individuals or having greater than 10 connections in accordance with SDWA requirements. Data describing the landscape of active systems and SDWA violations within this report represent those available (last verified) on January 27, 2025.

Unless otherwise specified in the report, the analysis only considers active systems. Transient non-community water systems (TNCWS) were excluded as these refer to facilities serving locations where customer populations are nonconstant (e.g., gas stations, campgrounds, etc.). Non-transient non-community water systems (NCWS) were also excluded (e.g., schools, factories, hospitals, etc. that maintain onsite water treatment).

Data available characterizing community water systems (CWS) include population served, source water type (surface water, purchased surface water, ground water, purchased groundwater, groundwater under the influence of surface water, and purchased groundwater under the influence of surface water), and private versus public ownership. Using population served data, the team grouped CWS into standard U.S. EPA size designations (very small: <500 connections; small: 501-3,300 connections; medium: 3,300-10,000 connections; large: 10,001-100,000 connections; very large: more than 100,000 connections). SDWIS data is county-level. Therefore, the analysis compares the 423 counties within Appalachia versus all non-Appalachian counties within the United States. The team used ARC's publicly available spreadsheet of Appalachian counties to categorize CWS as Appalachian or non-Appalachian using the county FIPS code as a link between ARC's data and SDWIS data.[xvi]

The team encountered some challenges working with the data. First, not all CWS in the SDWIS database had sufficient information available to readily link them with a specific county. In addition, several states include cities classified as independent from the counties they are located in or adjacent to. In the case of Virginia, the ARC county identifiers database clearly specifies county membership for these independent cities, and thus, the team was able to classify them as being within or outside of the analysis region.

Central to this analysis was an effort to estimate the number of people in each county with and without utility-supplied water per year. SDWIS data provide estimates of the population served by each CWS.[xvii] However, updated data overwrite historic data. Thus, the estimates of the population served per CWS used in this analysis are likely representative of 2024 Q4.

[xvi] ARC county data is available for download at https://www.arc.gov/appalachian-counties-served-by-arc/.

[xvii] These data are self-reported by utilities, collected by state agencies, and then reported to the EPA.

Another related challenge is that population data aggregated from CWS data by county often exceeded the U.S. Census estimates of total county population. In those instances, the Team assumed that the vast majority of the county population has access to utility-supplied water, but that household-level access is not actually 100%.

Functionality of Drinking Water Systems: Safe Drinking Water Act Violations

This analysis uses Safe Drinking Water Act (SWDA) violation data from SDWIS. To examine a present snapshot of common water quality compliance challenges in the Appalachian Region, the team extracted Monitoring and Reporting (MR) violations and Health-based (HB) violations in the 2024 calendar year for all CWS and compared Appalachia with the non-Appalachian U.S.

Hughes et al. (2005) did not include an examination of patterns of CWS violations. To identify potential trends over time, the team examined the sum of MR and HB violations for three time periods: 2005-2007 (roughly congruent with Hughes et al. (2005)), 2014-2016 (midway between the two analyses), and 2021-2023 (just before the current analysis). Multiple years were included in each data period to minimize the impact of changes in reporting requirements (e.g., the Stage II disinfectant Byproduct Rule was introduced in 2006). Violations data are filtered given the date range by the noncompliance begin and end dates. Violations are not representative of when they start since they can include violations starting before 2005 but are ongoing through the 2005 date range.

Reliance on Alternatives: Bottled Water Consumption in Appalachia

The project team used NielsenIQ bottled water purchasing data (through its Homescan Services for all food categories, including beverages, to analyze and characterize bottled water use trends across the Appalachian Region over 15 years (2005-2020). The team chose an end date just prior to the start of the COVID-19 pandemic because of the pandemic's impact on consumption and other trends. In addition to characterizing bottled water use trends spatially and over time for the region and its subregions, the team used statistical models to assess potential county-level associations between SDWA violations and bottled water use. The team ran models both with and without adjustment for other factors potentially associated with bottled water consumption (e.g., income, educational attainment, and estimates of the population served by CWS in each county). The analysis combined these data with county-level U.S. Census data on population size, household median income, head of the household's educational attainment, the number of CWS, and the total estimated population served by CWS. For 2005-2009, the analysis used values from the 2000 decennial census; for 2009-2020, the analysis used values from 5-year ACS data. The team also examined the number of NielsenIQ households per county to assess if the ratio of households to county populations was relatively similar across counties. To assess options for variable creation, the team calculated the ratio of participating households per county to population per county, which was sufficiently consistent across Appalachia overall to warrant the incorporation of county-specific population data in the models.

Landscape of Wastewater Characteristics

The project team compiled data from the ECHO Facility Demographics and the ICIS-NPDES National Dataset.[2] In brief, the team selected sewerage system facilities (code 4952) and filtered by state. Duplicates were removed via selection for unique NPDES IDs. ICIS permits for publicly owned treatment works (POTW) and non-POTW were selected and merged to external permit numbers to obtain linked information on associated outflow (if available) and populations. It is worth noting that population is calculated via inclusion within a set radial distance, which is clearly a rough estimate. The team only included wastewater systems if county information was available (i.e., any "N/A" locations were removed).

[1] "Safe Drinking Water Information System (SDWIS) Federal Reporting Services," United States Environmental Protection Agency, Updated February 27, 2025, https://www.epa.gov/ground-water-and-drinking-water/safe-drinking-water-information-system-sdwis-federal-reporting.
[2] "ECHO Data Downloads," United States Environmental Protection Agency, Retrieved March 2025, https://echo.epa.gov/tools/data-downloads.

Appendix C. Decentralized Users Case Studies

Home Rainwater System

Location: McDowell County, WV

Designed/Managed By: Dig Deep, Inc's Appalachian Water Project (Welch, WV)

Date of Visit: Aug 26, 2024

Motivation

This pilot project aimed to improve home drinking water quantity and quality for a single-family home in rural McDowell County, West Virginia. Because the home is situated on the top of a ridge of significant elevation with only a small cluster of inhabited houses, running main lines from the local water authority was technically and economically undesirable.[xviii] The home had a private well with limited yield (residents noted decreasing flow to the kitchen sink). Residents relied on a "pour flush" toilet and did not have a tub or shower, requiring them to visit a friend or relative's home for washing.

Design

The new system relies on the existing EDPM (i.e., rubber membrane) roof as a rainfall catchment area (Figure C1, page 141) with no roof extension required. Rain is collected into gutters and runs through a first flush diverter and screening filter before piped diversion to an approximately 4,000-gallon in-ground cistern, specifically designed to cultivate a treatment biofilm (Figure C2, page 141). A pump moves water from the cistern into a pressure tank and through two filters: one to remove sediment, and one to remove large microorganisms (e.g., Cryptosporidium) (Figure C3, page 142). Finally, water passes through a UV filter before reaching the point of use. If rainfall does not meet household needs, water is trucked in from a local spring to fill the cistern as chlorinated water from the local service authority would disrupt the cistern biofilm. The estimated installation cost for the system was $25-30,000, which included substantial refurbishing of the existing house structure to accommodate the installation (re-plumbing the house to accommodate a modern bathroom and electrical system upgrades to support the new pump and filtration system).

[xviii] The exact location is withheld for privacy.

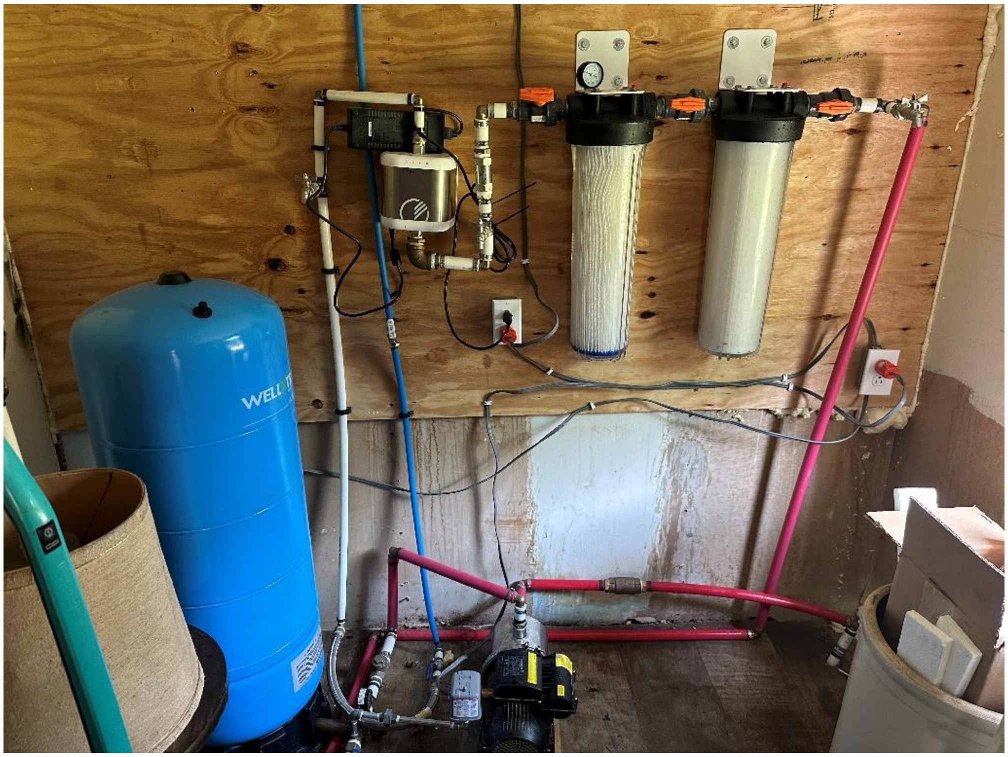
Appendix Figure C.1: Existing EPDM Roof Serving as Rainfall Catchment Area

Source: Dr. Leigh-Anne Krometis

Appendix Figure C.2: Cistern Access Point behind the House

Source: Dr. Leigh-Anne Krometis

Appendix Figure C.3: In-Home Pressure Tank and Filtration System



Source: Dr. Leigh-Anne Krometis

Success

Dig Deep installed the system in December 2023, and the residents are so pleased with it that they have asked Dig Deep about the possibility of installing a similar system for relatives living nearby. The residents now have a flush toilet, shower, and sink and sufficient water quantity. Up to six other homes are now interested in a similar system to meet their basic needs.

Remaining Challenges and Lessons Learned

Remaining challenges involve long-term monitoring and maintenance requirements. Because the home is quite remote, it is impractical for Dig Deep to regularly visit and test water quality, change filters and UV bulbs, and inspect/clean the roof and cistern area. Filters and UV bulbs are an additional cost that the homeowners cannot cover with their limited budget. As a pilot project, the long-term costs and design life are unclear. While Dig Deep is currently maintaining the system and monitoring water quality, long-term sustainability for similar projects would require a balance of nonprofit and household responsibility for maintenance. Further, the home is reliant on a septic system for wastewater disposal that will likely require redesign or upgrade to accommodate the household's increased water use.

Other groups interested in the potential design and installation of similar systems need to consider (and budget for) all household renovations that are likely required to support a new drinking water system: premise plumbing and electrical upgrades are quite likely. This house's EPDM roof was recently installed, but other homes may need to invest in roof repairs or replacement to support this type of system. The residents and Dig Deep personnel have noticed white "gummy" flakes in water before treatment that are likely wash-off residue from the rubber roofing material. Though removed by the filters, these flakes reduce filter life. Metal roofing might be more appropriate for future installations.

Community Wastewater Treatment System

Location: Walnut Cove, Stokes County, NC

Designed/Managed By: Wolverton and Associates/Town of Walnut Cove

Date of Visit: December 20, 2024

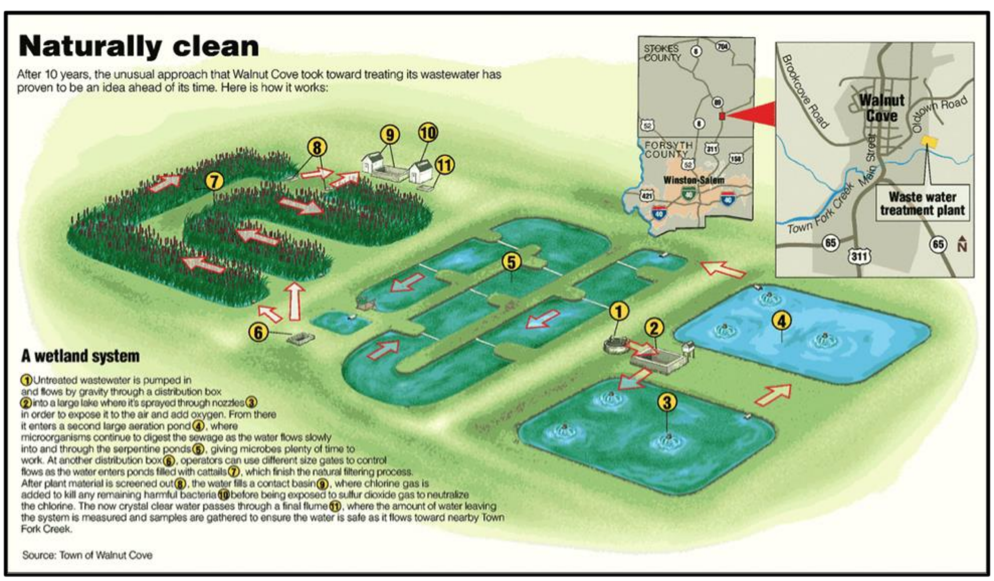
Motivation

Walnut Cove is a small community of about 1,800 people located in Stokes County, North Carolina. In the early 1990s, Walnut Cove's wastewater treatment plant (WWTP), which consisted of two lagoons, needed updates estimated to cost several million dollars. In 1996, the town decided to implement a non-traditional and cheaper alternative—a wastewater treatment wetland—at a cost of about $1 million instead.

Design

The system consists of the two original lagoons (about 10 ft deep), which are designed to be aerated, followed by a raceway (about two feet deep), and then a distribution box that splits the flow into two treatment wetland cells (each roughly 1,200 feet long and 60 feet wide). The hydraulic retention time (i.e., contact time) with the treatment wetland cells is about five days. Then, the wastewater enters a contact basin for treatment with chlorine gas and sulfur dioxide neutralizing gas before discharge through a flume into a nearby creek (Figure C4, below, and Figures 5-9, pages 144-146).

Appendix Figure C.4: Design Schematic of Walnut Cove Wastewater Treatment Wetland System



Source: Retrieved from https://efc.web.unc.edu/2016/09/23/constructed-wetlands-wastewater-treatment-walnut-cove-nc/

Appendix Figure C.5: Distribution Box that Diverts Raw Sewage into Aerated Lagoons

Source: Dr. Natasha Bell

Appendix Figure C.6: An Aerated Lagoon, the First Stage of Wastewater Treatment

Source: Dr. Natasha Bell

Appendix Figure C.7: Distribution Box that Diverts Wastewater from Raceway into Treatment Wetlands

Source: Dr. Natasha Bell

Appendix Figure C.8: Treatment Wetland with Alternating Areas of Open Water and Densely Populated Cattails

Source: Dr. Natasha Bell

Appendix Figure C.9: The Exit Point of the Treatment Wetland

Source: Dr. Natasha Bell

Success

With this system, Walnut Cove has met its permitting requirements for nitrogen and phosphorus discharges. Through a fruitful long-term collaboration with Dr. Mike Burchell from NC State University, the facility has explored appropriate operations and maintenance actions to help keep its nutrient discharges in compliance. One recent project investigated how the removal of organic matter within the treatment wetlands may reduce internal production of ammonium in the system and increase hydraulic retention time. Town leaders Kim Greenwood (Town Manager) and Chad Jarvis (Town Commissioner) expressed appreciation for the sustained partnership with Dr. Burchell and shared positive comments about the improvements to the resilience of the wastewater treatment wetland system during the project team's visit.

Remaining Challenges and Lessons Learned

Town leaders and Dr. Burchell noted that ongoing maintenance of the system has been a challenge. The aeration of the facultative lagoons has been intermittent due to electrical issues and clogged aerators. The town recently invested in a generator to hopefully maintain appropriate aeration. Rising ammonium concentrations in the wastewater effluent has been another challenge. However, as discussed above, periodic removal of organic matter is showing promising results with respect to reducing ammonium production. Total nitrogen treatment at this site would also be enhanced if more ammonium-nitrogen were converted to nitrate-nitrogen through aerobic nitrification processes in the lagoons before discharge into the constructed wetlands because wetlands more effectively remove nitrate-nitrogen through anaerobic processes. Another issue is the dilute nature of the incoming wastewater, an indicator of significant inflow and infiltration (I&I) and a common problem in rural wastewater systems with aging infrastructure. The I&I increases the hydraulic load that passes through the system. Like other small towns, budgetary and staff limitations hamper the ability to address this issue.

Appendix D. Sub-State Variation in Financial Needs

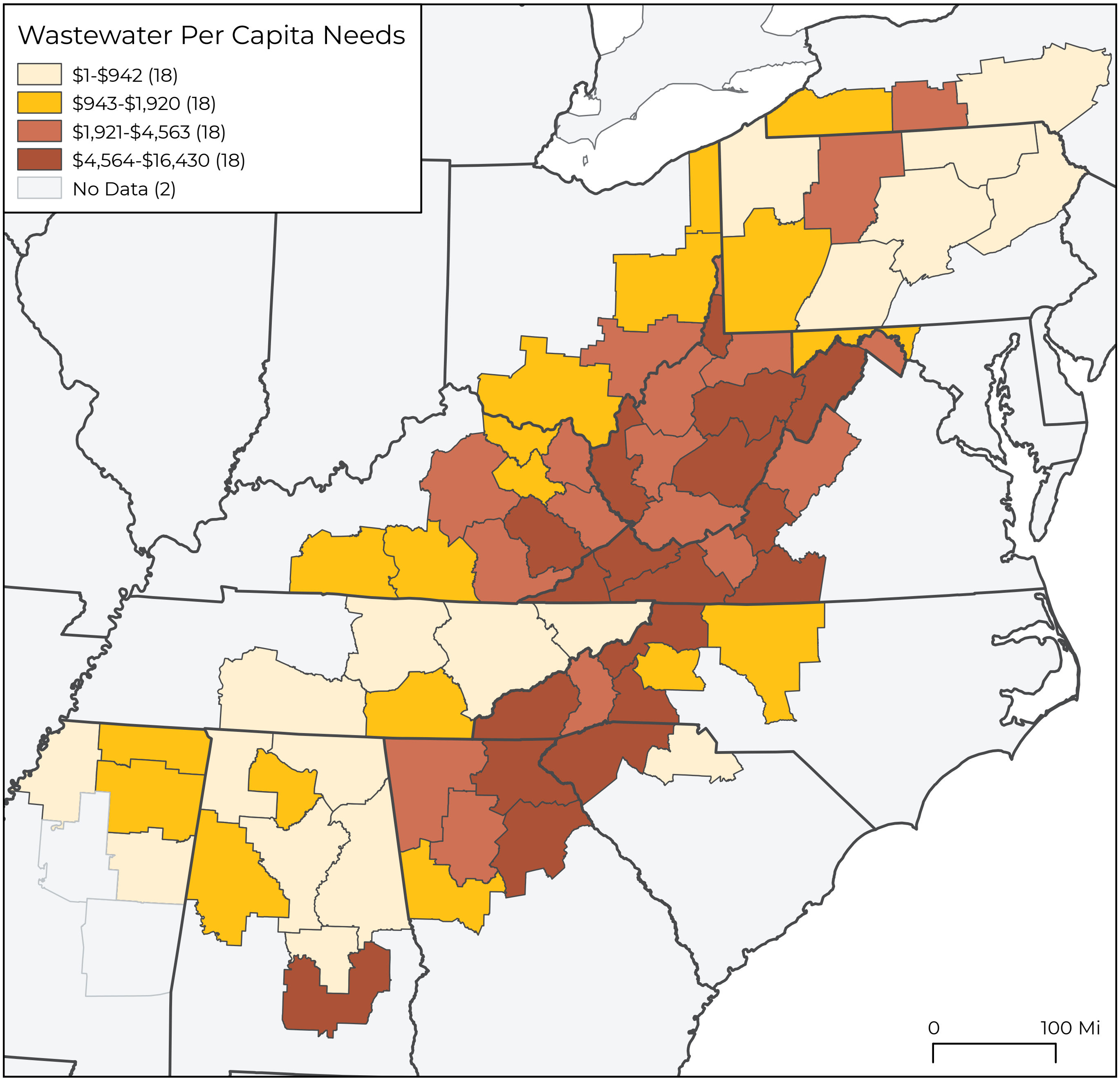
Aggregating needs by LDD can provide insight into sub-state variation. On a per capita basis, wastewater needs are generally higher throughout central Appalachia, with the top ten LDDs concentrated in Virginia and West Virginia. However, LDDs in Georgia also tend to have higher per capita needs, which could reflect that Atlanta (and its large metro area) lies mostly within the Appalachian LDDs. Generally, wastewater needs per capita increase moving from east to west within New York, North Carolina, and Pennsylvania (Table D.1 below, Figure D.1, page 149). Per capita drinking water needs have more scattered variation both within states and between states (Table D.1 below and Figure D.2, page 150). However, it is important to note that 17 of 74 LDDs had no community water systems respond to the drinking water needs survey, eight of which are in West Virginia. Table D.2 (page 151) lists total and per capita needs for all 74 LDDs in Appalachia.

Appendix Table D.1: Per Capita Wastewater and Drinking Water Needs, Most Expensive LDDs

State	Local Development District Name	Needs Per Capita
Wastewater		
Virginia	LENOWISCO Planning District Commission	$16,430
Alabama	South Central Alabama Development Commission	$13,925
West Virginia	Region 8–Planning and Development Council	$10,972
Virginia	Mount Rogers Planning District Commission	$9,976
West Virginia	Region 2–Planning and Development Council	$9,759
Georgia	Georgia Mountains Regional Commission	$9,400
Virginia	Cumberland Plateau Planning District Commission	$9,322
Georgia	Northeast Georgia Regional Commission	$8,122
North Carolina	Southwestern Commission	$7,847
West Virginia	Region 7–Planning and Development Council	$7,211
Drinking Water		
West Virginia	Region 3–B-C-K-P Regional Intergovernmental Council	$11,204
West Virginia	Region 5–Mid-Ohio Valley Regional Council	$5,994
North Carolina	Foothills Regional Commission	$4,536
Kentucky	Kentucky River Area Development District	$3,387
Virginia	New River Valley Planning District Commission	$2,563
Mississippi	Northeast Mississippi Planning and Development District	$2,523
Ohio	Ohio Mid-Eastern Governments Association	$2,507
Kentucky	Gateway Area Development District	$2,492
Georgia	Three Rivers Regional Commission	$2,301
Ohio	Ohio Valley Regional Development Commission	$2,250

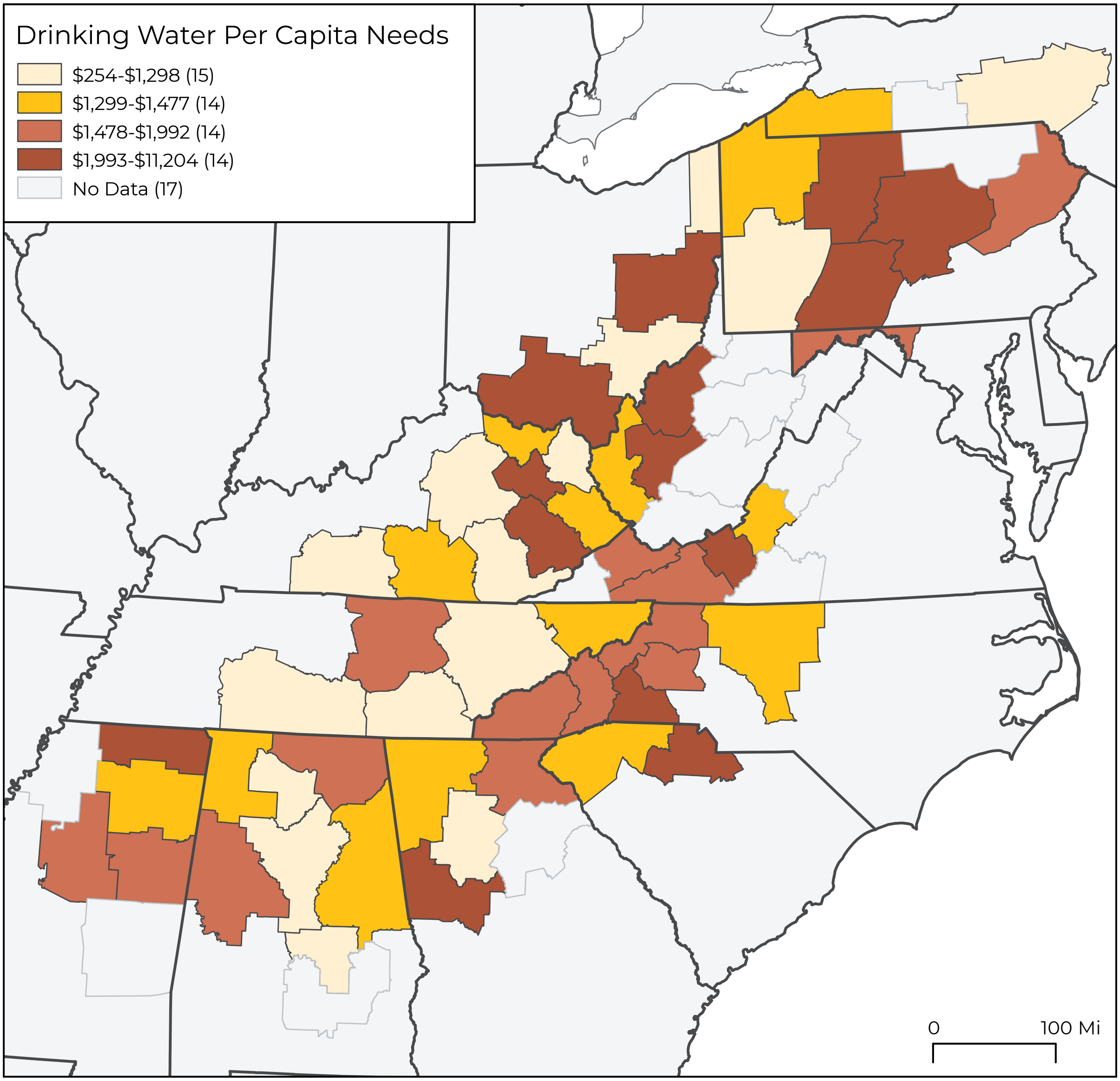
Source: (Systems Sampled) U.S. EPA, Drinking Water Infrastructure Needs Survey and Assessment: 7th Report to Congress and U.S. EPA, 2022 Clean Watershed Needs Survey; (LDDs) Appalachian Regional Commission, ARC Local Development Districts
Notes: Per capita was calculated using population values as reported in the Clean Watershed and Drinking Water Needs Surveys and excludes extrapolated data for drinking water.

Appendix Figure D.1: Wastewater Per Capita Needs by LDD, 2022



Source: (Systems Sampled) U.S. EPA, 2022 Clean Watershed Needs Survey; (LDDs) Appalachian Regional Commission, ARC Local Development Districts
Notes: Per capita was calculated using population values as reported in the Clean Watershed Needs Surveys. Data are shown as quartiles.

Appendix Figure D.2: Drinking Water Per Capita Needs by LDD, 2021



Source: (Systems Sampled) U.S. EPA, Drinking Water Infrastructure Needs Survey and Assessment: 7th Report to Congress; (LDDs) Appalachian Regional Commission, ARC Local Development Districts
Notes: Per capita was calculated using population values as reported in the Drinking Water Needs Survey and excludes extrapolated data for drinking water. Data are shown as quartiles.

Appendix Table D.2: Total and Per Capita Needs by Local Development District
(continued on next page)

State	Local Development District Name	Total Needs ($M)			Per Capita Needs	
		WW	DW	Combined	WW	DW
Alabama	Central Alabama Regional Planning and Development Commission	$38	$24	$62	$875	$254
Alabama	East Alabama Regional Planning and Development Commission	$236	$582	$818	$931	$1,347
Alabama	North Central Alabama Regional Council Of Governments	$193	$597	$790	$1,540	$1,142
Alabama	Northwest Alabama Council Of Local Governments	$119	$214	$333	$696	$1,477
Alabama	Regional Planning Commission Of Greater Birmingham	$360	$1,591	$1,951	$481	$1,232
Alabama	South Central Alabama Development Commission	$137	No Data	$137	$13,925	No Data
Alabama	Top Of Alabama Regional Council Of Governments	$248	$1,152	$1,400	$581	$1,577
Alabama	West Alabama Regional Commission	$228	$508	$736	$1,364	$1,992
Georgia	Atlanta Regional Commission	$4,407	$2,145	$6,552	$3,746	$1,265
Georgia	Georgia Mountains Regional Commission	$1,489	$312	$1,801	$9,400	$1,804
Georgia	Northeast Georgia Regional Commission	$733	No Data	$733	$8,122	No Data
Georgia	Northwest Georgia Regional Commission	$1,442	$857	$2,299	$4,077	$1,444
Georgia	Three Rivers Regional Commission	$76	$258	$334	$1,527	$2,301
Kentucky	Barren River Area Development District	$29	$31	$60	$1,514	$522
Kentucky	Big Sandy Area Development District	$178	$184	$362	$4,563	$1,416
Kentucky	Bluegrass Area Development District	$271	$117	$388	$2,215	$1,209
Kentucky	Buffalo Trace Area Development District	$13	$6	$19	$1,678	$1,324
Kentucky	Cumberland Valley Area Development District	$250	$123	$373	$2,729	$767
Kentucky	Fivco Area Development District	$238	$114	$352	$2,913	$869
Kentucky	Gateway Area Development District	$51	$46	$97	$1,345	$2,492
Kentucky	Kentucky River Area Development District	$207	$62	$269	$6,728	$3,387
Kentucky	Lake Cumberland Area Development District, Inc.	$114	$275	$389	$1,920	$1,424
Maryland	Tri-County Council For Western Maryland, Inc.	$330	$239	$569	$1,345	$1,581
Mississippi	East Central Planning and Development District	No Data	No Data	No Data	No Data	No Data
Mississippi	Golden Triangle Planning and Development District	$6	$148	$154	$402	$1,540
Mississippi	North Central Planning and Development District	No Data	$15	$15	No Data	$1,491
Mississippi	North Delta Planning and Development District	$10	No Data	$10	$737	No Data
Mississippi	Northeast Mississippi Planning and Development District	$13	$153	$166	$1,420	$2,523

Appendix Table D.2 (continued): Total and Per Capita Needs by Local Development District
(continued on next page)

State	Local Development District Name	Total Needs ($M)			Per Capita Needs	
		WW	DW	Combined	WW	DW
Mississippi	Three Rivers Planning and Development District	$7	$172	$179	$1,288	$1,459
New York	Southern Tier 8 Regional Board	$266	$52	$318	$741	$677
New York	Southern Tier Central Regional Planning and Development Board	$401	No Data	$401	$3,287	No Data
New York	Southern Tier West Regional Planning and Development Board	$253	$62	$315	$1,420	$1,333
North Carolina	Foothills Regional Commission	$334	$342	$676	$4,651	$4,536
North Carolina	High Country Council Of Governments	$294	$36	$330	$6,181	$1,614
North Carolina	Land-Of-Sky Regional Council	$632	$499	$1,131	$3,050	$1,928
North Carolina	Piedmont Triad Regional Council	$504	$570	$1,074	$1,221	$1,451
North Carolina	Southwestern Commission	$354	$17	$371	$7,847	$1,573
North Carolina	Western Piedmont Council Of Governments	$417	$259	$676	$1,585	$1,665
Ohio	Buckeye Hills Regional Council	$216	$57	$273	$2,060	$1,034
Ohio	Eastgate Regional Council Of Governments	$454	$306	$760	$1,147	$1,075
Ohio	Ohio Mid-Eastern Governments Association	$506	$141	$647	$1,591	$2,507
Ohio	Ohio Valley Regional Development Commission	$611	$578	$1,189	$1,812	$2,250
Pennsylvania	North Central Pennsylvania Regional Planning and Dev. Commission	$81	$47	$128	$3,717	$2,188
Pennsylvania	Northeastern Pennsylvania Alliance	$32	$328	$360	$154	$1,502
Pennsylvania	Northern Tier Regional Planning and Development Commission	$6	No Data	$6	$942	No Data
Pennsylvania	Northwest Pennsylvania Regional Planning and Dev. Commission	$46	$323	$369	$382	$1,366
Pennsylvania	Seda Council Of Governments	$30	$151	$181	$285	$2,179
Pennsylvania	Southern Alleghenies Planning and Development Commission	$160	$20	$180	$828	$2,213
Pennsylvania	Southwestern Pennsylvania Commission	$2,823	$3,639	$6,462	$1,412	$984
South Carolina	Catawba Regional Council Of Governments	$11	$79	$90	No Data	$2,033
South Carolina	South Carolina Appalachian Council Of Governments	$3,296	$1,910	$5,206	$6,550	$1,466
Tennessee	East Tennessee Development District	$94	$967	$1,061	$118	$1,298
Tennessee	First Tennessee Development District	$123	$575	$698	$449	$1,364
Tennessee	South Central Tennessee Development District	$9	$107	$116	$140	$913
Tennessee	Southeast Tennessee Development District	$436	$801	$1,237	$1,048	$1,202
Tennessee	Upper Cumberland Development District	$51	$289	$340	$448	$1,496

Appendix Table D.2 (continued): Total and Per Capita Needs by Local Development District

State	Local Development District Name	Total Needs ($M)			Per Capita Needs	
		WW	DW	Combined	WW	DW
Virginia	Central Shenandoah Planning District Commission	$62	No Data	$62	$2,659	No Data
Virginia	Cumberland Plateau Planning District Commission	$558	$122	$680	$9,322	$1,725
Virginia	Lenowisco Planning District Commission	$542	No Data	$542	$16,430	No Data
Virginia	Mount Rogers Planning District Commission	$554	$135	$689	$9,976	$1,945
Virginia	New River Valley Planning District Commission	$313	$25	$338	$2,149	$2,563
Virginia	Roanoke Valley Alleghany Regional Commission	$49	$11	$60	$6,479	$1,325
Virginia	West Piedmont Planning District Commission	$168	No Data	$168	$4,917	No Data
West Virginia	Region 10 Bel-O-Mar Reg. Council and Interstate Planning Commission	$281	No Data	$281	$5,444	No Data
West Virginia	Region 11 Brooke-Hancock Regional Planning and Development	$163	No Data	$163	$3,740	No Data
West Virginia	Region 2 Planning and Development Council	$1,319	$152	$1,471	$9,759	$1,300
West Virginia	Region 3 B-C-K-P Regional Intergovernmental Council	$958	$44	$1,002	$3,760	$11,204
West Virginia	Region 4 Planning and Development Council	$508	No Data	$508	$5,200	No Data
West Virginia	Region 5 Mid-Ohio Valley Regional Council	$487	$17	$504	$4,133	$5,994
West Virginia	Region 6 Planning and Development Council	$797	No Data	$797	$4,542	No Data
West Virginia	Region 7 Planning and Development Council	$501	No Data	$501	$7,211	No Data
West Virginia	Region 8 Planning and Development Council	$328	No Data	$328	$10,972	No Data
West Virginia	Region 9 Eastern Panhandle Regional Planning and Dev. Council	$327	No Data	$327	$3,818	No Data
West Virginia	Region I Planning and Development Council	$673	No Data	$673	$4,450	No Data

Source: (Systems Sampled) U.S. EPA, Drinking Water Infrastructure Needs Survey and Assessment: 7th Report to Congress and U.S. EPA, 2022 Clean Watershed Needs Survey; (LDDs) Appalachian Regional Commission, ARC Local Development Districts
Notes: WW = wastewater; DW = Drinking Water; Per capita was calculated using population values as reported in the Clean Watershed and Drinking Water Needs Surveys and excludes extrapolated data for drinking water.

Appendix E. Financial Needs Analysis Methods

Clean Watershed Needs Survey Analysis Methods

This analysis is based on four data tables from the 2022 EPA Clean Water Needs Survey: Physical Location, Needs Cost by Category, Facilities, and Population Wastewater. While the survey data does not associate facilities with counties, the Physical Location table includes coordinates for each facility, which were mapped and linked with county shapefiles to assign a county to each facility. The Facilities table contains all of the facilities that participated in the survey and indicates whether the facilities have documented needs. The Population Wastewater table details the current and projected population served by a facility. This data was used when performing per capita analyses. The majority of systems surveyed corresponded to one county. However, three systems listed multiple counties. Needs reported for these systems were divided among the counties based on their population.

Hughes et al. (2005) limited the scope to Categories I-V; this analysis includes two additional categories (Category X: Water Reuse and Category XII: Decentralized Wastewater Treatment Systems) (Table Appendix E.1).

Appendix Table E.1: Descriptions of CWNS Categories Included in the Analysis
(continued on the next page)

Category Number and Name	Description
I. Secondary Wastewater Treatment	This category includes needs for meeting secondary treatment criteria. Secondary treatment typically requires a treatment level that produces an effluent quality of 30 milligrams per liter of both 5-day biochemical oxygen demand (BOD5) and total suspended solids. (Secondary treatment levels required for some lagoon systems may be less stringent.) In addition, the secondary treatment must remove 85 percent of BOD5 and total suspended solids from the influent wastewater. This category also includes facilities granted waivers of secondary treatment for marine discharges under section 301(h) of the CWA and “honey bucket lagoons,” though they do not provide secondary treatment.
II. Advanced Wastewater Treatment	This category includes needs for attaining or maintaining a level of treatment that is more stringent than secondary treatment or producing a significant reduction in nonconventional or toxic pollutants in the wastewater treated by a facility. A facility is considered to have advanced wastewater treatment if it achieves one or more of the following: BOD5 less than 20 milligrams per liter, nitrogen removal, phosphorus removal, ammonia removal, metal removal, or synthetic organic removal.
III-A. Infiltration / Inflow (II) Correction	This category includes needs for correction of sewer system I/I problems. For infiltration, this includes controlling the penetration of water into a sanitary or combined sewer system from the ground through defective pipes or manholes. For inflow, it includes controlling the penetration of water into the system from drains, storm sewers, and other improper entries. It also includes costs for preliminary sewer system analysis and detailed sewer system evaluation surveys.

Appendix Table E.1 (continued): Descriptions of CWNS Categories Included in the Analysis

Category Number and Name	Description
III-B. Sewer Replacement / Rehabilitation	This category includes needs for the maintenance (above and beyond ongoing operations and maintenance), reinforcement, or reconstruction of structurally deteriorating sanitary or combined sewers. The corrective actions must be necessary to maintain the structural integrity of the system.
IV-A. New Collector Sewers and Appurtenances	This category includes needs for new pipes used to collect wastewater from a sanitary or industrial wastewater source and carry it to an interceptor sewer that will convey it to a treatment facility.
IV-B. New Interceptor Sewers and Appurtenances	This category includes needs for constructing new interceptor sewers and pumping stations to convey wastewater from collection sewer systems to a treatment facility or to another interceptor sewer. Needs for relief sewers are included in this category.
V. Combined Sewer Overflow (CSO) Correction	This category includes needs to prevent or control the periodic discharges of mixed stormwater and untreated wastewater (CSOs) that occur when the capacity of a sewer system is exceeded during a wet weather event. This category does not include needs for overflow control allocated to flood control, drainage improvement, or the treatment or control of stormwater in separate storm systems.
X. Water Reuse	This category includes needs associated with conveyance of treated wastewater that is being reused, including associated rehabilitation/replacement needs. Examples are pipes to convey treated water from the wastewater facility to the drinking water distribution system or the drinking water treatment facility and equipment for application of effluent on publicly owned land. The needs associated with additional unit processes to increase the level of treatment to potable—or less than potable but greater than the level normally associated with surface discharge needs—are reported in Category II.
XII. Decentralized Wastewater Treatment Systems	This category includes needs associated with the rehabilitation, replacement, or new installation of on-site wastewater treatment systems or clustered (community) systems. It also includes the treatment portion of other decentralized sewage disposal technologies. Costs related to the development and implementation of on-site management districts are included (but not the costs of ongoing operations of such districts). Costs could also include the limited collection systems associated with the decentralized system. Public ownership is not required for decentralized systems. This category does not include the needs to change a service area from decentralized wastewater treatment to a publicly owned centralized treatment system. Needs to construct a publicly owned centralized collection and treatment system should be reported in Category I and/or Category II. Needs to install sewers to connect the service area to an existing collection system are reported in Category IV-A and Category IV-B.

Source: U.S. EPA, 2022 Clean Watershed Needs Survey

All cost figures have been adjusted for inflation to reflect 2024 dollars using data from the Bureau of Labor Statistics API.[1] The project team used the tidycensus package available in R to retrieve county-level population data across all states in the Appalachian Region.

The project team then cleaned the Needs Cost by Category table, which contains details on the various categories of need and associated costs at the facility level. This national dataset was filtered to include only Appalachian states and was joined with the Physical Location table to get the associated county. Facilities were then flagged as being either inside or outside Appalachia. Facilities that appeared in the Facilities table and were flagged as having no needs were added manually to the cleaned Needs dataset to ensure completeness.

Next, the Population Wastewater table was filtered to include only Appalachian states and filtered by the type of population served. In keeping with the 2005 report, only facilities marked as “Receiving Collection” were included in the final dataset. Each facility was flagged based on whether it was located within or outside Appalachia.

To analyze the needs, the project team grouped the data by county and need category, calculating total costs per group. This data was combined with the population data to compute the per capita need for each county and category group. A final dataset linking needs and county boundaries was created to support mapping.

Drinking Water Needs Survey Analysis Methods

The DWNS covers a national sample of small systems, a representative sample of medium systems for each state, and all large systems. Because not all systems are surveyed, the project team supplemented the data with information from the Safe Drinking Water Information System (SDWIS). For systems included in the survey, the DWNS provided both population and water source data. For systems not surveyed, this information was retrieved from SDWIS. Some systems had inconsistencies between their reported population and water source and those listed in SDWIS; in these cases, the value reported in the survey was used.

To create the Summary SDWIS Table, the project team downloaded data from SDWIS. These data include key attributes such as county, state, water source type (groundwater or surface water), and population served for each community water system (CWS). Since SDWIS does not provide county FIPS codes, the project team generated a new variable called Population Stratum to align with classifications used in the Drinking Water Needs Survey (DWNS), and then linked each CWS to its respective county FIPS code using the county and state names. Using these county FIPS codes, the project team flagged each county as either within or outside the Appalachian Region. Next, they grouped the CWS data by state, water source, population stratum, and Appalachian status, and counted the number of systems in each group, creating a comprehensive systems count table.

The project team then filtered the SDWIS data to retain only systems located within the Appalachian Region and summed the total number of these systems by state. For the DWNS data, the project team filtered the survey down to CWSs in Appalachian states and cleaned the dataset by grouping it by each Public Water System ID (PWSID) to account for multiple reported needs per system, thus calculating the total need per system.

To extrapolate the needs of small systems, the cleaned DWNS data were further filtered to include only small systems. The project team grouped these by population stratum and water source, calculated the average unadjusted need for each group, and then joined this information with the Summary SDWIS Table containing the number of systems in each group. Multiplying the number of systems by the average unadjusted need generated projected needs, which were then adjusted for inflation. These projections were summed by state, resulting in a final table listing states alongside their projected needs for small systems.

A similar process was applied for medium systems, except grouping was performed by state, population stratum, and water source. The formula used was: the number of CWSs in each group multiplied by the average unadjusted need and an inflation multiplier. This produced a final table of projected needs by state for medium systems.

For large systems, since the majority were captured in the DWNS, the project team simply adjusted the data for inflation and summarized the needs by state.

Finally, the project team consolidated the projections by joining the small and medium system tables and adding their projected needs by state. This combined data was then merged with the large systems table and the systems count table. From these joined tables, the project team calculated total projected needs by state as well as for the Appalachian Region as a whole. The project team's estimates for large systems closely matched EPA's reported values. However, the project team's calculations for medium systems consistently showed higher needs than those reported by the EPA, despite both using weighted average methods. This discrepancy highlights potential differences in methodology.

[1] U.S. Bureau of Labor Statistics, Bureau of Labor Statistics' (BLS) Public Data Application Programming Interface, Retrieved March 2025, https://www.bls.gov/developers/home.htm.

Appendix F. Water and Wastewater Operator Survey

Good morning/afternoon! We are conducting a short survey of water and wastewater utilities in counties served by the Appalachian Regional Commission as part of a formal evaluation of water and wastewater needs throughout the region. Your utility has been randomly selected to participate in this voluntary survey, with the goal of assisting the Commission on better understanding regional needs and how to support utilities. Are you able/willing to answer a few questions for us? (if no → could you let us know the contact of someone who might be able to speak with us? → time to set up?)

Utility Name:____

What is the name of the community, town, or cities you serve?

Which of the following best describes your utility?

Drinking Water

Wastewater

How many customers are served by your facility (annually)?

<500

500-3300

3300-10,000

10,000-100,000

>100,000

How old is your system (in years)?

Treatment plant _________

Collection/distribution system ____________

How many employees work at your facility right now? Please enter the number in each category below.

Certified Operators: ___

Operators in Training / Apprenticeship: ___

Office Staff: ___

Other (including maintenance staff): ___

I'm going to read through some potential operational challenges that water and wastewater operations may face. Could you rate each on a scale of one to four, where one means it poses no current challenge, and five means it is a severe challenge that limits your ability to serve your community?

Potential Issue	1 (not a challenge)	2 (minor challenge)	3 (moderate challenge)	4 (serious challenge)
Inadequate/aging infrastructure				
Recruiting staff				
Retaining staff/ employee turnover				
Poor source water quality				
Inadequate user rates (customer base charges)				
Stakeholder support				
Inadequate staff training				
Educational opportunities for staff				
Regulatory compliance				
Retirement/aging workforce				

Are there other challenges your utility faces that we have not mentioned? Please feel free to describe.

Of the challenges that we discussed, which is the most pressing, that is, which is the one that most limits your ability to succeed in your community?

Is it your sense that user rates and fees adequately cover the costs associated with running your facility?

___ Yes

___ No

Have you applied for Appalachian Regional Commission grants to support your facility's operations in the last five years?

___ Yes (12)

→ If YES to #10: 12. Were you successful in receiving these funds?

___ Yes (14)

→ If YES to #12: 14. Could you tell us a little bit about this project and whether you believe it has been successful?

___ No (13)

→ If NO to #12: 13. Do you intend to reapply?

___ Yes (15)

___ No (15)

___ No (11)

--> If NO to #10: 11. Why not?

15. What additional support would be helpful to your utility?

16. Are there challenges we’ve missed or questions we should have asked that we did not?

Appendix G. Additional Information and Analysis Regarding Federal Funding

Federal Funding Programs Included in the Disbursements Analysis

The USASpending database contains information on all federal funding sources. The project team used the following keywords to filter the dataset to relevant funding programs: drinking, utility, stormwater, plumbing, sewage, sewer, wastewater, water, water treatment, water quality. The search returned 773 programs, 431 active programs and 342 inactive programs. Of these, 46 programs were selected to be considered in the analysis. Of the 46 selected, 27 had funding outlays in Appalachian states and only 19 within Appalachia (Appendix Table G1). The remaining programs were not represented in the downloaded dataset.

Appendix Table G.1: Federal Funding Programs Selected from USASpending, FY21-24 (continued on next page)

Listing Code	Listing Name
10.097	Water Saving Commodities Grant
10.759	Part 1774 Special Evaluation Assistance For Rural Communities and Households Search
10.76	Water and Waste Disposal Systems For Rural Communities
10.761	Water and Waste Technical Assistance and Training Grants
10.762	Solid Waste Management Grants
10.763	Emergency Community Water Assistance Grants
10.77	Water and Waste Grants and Loans and Loan Guarantees Section 306 C
10.862	Rural Decentralized Water Systems Grant Program
10.864	Grant Program To Establish A Fund For Financing Water and Wastewater Projects
11.3	Investments For Public Works and Economic Development Facilities
12.026	Corps Water Infrastructure Financing Program (CWIFP)
14.218	Community Development Block Grants Entitlement Grants
14.227	Community Development Block Grants Technical Assistance Program
14.228	Community Development Block Grants States Program and Non Entitlement Grants in Hawaii
15.037	Water Resources On Indian Lands
15.074	Small Surface Water and Groundwater Storage Projects
15.504	Water Recycling and Desalination Construction Programs
15.507	Watersmart Sustain and Manage Americas Resources For Tomorrow
15.519	Indian Tribal Water Resources Development Management and Protection
15.52	Lewis and Clark Rural Water System
15.572	Agricultural Water Use Efficiency Program
15.574	Water Storage Enhancement
15.577	Domestic Water Supply Projects

Appendix Table G.1 (continued): Federal Funding Programs Selected from USASpending, FY21-24

Listing Code	Listing Name
15.582	Dry Redwater Rural Water Project Feasibility Study
15.98	National Ground Water Monitoring Network
23.002	Appalachian Area Development
66.418	Construction Grants For Wastewater Treatment Works
66.424	Surveys Studies Investigations Demonstration and Training Grants Section 1442 Of The Safe Drinking Water Act
66.432	State Public Water System Supervision
66.433	State Underground Water Source Protection
66.442	Water Infrastructure Improvements For The Nation Small and Underserved Communities Emerging Contaminants Grant Program
66.443	Reducing Lead In Drinking Water SDWA 1459 B
66.444	Voluntary School and Child Care Lead Testing and Reduction Grant Program SDWA 1464 D
66.445	Innovative Water Infrastructure Workforce Development Program SDWA 1459 E
66.446	Technical Assistance For Treatment Works Clean Water Act CWA Section 104 B 8
66.447	Sewer Overflow and Stormwater Reuse Municipal Grant Program
66.448	Drinking Water System Infrastructure Resilience and Sustainability Program Sdwa 1459 A L
66.454	Water Quality Management Planning
66.458	Clean Water State Revolving Fund
66.468	Drinking Water State Revolving Fund
66.488	Midsize and Large Drinking Water System Infrastructure Resilience and Sustainability Program Safe Drinking Water Act 1459 F
66.49	Centers Of Excellence For Stormwater Control Infrastructure Technologies Grant Program
66.521	Innovative Water Technology Grant Program
66.804	Underground Storage Tank Ust Prevention Detection and Compliance Program
66.958	Water Infrastructure Finance and Innovation (WIFIA)
93.499	Low Income Household Water Assistance Program

Source: U.S. Department of the Treasury, USAspending.gov Database, Retrieved August 2025

Additional Analysis of Federal Funding

USASpending provides outlays (i.e., disbursements) data starting in FY 2021. Appendix Table G.2 shows the total number of transactions with information on outlays reported in the dataset for the programs selected for the analysis.

Appendix Table G.2: Number of Award Transactions Reported Annually, FY21-24

Federal Fiscal Year	Number of Awards			% of Awards in Appalachia
	Appalachia	Non-Appalachian U.S.	U.S.	
2021	474	5,783	6,257	8%
2022	386	3,004	3,390	11%
2023	462	3,367	3,829	12%
2024	403	3,291	3,694	11%
Total	**1,725**	**15,445**	**17,170**	**10%**

Source: U.S. Department of the Treasury, USAspending.gov Database, Retrieved August 2025

In Appendix Table G.3, each of the federal funding programs downloaded from USASpending is listed along with the total funding amount and the percentage of federal funding within Appalachia that they each represent.

Appendix Table G.3: Programs by Total Federal Outlay in Appalachia, FY21-24 (continued on next page)

Program Name	Awarding Agency	Total Funding ($M)	% of Total
Community Development Block Grants - Entitlement Grants	HUD-CDBG	$681.96	61.24%
Drinking Water State Revolving Fund	EPA-DW SRF	$164.03	14.73%
Water and Waste Disposal Systems for Rural Communities	USDA-RUS	$67.76	6.08%
Clean Water State Revolving Fund	EPA-CW SRF	$60.60	5.44%
Community Development Block Grants - State's Program and Non-Entitlement Grants In Hawaii	HUD-CDBG	$51.06	4.59%
Appalachian Area Development	ARC	$48.05	4.31%
Investments For Public Works and Economic Development Facilities	EDA	$17.10	1.54%
Underground Storage Tank (Ust) Prevention, Detection, and Compliance Program	EPA	$9.09	0.82%
Water Infrastructure Improvements For The Nation Small and Underserved Communities Emerging Contaminants Grant	EPA	$3.45	0.31%
Water and Waste Technical Assistance and Training Grants	USDA-RUS	$2.38	0.21%

Appendix Table G.3 (continued): Programs by Total Federal Outlay in Appalachia, FY21-24

Program Name	Awarding Agency	Total Funding ($M)	% of Total
Emergency Community Water Assistance Grants	USDA-RUS	$2.22	0.20%
Lead Testing In School and Child Care Program Drinking Water (Sdwa 1464(D))	EPA	$1.55	0.14%
Innovative Water Technology Grant Program	EPA	$1.59	0.14%
Sewer Overflow and Stormwater Reuse Municipal Grant Program	EPA	$1.42	0.13%
Solid Waste Management Grants	USDA-RUS	$0.74	0.07%
Innovative Water Infrastructure Workforce Development Program (Sdwa 1459e)	EPA	$0.44	0.04%
Part 1774 Special Evaluation Assistance For Rural Communities and Households (Search)	USDA-RUS	$0.06	0.01%
National Ground-Water Monitoring Network	Other	$0.14	0.01%
State Public Water System Supervision	EPA	<$0.01	0.00%

Source: U.S. Department of the Treasury, USAspending.gov Database, Retrieved August 2025
Notes: Programs not included in this table did not report outlays within Appalachia.

Appendix Table G.4 compares per capita outlays for all programs that disbursed funding in Appalachian states for FY21-24 between Appalachia and the U.S.

Appendix Table G.4: Programs Ranked by Funding Per Capita in FY21-24, Appalachia and U.S. (continued on next page)

Program Name	Awarding Agency	Per Capita	
		Appalachia	U.S.
Community Development Block Grants - Entitlement Grants	HUD-CDBG	$25.97	$47.51
Drinking Water State Revolving Fund	EPA-DW SRF	$6.25	$1.25
Water and Waste Disposal Systems for Rural Communities	USDA-RUS	$2.58	$1.72
Clean Water State Revolving Fund	EPA-CW SRF	$2.31	$1.41
Community Development Block Grants - State's Program and Non-Entitlement Grants In Hawaii	HUD-CDBG	$1.94	$43.52
Appalachian Area Development	ARC	$1.83	$0.15

Appendix Table G.4 (continued): Programs Ranked by Funding Per Capita in FY21-24, Appalachia and U.S.

Program Name	Awarding Agency	Per Capita	
		Appalachia	U.S.
Investments For Public Works and Economic Development Facilities	EDA	$0.65	$0.35
Underground Storage Tank (Ust) Prevention, Detection, and Compliance Program	EPA	$0.35	$0.19
Water Infrastructure Improvements For The Nation Small and Underserved Communities Emerging Contaminants Grant	EPA	$0.13	$0.13
Water and Waste Technical Assistance and Training Grants	USDA-RUS	$0.09	$0.31
Emergency Community Water Assistance Grants	USDA-RUS	$0.08	$0.10
Lead Testing In School and Child Care Program Drinking Water (Sdwa 1464(D))	EPA	$0.06	$0.04
Innovative Water Technology Grant Program	EPA	$0.06	$0.01
Sewer Overflow and Stormwater Reuse Municipal Grant Program	EPA	$0.05	$0.02
Solid Waste Management Grants	USDA-RUS	$0.03	$0.04
Innovative Water Infrastructure Workforce Development Program (Sdwa 1459e)	EPA	$0.02	$0.01
National Ground-Water Monitoring Network	Other	$0.01	$0.02
Part 1774 Special Evaluation Assistance For Rural Communities and Households (Search)	USDA-RUS	<$0.01	$0.01
State Public Water System Supervision	EPA	<$0.01	$0.21

Source: U.S. Department of the Treasury, USAspending.gov Database, Retrieved August 2025; (Population) United States Census Bureau, American Community Survey 5-Year Data (2019-2023), Retrieved March 2025
Notes: Per capita calculations rely on population estimates derived from ACS Census 5-year 2019-2023 data.

Appendix H. Utilities with Moody's Credit Ratings

Appendix Table H.1: Utilities with Moody's Credit Ratings in 2024
(continued on next page)

State	County	Utility Name	Utility Type	ARC Economic Designation (FY25)	Utility Rating (2024)
Alabama	Limestone	Athens (City of) AL Water and Sewer Ent.	Combined Water & Sewer Enterprise	Competitive	A1
Alabama	Jefferson	Bessemer Government Utility Services Corporation, AL	Water Enterprise	Transitional	A2
Alabama	Cullman	Cullman Utilities Board, AL Water Enterprise	Water Enterprise	Transitional	A1
Alabama	DeKalb	DeKalb-Jackson Water Supply District, AL	Water Enterprise	Transitional	A3
Alabama	Lauderdale	Florence (City of) AL Water and Sewer Ent.	Combined Water & Sewer Enterprise	Transitional	A1
Alabama	Etowah	Gadsden Waterworks & Sewer Board, AL	Combined Water & Sewer Enterprise	Transitional	A1
Alabama	Limestone	Huntsville (City of) AL Water Enterprise	Water Enterprise	Competitive	Aa1
Alabama	Jefferson	Jefferson (County of) AL Sewer Enterprise	Sewer Enterprise	Transitional	Baa1
Alabama	Limestone	Limestone County Water & Sewer Authority, AL	Combined Water & Sewer Enterprise	Competitive	Aa3
Alabama	Madison	Madison (County of) AL Water Enterprise	Water Enterprise	Competitive	Aa2
Alabama	Madison	Madison Water & Wastewater Board, AL	Combined Water & Sewer Enterprise	Competitive	Aa2
Alabama	Shelby	Montevallo City Water Works & Sewer Brd., AL	Combined Water & Sewer Enterprise	Attainment	A1
Alabama	Jefferson	Water Works Board of the City of Birmingham, Al (The)	Combined Water & Sewer Enterprise	Transitional	Aa2
Georgia	Carroll	Carroll County Water Authority, GA	Combined Water & Sewer Enterprise	Transitional	Aa3
Georgia	Bartow	Cartersville (City of) GA Water & Sewer Ent.	Combined Water & Sewer Enterprise	Transitional	Aa3
Georgia	Cherokee	Cherokee County Water & Sewerage Auth., GA	Combined Water & Sewer Enterprise	Attainment	Aa1

Appendix Table H.1 (continued): Utilities with Moody's Credit Ratings in 2024
(continued on next page)

State	County	Utility Name	Utility Type	ARC Economic Designation (FY25)	Utility Rating (2024)
Georgia	Habersham	Demorest (City of) GA Water & Sewer Enterprise	Combined Water & Sewer Enterprise	Transitional	Baa1
Georgia	Douglas	Douglasville-Douglas Cnty Wtr & Sew Auth., GA	Combined Water & Sewer Enterprise	Transitional	Aa2
Georgia	Floyd	Floyd (County of) GA Water Enterprise	Water Enterprise	Transitional	Aa3
Georgia	Hall	Gainesville (City of) GA Water & Sewer Ent.	Combined Water & Sewer Enterprise	Transitional	Aa2
Georgia	Jackson	Jackson County Water & Sewerage Authority, GA	Combined Water & Sewer Enterprise	Competitive	Aa3
Kentucky	Boyd	Ashland (City of) KY Water and Sewer Ent.	Combined Water & Sewer Enterprise	At-Risk	A2
New York	Chautauqua	Chautauqua Utility District, NY	Combined Water & Sewer Enterprise	At-Risk	A1
North Carolina	Buncombe	Asheville (City of) NC Water Enterprise	Water Enterprise	Transitional	Aa1
North Carolina	Buncombe	Broad River Water Authority, NC	Water Enterprise	Transitional	A1
North Carolina	Forsyth	Winston-Salem (City of) NC Water & Sewer Ent.	Combined Water & Sewer Enterprise	Transitional	Aa1
Ohio	Mahoning	Mahoning (County of) OH Sewer Enterprise	Sewer Enterprise	Transitional	Aa3
Pennsylvania	Allegheny	Allegheny County Sanitary Authority, PA	Sewer Enterprise	Transitional	Aa3
Pennsylvania	Crawford	Cambridge Area Joint Authority, PA	Combined Water & Sewer Enterprise	Transitional	Ba1
Pennsylvania	Erie	Erie City Water Authority, PA	Water Enterprise	Transitional	A2
Pennsylvania	Clearfield	Glendale Valley Municipal Authority, PA	Combined Water & Sewer Enterprise	Transitional	Ba2
Pennsylvania	Mercer	Greenville Water Authority, PA	Water Enterprise	Transitional	A3
Pennsylvania	Allegheny	Marshall Township Municipal Sanitary Authority, PA	Sewer Enterprise	Transitional	Aa3
Pennsylvania	Allegheny	Monroeville Municipal Auth., PA Sewer Ent.	Sewer Enterprise	Transitional	A2
Pennsylvania	Allegheny	Ohio Township Sanitary Authority, PA	Sewer Enterprise	Transitional	A1

Appendix Table H.1 (continued): Utilities with Moody's Credit Ratings in 2024

State	County	Utility Name	Utility Type	ARC Economic Designation (FY25)	Utility Rating (2024)
Pennsylvania	Allegheny	Pittsburgh Water & Sewer Authority, PA	Combined Water & Sewer Enterprise	Transitional	A3
Pennsylvania	Schuylkill	Schuylkill County Municipal Authority, PA	Water Enterprise	Transitional	A1
Pennsylvania	Centre	Spring Benner Walker Joint Authority, PA	Sewer Enterprise	Transitional	A3
Pennsylvania	Westmoreland	Westmoreland County Municipal Authority, PA	Combined Water & Sewer Enterprise	Transitional	A1
Pennsylvania	Greene	Southwestern Pennsylvania Water Authority	Water Enterprise	Transitional	A1
South Carolina	Anderson	Anderson (City of) SC Water and Sewer Ent.	Combined Water & Sewer Enterprise	Transitional	Aa3
South Carolina	Greenville	Greenville (City of) SC Water Enterprise	Water Enterprise	Competitive	Aaa
South Carolina	Greenville	Simpsonville (City of) SC Sew. Ent.	Sewer Enterprise	Competitive	Aa3
South Carolina	Spartanburg	Spartanburg (City of) SC Water Enterprise	Water Enterprise	Transitional	Aa2
South Carolina	Oconee	Walhalla (City of) SC Water and Sewer Enterprise	Combined Water & Sewer Enterprise	Transitional	A2
South Carolina	Spartanburg	Woodruff-Roebuck Water District, SC	Water Enterprise	Transitional	A1
Tennessee	Grainger	Bean Station Utility District, TN	Water Enterprise	At-Risk	A3
Tennessee	Knox	Knoxville (City of) TN Sewer Enterprise	Sewer Enterprise	Competitive	Aa2
Tennessee	Knox	Knoxville (City of) TN Water Enterprise	Water Enterprise	Competitive	Aa1
Tennessee	Morgan	Plateau Utility District, TN	Water Enterprise	At-Risk	A2
West Virginia	Jefferson	Charles Town (City of) WV Water & Sewer Ent.	Combined Water & Sewer Enterprise	Competitive	A1
West Virginia	Monongalia	Morgantown Utility Board, WV	Combined Water & Sewer Enterprise	Transitional	A1

Source: (Credit Ratings) Moody's Investors Service, Inc., "Combined Water & Sewer Enterprise - United States," Moodys.com, Retrieved May 2024, https://www.moodys.com/researchandratings/region/north-america/united-states/0420B6/005003000001?tb=1; (ARC Economic Designation) Appalachian Regional Commission, ARC Economic Designation
Notes: Descriptions of ratings are available at https://ratings.moodys.com/rmc-documents/53954.

Appendix I. Technical Assistance Providers

Alabama

Provider Name	Water	Wastewater	Stormwater	Onsite Users	Website
EPA Water TA Portal	x	x	x		https://www.epa.gov/water-infrastructure/water-technical-assistance-waterta
National Rural Water Association	x	x			https://nrwa.org/our-technical-assistance/
Community Engineering Corps	x	x	x		https://communityengineeringcorps.org/Communities
ARC Local Development Districts (LDDs, COGs, ADDs)	x	x			https://www.arc.gov/local-development-districts/
U.S. Army Corps of Engineers - Floodplain Management Services	x				https://www.sad.usace.army.mil/Missions/Assistance-Programs/Floodplain-Management-Services/
EPA Risk Assessment Technical Assistance for Water Sector Utilities	x	x	x		https://www.epa.gov/crwu/forms/risk-assessment-technical-assistance-water-sector-utilities
Federal Emergency Management Agency Building Resilient Infrastructure and Communities Direct Technical Assistance	x	x	x		https://www.fema.gov/grants/mitigation/learn/building-resilient-infrastructure-communities/direct-technical-assistance/communities
Circuit Rider Program - Technical Assistance for Rural Water Systems (via the U.S. Department of Agriculture and the National Rural Water Association)	x				https://www.rd.usda.gov/programs-services/water-environmental-programs/circuit-rider-program-technical-assistance-rural-water-systems
Local Infrastructure Hub Grant Application Bootcamp	x	x	x		https://localinfrastructure.org/application-bootcamp/

Provider Name	Water	Wastewater	Stormwater	Onsite Users	Website
American Water Works Association	x				https://www.awwa.org/contact-us/
Appalachian Management Systems LLP	x	x	x		https://appalachianms.com/
The Conservation Fund	x	x	x		https://www.conservationfund.org/about-us/contact-us/
Water Finance Exchange	x	x			https://waterfx.org/technical-assistance/
U.S. Water Alliance	x	x	x		https://uswateralliance.org/programs/environmental-finance-center/
Tennessee Valley Authority - Managing Water Supply	x				https://www.tva.com/environment/managing-the-river/managing-water-supply
RCAP - Communities Unlimited (CU)	x	x		x	https://communitiesu.org/environmental/
Alabama Rural Water Association	x	x			https://www.alruralwater.com/
Alabama Department of Environmental Management	x	x			https://web-prd.adem.alabama.gov/water/state-revolving-fund-srf
Alabama League of Municipalities	x	x	x		https://almonline.org/
Alabama Department of Environmental Conservation (ADECA)'s Office of Water Resources (OWR)			x		https://adeca.alabama.gov/water/

Georgia

Provider Name	Water	Wastewater	Stormwater	Onsite Users	Website
EPA Water TA Portal	x	x	x		https://www.epa.gov/water-infrastructure/water-technical-assistance-waterta
National Rural Water Association	x	x			https://nrwa.org/our-technical-assistance/
Community Engineering Corps	x	x	x		https://communityengineeringcorps.org/Communities
ARC Local Development Districts (LDDs, COGs, ADDs)	x	x			https://www.arc.gov/local-development-districts/
U.S. Army Corps of Engineers - Floodplain Management Services	x				https://www.sad.usace.army.mil/Missions/Assistance-Programs/Floodplain-Management-Services/
EPA Risk Assessment Technical Assistance for Water Sector Utilities	x	x	x		https://www.epa.gov/crwu/forms/risk-assessment-technical-assistance-water-sector-utilities
Federal Emergency Management Agency Building Resilient Infrastructure and Communities Direct Technical Assistance	x	x	x		https://www.fema.gov/grants/mitigation/learn/building-resilient-infrastructure-communities/direct-technical-assistance/communities
Circuit Rider Program - Technical Assistance for Rural Water Systems (via the U.S. Department of Agriculture and the National Rural Water Association)	x				https://www.rd.usda.gov/programs-services/water-environmental-programs/circuit-rider-program-technical-assistance-rural-water-systems
Local Infrastructure Hub Grant Application Bootcamp	x	x	x		https://localinfrastructure.org/application-bootcamp/
American Water Works Association	x				https://www.awwa.org/contact-us/
Appalachian Management Systems LLP	x	x	x		https://appalachianms.com/

Provider Name	Water	Wastewater	Stormwater	Onsite Users	Website
The Conservation Fund	x	x	x		https://www.conservationfund.org/about-us/contact-us/
Water Finance Exchange	x	x			https://waterfx.org/technical-assistance/
U.S. Water Alliance	x	x	x		https://uswateralliance.org/programs/environmental-finance-center/
Tennessee Valley Authority - Managing Water Supply	x				https://www.tva.com/environment/managing-the-river/managing-water-supply
RCAP - Southeast Rural Community Assistance Partnership (SERCAP)	x	x		x	https://sercap.org/get-help
Georgia Environmental Finance Authority - Water Loss Technical Assistance	x				https://gefa.georgia.gov/water-loss-technical-assistance
Georgia Rural Water Association	x	x			https://www.grwa.org/
Georgia Municipal Association	x	x	x		https://www.gacities.com/Home.aspx
Metropolitan North Georgia Water Planning District	x		x		https://northgeorgiawater.org/utilities-board-committees/technical-assistance-program/

Kentucky

Provider Name	Water	Wastewater	Stormwater	Onsite Users	Website
EPA Water TA Portal	x	x	x		https://www.epa.gov/water-infrastructure/water-technical-assistance-waterta
National Rural Water Association	x	x			https://nrwa.org/our-technical-assistance/
Community Engineering Corps	x	x	x		https://communityengineeringcorps.org/Communities
ARC Local Development Districts (LDDs, COGs, ADDs)	x	x			https://www.arc.gov/local-development-districts/
U.S. Army Corps of Engineers - Floodplain Management Services	x				https://www.sad.usace.army.mil/Missions/Assistance-Programs/Floodplain-Management-Services/
EPA Risk Assessment Technical Assistance for Water Sector Utilities	x	x	x		https://www.epa.gov/crwu/forms/risk-assessment-technical-assistance-water-sector-utilities
Federal Emergency Management Agency Building Resilient Infrastructure and Communities Direct Technical Assistance	x	x	x		https://www.fema.gov/grants/mitigation/learn/building-resilient-infrastructure-communities/direct-technical-assistance/communities
Circuit Rider Program - Technical Assistance for Rural Water Systems (via the U.S. Department of Agriculture and the National Rural Water Association)	x				https://www.rd.usda.gov/programs-services/water-environmental-programs/circuit-rider-program-technical-assistance-rural-water-systems
Local Infrastructure Hub Grant Application Bootcamp	x	x	x		https://localinfrastructure.org/application-bootcamp/
American Water Works Association	x				https://www.awwa.org/contact-us/
Appalachian Management Systems LLP	x	x	x		https://appalachianms.com/
The Conservation Fund	x	x	x		https://www.conservationfund.org/about-us/contact-us/
Water Finance Exchange	x	x			https://waterfx.org/technical-assistance/

Provider Name	Water	Wastewater	Stormwater	Onsite Users	Website
U.S. Water Alliance	x	x	x		https://uswateralliance.org/programs/environmental-finance-center/
RCAP - Great Lakes Community Action Partnership (GLCAP)	x	x		x	https://www.glcap.org/programs/community-rural-development/rural-community-assistance-program-rcap/technical-assistance/
Appalachian Community Technical Assistance and Training (ACTAT) Program	x	x			https://actat.wvu.edu/
Kentucky Department of Environmental Protection	x				https://eec.ky.gov/Environmental-Protection/Water/Drinking/DWProfessionals/Pages/Technical-Assistance.aspx
Kentucky Rural Water	x	x			https://www.krwa.org/
Kentucky League of Cities Community and Economic Development team	x	x	x		https://www.klc.org/CDS
Kentucky Water Research Institute (KWRI) - Appalachian Community Technical Assistance and Training (ACTAT) program	x	x	x		https://kwri.uky.edu/actat

Maryland

Provider Name	Water	Wastewater	Stormwater	Onsite Users	Website
EPA Water TA Portal	x	x	x		https://www.epa.gov/water-infrastructure/water-technical-assistance-waterta
National Rural Water Association	x	x			https://nrwa.org/our-technical-assistance/
Community Engineering Corps	x	x	x		https://communityengineeringcorps.org/Communities
ARC Local Development Districts (LDDs, COGs, ADDs)	x	x			https://www.arc.gov/local-development-districts/
U.S. Army Corps of Engineers - Floodplain Management Services	x				https://www.sad.usace.army.mil/Missions/Assistance-Programs/Floodplain-Management-Services/
EPA Risk Assessment Technical Assistance for Water Sector Utilities	x	x	x		https://www.epa.gov/crwu/forms/risk-assessment-technical-assistance-water-sector-utilities
Federal Emergency Management Agency Building Resilient Infrastructure and Communities Direct Technical Assistance	x	x	x		https://www.fema.gov/grants/mitigation/learn/building-resilient-infrastructure-communities/direct-technical-assistance/communities
Circuit Rider Program - Technical Assistance for Rural Water Systems (via the U.S. Department of Agriculture and the National Rural Water Association)	x				https://www.rd.usda.gov/programs-services/water-environmental-programs/circuit-rider-program-technical-assistance-rural-water-systems
Local Infrastructure Hub Grant Application Bootcamp	x	x	x		https://localinfrastructure.org/application-bootcamp/
American Water Works Association	x				https://www.awwa.org/contact-us/
Appalachian Management Systems LLP	x	x	x		https://appalachianms.com/
The Conservation Fund	x	x	x		https://www.conservationfund.org/about-us/contact-us/
Water Finance Exchange	x	x			https://waterfx.org/technical-assistance/

Provider Name	Water	Wastewater	Stormwater	Onsite Users	Website
U.S. Water Alliance	x	x	x		https://uswateralliance.org/programs/environmental-finance-center/
RCAP - Southeast Rural Community Assistance Partnership (SERCAP)	x	x		x	https://sercap.org/get-help
Environmental Finance Center at the University of Maryland*	x	x			https://arch.umd.edu/research-creative-practice/centers/environmental-finance-center/project-areas/technical-assistance/region-3-waterta-program
Maryland Rural Water Association	x	x			https://www.md-rwa.org/

Mississippi

Provider Name	Water	Wastewater	Stormwater	Onsite Users	Website
EPA Water TA Portal	x	x	x		https://www.epa.gov/water-infrastructure/water-technical-assistance-waterta
National Rural Water Association	x	x			https://nrwa.org/our-technical-assistance/
Community Engineering Corps	x	x	x		https://communityengineeringcorps.org/Communities
ARC Local Development Districts (LDDs, COGs, ADDs)	x	x			https://www.arc.gov/local-development-districts/
U.S. Army Corps of Engineers - Floodplain Management Services	x				https://www.sad.usace.army.mil/Missions/Assistance-Programs/Floodplain-Management-Services/
EPA Risk Assessment Technical Assistance for Water Sector Utilities	x	x	x		https://www.epa.gov/crwu/forms/risk-assessment-technical-assistance-water-sector-utilities
Federal Emergency Management Agency Building Resilient Infrastructure and Communities Direct Technical Assistance	x	x	x		https://www.fema.gov/grants/mitigation/learn/building-resilient-infrastructure-communities/direct-technical-assistance/communities
Circuit Rider Program - Technical Assistance for Rural Water Systems (via the U.S. Department of Agriculture and the National Rural Water Association)	x				https://www.rd.usda.gov/programs-services/water-environmental-programs/circuit-rider-program-technical-assistance-rural-water-systems
Local Infrastructure Hub Grant Application Bootcamp	x	x	x		https://localinfrastructure.org/application-bootcamp/
American Water Works Association	x				https://www.awwa.org/contact-us/
Appalachian Management Systems LLP	x	x	x		https://appalachianms.com/
The Conservation Fund	x	x	x		https://www.conservationfund.org/about-us/contact-us/
Water Finance Exchange	x	x			https://waterfx.org/technical-assistance/

Provider Name	Water	Wastewater	Stormwater	Onsite Users	Website
U.S. Water Alliance	x	x	x		https://uswateralliance.org/programs/environmental-finance-center/
Tennessee Valley Authority - Managing Water Supply	x				https://www.tva.com/environment/managing-the-river/managing-water-supply
RCAP - Communities Unlimited (CU)	x	x		x	https://communitiesu.org/environmental/
Mississippi Department of Health - On-Site Wastewater Program				x	https://msdh.ms.gov/page/30,0,78.html
Mississippi Rural Water Association	x	x			https://msrwa.org/
Mississippi Municipal League	x	x	x		https://www.mmlonline.com/
Mississippi State University Extension	x	x	x		https://extension.msstate.edu/natural-resources/water-resources/rural-water-association

New York

Provider Name	Water	Wastewater	Stormwater	Onsite Users	Website
EPA Water TA Portal	x	x	x		https://www.epa.gov/water-infrastructure/water-technical-assistance-waterta
National Rural Water Association	x	x			https://nrwa.org/our-technical-assistance/
Community Engineering Corps	x	x	x		https://communityengineeringcorps.org/Communities
ARC Local Development Districts (LDDs, COGs, ADDs)	x	x			https://www.arc.gov/local-development-districts/
U.S. Army Corps of Engineers - Floodplain Management Services	x				https://www.sad.usace.army.mil/Missions/Assistance-Programs/Floodplain-Management-Services/
EPA Risk Assessment Technical Assistance for Water Sector Utilities	x	x	x		https://www.epa.gov/crwu/forms/risk-assessment-technical-assistance-water-sector-utilities
Federal Emergency Management Agency Building Resilient Infrastructure and Communities Direct Technical Assistance	x	x	x		https://www.fema.gov/grants/mitigation/learn/building-resilient-infrastructure-communities/direct-technical-assistance/communities
Circuit Rider Program - Technical Assistance for Rural Water Systems (via the U.S. Department of Agriculture and the National Rural Water Association)	x				https://www.rd.usda.gov/programs-services/water-environmental-programs/circuit-rider-program-technical-assistance-rural-water-systems
Local Infrastructure Hub Grant Application Bootcamp	x	x	x		https://localinfrastructure.org/application-bootcamp/
American Water Works Association	x				https://www.awwa.org/contact-us/
Appalachian Management Systems LLP	x	x	x		https://appalachianms.com/
The Conservation Fund	x	x	x		https://www.conservationfund.org/about-us/contact-us/
Water Finance Exchange	x	x			https://waterfx.org/technical-assistance/

Provider Name	Water	Wastewater	Stormwater	Onsite Users	Website
U.S. Water Alliance	x	x	x		https://uswateralliance.org/programs/environmental-finance-center/
RCAP - RCAP Solutions (RSOL)	x	x		x	https://www.rcapsolutions.org/contact-us/
New York Rural Water Association	x	x			https://www.nyruralwater.org/
Environmental Finance Center at Syracuse University	x	x			https://efc.syr.edu/assistance/
New York Association of Towns	x	x	x		https://www.nytowns.org/
New York Department of State Local Government Services and Support	x	x	x		https://dos.ny.gov/services-and-support
New York Environmental Facilities Corporation - Community Assistance Teams	x	x			https://efc.ny.gov/CAT
New York District and County Health Departments	x				https://www.health.ny.gov/environmental/water/drinking/doh_pub_contacts_map.htm

North Carolina

Provider Name	Water	Wastewater	Stormwater	Onsite Users	Website
EPA Water TA Portal	x	x	x		https://www.epa.gov/water-infrastructure/water-technical-assistance-waterta
National Rural Water Association	x	x			https://nrwa.org/our-technical-assistance/
Community Engineering Corps	x	x	x		https://communityengineeringcorps.org/Communities
ARC Local Development Districts (LDDs, COGs, ADDs)	x	x			https://www.arc.gov/local-development-districts/
U.S. Army Corps of Engineers - Floodplain Management Services	x				https://www.sad.usace.army.mil/Missions/Assistance-Programs/Floodplain-Management-Services/
EPA Risk Assessment Technical Assistance for Water Sector Utilities	x	x	x		https://www.epa.gov/crwu/forms/risk-assessment-technical-assistance-water-sector-utilities
Federal Emergency Management Agency Building Resilient Infrastructure and Communities Direct Technical Assistance	x	x	x		https://www.fema.gov/grants/mitigation/learn/building-resilient-infrastructure-communities/direct-technical-assistance/communities
Circuit Rider Program - Technical Assistance for Rural Water Systems (via the U.S. Department of Agriculture and the National Rural Water Association)	x				https://www.rd.usda.gov/programs-services/water-environmental-programs/circuit-rider-program-technical-assistance-rural-water-systems
Local Infrastructure Hub Grant Application Bootcamp	x	x	x		https://localinfrastructure.org/application-bootcamp/
American Water Works Association	x				https://www.awwa.org/contact-us/
Appalachian Management Systems LLP	x	x	x		https://appalachianms.com/
The Conservation Fund	x	x	x		https://www.conservationfund.org/about-us/contact-us/
Water Finance Exchange	x	x			https://waterfx.org/technical-assistance/

Provider Name	Water	Wastewater	Stormwater	Onsite Users	Website
U.S. Water Alliance	x	x	x		https://uswateralliance.org/programs/environmental-finance-center/
Environmental Finance Center at the University of North Carolina, Chapel Hill	x	x	x		https://efc.sog.unc.edu/technical-assistance/
Tennessee Valley Authority - Managing Water Supply	x				https://www.tva.com/environment/managing-the-river/managing-water-supply
RCAP - Southeast Rural Community Assistance Partnership (SERCAP)	x	x		x	https://sercap.org/get-help
North Carolina Rural Water Association	x	x			https://www.ncrwa.org/technicalassistance.html
North Carolina League of Municipalities	x	x	x		https://www.nclm.org/
North Carolina Local Government Commission	x	x			https://www.nctreasurer.com/divisions/state-and-local-government-finance/lgc/local-fiscal-management
Recreation Resources Service	x	x	x		https://rrs.cnr.ncsu.edu/
NC State Extension	x	x	x		https://www.ces.ncsu.edu/
NC Viable Utilities Program	x	x			https://www.deq.nc.gov/about/divisions/water-infrastructure/viable-utilities

Ohio

Provider Name	Water	Wastewater	Stormwater	Onsite Users	Website
EPA Water TA Portal	x	x	x		https://www.epa.gov/water-infrastructure/water-technical-assistance-waterta
National Rural Water Association	x	x			https://nrwa.org/our-technical-assistance/
Community Engineering Corps	x	x	x		https://communityengineeringcorps.org/Communities
ARC Local Development Districts (LDDs, COGs, ADDs)	x	x			https://www.arc.gov/local-development-districts/
U.S. Army Corps of Engineers - Floodplain Management Services	x				https://www.sad.usace.army.mil/Missions/Assistance-Programs/Floodplain-Management-Services/
EPA Risk Assessment Technical Assistance for Water Sector Utilities	x	x	x		https://www.epa.gov/crwu/forms/risk-assessment-technical-assistance-water-sector-utilities
Federal Emergency Management Agency Building Resilient Infrastructure and Communities Direct Technical Assistance	x	x	x		https://www.fema.gov/grants/mitigation/learn/building-resilient-infrastructure-communities/direct-technical-assistance/communities
Circuit Rider Program - Technical Assistance for Rural Water Systems (via the U.S. Department of Agriculture and the National Rural Water Association)	x				https://www.rd.usda.gov/programs-services/water-environmental-programs/circuit-rider-program-technical-assistance-rural-water-systems
Local Infrastructure Hub Grant Application Bootcamp	x	x	x		https://localinfrastructure.org/application-bootcamp/
American Water Works Association	x				https://www.awwa.org/contact-us/
Appalachian Management Systems LLP	x	x	x		https://appalachianms.com/
The Conservation Fund	x	x	x		https://www.conservationfund.org/about-us/contact-us/
Water Finance Exchange	x	x			https://waterfx.org/technical-assistance/

Provider Name	Water	Wastewater	Stormwater	Onsite Users	Website
U.S. Water Alliance	x	x	x		https://uswateralliance.org/programs/environmental-finance-center/
RCAP - Great Lakes Community Action Partnership (GLCAP)	x	x		x	https://www.glcap.org/programs/community-rural-development/rural-community-assistance-program-rcap/technical-assistance/
Ohio Environmental Protection Agency - Department of Environmental & Financial Assistance (DEFA)	x	x			https://epa.ohio.gov/divisions-and-offices/environmental-financial-assistance/financial-assistance/what-we-do
Ohio Rural Water Association	x	x			https://www.ohioruralwater.org/technical-assistance.html
Great Lakes Environmental Infrastructure Center at Michigan Technological University	x	x	x		https://gleic.org/technical-assistance
Ohio Municipal League	x	x	x		https://www.omlohio.org/
Mayors' Partnership for Progress	x	x			https://www.mayorspartnership.org/

Pennsylvania

Provider Name	Water	Wastewater	Stormwater	Onsite Users	Website
EPA Water TA Portal	x	x	x		https://www.epa.gov/water-infrastructure/water-technical-assistance-waterta
National Rural Water Association	x	x			https://nrwa.org/our-technical-assistance/
Community Engineering Corps	x	x	x		https://communityengineeringcorps.org/Communities
ARC Local Development Districts (LDDs, COGs, ADDs)	x	x			https://www.arc.gov/local-development-districts/
U.S. Army Corps of Engineers - Floodplain Management Services	x				https://www.sad.usace.army.mil/Missions/Assistance-Programs/Floodplain-Management-Services/
EPA Risk Assessment Technical Assistance for Water Sector Utilities	x	x	x		https://www.epa.gov/crwu/forms/risk-assessment-technical-assistance-water-sector-utilities
Federal Emergency Management Agency Building Resilient Infrastructure and Communities Direct Technical Assistance	x	x	x		https://www.fema.gov/grants/mitigation/learn/building-resilient-infrastructure-communities/direct-technical-assistance/communities
Circuit Rider Program - Technical Assistance for Rural Water Systems (via the U.S. Department of Agriculture and the National Rural Water Association)	x				https://www.rd.usda.gov/programs-services/water-environmental-programs/circuit-rider-program-technical-assistance-rural-water-systems
Local Infrastructure Hub Grant Application Bootcamp	x	x	x		https://localinfrastructure.org/application-bootcamp/
American Water Works Association	x				https://www.awwa.org/contact-us/
Appalachian Management Systems LLP	x	x	x		https://appalachianms.com/
The Conservation Fund	x	x	x		https://www.conservationfund.org/about-us/contact-us/
Water Finance Exchange	x	x			https://waterfx.org/technical-assistance/

Provider Name	Water	Wastewater	Stormwater	Onsite Users	Website
U.S. Water Alliance	x	x	x		https://uswateralliance.org/programs/environmental-finance-center/
Environmental Finance Center at the University of Maryland*	x	x			https://arch.umd.edu/research-creative-practice/centers/environmental-finance-center/project-areas/technical-assistance/region-3-waterta-program
RCAP - RCAP Solutions (RSOL)	x	x		x	https://www.rcapsolutions.org/contact-us/
Pennsylvania Rural Water Association	x	x	x		https://www.prwa.com/onsite
Governor's Center for Local Government Services (GCLGS)	x	x	x		https://dced.pa.gov/local-government/technical-assistance/
Pennsylvania Municipal Authorities Association	x	x			https://www.municipalauthorities.org/
Pennsylvania Department of Environmental Protection - Wastewater Technical Assistance Program		x			https://www.pa.gov/agencies/dep/programs-and-services/water/clean-water/wastewater-operations-and-assistance/wastewater-technical-assistance-program.html

South Carolina

Provider Name	Water	Wastewater	Stormwater	Onsite Users	Website
EPA Water TA Portal	x	x	x		https://www.epa.gov/water-infrastructure/water-technical-assistance-waterta
National Rural Water Association	x	x			https://nrwa.org/our-technical-assistance/
Community Engineering Corps	x	x	x		https://communityengineeringcorps.org/Communities
ARC Local Development Districts (LDDs, COGs, ADDs)	x	x			https://www.arc.gov/local-development-districts/
U.S. Army Corps of Engineers - Floodplain Management Services	x				https://www.sad.usace.army.mil/Missions/Assistance-Programs/Floodplain-Management-Services/
EPA Risk Assessment Technical Assistance for Water Sector Utilities	x	x	x		https://www.epa.gov/crwu/forms/risk-assessment-technical-assistance-water-sector-utilities
Federal Emergency Management Agency Building Resilient Infrastructure and Communities Direct Technical Assistance	x	x	x		https://www.fema.gov/grants/mitigation/learn/building-resilient-infrastructure-communities/direct-technical-assistance/communities
Circuit Rider Program - Technical Assistance for Rural Water Systems (via the U.S. Department of Agriculture and the National Rural Water Association)	x				https://www.rd.usda.gov/programs-services/water-environmental-programs/circuit-rider-program-technical-assistance-rural-water-systems
Local Infrastructure Hub Grant Application Bootcamp	x	x	x		https://localinfrastructure.org/application-bootcamp/
American Water Works Association	x				https://www.awwa.org/contact-us/
Appalachian Management Systems LLP	x	x	x		https://appalachianms.com/
The Conservation Fund	x	x	x		https://www.conservationfund.org/about-us/contact-us/
Water Finance Exchange	x	x			https://waterfx.org/technical-assistance/

Provider Name	Water	Wastewater	Stormwater	Onsite Users	Website
U.S. Water Alliance	x	x	x		https://uswateralliance.org/programs/environmental-finance-center/
RCAP - Southeast Rural Community Assistance Partnership (SERCAP)	x	x		x	https://sercap.org/get-help
SC Department of Environmental Services - Office of Rural Water	x				https://des.sc.gov/programs/bureau-water/office-rural-water
South Carolina Rural Water Association (SCRWA)	x	x			https://www.scrwa.org/
Municipal Association of South Carolina (MASC)	x	x	x		https://www.masc.sc/association/directory-services
Municipal Association of South Carolina	x	x	x		https://www.masc.sc/request-municipal-assistance

Tennessee

Provider Name	Water	Wastewater	Stormwater	Onsite Users	Website
EPA Water TA Portal	x	x	x		https://www.epa.gov/water-infrastructure/water-technical-assistance-waterta
National Rural Water Association	x	x			https://nrwa.org/our-technical-assistance/
Community Engineering Corps	x	x	x		https://communityengineeringcorps.org/Communities
ARC Local Development Districts (LDDs, COGs, ADDs)	x	x			https://www.arc.gov/local-development-districts/
U.S. Army Corps of Engineers - Floodplain Management Services	x				https://www.sad.usace.army.mil/Missions/Assistance-Programs/Floodplain-Management-Services/
EPA Risk Assessment Technical Assistance for Water Sector Utilities	x	x	x		https://www.epa.gov/crwu/forms/risk-assessment-technical-assistance-water-sector-utilities
Federal Emergency Management Agency Building Resilient Infrastructure and Communities Direct Technical Assistance	x	x	x		https://www.fema.gov/grants/mitigation/learn/building-resilient-infrastructure-communities/direct-technical-assistance/communities
Circuit Rider Program - Technical Assistance for Rural Water Systems (via the U.S. Department of Agriculture and the National Rural Water Association)	x				https://www.rd.usda.gov/programs-services/water-environmental-programs/circuit-rider-program-technical-assistance-rural-water-systems
Local Infrastructure Hub Grant Application Bootcamp	x	x	x		https://localinfrastructure.org/application-bootcamp/
American Water Works Association	x				https://www.awwa.org/contact-us/
Appalachian Management Systems LLP	x	x	x		https://appalachianms.com/
The Conservation Fund	x	x	x		https://www.conservationfund.org/about-us/contact-us/
Water Finance Exchange	x	x			https://waterfx.org/technical-assistance/

Provider Name	Water	Wastewater	Stormwater	Onsite Users	Website
U.S. Water Alliance	x	x	x		https://uswateralliance.org/programs/environmental-finance-center/
Tennessee Valley Authority - Managing Water Supply	x				https://www.tva.com/environment/managing-the-river/managing-water-supply
RCAP - Communities Unlimited (CU)	x	x		x	https://communitiesu.org/environmental/
Appalachian Community Technical Assistance and Training (ACTAT) Program	x	x			https://actat.wvu.edu/
Tennessee Rural Water Association	x	x			https://taud.org/
Tennessee Association of Utility Districts	x	x			https://taud.org/
University of Tennessee Institute for Public Service Municipal Technical Advisory Service	x	x			https://www.mtas.tennessee.edu/
The University of Tennessee, Knoxville - Tennessee Water Technical Assistance	x	x			https://tnwaterta.sites.utk.edu/

Virginia

Provider Name	Water	Wastewater	Stormwater	Onsite Users	Website
EPA Water TA Portal	x	x	x		https://www.epa.gov/water-infrastructure/water-technical-assistance-waterta
National Rural Water Association	x	x			https://nrwa.org/our-technical-assistance/
Community Engineering Corps	x	x	x		https://communityengineeringcorps.org/Communities
ARC Local Development Districts (LDDs, COGs, ADDs)	x	x			https://www.arc.gov/local-development-districts/
U.S. Army Corps of Engineers - Floodplain Management Services	x				https://www.sad.usace.army.mil/Missions/Assistance-Programs/Floodplain-Management-Services/
EPA Risk Assessment Technical Assistance for Water Sector Utilities	x	x	x		https://www.epa.gov/crwu/forms/risk-assessment-technical-assistance-water-sector-utilities
Federal Emergency Management Agency Building Resilient Infrastructure and Communities Direct Technical Assistance	x	x	x		https://www.fema.gov/grants/mitigation/learn/building-resilient-infrastructure-communities/direct-technical-assistance/communities
Circuit Rider Program - Technical Assistance for Rural Water Systems (via the U.S. Department of Agriculture and the National Rural Water Association)	x				https://www.rd.usda.gov/programs-services/water-environmental-programs/circuit-rider-program-technical-assistance-rural-water-systems
Local Infrastructure Hub Grant Application Bootcamp	x	x	x		https://localinfrastructure.org/application-bootcamp/
American Water Works Association	x				https://www.awwa.org/contact-us/
Appalachian Management Systems LLP	x	x	x		https://appalachianms.com/
The Conservation Fund	x	x	x		https://www.conservationfund.org/about-us/contact-us/
Water Finance Exchange	x	x			https://waterfx.org/technical-assistance/

Provider Name	Water	Wastewater	Stormwater	Onsite Users	Website
U.S. Water Alliance	x	x	x		https://uswateralliance.org/programs/environmental-finance-center/
Tennessee Valley Authority - Managing Water Supply	x				https://www.tva.com/environment/managing-the-river/managing-water-supply
RCAP - Southeast Rural Community Assistance Partnership (SERCAP)	x	x		x	https://sercap.org/get-help
Environmental Finance Center at the University of Maryland*	x	x			https://arch.umd.edu/research-creative-practice/centers/environmental-finance-center/project-areas/technical-assistance/region-3-waterta-program
Virginia Rural Water Association	x	x			https://www.vrwa.org/
Virginia Municipal League	x	x	x		https://www.vml.org/Organization/About-the-League
Virginia Department of Health -- Source Water Protection Program	x				https://www.vdh.virginia.gov/drinking-water/source-water-programs/source-water-protection-program/

West Virginia

Provider Name	Water	Wastewater	Stormwater	Onsite Users	Website
EPA Water TA Portal	x	x	x		https://www.epa.gov/water-infrastructure/water-technical-assistance-waterta
National Rural Water Association	x	x			https://nrwa.org/our-technical-assistance/
Community Engineering Corps	x	x	x		https://communityengineeringcorps.org/Communities
ARC Local Development Districts (LDDs, COGs, ADDs)	x	x			https://www.arc.gov/local-development-districts/
U.S. Army Corps of Engineers - Floodplain Management Services	x				https://www.sad.usace.army.mil/Missions/Assistance-Programs/Floodplain-Management-Services/
EPA Risk Assessment Technical Assistance for Water Sector Utilities	x	x	x		https://www.epa.gov/crwu/forms/risk-assessment-technical-assistance-water-sector-utilities
Federal Emergency Management Agency Building Resilient Infrastructure and Communities Direct Technical Assistance	x	x	x		https://www.fema.gov/grants/mitigation/learn/building-resilient-infrastructure-communities/direct-technical-assistance/communities
Circuit Rider Program - Technical Assistance for Rural Water Systems (via the U.S. Department of Agriculture and the National Rural Water Association)	x				https://www.rd.usda.gov/programs-services/water-environmental-programs/circuit-rider-program-technical-assistance-rural-water-systems
Local Infrastructure Hub Grant Application Bootcamp	x	x	x		https://localinfrastructure.org/application-bootcamp/
American Water Works Association	x				https://www.awwa.org/contact-us/
Appalachian Management Systems LLP	x	x	x		https://appalachianms.com/
The Conservation Fund	x	x	x		https://www.conservationfund.org/about-us/contact-us/
Water Finance Exchange	x	x			https://waterfx.org/technical-assistance/

Provider Name	Water	Wastewater	Stormwater	Onsite Users	Website
U.S. Water Alliance	x	x	x		https://uswateralliance.org/programs/environmental-finance-center/
RCAP - Great Lakes Community Action Partnership (GLCAP)	x	x		x	https://www.glcap.org/programs/community-rural-development/rural-community-assistance-program-rcap/technical-assistance/
Appalachian Community Technical Assistance and Training (ACTAT) Program	x	x			https://actat.wvu.edu/
Environmental Finance Center at the University of Maryland*	x	x			https://arch.umd.edu/research-creative-practice/centers/environmental-finance-center/project-areas/technical-assistance/region-3-waterta-program
West Virginia Rural Water Association	x	x			https://wvrwa.org/arc-specialist
West Virginia Municipal League	x	x	x		https://www.wvml.org/

Appendix J. Affordability Analysis Methods and Additional Visualizations

Affordability Methods

SOG EFC researchers leveraged rate information for 4,442 bills from 2,814 utilities across twelve of thirteen Appalachian states. The project team removed information for 65 bills across 49 utilities (1.46% bills) from consideration because they did not have accurate location data. The final sample size of utilities included in the analysis is 4,377. One of the limitations of these data is that they were not all collected in the same year (Appendix Table J.1). The project team used the consumer price index to ensure that comparisons are made in terms of 2024 dollars.

Appendix Table J.1: Number of Rates Included in the Affordability Analysis

Geographic Area	# of Rates					Total Number of Rates	% of Rates in Appalachia
	2018	2020	2022	2023	2024		
Alabama	0	0	0	566	0	566	61%
Georgia	0	0	0	824	0	824	27%
Kentucky	0	0	0	0	40	40	92%
Maryland	No Data					No Data	N/A
Mississippi	0	0	425	0	0	425	22%
New York	0	0	0	0	53	53	96%
North Carolina	0	0	0	920	0	920	24%
Ohio	0	612	0	0	61	673	35%
Pennsylvania	0	0	0	0	97	97	99%
South Carolina	0	0	0	0	23	23	100%
Tennessee	0	0	0	0	108	108	97%
Virginia	269	0	0	0	64	333	36%
West Virginia	0	0	315	0	0	315	100%
Appalachian States	**269**	**612**	**740**	**2,310**	**446**	**4,377**	**43%**

Source: Data collected by SOG EFC staff between 2018 and 2024

Of the 423 counties across the Appalachian Region, the dataset covers 338 (80%) (Appendix Table J.2).

Appendix Table J.2: Counties Represented in the Affordability Analysis

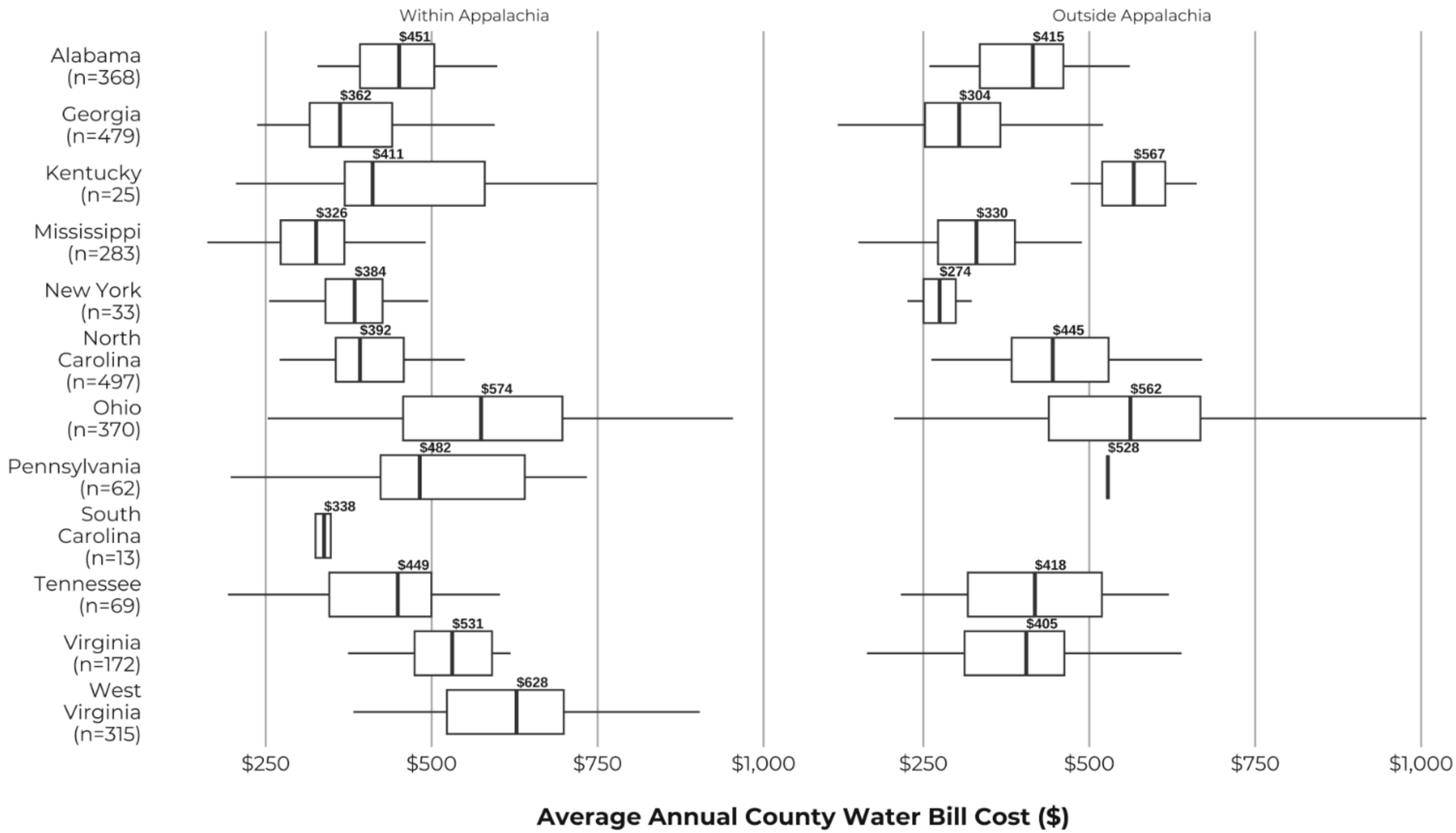
State	Number of Counties Represented in Analysis		Total Number of Counties in State	% of Counties Represented in Analysis
	Within Appalachia	Outside Appalachia		
Alabama	37	29	67	99%
Georgia	36	120	159	98%
Kentucky	19	2	120	18%
Maryland	No Data		23	0%
Mississippi	23	53	82	93%
New York	13	2	62	24%
North Carolina	31	69	100	100%
Ohio	31	56	88	99%
Pennsylvania	32	1	67	49%
South Carolina	5	0	46	11%
Tennessee	40	2	95	44%
Virginia	16	74	133	68%
West Virginia	55	0	55	100%
Overall	**338**	**408**	**1,097**	**31%**

Source: Data collected by SOG EFC staff between 2018 and 2024

Additional Data Visualizations

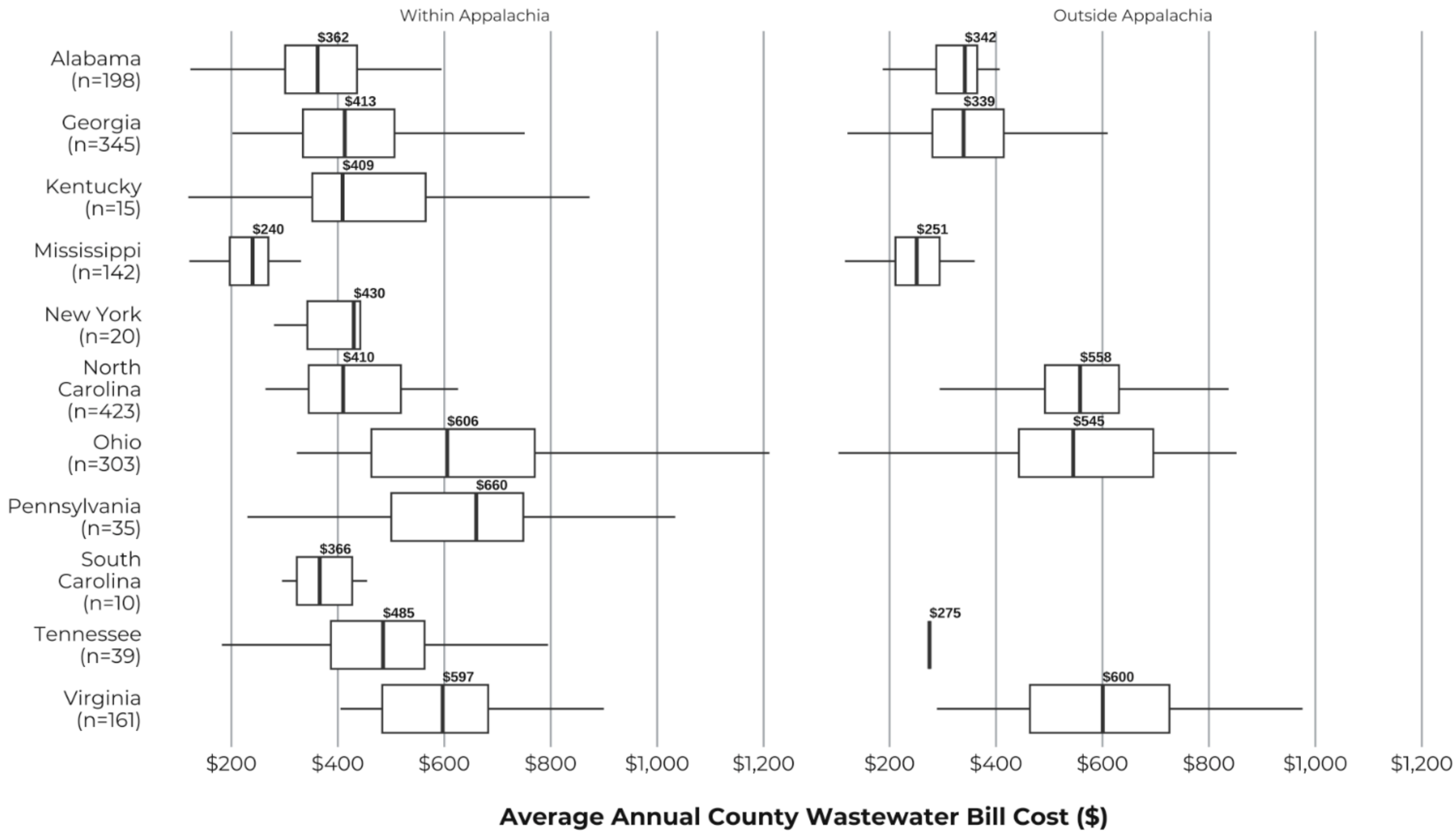
Appendix Figures J.1 (page 197) and J.2 (page 198) show boxplots of bill cost by state, within and outside Appalachia, while Appendix Figures J.3 (page 199) and J.4 (page 200) show average bills as a percentage of median household income. Finally, Appendix Table J.3 (page 201) shows number rates, average annual bill (as dollars and percentage of MHI), and the maximum annual bill as a percentage of MHI for all counties within Appalachia for which the project team had data.

Appendix Figure J.1: Boxplots of Water Bill Cost by State, Within and Outside Appalachia



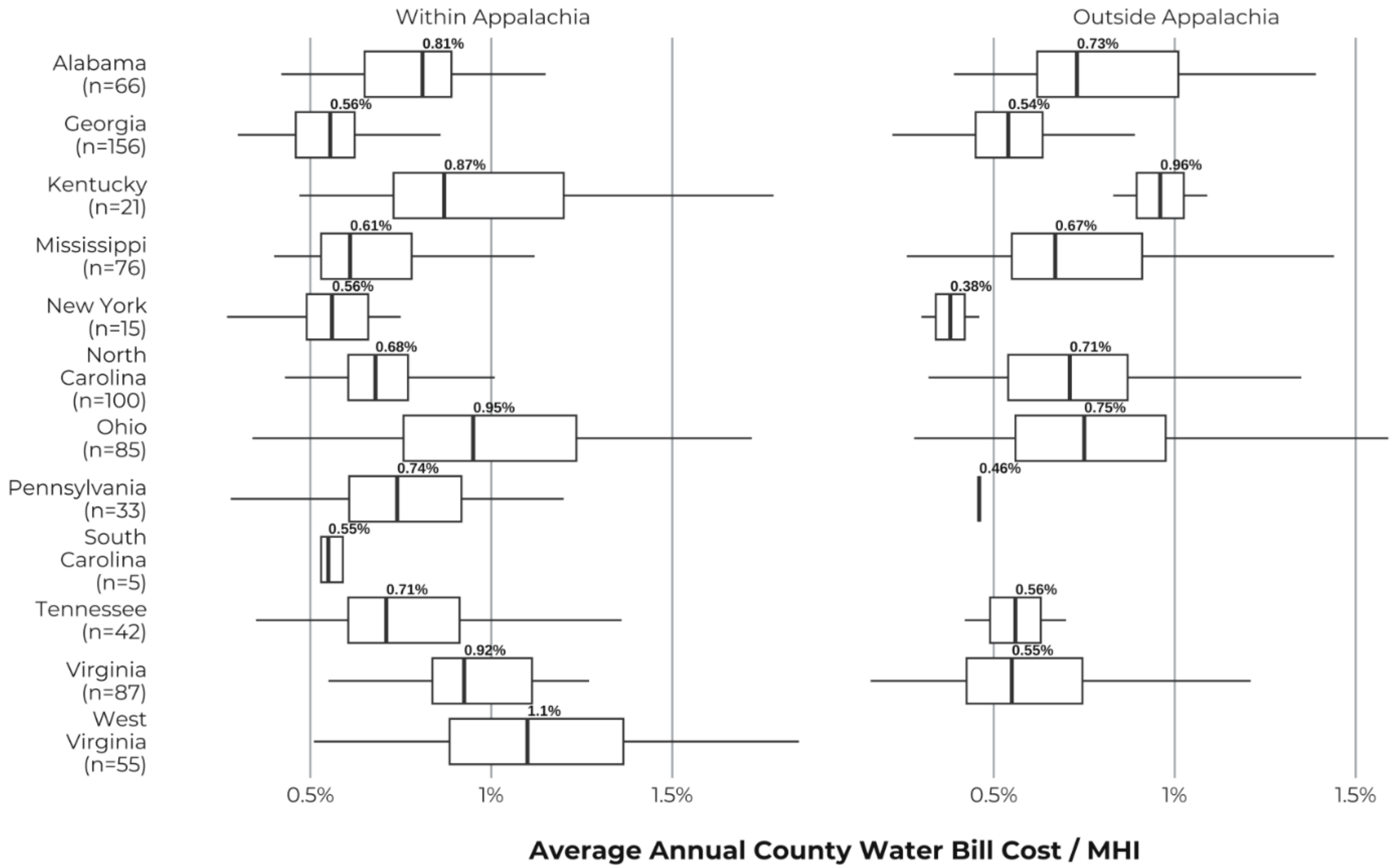
Source: Data collected by SOG EFC staff between 2018 and 2024
Notes: N represents the total number of <u>water</u> rates included in the analysis (within and outside Appalachia combined). No rates were collected in Maryland.

Appendix Figure J.2: Boxplots of Wastewater Bill Cost by State, Within and Outside Appalachia



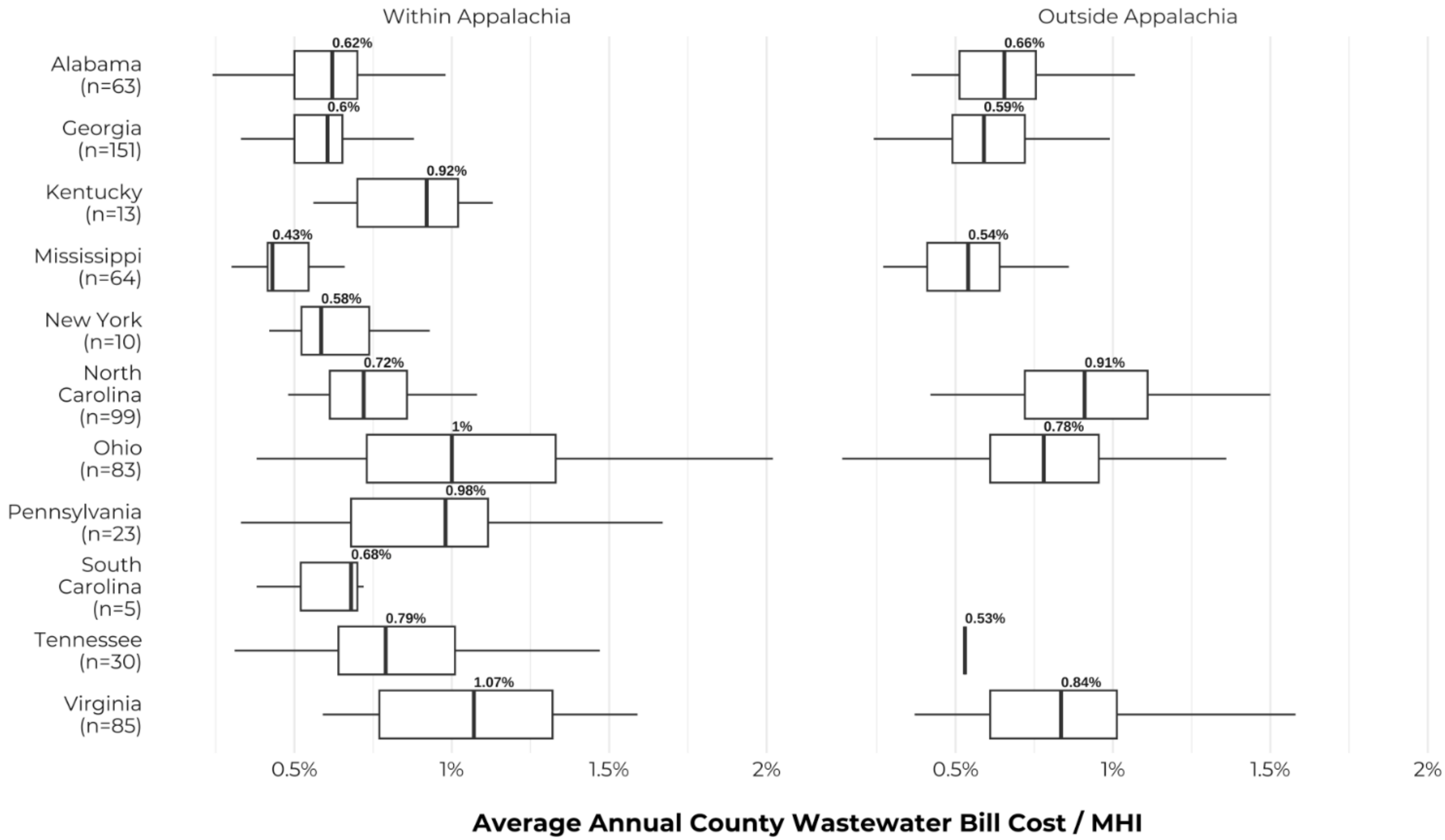
Source: Data collected by SOG EFC staff between 2018 and 2024
Notes: N represents the total number of wastewater rates included in the analysis (within and outside Appalachia combined). No rates were collected in Maryland or West Virginia.

Appendix Figure J.3: Average Annual County Water Bill Cost as a Percent of Median Household Income (MHI)



Source: Data collected by SOG EFC staff between 2018 and 2024
Notes: N represents the total number of counties with data for <u>water</u> rates included in the analysis (within and outside Appalachia combined). No rates were collected in Maryland.

Appendix Figure J.4: Average Annual County Wastewater Bill Cost as a Percent of Median Household Income (MHI)



Source: Data collected by SOG EFC staff between 2018 and 2024.
Notes: N represents the total number of counties with data for wastewater rates included in the analysis (within and outside Appalachia combined). No rates were collected in Maryland.

Appendix Table J.3: Water and Wastewater Bills by County in Appalachia (continued on next page)

State	County	# of Rates		Avg. Annual Bill		Avg. Annual Bill as % MHI		Max. Annual Bill as % MHI	
		Water	WW	Water	WW	Water	WW	Water	WW
Alabama	Bibb	5	3	$457	$344	0.87%	0.65%	1.23%	0.94%
Alabama	Blount	9	4	$556	$424	0.88%	0.67%	1.30%	0.86%
Alabama	Calhoun	7	2	$333	$235	0.58%	0.41%	0.81%	0.47%
Alabama	Chambers	4	3	$328	$314	0.65%	0.62%	0.81%	0.84%
Alabama	Cherokee	3	3	$391	$309	0.75%	0.59%	0.82%	0.67%
Alabama	Chilton	4	3	$482	$445	0.76%	0.70%	0.86%	1.05%
Alabama	Clay	3	1	$548	$258	1.03%	0.48%	1.18%	0.48%
Alabama	Cleburne	3	1	$445	$296	0.81%	0.54%	1.14%	0.54%
Alabama	Colbert	8	6	$429	$360	0.73%	0.62%	0.96%	0.76%
Alabama	Coosa	4	2	$477	$240	0.81%	0.41%	0.93%	0.50%
Alabama	Cullman	7	6	$558	$451	0.89%	0.72%	1.06%	1.42%
Alabama	DeKalb	9	3	$524	$220	1%	0.42%	1.28%	0.56%
Alabama	Elmore	8	4	$343	$346	0.44%	0.44%	0.64%	0.50%
Alabama	Etowah	10	5	$453	$398	0.83%	0.73%	1.30%	0.81%
Alabama	Fayette	2	1	$599	$123	1.15%	0.24%	1.37%	0.24%
Alabama	Franklin	5	2	$497	$318	0.94%	0.60%	1.38%	0.68%
Alabama	Hale	3	2	$353	$207	0.83%	0.49%	1.45%	0.74%
Alabama	Jackson	9	5	$401	$452	0.79%	0.89%	1.04%	1.04%
Alabama	Jefferson	12	9	$575	$1,687	0.86%	2.54%	1.83%	14.37%
Alabama	Lamar	4	3	$451	$301	0.92%	0.62%	1.20%	0.81%
Alabama	Lauderdale	7	2	$390	$595	0.64%	0.98%	0.89%	1.16%
Alabama	Lawrence	2	1	$432	$416	0.70%	0.67%	0.72%	0.67%
Alabama	Limestone	3	3	$455	$495	0.53%	0.58%	0.59%	0.80%
Alabama	Macon	1	1	$465	$336	0.98%	0.71%	0.98%	0.71%
Alabama	Madison	8	7	$359	$425	0.42%	0.49%	0.56%	0.76%
Alabama	Marion	6	4	$434	$298	0.83%	0.57%	0.97%	0.73%
Alabama	Marshall	4	2	$429	$436	0.68%	0.70%	0.83%	0.92%
Alabama	Morgan	6	5	$363	$430	0.54%	0.64%	0.74%	0.86%
Alabama	Pickens	3	3	$392	$241	0.81%	0.50%	0.89%	0.56%
Alabama	Randolph	3	2	$473	$328	0.89%	0.62%	1.10%	0.94%
Alabama	Shelby	11	4	$404	$458	0.42%	0.48%	0.59%	0.69%
Alabama	St. Clair	8	4	$412	$419	0.51%	0.52%	0.64%	0.86%
Alabama	Talladega	7	3	$366	$367	0.63%	0.63%	0.84%	0.73%
Alabama	Tallapoosa	7	2	$529	$770	0.90%	1.31%	1.27%	1.48%
Alabama	Tuscaloosa	10	5	$516	$400	0.78%	0.61%	1.08%	0.94%
Alabama	Walker	13	5	$575	$362	1.03%	0.65%	1.45%	0.89%
Alabama	Winston	5	2	$504	$448	1.02%	0.91%	1.14%	0.93%

Appendix Table J.3 (continued): Water and Wastewater Bills by County in Appalachia (continued on next page)

State	County	# of Rates		Avg. Annual Bill		Avg. Annual Bill as % MHI		Max. Annual Bill as % MHI	
		Water	WW	Water	WW	Water	WW	Water	WW
Georgia	Banks	3	2	$403	$457	0.57%	0.64%	0.69%	0.66%
Georgia	Barrow	5	5	$493	$409	0.62%	0.51%	0.72%	0.64%
Georgia	Bartow	6	5	$322	$408	0.39%	0.50%	0.53%	0.73%
Georgia	Carroll	8	5	$348	$461	0.47%	0.62%	0.57%	0.83%
Georgia	Catoosa	3	2	$305	$425	0.41%	0.57%	0.46%	0.72%
Georgia	Chattooga	5	4	$303	$300	0.62%	0.61%	0.74%	0.99%
Georgia	Cherokee	5	4	$360	$457	0.33%	0.42%	0.42%	0.48%
Georgia	Dade	7	1	$368	$288	0.61%	0.47%	0.72%	0.47%
Georgia	Dawson	2	2	$577	$586	0.63%	0.64%	0.76%	0.65%
Georgia	Douglas	1	1	$409	$551	0.49%	0.66%	0.49%	0.66%
Georgia	Elbert	2	2	$289	$316	0.56%	0.62%	0.68%	0.68%
Georgia	Fannin	3	2	$481	$556	0.80%	0.93%	0.86%	1.05%
Georgia	Floyd	6	5	$338	$487	0.53%	0.76%	0.61%	1.02%
Georgia	Forsyth	2	2	$275	$504	0.19%	0.35%	0.22%	0.38%
Georgia	Franklin	5	4	$318	$323	0.59%	0.60%	0.68%	0.71%
Georgia	Gilmer	1	1	$325	$369	0.43%	0.49%	0.43%	0.49%
Georgia	Gordon	2	2	$391	$238	0.61%	0.37%	0.79%	0.46%
Georgia	Gwinnett	3	2	$259	$285	0.30%	0.33%	0.42%	0.62%
Georgia	Habersham	6	4	$370	$433	0.55%	0.64%	0.73%	0.95%
Georgia	Hall	4	3	$318	$534	0.40%	0.67%	0.52%	0.69%
Georgia	Haralson	5	4	$311	$333	0.47%	0.50%	0.52%	0.65%
Georgia	Hart	2	1	$388	$471	0.66%	0.80%	0.67%	0.80%
Georgia	Heard	2	1	$478	$568	0.74%	0.88%	0.83%	0.88%
Georgia	Jackson	5	4	$428	$514	0.49%	0.59%	0.60%	0.67%
Georgia	Lumpkin	2	2	$700	$751	0.94%	1.01%	1.01%	1.28%
Georgia	Madison	6	3	$364	$396	0.60%	0.65%	0.70%	0.77%
Georgia	Murray	1	1	$283	$335	0.40%	0.48%	0.40%	0.48%
Georgia	Paulding	3	2	$481	$533	0.49%	0.55%	0.65%	0.58%
Georgia	Pickens	3	2	$595	$202	0.77%	0.26%	0.93%	0.30%
Georgia	Polk	3	3	$297	$417	0.52%	0.73%	0.74%	0.96%
Georgia	Rabun	4	3	$541	$402	0.86%	0.64%	1.16%	0.69%
Georgia	Stephens	2	1	$325	$298	0.60%	0.55%	0.63%	0.55%
Georgia	Towns	4	3	$512	$574	0.85%	0.95%	0.97%	0.97%
Georgia	Union	3	1	$319	$337	0.47%	0.50%	0.57%	0.50%
Georgia	Walker	4	4	$370	$358	0.64%	0.62%	0.87%	0.87%
Georgia	White	2	2	$237	$360	0.33%	0.50%	0.35%	0.52%
Georgia	Whitfield	No Data							

Appendix Table J.3 (continued): Water and Wastewater Bills by County in Appalachia (continued on next page)

State	County	# of Rates		Avg. Annual Bill		Avg. Annual Bill as % MHI		Max. Annual Bill as % MHI	
		Water	WW	Water	WW	Water	WW	Water	WW
Kentucky	Adair	No Data							
Kentucky	Bath	1	1	$629	$629	1.13%	1.13%	1.13%	1.13%
Kentucky	Bell	No Data							
Kentucky	Boyd	1	1	$407	$352	0.65%	0.56%	0.65%	0.56%
Kentucky	Breathitt	No Data							
Kentucky	Carter	No Data							
Kentucky	Casey	No Data							
Kentucky	Clark	1	1	$350	$119	0.50%	0.17%	0.50%	0.17%
Kentucky	Clay	No Data							
Kentucky	Clinton	No Data							
Kentucky	Cumberland	1	1	$381	$395	0.93%	0.97%	0.93%	0.97%
Kentucky	Edmonson	No Data							
Kentucky	Elliott	No Data							
Kentucky	Estill	No Data							
Kentucky	Fleming	No Data							
Kentucky	Floyd	1	1	$544	$437	1.27%	1.02%	1.27%	1.02%
Kentucky	Garrard	No Data							
Kentucky	Green	No Data							
Kentucky	Greenup	1	1	$483	$565	0.79%	0.92%	0.79%	0.92%
Kentucky	Harlan	No Data							
Kentucky	Hart	No Data							
Kentucky	Jackson	1	1	$360	$409	0.84%	0.96%	0.84%	0.96%
Kentucky	Johnson	No Data							
Kentucky	Knott	1	1	$1,799	$873	4.63%	2.25%	4.63%	2.25%
Kentucky	Knox	No Data							
Kentucky	Laurel	1	No Data	$391	No Data	0.67%	No Data	0.67%	No Data
Kentucky	Lawrence	1	No Data	$378	No Data	0.81%	No Data	0.81%	No Data
Kentucky	Lee	No Data							
Kentucky	Leslie	No Data							
Kentucky	Letcher	1	No Data	$638	No Data	1.53%	No Data	1.53%	No Data
Kentucky	Lewis	No Data							
Kentucky	Lincoln	No Data							
Kentucky	Madison	2	2	$303	$453	0.47%	0.70%	0.55%	0.92%
Kentucky	Magoffin	1	No Data	$616	No Data	1.78%	No Data	1.78%	No Data
Kentucky	Martin	1	1	$749	$751	1.57%	1.58%	1.57%	1.58%
Kentucky	McCreary	No Data							
Kentucky	Menifee	No Data							

Appendix Table J.3 (continued): Water and Wastewater Bills by County in Appalachia (continued on next page)

State	County	# of Rates		Avg. Annual Bill		Avg. Annual Bill as % MHI		Max. Annual Bill as % MHI	
		Water	WW	Water	WW	Water	WW	Water	WW
Kentucky	Metcalfe	No Data							
Kentucky	Monroe	No Data							
Kentucky	Montgomery	No Data							
Kentucky	Morgan	No Data							
Kentucky	Nicholas	No Data							
Kentucky	Owsley	No Data							
Kentucky	Perry	1	No Data	$411	No Data	0.88%	No Data	0.88%	No Data
Kentucky	Pike	1	1	$420	$330	0.97%	0.76%	0.97%	0.76%
Kentucky	Powell	No Data							
Kentucky	Pulaski	2	No Data	$455	No Data	0.87%	No Data	0.99%	No Data
Kentucky	Robertson	No Data							
Kentucky	Rockcastle	No Data							
Kentucky	Rowan	No Data							
Kentucky	Russell	No Data							
Kentucky	Wayne	1	1	$354	$379	0.82%	0.88%	0.82%	0.88%
Kentucky	Whitley	2	2	$205	$258	0.48%	0.60%	0.60%	0.61%
Kentucky	Wolfe	No Data							
Maryland	Allegany	No Data							
Maryland	Garrett	No Data							
Maryland	Washington	No Data							
Mississippi	Alcorn	2	No Data	$451	No Data	0.88%	No Data	0.97%	No Data
Mississippi	Benton	1	1	$244	$183	0.59%	0.44%	0.59%	0.44%
Mississippi	Calhoun	3	2	$424	$199	0.89%	0.42%	1.02%	0.46%
Mississippi	Chickasaw	2	2	$373	$283	0.87%	0.66%	0.95%	0.95%
Mississippi	Choctaw	1	1	$244	$195	0.54%	0.44%	0.54%	0.44%
Mississippi	Clay	1	1	$162	$121	0.40%	0.30%	0.40%	0.30%
Mississippi	Itawamba	No Data							
Mississippi	Kemper	1	No Data	$514	No Data	1.12%	No Data	1.12%	No Data
Mississippi	Lee	7	5	$282	$267	0.41%	0.39%	0.67%	0.63%
Mississippi	Lowndes	3	2	$326	$241	0.57%	0.42%	0.58%	0.44%
Mississippi	Marshall	1	No Data	$491	No Data	0.89%	No Data	0.89%	No Data
Mississippi	Monroe	4	1	$337	$267	0.61%	0.49%	0.73%	0.49%
Mississippi	Montgomery	4	1	$418	$261	1.06%	0.66%	1.34%	0.66%
Mississippi	Noxubee	1	1	$212	$190	0.47%	0.42%	0.47%	0.42%
Mississippi	Oktibbeha	4	2	$320	$180	0.69%	0.39%	0.91%	0.47%
Mississippi	Panola	3	2	$344	$222	0.67%	0.43%	0.95%	0.63%
Mississippi	Pontotoc	3	2	$304	$309	0.52%	0.53%	0.56%	0.56%

Appendix Table J.3 (continued): Water and Wastewater Bills by County in Appalachia (continued on next page)

State	County	# of Rates		Avg. Annual Bill		Avg. Annual Bill as % MHI		Max. Annual Bill as % MHI	
		Water	WW	Water	WW	Water	WW	Water	WW
Mississippi	Prentiss	3	1	$347	$240	0.63%	0.43%	0.72%	0.43%
Mississippi	Tippah	3	2	$298	$209	0.58%	0.41%	0.70%	0.51%
Mississippi	Tishomingo	5	3	$263	$297	0.54%	0.61%	0.62%	0.77%
Mississippi	Union	3	No Data	$364	No Data	0.61%	No Data	0.69%	No Data
Mississippi	Webster	2	2	$297	$206	0.50%	0.34%	0.52%	0.41%
Mississippi	Winston	1	1	$246	$272	0.50%	0.56%	0.50%	0.56%
Mississippi	Yalobusha	3	1	$346	$331	0.69%	0.66%	0.79%	0.66%
New York	Allegany	No Data							
New York	Broome	3	2	$255	$443	0.41%	0.70%	0.56%	0.73%
New York	Cattaraugus	2	2	$396	$338	0.66%	0.56%	0.86%	0.82%
New York	Chautauqua	5	3	$426	$435	0.73%	0.75%	0.85%	0.94%
New York	Chemung	1	No Data	$177	No Data	0.27%	No Data	0.27%	No Data
New York	Chenango	2	2	$340	$305	0.53%	0.48%	0.65%	0.53%
New York	Cortland	1	1	$206	$357	0.30%	0.51%	0.30%	0.51%
New York	Delaware	1	No Data	$468	No Data	0.75%	No Data	0.75%	No Data
New York	Otsego	3	2	$384	$640	0.56%	0.93%	0.71%	1%
New York	Schoharie	1	1	$480	$440	0.65%	0.60%	0.65%	0.60%
New York	Schuyler	2	2	$403	$624	0.60%	0.92%	0.61%	1.04%
New York	Steuben	4	1	$343	$280	0.51%	0.42%	0.67%	0.42%
New York	Tioga	1	No Data	$364	No Data	0.49%	No Data	0.49%	No Data
New York	Tompkins	5	4	$495	$425	0.66%	0.57%	0.87%	0.78%
North Carolina	Alexander	2	1	$405	$392	0.60%	0.58%	0.62%	0.58%
North Carolina	Alleghany	1	1	$404	$339	0.89%	0.74%	0.89%	0.74%
North Carolina	Ashe	3	3	$390	$318	0.75%	0.61%	0.86%	0.80%
North Carolina	Avery	4	4	$325	$339	0.55%	0.57%	0.72%	0.72%
North Carolina	Buncombe	4	2	$456	$435	0.63%	0.60%	0.74%	0.61%
North Carolina	Burke	8	6	$390	$403	0.68%	0.70%	1.06%	1.16%
North Carolina	Caldwell	5	5	$360	$417	0.63%	0.73%	0.76%	1.01%
North Carolina	Catawba	6	6	$389	$503	0.59%	0.76%	1.19%	1.58%
North Carolina	Cherokee	2	2	$402	$329	0.76%	0.62%	0.83%	0.83%
North Carolina	Clay	1	1	$271	$271	0.49%	0.49%	0.49%	0.49%
North Carolina	Cleveland	9	9	$392	$527	0.68%	0.92%	1.15%	1.27%
North Carolina	Davie	3	5	$761	$1,573	1.01%	2.09%	2.02%	5.35%
North Carolina	Forsyth	4	4	$291	$481	0.43%	0.71%	0.46%	0.86%
North Carolina	Graham	3	2	$498	$434	0.99%	0.86%	1.48%	0.98%
North Carolina	Haywood	8	5	$407	$399	0.65%	0.64%	0.80%	1.02%
North Carolina	Henderson	1	No Data	$324	No Data	0.47%	No Data	0.47%	No Data

Appendix Table J.3 (continued): Water and Wastewater Bills by County in Appalachia (continued on next page)

State	County	# of Rates		Avg. Annual Bill		Avg. Annual Bill as % MHI		Max. Annual Bill as % MHI	
		Water	WW	Water	WW	Water	WW	Water	WW
North Carolina	Jackson	1	3	$351	$576	0.64%	1.05%	0.64%	1.73%
North Carolina	Macon	2	2	$416	$402	0.76%	0.73%	0.81%	0.81%
North Carolina	Madison	3	3	$373	$380	0.62%	0.63%	0.79%	0.83%
North Carolina	McDowell	3	2	$383	$275	0.67%	0.48%	0.88%	0.53%
North Carolina	Mitchell	2	2	$272	$284	0.45%	0.48%	0.45%	0.50%
North Carolina	Polk	3	3	$492	$616	0.78%	0.98%	1.12%	1.12%
North Carolina	Rutherford	8	5	$460	$551	0.90%	1.08%	1.40%	2.17%
North Carolina	Stokes	4	3	$433	$493	0.70%	0.80%	1.20%	1.41%
North Carolina	Surry	7	6	$550	$626	0.95%	1.08%	1.25%	1.45%
North Carolina	Swain	2	1	$281	$364	0.49%	0.64%	0.61%	0.64%
North Carolina	Transylvania	2	2	$498	$520	0.75%	0.78%	0.91%	0.91%
North Carolina	Watauga	4	3	$537	$514	1.02%	0.97%	1.17%	1.17%
North Carolina	Wilkes	6	1	$317	$264	0.61%	0.51%	0.79%	0.51%
North Carolina	Yadkin	6	7	$502	$526	0.81%	0.85%	1.45%	1.02%
North Carolina	Yancey	1	1	$387	$387	0.68%	0.68%	0.68%	0.68%
Ohio	Adams	2	1	$645	$704	1.33%	1.45%	1.47%	1.45%
Ohio	Ashtabula	4	4	$640	$770	1.10%	1.33%	1.73%	1.77%
Ohio	Athens	7	6	$694	$687	1.32%	1.30%	2.15%	2.72%
Ohio	Belmont	9	9	$576	$667	0.93%	1.08%	1.65%	1.67%
Ohio	Brown	3	2	$698	$958	0.98%	1.33%	1.17%	1.88%
Ohio	Carroll	2	1	$291	$480	0.46%	0.75%	0.57%	0.75%
Ohio	Clermont	3	2	$285	$323	0.34%	0.38%	0.56%	0.43%
Ohio	Columbiana	4	5	$518	$465	0.86%	0.78%	1.35%	1.24%
Ohio	Coshocton	4	3	$373	$501	0.65%	0.88%	0.87%	1.04%
Ohio	Gallia	2	2	$754	$874	1.27%	1.47%	1.59%	1.89%
Ohio	Guernsey	2	2	$954	$902	1.70%	1.61%	1.76%	1.76%
Ohio	Harrison	5	3	$705	$1,211	1.18%	2.02%	1.50%	2.93%
Ohio	Highland	6	6	$463	$649	0.75%	1.05%	1.06%	1.55%
Ohio	Hocking	1	1	$269	$367	0.43%	0.58%	0.43%	0.58%
Ohio	Holmes	7	2	$348	$473	0.45%	0.61%	0.76%	0.89%
Ohio	Jackson	No Data	1	No Data	$736	No Data	1.22%	No Data	1.22%
Ohio	Jefferson	5	4	$694	$637	1.22%	1.12%	1.59%	1.53%
Ohio	Lawrence	3	3	$407	$457	0.72%	0.81%	0.89%	1.29%
Ohio	Mahoning	2	2	$707	$468	1.24%	0.82%	1.43%	1.11%
Ohio	Meigs	4	2	$868	$1,141	1.72%	2.25%	2.63%	2.62%
Ohio	Monroe	2	No Data	$493	No Data	0.83%	No Data	1.10%	No Data
Ohio	Morgan	6	4	$636	$856	1.19%	1.58%	1.73%	2.11%

Appendix Table J.3 (continued): Water and Wastewater Bills by County in Appalachia (continued on next page)

State	County	# of Rates		Avg. Annual Bill		Avg. Annual Bill as % MHI		Max. Annual Bill as % MHI	
		Water	WW	Water	WW	Water	WW	Water	WW
Ohio	Muskingum	8	6	$473	$560	0.80%	0.95%	1.20%	1.20%
Ohio	Noble	3	No Data	$882	No Data	1.45%	No Data	1.72%	No Data
Ohio	Perry	9	7	$630	$770	0.97%	1.18%	1.37%	1.98%
Ohio	Pike	2	1	$573	$341	1.09%	0.67%	1.33%	0.67%
Ohio	Ross	3	6	$253	$421	0.41%	0.67%	0.56%	0.97%
Ohio	Scioto	2	No Data	$859	No Data	1.69%	No Data	1.75%	No Data
Ohio	Trumbull	14	5	$455	$342	0.78%	0.59%	1.34%	0.75%
Ohio	Tuscarawas	8	6	$522	$425	0.79%	0.64%	1.22%	1.01%
Ohio	Vinton	No Data							
Ohio	Washington	6	3	$535	$574	0.85%	0.91%	1.13%	1.06%
Pennsylvania	Allegheny	4	1	$444	$478	0.56%	0.61%	0.72%	0.61%
Pennsylvania	Armstrong	3	2	$446	$786	0.67%	1.19%	0.78%	1.43%
Pennsylvania	Beaver	No Data							
Pennsylvania	Bedford	1	1	$681	$1,034	1.10%	1.67%	1.10%	1.67%
Pennsylvania	Blair	2	2	$589	$609	0.94%	0.98%	1.18%	1.13%
Pennsylvania	Bradford	2	2	$429	$660	0.67%	1.03%	0.87%	1.36%
Pennsylvania	Butler	No Data							
Pennsylvania	Cambria	4	1	$697	$768	1.20%	1.33%	1.35%	1.33%
Pennsylvania	Cameron	No Data							
Pennsylvania	Carbon	1	No Data	$477	No Data	0.68%	No Data	0.68%	No Data
Pennsylvania	Centre	No Data							
Pennsylvania	Clarion	No Data							
Pennsylvania	Clearfield	No Data							
Pennsylvania	Clinton	No Data							
Pennsylvania	Columbia	No Data							
Pennsylvania	Crawford	4	3	$312	$723	0.50%	1.17%	0.81%	1.78%
Pennsylvania	Elk	2	1	$422	$660	0.64%	1%	1%	1%
Pennsylvania	Erie	3	2	$376	$230	0.59%	0.36%	0.75%	0.54%
Pennsylvania	Fayette	No Data							
Pennsylvania	Forest	1	No Data	$423	No Data	0.82%	No Data	0.82%	No Data
Pennsylvania	Fulton	No Data							
Pennsylvania	Greene	1	No Data	$734	No Data	1.07%	No Data	1.07%	No Data
Pennsylvania	Huntingdon	2	2	$565	$636	0.84%	0.94%	0.88%	0.94%
Pennsylvania	Indiana	2	2	$627	$810	1.04%	1.34%	1.48%	1.44%
Pennsylvania	Jefferson	No Data							
Pennsylvania	Juniata	2	1	$369	$340	0.56%	0.52%	0.86%	0.52%
Pennsylvania	Lackawanna	No Data							

Appendix Table J.3 (continued): Water and Wastewater Bills by County in Appalachia (continued on next page)

State	County	# of Rates		Avg. Annual Bill		Avg. Annual Bill as % MHI		Max. Annual Bill as % MHI	
		Water	WW	Water	WW	Water	WW	Water	WW
Pennsylvania	Lawrence	2	1	$567	$863	0.91%	1.38%	1.23%	1.38%
Pennsylvania	Luzerne	No Data							
Pennsylvania	Lycoming	3	2	$517	$663	0.78%	1%	0.94%	1.10%
Pennsylvania	McKean	2	No Data	$680	No Data	1.07%	No Data	1.41%	No Data
Pennsylvania	Mercer	No Data							
Pennsylvania	Mifflin	1	No Data	$445	No Data	0.70%	No Data	0.70%	No Data
Pennsylvania	Monroe	No Data							
Pennsylvania	Montour	1	1	$452	$444	0.60%	0.59%	0.60%	0.59%
Pennsylvania	Northumberland	No Data							
Pennsylvania	Perry	1	No Data	$638	No Data	0.79%	No Data	0.79%	No Data
Pennsylvania	Pike	1	No Data	$2,710	No Data	3.32%	No Data	3.32%	No Data
Pennsylvania	Potter	1	No Data	$432	No Data	0.70%	No Data	0.70%	No Data
Pennsylvania	Schuylkill	2	1	$218	$418	0.32%	0.61%	0.57%	0.61%
Pennsylvania	Snyder	1	1	$197	$528	0.28%	0.75%	0.28%	0.75%
Pennsylvania	Somerset	1	1	$384	$523	0.63%	0.86%	0.63%	0.86%
Pennsylvania	Sullivan	No Data							
Pennsylvania	Susquehanna	1	No Data	$983	No Data	1.43%	No Data	1.43%	No Data
Pennsylvania	Tioga	3	2	$527	$537	0.81%	0.83%	0.82%	0.90%
Pennsylvania	Union	2	2	$423	$696	0.56%	0.93%	0.64%	1.04%
Pennsylvania	Venango	No Data							
Pennsylvania	Warren	No Data							
Pennsylvania	Washington	1	1	$487	$263	0.61%	0.33%	0.61%	0.33%
Pennsylvania	Wayne	No Data							
Pennsylvania	Westmoreland	3	2	$654	$730	0.88%	0.98%	1.35%	1.05%
Pennsylvania	Wyoming	1	1	$647	$767	0.89%	1.06%	0.89%	1.06%
South Carolina	Anderson	2	1	$396	$455	0.59%	0.68%	0.68%	0.68%
South Carolina	Cherokee	2	2	$348	$366	0.69%	0.72%	0.77%	0.72%
South Carolina	Greenville	3	2	$216	$295	0.28%	0.38%	0.42%	0.51%
South Carolina	Oconee	3	2	$338	$323	0.55%	0.52%	0.60%	0.64%
South Carolina	Pickens	3	3	$325	$427	0.53%	0.70%	0.61%	0.81%
South Carolina	Spartanburg	No Data							
South Carolina	Union	No Data							
Tennessee	Anderson	2	1	$407	$360	0.63%	0.55%	0.85%	0.55%
Tennessee	Bledsoe	1	1	$480	$596	0.94%	1.17%	0.94%	1.17%
Tennessee	Blount	3	1	$399	$487	0.52%	0.63%	0.73%	0.63%
Tennessee	Bradley	No Data							
Tennessee	Campbell	1	1	$524	$578	1.01%	1.12%	1.01%	1.12%

Appendix Table J.3 (continued): Water and Wastewater Bills by County in Appalachia (continued on next page)

State	County	# of Rates		Avg. Annual Bill		Avg. Annual Bill as % MHI		Max. Annual Bill as % MHI	
		Water	WW	Water	WW	Water	WW	Water	WW
Tennessee	Cannon	No Data							
Tennessee	Carter	1	1	$428	$414	0.86%	0.83%	0.86%	0.83%
Tennessee	Claiborne	3	2	$592	$563	1.23%	1.17%	1.42%	1.35%
Tennessee	Clay	No Data							
Tennessee	Cocke	1	No Data	$335	No Data	0.67%	No Data	0.67%	No Data
Tennessee	Coffee	2	2	$259	$363	0.41%	0.58%	0.42%	0.63%
Tennessee	Cumberland	2	1	$603	$387	1%	0.64%	1.55%	0.64%
Tennessee	DeKalb	1	1	$396	$413	0.79%	0.83%	0.79%	0.83%
Tennessee	Fentress	No Data							
Tennessee	Franklin	3	3	$388	$515	0.61%	0.81%	0.89%	1.04%
Tennessee	Grainger	2	No Data	$478	No Data	0.91%	No Data	1.03%	No Data
Tennessee	Greene	2	1	$346	$398	0.62%	0.72%	0.84%	0.72%
Tennessee	Grundy	2	1	$555	$1,397	1.18%	2.98%	1.38%	2.98%
Tennessee	Hamblen	1	No Data	$193	No Data	0.35%	No Data	0.35%	No Data
Tennessee	Hamilton	2	No Data	$505	No Data	0.68%	No Data	0.72%	No Data
Tennessee	Hancock	1	No Data	$736	No Data	2.23%	No Data	2.23%	No Data
Tennessee	Hawkins	No Data							
Tennessee	Jackson	No Data							
Tennessee	Jefferson	2	1	$467	$493	0.72%	0.76%	0.81%	0.76%
Tennessee	Johnson	1	No Data	$309	No Data	0.57%	No Data	0.57%	No Data
Tennessee	Knox	2	2	$495	$795	0.67%	1.08%	0.78%	1.26%
Tennessee	Lawrence	No Data							
Tennessee	Lewis	No Data							
Tennessee	Loudon	3	3	$447	$534	0.54%	0.65%	0.83%	0.68%
Tennessee	Macon	1	1	$270	$485	0.47%	0.84%	0.47%	0.84%
Tennessee	Marion	2	1	$314	$535	0.52%	0.89%	0.71%	0.89%
Tennessee	McMinn	2	1	$484	$621	0.79%	1.01%	0.96%	1.01%
Tennessee	Meigs	1	1	$385	$357	0.64%	0.59%	0.64%	0.59%
Tennessee	Monroe	2	2	$345	$357	0.59%	0.61%	0.62%	0.62%
Tennessee	Morgan	1	No Data	$804	No Data	1.36%	No Data	1.36%	No Data
Tennessee	Overton	No Data							
Tennessee	Pickett	1	1	$327	$673	0.71%	1.47%	0.71%	1.47%
Tennessee	Polk	No Data							
Tennessee	Putnam	2	1	$451	$386	0.77%	0.66%	1.02%	0.66%
Tennessee	Rhea	2	No Data	$501	No Data	0.84%	No Data	0.99%	No Data
Tennessee	Roane	2	1	$579	$498	0.85%	0.73%	1.24%	0.73%
Tennessee	Scott	1	No Data	$478	No Data	1.09%	No Data	1.09%	No Data

Appendix Table J.3 (continued): Water and Wastewater Bills by County in Appalachia **(continued on next page)**

State	County	# of Rates		Avg. Annual Bill		Avg. Annual Bill as % MHI		Max. Annual Bill as % MHI	
		Water	WW	Water	WW	Water	WW	Water	WW
Tennessee	Sequatchie	No Data							
Tennessee	Sevier	1	1	$369	$369	0.56%	0.56%	0.56%	0.56%
Tennessee	Smith	1	No Data	$461	No Data	0.71%	No Data	0.71%	No Data
Tennessee	Sullivan	3	1	$405	$182	0.69%	0.31%	0.92%	0.31%
Tennessee	Unicoi	2	1	$480	$412	0.92%	0.79%	1.24%	0.79%
Tennessee	Union	No Data							
Tennessee	Van Buren	1	No Data	$744	No Data	1.20%	No Data	1.20%	No Data
Tennessee	Warren	1	1	$499	$678	0.90%	1.22%	0.90%	1.22%
Tennessee	Washington	2	2	$328	$437	0.52%	0.70%	0.60%	0.72%
Tennessee	White	1	1	$332	$432	0.62%	0.80%	0.62%	0.80%
Virginia	Alleghany	2	3	$606	$900	1.01%	1.53%	1.13%	1.86%
Virginia	Bath	No Data							
Virginia	Bland	No Data							
Virginia	Botetourt	4	4	$463	$500	0.55%	0.59%	0.63%	0.79%
Virginia	Buchanan	No Data							
Virginia	Carroll	5	5	$600	$704	1.11%	1.30%	1.30%	1.47%
Virginia	Craig	No Data							
Virginia	Dickenson	No Data							
Virginia	Floyd	No Data							
Virginia	Giles	3	3	$588	$535	0.89%	0.81%	1.03%	1.01%
Virginia	Grayson	2	2	$433	$608	0.98%	1.38%	1.01%	1.84%
Virginia	Henry	No Data							
Virginia	Highland	3	2	$377	$435	0.64%	0.73%	0.91%	1.04%
Virginia	Lee	2	No Data	$374	No Data	0.86%	No Data	0.96%	No Data
Virginia	Montgomery	4	4	$489	$467	0.69%	0.66%	0.76%	0.90%
Virginia	Patrick	No Data							
Virginia	Pulaski	3	4	$506	$597	0.80%	0.93%	0.95%	1.01%
Virginia	Rockbridge	4	3	$581	$731	0.85%	1.07%	0.96%	1.24%
Virginia	Russell	4	3	$478	$434	0.96%	0.87%	1.43%	1.03%
Virginia	Scott	5	4	$588	$623	1.23%	1.29%	1.45%	1.68%
Virginia	Smyth	5	5	$550	$549	1.12%	1.12%	1.46%	1.46%
Virginia	Tazewell	5	4	$609	$661	1.22%	1.34%	1.58%	1.58%
Virginia	Washington	No Data							
Virginia	Wise	6	6	$619	$775	1.27%	1.59%	1.72%	2.21%
Virginia	Wythe	5	5	$512	$405	0.87%	0.69%	1.18%	0.85%
West Virginia	Barbour	6	No Data	$675	No Data	1.42%	No Data	2.05%	No Data

Appendix Table J.3 (continued): Water and Wastewater Bills by County in Appalachia (continued on next page)

State	County	# of Rates		Avg. Annual Bill		Avg. Annual Bill as % MHI		Max. Annual Bill as % MHI	
		Water	WW	Water	WW	Water	WW	Water	WW
West Virginia	Boone	1	No Data	$853	No Data	1.42%	No Data	1.42%	No Data
West Virginia	Braxton	1	No Data	$671	No Data	1.48%	No Data	1.48%	No Data
West Virginia	Brooke	6	No Data	$484	No Data	0.87%	No Data	1.28%	No Data
West Virginia	Cabell	2	No Data	$674	No Data	1.28%	No Data	1.63%	No Data
West Virginia	Calhoun	3	No Data	$776	No Data	1.85%	No Data	2.15%	No Data
West Virginia	Clay	2	No Data	$613	No Data	1.38%	No Data	1.75%	No Data
West Virginia	Doddridge	2	No Data	$512	No Data	0.84%	No Data	0.97%	No Data
West Virginia	Fayette	8	No Data	$612	No Data	1.14%	No Data	1.70%	No Data
West Virginia	Gilmer	2	No Data	$453	No Data	0.82%	No Data	1.13%	No Data
West Virginia	Grant	3	No Data	$401	No Data	0.71%	No Data	0.85%	No Data
West Virginia	Greenbrier	8	No Data	$707	No Data	1.45%	No Data	2.35%	No Data
West Virginia	Hampshire	3	No Data	$765	No Data	1.29%	No Data	1.44%	No Data
West Virginia	Hancock	7	No Data	$551	No Data	0.89%	No Data	1.15%	No Data
West Virginia	Hardy	4	No Data	$477	No Data	0.91%	No Data	1.18%	No Data
West Virginia	Harrison	16	No Data	$632	No Data	1.05%	No Data	1.64%	No Data
West Virginia	Jackson	5	No Data	$500	No Data	0.85%	No Data	1.01%	No Data
West Virginia	Jefferson	5	No Data	$630	No Data	0.63%	No Data	0.79%	No Data
West Virginia	Kanawha	11	No Data	$709	No Data	1.20%	No Data	1.89%	No Data
West Virginia	Lewis	2	No Data	$723	No Data	1.34%	No Data	1.57%	No Data
West Virginia	Lincoln	3	No Data	$663	No Data	1.21%	No Data	1.48%	No Data
West Virginia	Logan	4	No Data	$538	No Data	1.19%	No Data	1.42%	No Data
West Virginia	Marion	22	No Data	$656	No Data	1.02%	No Data	1.72%	No Data
West Virginia	Marshall	6	No Data	$534	No Data	0.86%	No Data	1.18%	No Data
West Virginia	Mason	7	No Data	$473	No Data	0.83%	No Data	1.20%	No Data
West Virginia	McDowell	10	No Data	$398	No Data	1.32%	No Data	2.90%	No Data
West Virginia	Mercer	10	No Data	$510	No Data	1.02%	No Data	1.71%	No Data
West Virginia	Mineral	10	No Data	$621	No Data	0.90%	No Data	1.26%	No Data
West Virginia	Mingo	6	No Data	$712	No Data	1.73%	No Data	2.82%	No Data
West Virginia	Monongalia	8	No Data	$606	No Data	0.93%	No Data	1.18%	No Data
West Virginia	Monroe	3	No Data	$499	No Data	0.89%	No Data	0.96%	No Data
West Virginia	Morgan	4	No Data	$904	No Data	1.38%	No Data	2.02%	No Data
West Virginia	Nicholas	10	No Data	$704	No Data	1.35%	No Data	1.62%	No Data
West Virginia	Ohio	5	No Data	$677	No Data	1.14%	No Data	1.52%	No Data
West Virginia	Pendleton	2	No Data	$865	No Data	1.54%	No Data	1.71%	No Data
West Virginia	Pleasants	4	No Data	$561	No Data	0.88%	No Data	0.99%	No Data
West Virginia	Pocahontas	2	No Data	$639	No Data	1.43%	No Data	2.26%	No Data
West Virginia	Preston	12	No Data	$630	No Data	0.98%	No Data	1.70%	No Data

Appendix Table J.3 (continued): Water and Wastewater Bills by County in Appalachia

State	County	# of Rates		Avg. Annual Bill		Avg. Annual Bill as % MHI		Max. Annual Bill as % MHI	
		Water	WW	Water	WW	Water	WW	Water	WW
West Virginia	Boone	1	No Data	$853	No Data	1.42%	No Data	1.42%	No Data
West Virginia	Putnam	3	No Data	$714	No Data	0.88%	No Data	1.25%	No Data
West Virginia	Raleigh	5	No Data	$535	No Data	1.04%	No Data	1.51%	No Data
West Virginia	Randolph	11	No Data	$605	No Data	1.10%	No Data	1.62%	No Data
West Virginia	Ritchie	4	No Data	$692	No Data	1.32%	No Data	1.72%	No Data
West Virginia	Roane	5	No Data	$628	No Data	1.42%	No Data	2.40%	No Data
West Virginia	Summers	2	No Data	$700	No Data	1.52%	No Data	1.85%	No Data
West Virginia	Taylor	3	No Data	$479	No Data	0.84%	No Data	1%	No Data
West Virginia	Tucker	6	No Data	$559	No Data	0.96%	No Data	1.16%	No Data
West Virginia	Tyler	3	No Data	$681	No Data	1.07%	No Data	1.27%	No Data
West Virginia	Upshur	5	No Data	$698	No Data	1.31%	No Data	1.56%	No Data
West Virginia	Wayne	6	No Data	$622	No Data	1.10%	No Data	1.47%	No Data
West Virginia	Webster	3	No Data	$729	No Data	1.57%	No Data	1.83%	No Data
West Virginia	Wetzel	6	No Data	$604	No Data	1.11%	No Data	1.49%	No Data
West Virginia	Wirt	1	No Data	$830	No Data	1.47%	No Data	1.47%	No Data
West Virginia	Wood	8	No Data	$382	No Data	0.66%	No Data	1.05%	No Data
West Virginia	Wyoming	15	No Data	$412	No Data	0.86%	No Data	1.66%	No Data

Source: (Bill Information) Data collected by SOG EFC staff between 2018 and 2024; (MHI) U.S. Census Bureau, American Community Survey Data (2018, 2020, 2022, 2023)

Appendix K. LDD Survey Methods and Questions

Methods

The project team designed the survey in collaboration with ARC staff and the project's Advisory Council to capture information in three main areas: LDD administration and governance, investment in water and wastewater issues, and capacity needs and barriers. The team piloted the survey with LDDs in Appalachian states but outside of the Appalachian region. In June 2024, the Team distributed the survey to all 74 LDDs serving Appalachian counties via email using a point of contact provided by ARC and received a total of thirty-six responses by August 2024. To increase the response rate, the team distributed a shortened version of the survey in August, consisting of 10 questions most critical to understanding capacity gaps. An additional seven LDDs responded, yielding an overall response rate of 58%.

Survey Questions

Those questions included in the short survey are colored orange and have the corresponding question number in brackets at the end.

*[**Script included at the beginning of the survey**: Even in a time of considerable federal and state investment in water/wastewater infrastructure, capacity gaps may preclude some water/wastewater systems from accessing funds. This survey seeks to understand the role Local Development Districts (LDDs) play in the water/wastewater infrastructure space, how that role varies across states and counties within the Region, and how LDDs can be supported to address capacity gaps at the water/wastewater system level to foster widespread access to federal and state infrastructure investment.*

Defining capacity development (US-EPA)

Technical

- *Source water adequacy*
- *Infrastructure adequacy (source, treatment, distribution, storage)*
- *Technical knowledge and implementation*

Managerial

- *Ownership + accountability*
- *Staffing and organizational*
- *Partnerships*

Financial

- *Revenue sufficiency*
- *Credit worthiness*
- *Fiscal management + controls*

The Appalachian Regional Commission refers to multi-county planning districts as Local Development Districts (LDDs). For the purposes of this survey, all Area Development

Districts (ADDs), Council of Governments (COGs), or Regional Planning and Development Commissions will be referred to as LDDs.]

1. State: ____________________ [Q5]
2. What LDD do you represent? ____________________ [Q4]
3. Approximate number of member local governments in your district: ____________________
4. Total annual budget ($): ____________________
5. Approximate percentage of budget spent specifically on water and/or wastewater issues: ____________________
6. Are funds spent on water and/or sewer spent within your LDD or distributed to water/wastewater entities? (Select one.)
    a. Funds generally spent within LDD
    b. Funds generally distributed to water/wastewater entities
    c. Funds evenly split between LDD and water/wastewater entities
    d. NA
    e. Other: ____________________
7. Annual administrative grant from the ARC ($): ____________________

Local Development District (LDD) Information

8. Number of full-time staff at LDD
9. Number of part-time staff at LDD
10. What programs and/or services does your LDD provide? (Select all that apply.)
    a. Helping local governments maintain capital infrastructure
    b. Workforce Development
    c. Area Aging
    d. Community and Economic Development Planning
    e. Resilience
    f. Transportation
    g. Other: ____________________
11. Please rate the importance of selected programs and services from not important to very important.

	Not Important	Somewhat Important	Very Important
a. Helping local governments maintain capital infrastructure	O	O	O
b. Workforce development	O	O	O
c. Area aging	O	O	O
d. Community and economic development	O	O	O
e. Planning	O	O	O
f. Resilience	O	O	O
g. Transportation	O	O	O

h. Other: ______________________ O O O

12. How does the LDD reach out to member local governments? (Select all that apply.)
    a. Newsletter/written updates
    b. Periodic meetings
    c. Social media posts
    d. Trainings
    e. In-person visits
    f. Other: ____________________
    g. We don't do direct outreach to member local governments
13. Of the local governments in the district, how many are receiving support from the LDD?
    a. None
    b. A few
    c. Several
    d. Nearly all
    e. All

Water and Wastewater Assistance

14. Does your LDD have any staff who spend the majority of their time (>50%) assisting on water/wastewater programs or projects (e.g., grants for water/wastewater infrastructure, workforce for water/wastewater systems, rate-setting, mapping, engineering)? [Q6]
    a. Yes
    b. No
    c. Unsure
15. What is that staff member's title/role? ____________________
16. How is that staff member's salary funded? ____________________
17. Does your LDD have an inventory or list of water/wastewater systems in your region?
    a. Yes
    b. No
    c. Unsure
18. What type of information is included in the list/inventory of water/wastewater systems? ____________________
19. How often is the inventory/list updated?
    a. At least once a year
    b. Once every 2 - 3 years
    c. Once every 4 - 10 years
    d. Less often than once every 10 years
    e. Never
    f. Unsure
20. Does your LDD or system staff update the list/inventory?
    a. LDD staff
    b. System staff
    c. A combination of LDD and system staff

    d. Other: ____________________

21. How is the list/inventory used? ____________________
22. How important are water/wastewater issues to the work of your LDD? [Q7]
    a. Not at all important
    b. Somewhat important
    c. Important
    d. Very important
23. How frequently do LDD staff assist water/wastewater systems? [Q8]
    a. Every day
    b. Once a week
    c. Once a month
    d. Once a year
    e. Less than once a year
    f. Never
24. What are the primary methods of assistance provided to water/wastewater systems by the LDD? (Select all that apply.) [Q9]
    a. Grant/loan writing (e.g., preparing an application for funding)
    b. Project implementation (e.g., implementation of grant-funded projects)
    c. Grant/loan administration
    d. Asset management and capital improvement planning
    e. Workforce development
    f. Rate-setting/rates analysis
    g. System facility operation support
    h. GIS/mapping support
    i. Sustainability/resiliency planning
    j. Other: ____________________
25. Of the methods selected, please rank from most utilized to least utilized by local governments.
    a. Grant/loan administration
    b. Asset management and capital improvement planning
    c. Workforce development
    d. Rate-setting/rates analysis
    e. System facility operation support
    f. GIS/mapping support
    g. Sustainability/resiliency planning
    h. Other: ____________________
26. In which area could your LDD benefit from having additional capacity to support water/wastewater systems? (Select all that apply.) [Q10]
    a. Grant/loan writing (e.g., preparing an application for funding)
    b. Project implementation (e.g., implementation of grant-funded projects)
    c. Grant/loan administration
    d. Asset management and capital improvement planning
    e. Workforce development
    f. Rate-setting/rates analysis
    g. System operation support
    h. GIS/mapping support

    i. Other: ___________________

27. Roughly how many grant/loan applications that your LDD writes for water/wastewater systems are submitted per year? ___________________
28. Roughly how many grant/loan applications that your LDD writes for water/wastewater systems are awarded per year? ___________________
29. What, if any, additional resources would assist your LDD in providing more support to water/wastewater systems? ___________________
30. Does your LDD provide training for water/wastewater system staff in the district?
    a. Yes
    b. No
31. Are those trainings technical, managerial, or financial in nature? (Select all that apply.)
    a. Technical (i.e., about the operations of a water/wastewater system)
    b. Managerial (i.e., about managing a water/wastewater system)
    c. Financial (i.e., about maintaining sufficient revenues)
32. Does your LDD promote partnerships and/or regional solutions amongst water/wastewater systems? [Q11]
    a. Yes [If yes, please describe. ___________________]
    b. No
    c. Unsure
33. In the last 10 years, has your LDD been instrumental in establishing a new water/wastewater partnership or regional solution?
    a. Yes
    b. No
34. Please describe that partnership or regional solution: ___________________
35. Does your LDD partner with any technical assistance providers to assist with water/wastewater capacity development?
    a. Yes
    b. No
    c. Unsure
36. What technical assistance providers do you partner with to help build water/wastewater capacity? ___________________
37. Does your LDD facilitate any of the following between local governments and EPA regional staff? (Select all that apply.)
    a. Knowledge or information
    b. Technical assistance
    c. Grant/loan application assistance
    d. Other: ___________________
    e. NA
38. Does your LDD facilitate any of the following between local governments and your state environmental agency? (Select all that apply.)
    a. Knowledge or information
    b. Technical assistance
    c. Grant/loan application assistance
    d. Other: ___________________
    e. NA

39. Please estimate the percentage of the population in your service area that has either a well and/or septic system. ____________________
40. Does your LDD work with decentralized users (e.g., those on well or septic) to assist with water/wastewater needs? [Q12]
    a. Yes [If yes, please describe. ____________________]
    b. No
    c. Unsure
41. Please share how your LDD has assisted decentralized users. ____________________
42. What barriers, either real or perceived, exist that limit the implementation of water/wastewater improvements (i.e., economic, social, political, physical, etc.)? ____________________
43. How does your LDD prioritize support for water/wastewater systems in your district? ____________________

[Q13] What challenges, if any, exist in connecting water/wastewater systems to grants or loans? ____________________

Personal Information

44. What is your role at your LDD? ____________________
45. How long have you been with your LDD?
    a. Less than 1 year
    b. 1 year to 3 years
    c. 4 years - 10 years
    d. More than 10 years
46. What are your areas of expertise? (Select all that apply.)
    a. Water/wastewater/stormwater
    b. Community and economic development
    c. Planning
    d. Aging
    e. Workforce Development
    f. Transportation
    g. Other: ____________________
47. Age
    a. 18 - 29
    b. 30 - 39
    c. 40 - 49
    d. 50 - 59
    e. 60 - 69
    f. 70 or older
48. Gender
    a. Male
    b. Female
    c. Non-binary/non-conforming
    d. Prefer not to say
49. Highest level of education
    a. Less than high school

b. High school graduate
c. Some college
d. 2-year degree
e. 4-year degree
f. Professional degree
g. Doctorate

Your Governing Board

50. How many members sit on your board? ____________________
51. What sectors do board members represent? (Select all that apply.)
    a. Local government staff in the region
    b. Local government elected officials in the region
    c. Businesses
    d. Nonprofits
    e. Universities/academia
    f. State government
    g. Other: ____________________
52. How long are board member terms? ____________________

Appendix L. Governance Profiles

Profile Description

These governance profiles represent the project team's best understanding of entities involved in the governance of water and wastewater utilities and/or private wells and septic systems, but may not be exhaustive. The primary focus of these profiles is state-level structures, though there are many instances where state entities may intersect with local government bodies.

Each profile includes five sections.

1. **Distribution of roles.** Water and wastewater governance can involve many diverse entities. The section provides information about how the various roles linked to water and wastewater governance are distributed across state-level entities.[xix]
2. **Relationships and efficiencies.** How state-level entities are connected can highlight synergies. This section details connections entities, with an emphasis on those impacting funding administration or oversight, and/or structures and processes that may streamline funding administration.
3. **Financial regulation and oversight.** Understanding financial oversight of water and wastewater utilities can provide helpful context. This section highlights key policies or entities involved in the financial oversight of water and wastewater utilities and/or water and wastewater infrastructure funding.
4. **Key aspects of state revolving fund programs.** The Drinking Water and Clean Water State Revolving Fund programs (DWSRF and CWSRF) are significant sources of water and wastewater infrastructure funding. These programs receive a federal capitalization grant and corresponding state match each year. Program funding may then be allocated to individual water and wastewater projects across the state. Individual state SRF programs define priority ranking criteria to target projects addressing the state's most pressing concerns for water and wastewater infrastructure. These criteria are used to rank funding applications. This section includes how each state structures the administration of these programs and significant differences in the application/award process compared to other Appalachian states. The section also details state priority ranking criteria based on the information that is publicly available, with particular attention to key themes throughout this report: regionalization, asset management/capital improvement planning, and affordability. The level of detail states provide about their criteria varies, and the tables include additional details for categories particularly relevant to this report when available. For example, points for asset management or capital improvement plans may be embedded within a category as opposed to being a separate category.
5. **Onsite system management.** As highlighted throughout this report, the responsibility for maintaining onsite systems (e.g., private wells and septic systems) largely falls on the individual owners. This section describes state-level support or oversight related to onsite system management.

[xix] Key acronyms: ARC, Appalachian Regional Commission; SRF, State Revolving Fund; CBDG, Community Development Block Grants

Governance Profile: Alabama

Distribution of Roles Across Governance Entities

- Two state agencies administer funding for water and wastewater infrastructure projects in Alabama (Appendix Table L.1).[1]
- The Alabama Department of Environmental Management (ADEM) conducts environmental reviews as required by funding programs. It is also responsible for the regulation of and permitting related to the public water supply as well as National Pollution Discharge Elimination System (NPDES) permits (Appendix Table L.1).[2]
- One state agency and county health departments support onsite system management (Appendix Table L.1).[3]
- The Department of Examiners of Public Accounts provides financial oversight (Appendix Table L.1).[4]
- The Alabama Public Service Commission is charged with regulating rates and services of water utilities (Appendix Table L.1).[5]

Appendix Table L.1: Distribution of Roles Across Governance Entities, Alabama

ENTITY NAME	ENTITY TYPE					ENTITY ROLES																		
						FUNDING						PERMITTING			REGULATION				OVERSIGHT				OTHER	
	State Agency/Department	State Office	Legislative Department	Local Government	Other Entity	Admin, SRF	Admin, ARC	Admin, CDBG	Admin, Other	Provision, Grants/Loans	Provision, Bond Bank	Public Water Supply	Private Wells	Septic	Public Water Supply	Private Wells	Septic	W/WW Rate-Setting and Service Provision	Financial/Funding	Onsite Systems	General Water Resources	Conducts State Env. Reviews	Well Water Testing	Provides Technical Assistance
Dept. of Environmental Management	x					x						x			x					x		x		
Dept. of Economic and Community Affairs (ADECA)	x						x	x													x			
Dept. of Public Health	x																			x				
Dept. of Examiners of Public Accounts			x																x					
County Health Departments				x										x			x						x	
Public Service Commission					x													x						

Source: See endnotes embedded in text for this section.

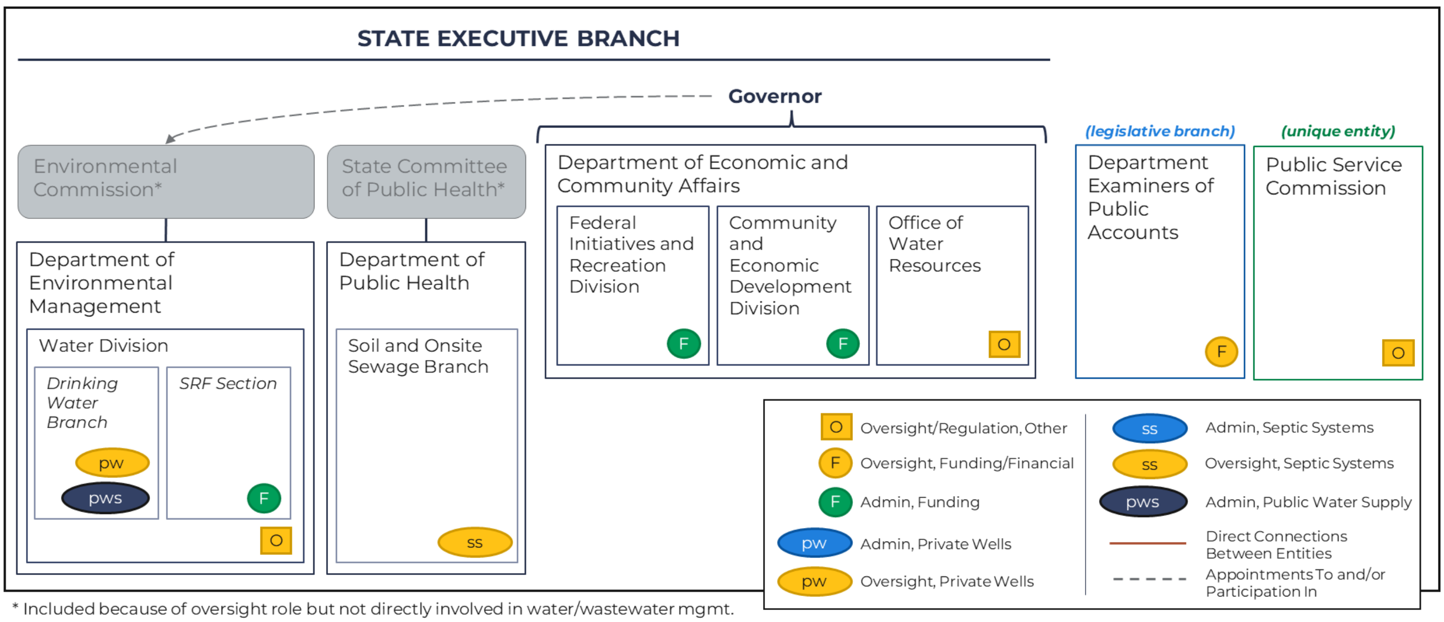
Relationships and Efficiencies

The **Department of Economic and Community Affairs** administers funding through multiple divisions: ARC through the Federal Initiatives and Recreation Division and Community Development Block Grants (CBDG) through the Community and Economic Development Division (Appendix Figure L.1).

While the **ADEM** is not under the direct purview of the governor, the governor appoints all seven members of its oversight body, the Environmental Commission, for six-year terms with the confirmation of the Alabama Senate (Appendix Figure L.1).

Public Service Commissioners are elected every four years in state-wide partisan elections.[6]

Appendix Figure L.1: Graphical Depiction of Governance Entity Roles and Relationships, Alabama



* Included because of oversight role but not directly involved in water/wastewater mgmt.

Source: See endnotes embedded in text for this section.

Financial Regulation and Oversight

Local governments must adhere to constitutional debt limits.[7] Municipalities must provide an audit or annual financial report to the Department of Examiners of Public Accounts.[8]

Key Aspects of Alabama's State Revolving Fund (SRF) Programs

Administration and Application Process

Alabama has **sole administration**, including required environmental reviews, of the drinking water and clean water state revolving fund (SRF) programs through ADEM.[9] No significant differences in the Alabama SRF application process compared to other Appalachian states were identified.

Ranking Criteria

Alabama's priority ranking system includes **consolidation**, **asset management plans, and affordability** (Appendix Table L.2).[10]

Appendix Table L.2: Summary of Priority Ranking Criteria for the State of Alabama

Priority Ranking Category	Included in Which SRF Program?		Additional Relevant Details About Points Awarded within Category
	Drinking Water	Clean Water	
Enforcement and Compliance	x	x	
Contaminants/Water Quality	x	x	
Water/Energy Efficiency	x	x	
Capacity and Pressure	x		
System Consolidation	x		This category also includes points for projects involving interconnections.
Sustainability	x	x	This category includes points for having an asset management plan.
Reporting	x		
Affordability	x		Points are awarded based on a calculation of the annual water bill ias a percent of median household income.
Type of Infrastructure Improvement	x		
Stormwater Management		x	
Agricultural/Non-Point Source Pollution		x	
Growth		x	Projects not focused on growth are worth more points.

Source: Alabama Department of Environmental Management, Form 370: Drinking Water State Revolving Fund Preapplication; Alabama Department of Environmental Management, Form 340: Clean Water State Revolving Fund Preapplication

Onsite System Management

Private Wells

ADEM oversees private well construction. Both a Notice of Intent and Certification of Completion must be filed with the department by a licensed well driller.[11] Owners are solely responsible for testing their water supply, which can be done through the county health department.[12]

Septic Systems

The Soil and Onsite Sewage Branch of Alabama Public Health coordinates the onsite sewage program with county health departments by establishing and enforcing requirements for all aspects of onsite sewage systems.[13] Owners must get permits for new systems or repairs to existing systems through their county health department.[14]

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[1] See funding tables for links to all funding program websites.
[2] "Drinking Water Branch," Alabama Department of Environmental Management, Accessed March 10, 2025, https://adem.alabama.gov/programs/water/drinkingwater.cnt; "NPDES Permits," Alabama Department of Environmental Management, Accessed April 8, 2025, https://adem.alabama.gov/programs/water/permitting.cnt.
[3] J. Curl and Laura Bell, "Water Well Construction," Alabama A&M and Auburn Universities Extension (blog), June 7, 2021, https://www.aces.edu/blog/topics/fish-water/water-well-construction/.; "Soil and Onsite Sewage," Alabama Public Health, Accessed March 7, 2025, https://www.alabamapublichealth.gov/onsite/
[4] Alabama League of Municipalities, *The Municipal Budget and Auditing Process* (Alabama League of Municipalities, 2022), https://almonline.org/Assets/Files/LegalSelectedReadings/28.%20The%20Municipal%20Budget%20and%20Auditing%20Process%202022.pdf.
[5] Ala. Code § 37-1-32 (2024).; Ala. Code § 37-1-80 (2024).
[6] Ala. Code § 37-1-3 (2024).
[7] Alabama League of Municipalities, "Municipal Debt Financing," 2024, https://almonline.org/Assets/Files/LegalSelectedReadings/40.Municipal-Debt-Financing-REVISED-2024.pdf.
[8] Alabama League of Municipalities, *The Municipal Budget and Auditing Process* (Alabama League of Municipalities, 2022), https://almonline.org/Assets/Files/LegalSelectedReadings/28.%20The%20Municipal%20Budget%20and%20Auditing%20Process%202022.pdf,
[9] Alabama Department of Environmental Management, "Alabama State Revolving Fund," Accessed March 10, 2025, https://adem.alabama.gov/programs/water/srfreports/SRFBrochure.pdf.
[10] Alabama Department of Environmental Management, "Form 370: Drinking Water State Revolving Fund Preapplication," Accessed March 10, 2025, https://adem.alabama.gov/DeptForms/Form370.pdf.; Alabama Department of Environmental Management, "Form 340: Clean Water State Revolving Fund Preapplication," Accessed March 10, 2025, https://adem.alabama.gov/DeptForms/Form340.pdf.
[11] J. Curl and Laura Bell, "Water Well Construction," Alabama A&M and Auburn Universities Extension (blog), June 7, 2021, https://www.aces.edu/blog/topics/fish-water/water-well-construction/.
[12] "Well Water," Alabama Public Health, Accessed March 7, 2025, https://www.alabamapublichealth.gov/environmental/well-water.html.
[13] "Soil and Onsite Sewage," Alabama Public Health, Accessed March 7, 2025, https://www.alabamapublichealth.gov/onsite/.
[14] "Onsite Sewage Disposal," Alabama Public Health, Accessed March 7, 2025, https://www.alabamapublichealth.gov/baldwin/sewage.html.

Governance Profile: Georgia

Distribution of Roles Across Governance Entities

- Five entities administer funding for water and wastewater infrastructure projects in Georgia: three state agencies, the Office of Planning and Budget, and the Georgia Environmental Finance Authority (GEFA) (Appendix Table L.3).
- The Department of Natural Resources conducts environmental reviews as required by funding programs. It is also responsible for the regulation of and permitting related to the public water supply as well as National Pollution Discharge Elimination System permits (Appendix Table L.3).
- One state agency and local governments support onsite system management. Three entities provide financial oversight: the Department of Community Affairs, the Department of Audits & Accounts, and Regional Water Councils (Appendix Table L.3).

Appendix Table L.3: Distribution of Roles Across Governance Entities, Georgia

ENTITY NAME	ENTITY TYPE: State Agency/Department	ENTITY TYPE: State Office	ENTITY TYPE: Legislative Department	ENTITY TYPE: Local Government	ENTITY TYPE: Other Entity	FUNDING: Admin, SRF	FUNDING: Admin, ARC	FUNDING: Admin, CDBG	FUNDING: Admin, Other	FUNDING: Provision, Grants/Loans	FUNDING: Provision, Bond Bank	PERMITTING: Public Water Supply	PERMITTING: Private Wells	PERMITTING: Septic	REGULATION: Public Water Supply	REGULATION: Private Wells	REGULATION: Septic	REGULATION: W/WW Rate-Setting and Service Provision	OVERSIGHT: Financial/Funding	OVERSIGHT: Onsite Systems	OVERSIGHT: General Water Resources	OVERSIGHT: Conducts State Env. Reviews	OTHER: Well Water Testing	OTHER: Provides Technical Assistance
Dept. of Community Affairs	x						x	x	x										x					
Dept. of Natural Resources	x					x			x			x			x							x		
Emergency Mgmt. and Homeland Security	x								x															
Dept. of Public Health	x															x				x				x
Office of Planning and Budget		x							x															
Dept. of Audits & Accounts			x																x					
County Boards of Health				x									x	x									x	
Georgia Environmental Finance Authority					x	x			x															x
Regional Water Councils					x														x		x			

Source: See endnotes embedded in text for this section.

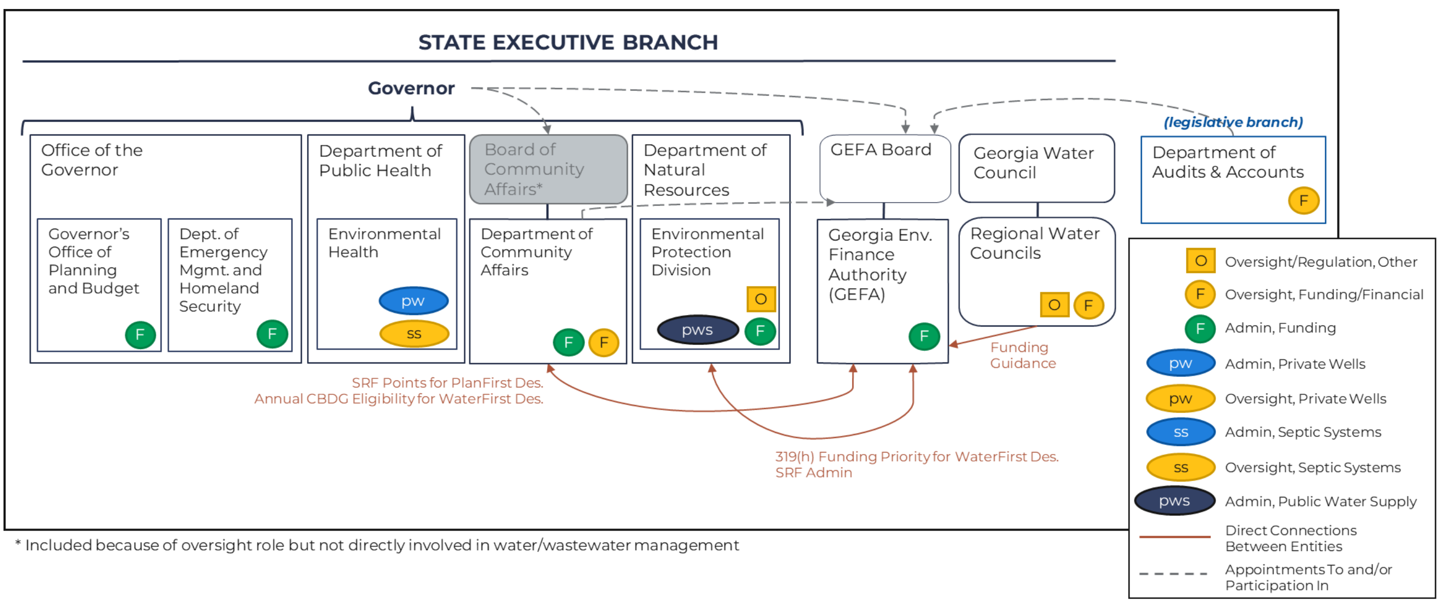
Relationships and Efficiencies

GEFA oversees water and sewer financing programs and manages the WaterFirst program.[1] The governor appoints all eleven members of GEFA's Board of Directors. Three appointments are via their governor-appointed positions (State Auditor, Commissioner of Community Affairs, and Commissioner of the Department of Economic Development). The remaining eight are direct appointments to the board (Appendix Figure L.2).[2]

WaterFirst communities (designated by GEFA) and PlanFirst communities (designated by the Department of Community Affairs) receive extra points on State Revolving Fund (SRF) program applications. WaterFirst communities are eligible for Community Development Block Grant funding (administered by the Department of Community Affairs) annually and also receive status for Section 319(h) Nonpoint Source Implementation Grants (administered by the Department of Natural Resources). Further, WaterFirst communities receive a lower interest rate on SRF loans. Also of note is that GEFA has a single application for all funding programs.[3]

Georgia Regional Water Councils are responsible for developing and/or implementing regional water plans and guiding decisions regarding funding through GEFA for water-related projects (Appendix Figure L.2). Membership varies based on existing water-related organizations within each region along with the characteristics of individual water resources, water uses, and regional economies but should be diverse and representative of local governments, water users, and other stakeholders.[4]

Appendix Figure L.2: Graphical Depiction of Governance Entity Roles and Relationships, Georgia



* Included because of oversight role but not directly involved in water/wastewater management

Source: See endnotes embedded in text for this section.

Financial Regulation and Oversight

Municipalities, counties, and local government authorities/boards/commissions empowered to enter into debt must report individual debt issuances exceeding $1 million to the Department of Community Affairs according to state law (O.C.G.A 36-82-10).[5] Local governments with expenditures exceeding $550,000 annually must submit an audit report of all funds to the State Auditor each year.[6]

Key Aspects of Georgia's State Revolving Fund (SRF) Programs

Administration and Application Process

Georgia has **joint administration** of the drinking water and clean water SRF programs via GEFA and the Georgia Environmental Protection Division within the Department of Natural Resources.[7] No significant differences in the Georgia SRF application process compared to other Appalachian states were identified.

Ranking Criteria

Georgia's priority ranking system **includes regionalization, asset management and/or capital improvement plans, and rate studies**. Georgia does not list affordability metrics in their priority criteria for SRF funding.[8] However, they **conduct a separate affordability analysis** that includes ten metrics (Appendix Table L.4).[9]

Appendix Table L.4: Summary of Priority Ranking Criteria for the State of Georgia

Priority Ranking Category	Included in Which SRF Program?		Additional Relevant Details About Points Awarded within Category
	Drinking Water	Clean Water	
Readiness to Proceed	x	x	Points are awarded for completing the state environmental review process.
Compliance and Public Health/Water Quality Benefits	x	x	
Priority Project Types	x	x	This category includes points for projects involving regionalization.
Priority Planning Elements	x	x	Points are awarded for having an asset management plan, capital improvement plan, and/or completed rate study.
Priority Applicant Status	x	x	Additional points are awarded for being a WaterFirst Community, a PlanFirst Community, or a first-time borrower.

Source: Georgia Environmental Finance Authority, 2024 Intended Use Plan Base and Supplemental Clean Water State Revolving Fund (2024); Georgia Department of Public Health, "Well Water," Accessed March 2025, https://dph.georgia.gov/environmental-health/well-water

Onsite System Management

Private Wells

Only licensed well water contractors can drill new wells, and they must submit a notice of intent to the county health department before beginning construction. Owners are responsible for testing, which can be done via county environmental health offices. The Non-Public Well Program within the Department of Public Health provides technical assistance and guidance for well owners and examines instances of water-borne illness.[10]

Septic Systems

The Georgia Department of Public Health oversees the implementation of the Onsite Sewage program at the county level. Boards of Health must inspect sites before construction and issue the permits.[11]

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[1] Water Infrastructure Financing," Georgia Environmental Finance Authority, Accessed March 7, 2025, https://gefa.georgia.gov/water-programs/water-infrastructure-financing; WaterFirst," Georgia Environmental Finance Authority, Accessed March 7, 2025, https://gefa.georgia.gov/waterfirst.

[2] Georgia Environmental Finance Authority, *2024 Intended Use Plan Base and Supplemental Clean Water State Revolving Fund* (2024), Available for download at https://gefa.georgia.gov/water-programs/intended-use-plans; "Pat Wilson," Georgia Department of Community Affairs, Accessed April 8, 2025, https://dca.georgia.gov/financing-tools/infrastructure/onegeorgia-authority/governing-board-overview-committee/pat-wilson; "Georgia Department of Community Affairs," Georgia Department of Community Affairs, Accessed April 8, 2025, https://dca.georgia.gov/; "Our History," Georgia Department of Audits & Accounts, Accessed April 8, 2025, https://www.audits2.ga.gov/about/our-history/.

[3] UGA Carl Vinson Institute of Government, *Handbook for Georgia Legislators* (2020), https://cviog.uga.edu/_resources/documents/resources/handbook-galeg-state-org-chart.pdf.; "Georgia Emergency Management and Homeland Security Agency," Georgia Emergency Management and Homeland Security Agency, Accessed March 10, 2025, https://gema.georgia.gov/about-us.; "Application Process," Georgia Environmental Finance Authority, Accessed March 10, 2025, https://gefa.georgia.gov/water-programs/application-process.; "Intended Use Plans," Georgia Environmental Finance Authority, Accessed March 10, 2025, https://gefa.georgia.gov/water-programs/intended-use-plans.; WaterFirst," Georgia Environmental Finance Authority, Accessed March 7, 2025, https://gefa.georgia.gov/waterfirst.; "PlanFirst," Georgia Department of Community Affairs, Accessed March 10, 2025, https://dca.georgia.gov/community-assistance/coordinated-planning/local-planning/planfirst (SRF points are noted on the 2025 Project Scoring Criteria available for download at https://gefa.georgia.gov/drinking-water-state-revolving-fund and https://gefa.georgia.gov/clean-water-state-revolving-fund).

[4] *Georgia Comprehensive State-wide Water Management Plan* (2008), https://waterplanning.georgia.gov/state-water-plan.

[5] "Debt Issuance Reporting," Georgia Department of Community Affairs, Accessed March 10, 2025, https://dca.georgia.gov/community-assistance/government-authority-reporting/debt-issuance-reporting.

[6] Ga. Code Ann. § 36-81-7 (2022).

[7] "Intended Use Plans," Georgia Environmental Finance Authority, Accessed March 10, 2025, https://gefa.georgia.gov/water-programs/intended-use-plans.

[8] Georgia Environmental Finance Authority, 2025 Drinking Water State Revolving Fund Call for Projects Project Scoring Criteria, Available for download at https://gefa.georgia.gov/drinking-water-state-revolving-fund.; Georgia Environmental Finance Authority, 2025 Drinking Clean State Revolving Fund Call for Projects Project Scoring Criteria, Available for download at https://gefa.georgia.gov/clean-water-state-revolving-fund.

[9] Georgia Environmental Finance Authority, *2024 Intended Use Plan Base and Supplemental Clean Water State Revolving Fund* (2024), Available for download at https://gefa.georgia.gov/water-programs/intended-use-plans.

[10] Well Water," Georgia Department of Public Health, Accessed March 7, 2025, https://dph.georgia.gov/environmental-health/well-water.

[11] "Onsite Sewage," Georgia Department of Public Health, Accessed March 7, 2025, https://dph.georgia.gov/environmental-health/onsite-sewage.

Governance Profile: Kentucky

Distribution of Roles Across Governance Entities

- Two state agencies and the Kentucky Infrastructure Authority (KIA) administer funding for water and wastewater infrastructure projects in Kentucky (Appendix Table L.5).[1]
- The Department of Environmental Protection conducts environmental reviews as required by funding programs. It is also responsible for the regulation of the public water supply as well as National Pollution Discharge Elimination System permits (Appendix Table L.5).[2]
- Both state agencies and local governments support onsite system management (Appendix Table L.5).[3]
- Two entities provide financial oversight: the Department for Local Government and the Kentucky Public Service Commission (Appendix Table L.5).[4]
- The Public Service Commission also regulates intrastate rates and services of investor-owned utilities as well as water districts and associations (Appendix Table L.5).[5]

Appendix Table L.5: Distribution of Roles Across Governance Entities, Kentucky

ENTITY NAME	ENTITY TYPE					ENTITY ROLES: FUNDING						PERMITTING			REGULATION				OVERSIGHT				OTHER	
	State Agency/Department	State Office	Legislative Department	Local Government	Other Entity	Admin, SRF	Admin, ARC	Admin, CDBG	Admin, Other	Provision, Grants/Loans	Provision, Bond Bank	Public Water Supply	Private Wells	Septic	Public Water Supply	Private Wells	Septic	W/WW Rate-Setting and Service Provision	Financial/Funding	Onsite Systems	General Water Resources	Conducts State Env. Reviews	Well Water Testing	Provides Technical Assistance
Dept. for Local Government	x						x	x											x					
Dept. for Environmental Protection	x					x						x			x					x		x		x
Dept. for Public Health	x																			x				
Local Health Departments				x										x			x							
Kentucky Infrastructure Authority					x	x			x	x														
Public Service Commission					x													x	x					

Source: See endnotes embedded in text for this section.

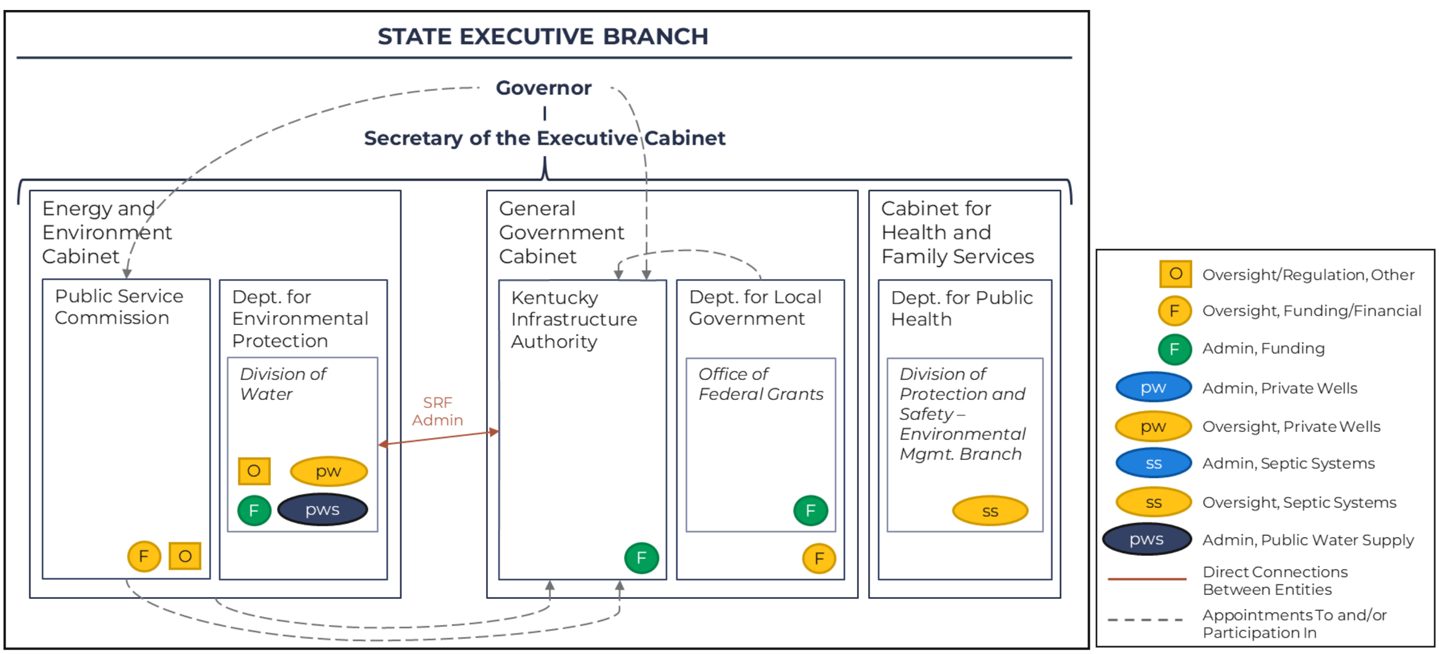
Relationships and Efficiencies

In Kentucky, the governor delegates direct oversight of all cabinets to the secretary of the executive cabinet. Administration of funding programs falls within the General Government Cabinet, though State Revolving Fund (SRF) administration is shared with the Department of Environmental Protection within the Energy and Environment Cabinet (Appendix Figure L.3).[6]

KIA is under the Office of the Governor and administratively attached to the Department for Local Government (for office space)(Appendix Figure L.3).[7] An 11-member board manages the affairs of KIA. Four members are defined by their governor-appointed positions: secretaries of the Economic Development, Finance and Administration, and Energy and Environment Cabinets; and the commissioner of the Department for Local Government. The executive director of the Public Service Commission also sits on the board. The governor appoints six at-large members from lists submitted by non-state entities: one nominated by the Kentucky Association of Counties (from a list of three), two nominated by the Kentucky League of Cities (one of whom must representation a municipality that provides water and wastewater services) (from a list of six), one nominated by the Kentucky Rural Water Association (from a list of three), one representing for-profit private water companies, and one nominated by the Kentucky section of the American Water Works Association (from a list of three). At-large members serve four-year terms.[8]

The Kentucky Public Service Commission consists of three members with quasi-legislative and quasi-judicial duties and powers.[9] *The members are appointed by the governor* with the advice and consent of the Senate (Appendix Figure L.3). Members serve four-year terms.[10]

Appendix Figure L.3: Graphical Depiction of Governance Entity Roles and Relationships, Kentucky



Source: See endnotes embedded in text for this section.

Financial Regulation and Oversight

The state requires local governments to notify the State Local Debt Officer, who resides in the Department of Local Government, before entering into debt. For bonds and obligations, local governments must provide written notification that contains details including maturity schedules, interest rates, date of issue, purpose, and paying agents.[11] Municipalities may also be required to file financial audits or statements with the Department of Local Government or the Public Service Commission.[12]

Key Aspects of Kentucky's State Revolving Fund (SRF) Programs

Administration and Application Process

Kentucky has **joint administration** of the drinking water and clean water SRF programs via KIA and the Division of Water within the Department for Environmental Protection (under the Kentucky Energy and Environment Cabinet).[13] The Department of Environmental Protection conducts environmental reviews.[14] The **process for the Kentucky DWSRF program differs slightly** from other Appalachian states in that public water systems first submit applications to their local area development district, which in turn, submits a priority list to KIA for review.[15]

Ranking Criteria

Both of Kentucky's priority ranking systems include **regionalization, asset management plans, and affordability.** The DWSRF priority ranking system also includes **PFAS** (Appendix Table L.6).[16]

Appendix Table L.6: Summary of Priority Ranking Criteria for the State of Kentucky (continued on next page)

Priority Ranking Category	Included in Which SRF Program?		Additional Relevant Details About Points Awarded within Category
	Drinking Water	Clean Water	
Regionalization	x	x	This category includes consolidation and interconnections. Additional points are awarded for the DWSRF if PFAS has been detected.
Public Health – Water Supply	x		Additional points are awarded for the DWSRF if PFAS has been detected.
Public Health – Treatment	x		Additional points are awarded for the DWSRF if PFAS has been detected.
Public Health – Distribution	x		
Service Line Inventory	x		
Lead Line Replacement	x		This category includes a consideration of the median household income(MHI)
Lead Compliance	x		
Security/Cybersecurity	x	x	
Compliance and Enforcement	x	x	
Financial Need	x	x	Additional points are awarded if the service area MHI falls below 80% of the state MHI.

Appendix Table L.6 (continued): Summary of Priority Ranking Criteria for the State of Kentucky

Priority Ranking Category	Included in Which SRF Program?		Additional Relevant Details About Points Awarded within Category
	Drinking Water	Clean Water	
Planning	x	x	This category includes points for having an asset management and/or capital improvement plan. It also incorporates the average monthly bill as a percent of MHI.
Sustainable Infrastructure/Green Projects	x	x	
Project Readiness	x	x	Additional points are awards for providing a complete technical plan (with specifications), submitting complete environmental or other required reviews, and/or having already secured additional funding (if applicable).
Project Readiness – Lead Inventory or Line Replacement	x		The priority ranking criteria list sepcific requirements for these projects.
Project Needs		x	
Water Quality		x	

Source: Department for Environmental Protection (Energy and Environment Cabinet), Priority System Guidance Document Kentucky Clean Water State Revolving Fund (2025); Department for Environmental Protection (Energy and Environment Cabinet), Priority System Guidance Document Kentucky Drinking Water State Revolving Fund (2025)

Onsite System Management

Private Wells

Neither the EPA nor the State of Kentucky regulates well water quality. It is incumbent upon the individual owner to have the water tested annually, which must be done using state-certified labs. Well owners must contract with a certified well driller, who will be responsible for submitting the required documentation to the Department of Environmental Protection. The Department also provides technical assistance regarding well maintenance and water quality problems.[17]

Septic Systems

Local health department inspectors perform evaluations to assess the suitability of a site for an onsite wastewater system. Homeowners must obtain a permit through their local health department and use a certified onsite septic installer.[18]

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[1] See funding tables for links to all funding program websites; "About KIA," Kentucky Infrastructure Authority, Accessed February 17, 2025, https://kia.ky.gov/Information/Pages/default.aspx.

[2] Division of Water, Kentucky State Environmental Review Process for State Revolving Fund Projects (Department for Environmental Protection, Energy and Environment Cabinet, 2017), https://eec.ky.gov/Environmental-Protection/Water/Protection/Wastewater%20Documents/KentuckyStateEnvironmentalReviewProcess-SERP.pdf' "Drinking Water: Division of Water," Energy and Environment Cabinet, Accessed February 17, 2025, https://eec.ky.gov/Environmental-Protection/Water/Drinking/Pages/Drinking%20Water.aspx; "Wastewater Discharge Permits," Energy and Environment Cabinet, Accessed April 8, 2025, https://eec.ky.gov/Environmental-Protection/Water/PermitCert/KPDES/Pages/default.aspx.

[3] "Water Well Information for Home Owners," Energy and Environment Cabinet, Accessed February 17, 2025, https://eec.ky.gov/Environmental-Protection/Water/GW/Pages/GWOwnerAssist.aspx.; "Onsite Sewage Disposal Program," Cabinet for Health and Family Services, Accessed February 17, 2025, https://www.chfs.ky.gov/agencies/dph/dphps/emb/Pages/environmentmgmt.aspx.
[4] "Local Government Debt," Kentucky Department for Local Government, Accessed February 17, 2025, https://dlg.ky.gov/counties/Pages/Local-Government-Debt.aspx; 807 Ky. Admin. Regs. Service 5:006.
[5] "About the Public Service Commission," Kentucky Public Service Commission, Accessed February 17, 2025, https://psc.ky.gov/Home/About#AbtComm.
[6] "Org Charts," Personnel Cabinet, Accessed March 11, 2025, https://personnel.ky.gov/organizational-chart.
[7] "About KIA," Kentucky Infrastructure Authority, Accessed February 17, 2025, https://kia.ky.gov/Information/Pages/default.aspx.
[8] Ky. Rev. Stat. § 224A.030 (2024).
[9] "About the Public Service Commission," Kentucky Public Service Commission, Accessed February 17, 2025, https://psc.ky.gov/Home/About#AbtComm.
[10] Ky. Rev. Stat. § 278.050 (2022).
[11] "Local Government Debt," Kentucky Department for Local Government, Accessed February 17, 2025, https://dlg.ky.gov/counties/Pages/Local-Government-Debt.aspx.
[12] "Information Central," Kentucky League of Cities, Accessed April 7, 2025, https://www.klc.org/InfoCentral/Detail/45; 807 Ky. Admin. Regs. Service 5:006.
[13] "Drinking Water State Revolving Fund," Energy and Environment Cabinet, Accessed February 17, 2025, https://eec.ky.gov/Environmental-Protection/Water/Funding/DWSRF/Pages/default.aspx.; "Clean Water State Revolving Fund, "Energy and Environment Cabinet, Accessed February 17, 2025, https://eec.ky.gov/Environmental-Protection/Water/Funding/CWSRF/Pages/default.aspx.
[14] "Clean Water State Revolving Fund, "Energy and Environment Cabinet, Accessed February 17, 2025, https://eec.ky.gov/Environmental-Protection/Water/Funding/CWSRF/Pages/default.aspx.
[15] "Drinking Water State Revolving Fund," Energy and Environment Cabinet, Accessed February 17, 2025, https://eec.ky.gov/Environmental-Protection/Water/Funding/DWSRF/Pages/default.aspx.
[16] Department for Environmental Protection. *Priority System Guidance Document Kentucky Clean Water State Revolving Fund* (2025). https://eec.ky.gov/Environmental-Protection/Water/Funding/CW%20DW%20SRF%20FORMS/2026%20CWSRF%20Guidance%20Document.pdf.; Department for Environmental Protection. *Priority System Guidance Document Kentucky Drinking Water State Revolving Fund* (2025). https://eec.ky.gov/Environmental-Protection/Water/Funding/CW%20DW%20SRF%20FORMS/2026%20DWSRF%20Guidance%20Document.pdf.
[17] "Water Well Information for Home Owners," Energy and Environment Cabinet, Accessed February 17, 2025, https://eec.ky.gov/Environmental-Protection/Water/GW/Pages/GWOwnerAssist.aspx.
[18] "Onsite Sewage Disposal Program," Cabinet for Health and Family Services, Accessed February 17, 2025, https://www.chfs.ky.gov/agencies/dph/dphps/emb/Pages/environmentmgmt.aspx.

Governance Profile: Maryland

Distribution of Roles Across Governance Entities

- Three state agencies administer funding for water and wastewater infrastructure projects in Maryland (Appendix Table L.7).[1]
- The Department of Natural Resources conducts environmental reviews as required by funding programs (Appendix Table L.7).[2]
- The Department of the Environment is responsible for the regulation of and permitting related to the public water supply as well as National Pollution Discharge Elimination System permits (Appendix Table L.7).[3]
- The Department of the Environment and local governments support onsite system management (Appendix Table L.7).[4]
- Two entities provide financial oversight: the Office of Legislative Audits within the Department of Legislative Services and the Maryland Board of Public Works (Appendix Table L.7).[5]
- The Public Service Commission provides rate and service oversight for private water systems in the state (Appendix Table L.7).[6]

Appendix Table L.7: Distribution of Roles Across Governance Entities, Maryland

ENTITY NAME	ENTITY TYPE					ENTITY ROLES: FUNDING						PERMITTING			REGULATION				OVERSIGHT				OTHER	
	State Agency/Department	State Office	Legislative Department	Local Government	Other Entity	Admin, SRF	Admin, ARC	Admin, CDBG	Admin, Other	Provision, Grants/Loans	Provision, Bond Bank	Public Water Supply	Private Wells	Septic	Public Water Supply	Private Wells	Septic	W/WW Rate-Setting and Service Provision	Financial/Funding	Onsite Systems	General Water Resources	Conducts State Env. Reviews	Well Water Testing	Provides Technical Assistance
Dept. of the Environment	x					x			x			x			x					x				x
Dept. of Natural Resources	x																					x		
Dept. of Planning	x						x																	
Dept. of Housing and Community Development	x							x																
Dept. of Legislative Services			x																x					
Local Health Departments				x									x	x			x						x	
Board of Public Works					x														x					
Public Service Commission					x													x						

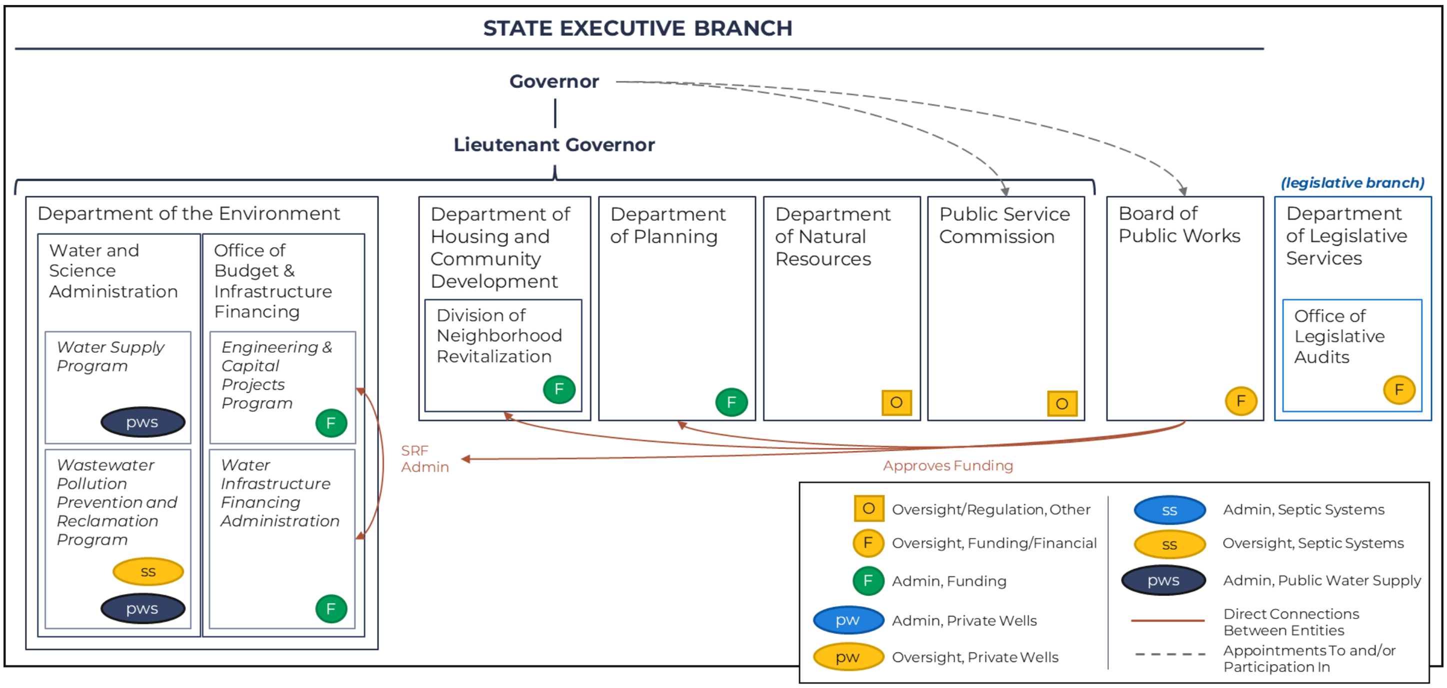
Source: See endnotes embedded in text for this section.

Relationships and Efficiencies

In Maryland, the **Board of Public Works** is a unique entity and the highest administrative body in the state government. The board consists of the governor, the comptroller, and the treasurer and derives its authority from the constitution. The governor and comptroller are elected by the general public whereas the treasurer is elected by the state general assembly (Appendix Figure L.4).[7]

Although the **Public Service Commission** is defined as an independent agency, it sits under the direction of the state executive branch. The governor appoints all four members of the PSC for staggered five-year terms with the approval of the state senate (Appendix Figure L.4).[8]

Appendix Figure L.4: Graphical Depiction of Governance Entity Roles and Relationships, Maryland



Source: See endnotes embedded in text for this section.

Financial Regulation and Oversight

The Office of Legislative Audits within the Department of Legislative Services reviews the audit reports of county and municipal governments.[9] The Maryland Board of Public Works approves funding for water and wastewater infrastructure projects.[10]

Key Aspects of Maryland's State Revolving Fund (SRF) Programs

Administration and Application Process

Maryland has **sole administration** of both SRF programs within the Department of the Environment, though two departments are involved: the Water Financing Administration and the Engineering and Capital Projects Program.[11] Projects must be consistent with the County Comprehensive Land Use Plan and included in, consistent with, or amended into the Water and

Sewer Usage Plan *and* be located in a Priority Funding Area.[12] Most applicants for drinking water projects must have a capacity management plan to be eligible for funding.[13]

Ranking Criteria

Maryland's DWSRF includes **consolidation, affordability,** and **asset management plan** considerations. Both SRF program ranking criteria include **PFAS** (Appendix Table L.8).[14]

Appendix Table L.8: Summary of Priority Ranking Criteria for the State of Maryland

Priority Ranking Category	Included in Which SRF Program?		Additional Relevant Details About Points Awarded within Category
	Drinking Water	Clean Water	
Addresses Water Quality Issues	x		This category includes points for addressing PFAS, LSLs, EC, MCLs, or other drinking water quality standards as defined by EPA.
Addresses Drinking Water Quantity Issues	x		Points are awarded for addressing sisues regarding water capacity, water shortage, and/or pressure loss.
Infrastructure Replacement and Improvements	x		This category includes consolidation projects.
MDE Orders/Directives	x		
Water Conservation and Other Practices	x		
Affordability, Cost Efficiency, and Sustainability	x		Additional points are awarded if the annual water bill exceeds 1% of MHI and/or the project costs less than $15,000 per EDU. This category also includes asset management plans.
Water Quality Benefit		x	This category includes points for nitrogen reduction efforts
Public Health and Safety		x	This category includes water quality and flooding and well as PFAS contamination.
Water Quality and Public Health Compliance		x	
Nitrogen Removal Cost Efficiency		x	
Co-benefits		x	This category includes co-benefits such as sustainability and climate

Source: Maryland Department of the Environment, Integrated Project Priority System for Drinking Water Capital Projects (2023); Maryland Department of the Environment, Integrated Project Priority System for Water Quality Capital Projects Point Sources and Nonpoint Sources (2024)

Onsite System Management

Private Wells

Well owners in Maryland are responsible for maintaining their own system.[15] Local departments of health issue permits to licensed drillers for new wells. Local health departments may test well water in new wells before issuing a certificate of potability.[16]

Septic Systems

Permits for new on-site system installations are issued by local health departments. The health department is responsible for conducting a percolation test and soil evaluation before issuing a permit.[17] The Onsite Systems Division of the Maryland Department of the Environment provides support to county health departments through technical assistance, policy review, training, and maintaining professional registration, among other activities.[18]

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[1] See funding tables for links to all funding program websites.
[2] "Environmental Review," Maryland Department of Natural Resources, Accessed March 18, 2025, https://dnr.maryland.gov/wildlife/Pages/plants_wildlife/er.aspx.
[3] "Maryland Water Permits," Maryland Department of the Environment, Accessed March 18, 2025, https://mde.maryland.gov/programs/permits/watermanagementpermits/pages/index.aspx; "Laws and Regulations Governing the MCE Water Supply Program," Maryland Department of the Environment, Accessed March 18, 2025, https://mde.maryland.gov/programs/Water/water_supply/pages/regulations.aspx; "Water Appropriation or Use Permit, Maryland Department of the Environment, Accessed March 18, 2025, https://mde.maryland.gov/programs/water/water_supply/Pages/WaterAppropriationsOrUsePermits.aspx; "Wastewater Permits Program," Maryland Department of the Environment, Access April 8, 2025, https://mde.maryland.gov/programs/Water/wwp/Pages/index.aspx.
[4] "Water Well Construction," Maryland Department of the Environment, Accessed March 18, 2025, https://mde.maryland.gov/programs/water/bayrestorationfund/onsitedisposalsystems/pages/wellconstruction.aspx; "Onsite Systems," Maryland Department of the Environment, Accessed March 6, 2025, https://mde.maryland.gov/programs/water/bayrestorationfund/onsitedisposalsystems/pages/onsitesystems.aspx; "Residential Wells," Maryland Department of the Environment, Accessed March 6, 2025, https://mde.maryland.gov/programs/water/water_supply/Pages/Residential_Wells.aspx; "Procedure for Disinfecting Water Wells," Garrett County Health Department, Accessed March 6, 2025, https://garretthealth.org/wells/; "Sewage Disposal Systems" Garrett County Health Department, Accessed March 6, 2025, https://garretthealth.org/sewage-disposal-systems/.
[5] Government Services in Maryland, Legislative Handbook Series Volume 2 (2022), Department of Legislative Services, https://dls.maryland.gov/pubs/prod/RecurRpt/Handbook_Volume_6_MD_Local_Government.pdf;"About BPW," Maryland Board of Public Works, Accessed March 18, 2025, https://bpw.maryland.gov/Pages/about-bpw.aspx.
[6] "The Water Division," Maryland Public Service Commission, Accessed March 18, 2025, https://www.psc.state.md.us/water/.
[7] "About BPW," Maryland Board of Public Works, Accessed March 18, 2025, https://bpw.maryland.gov/Pages/about-bpw.aspx.
[8] "The Commission," Maryland Public Service Commission, Accessed March 18, 2025, https://www.psc.state.md.us/the-commission/.
[9] Government Services in Maryland, Legislative Handbook Series Volume 2 (2022), Department of Legislative Services, https://dls.maryland.gov/pubs/prod/RecurRpt/Handbook_Volume_6_MD_Local_Government.pdf.
[10] "About BPW," Maryland Board of Public Works, Accessed March 18, 2025, https://bpw.maryland.gov/Pages/about-bpw.aspx.
[11] "Maryland Water Infrastructure Financing Administration," Maryland Department of the Environment, Accessed March 18, 2025, https://mde.maryland.gov/programs/water/WQFA/Pages/index.aspx.
[12] Prepare to Apply (2024), Maryland Water Quality Financing Administration, https://mde.maryland.gov/programs/water/WQFA/Documents/Prepare%20to%20apply_Oct%202024.pdf.
[13] Integrated Project Priority System for Drinking Water Capital Projects (2023), Maryland Department of the Environment, https://mde.maryland.gov/programs/water/WQFA/Documents/DW%20IPPS%20Rev%204_Final%20Approved%20by%20EPA.pdf.
[14] Integrated Project Priority System for Drinking Water Capital Projects (2023), Maryland Department of the Environment, https://mde.maryland.gov/programs/water/WQFA/Documents/DW%20IPPS%20Rev%204_Final%20Approved%20by%20EPA.pdf; Integrated Project Priority System for Water Quality Capital Projects Point Sources and Nonpoint Sources (2024), Maryland Department of the Environment, https://mde.maryland.gov/programs/water/WQFA/Documents/FINAL%20WQ%20IPPS%20Rev%206%20Amend%202.pdf.
[15] "Residential Wells," Maryland Department of the Environment, Accessed March 6, 2025, https://mde.maryland.gov/programs/water/water_supply/Pages/Residential_Wells.aspx.

[16] Procedure for Disinfecting Water Wells," Garrett County Health Department, Accessed March 6, 2025, https://garretthealth.org/wells/.
[17] "Sewage Disposal Systems," Garrett County Health Department, Accessed March 6, 2025, https://garretthealth.org/sewage-disposal-systems/.
[18] "Onsite Systems," Maryland department of the Environment, Accessed March 6, 2025, https://mde.maryland.gov/programs/water/bayrestorationfund/onsitedisposalsystems/pages/onsitesystems.aspx.

Governance Profile: Mississippi

Distribution of Roles Across Governance Entities

- Three state agencies administer funding for water and wastewater infrastructure projects in Mississippi (Appendix Table L.9).[1]
- The Department of Environmental Quality conducts environmental reviews as required by funding programs. It is also responsible for permitting related to the public water supply as well as National Pollution Discharge Elimination System permits (Appendix Table L.9).[2]
- The Department of Health regulates the public water supply (Appendix Table L.9).[3]
- Two state agencies provide support for onsite system management (Appendix Table L.9).[4]
- Three entities provide financial oversight: the Department of Audit, the Mississippi Public Utilities Staff (MPUS), and the Local Government and Rural Water Systems Improvements Board (the latter for DWSRF) (Appendix Table L.9).[5]
- Two entities provide oversight for water and wastewater utility rates and services: MPUS and the Public Service Commission (Appendix Table L.9).[6]

Appendix Table L.9: Distribution of Roles Across Governance Entities, Mississippi

ENTITY NAME	ENTITY TYPE					ENTITY ROLES: FUNDING						PERMITTING			REGULATION				OVERSIGHT				OTHER	
	State Agency/Department	State Office	Legislative Department	Local Government	Other Entity	Admin, SRF	Admin, ARC	Admin, CDBG	Admin, Other	Provision, Grants/Loans	Provision, Bond Bank	Public Water Supply	Private Wells	Septic	Public Water Supply	Private Wells	Septic	W/WW Rate-Setting and Service Provision	Financial/Funding	Onsite Systems	General Water Resources	Conducts State Env. Reviews	Well Water Testing	Provides Technical Assistance
Dept. of Environmental Quality	x					x			x			x	x			x						x		x
State Dept. of Health	x					x			x					x	x		x						x	
Development Authority	x							x	x															
Dept. of Audit	x																		x					
Public Utilties Staff	x																	x	x					
Public Service Commission					x													x						
Local Gov. and Rural Water Systems Improvements Board					x														x					

Source: See endnotes embedded in text for this section.

Relationships and Efficiencies

The Mississippi Public Utilities Staff (MPUS) provides financial and regulatory oversight for water and wastewater utilities through a variety of mechanisms. While it is independent from the Public

Service Commission, MPUS acts in an advisory capacity by reviewing and investigating all contested matters and making recommendations to the Commission. MPUS also provides technical assistance regarding the enforcement of rules to the Commission. MPUS assesses the viability of Community Development Block Grant water improvement projects and new public water systems. Finally, it ensures water and sewer companies comply with all laws and rules by reviewing accounting, engineering, and operational matters, conducting audits and cost studies, and monitoring construction projects.[7] The governor appoints the Executive Director (Appendix Figure L.5, page 241).[8]

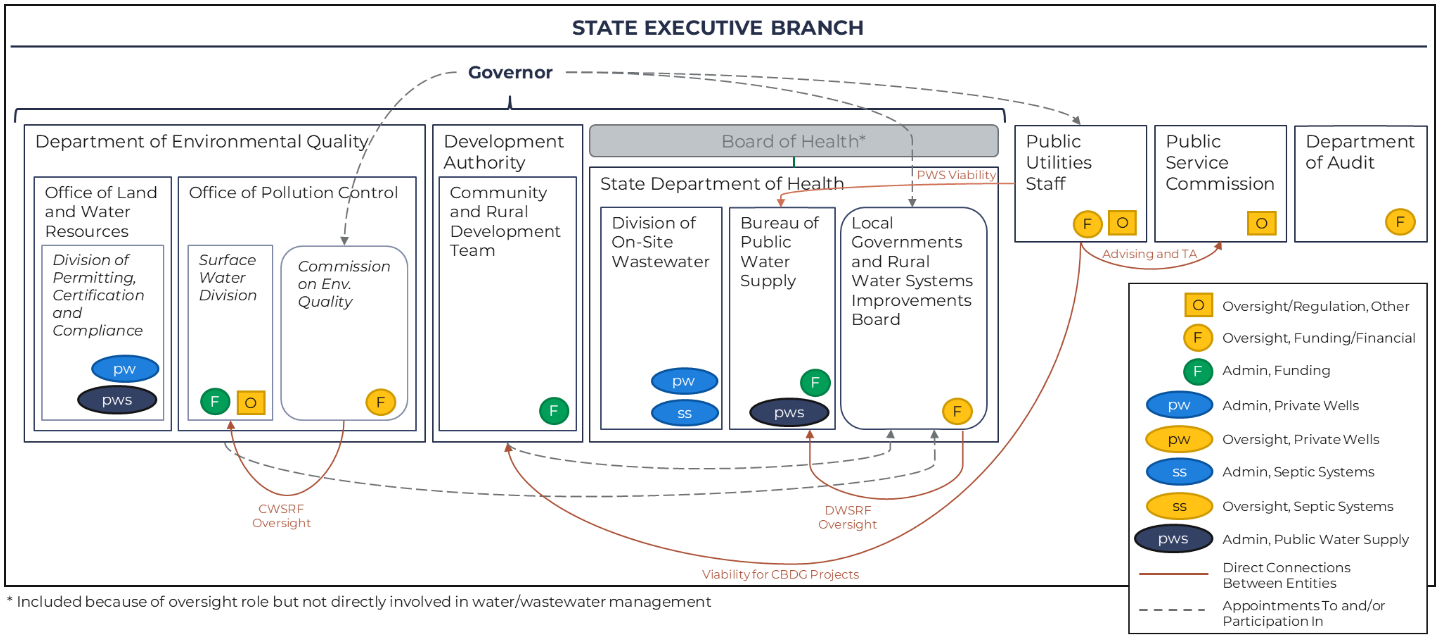
Currently, the **Public Service Commission** consists of three elected commissioners representing the three state Supreme Court districts who serve four-year terms.[9] Notably, a bill was introduced to the Mississippi State Senate during the 2024 regular session that sought to shift the Public Service Commission from an elected body to an appointed body and consolidate the Commission with the Public Utilities Staff. It did not move past the committee, but the section of the Mississippi code that established the Public Service Commission may have been repealed effective December 31, 2028.[10]

The **Local Government and Rural Water Systems Improvements Board** oversees the administration of the DWSRF program by the State Department of Health. The nine-person board consists of eight members determined by their positions (the State Health Officer (chair), the Executive Director of the Mississippi Development Authority (governor-appointed), the Executive Director of the Department of Environmental Quality (governor-appointed), the Executive Director of the Department of Finance and Administration (governor appointed), the Executive Director of the Mississippi Association of Supervisors, the Executive Director of the Mississippi Municipal League, the Executive Director of the American Council of Engineering Companies, and the State Director of the United States Department of Agriculture, Rural Development) plus one manager of a rural water system appointed by the governor (Appendix Figure L.5, page 241).[11] The original section of the Mississippi State Code of Law that establishes the board and defines its responsibilities (Section 41-3-16, MS Code of 1972 Annotated) has been repealed effective July 1, 2029.[12]

The **Commission on Environmental Quality** oversees the administration of the CWSRF program. The Commission consists of seven members appointed by the governor and approved by the Senate, representing each congressional district plus two at-large members (Appendix Figure L.5, page 241). Members currently serve seven-year terms, but the law has been amended to reduce the term length to four years effective January 1, 2028.[13]

Funds from the CWSRF can be used to satisfy matching funds requirements for ARC, Community Development Block Grant, and Rural Utilities Service programs.[14]

Appendix Figure L.5: Graphical Depiction of Governance Entity Roles and Relationships, Mississippi



* Included because of oversight role but not directly involved in water/wastewater management

Source: See endnotes embedded in text for this section.

Financial Regulation and Oversight

The Department of Audit conducts and oversees audits of public entities in Mississippi, including local governments.[15] The Public Utilities Staff ensure water and sewer companies comply with all laws and rules by reviewing accounting procedures and policies and conducting audits.[16]

Key Aspects of Mississippi's State Revolving Fund (SRF) Programs

Administration and Application Process

Mississippi has **split administration** of the SRF program, with the Department of Health (MSDH) administering the drinking water program and the Department of Environmental Quality administering the clean water program. Both programs allow for segmented projects.[17]

Ranking Criteria

Both the DWSRF and CWSRF use a multi-tiered ranking system.

DWSRF. For DWSRF, projects are initially categorized by type, creating thirteen categories. The first category is segmented projects, all of which are funded so long as there is enough funding available. The order of the remaining categories prioritizes projects that address the most serious risks to human health. The projects within these categories are ranked according to the criteria in Table X. However, all projects in Category II are funded before any projects in Category III and so forth. The criteria incorporate **affordability**, **consolidation**, and **asset management plans**. MSDH contracts with the Mississippi State Extension Service to provide free **technical assistance** and awards communities that participate in that program with additional points. In case of a tie, the community with the lower MHI will be prioritized for funding. Mississippi has also set aside a specific proportion of funding to support **small communities**. After all rankings are calculated, the list is adjusted to ensure that at least 15% of all funding is supporting communities serving fewer than 5,000 people (Appendix Table L.10, page 243).[18]

CWSRF. The CWSRF program allocates funding into three separate categories (green reserve, subsidy, and regular). Because the funding is allocated separately, there is no competition between categories. The CWSRF program also categorizes projects by type and funds all projects in the first category (segmented projects) before any projects in Category 2 and then funds all projects in Category 2 before any in Category 3, etc. Further, the Subsidy Priority List has two tiers. To be ranked on the higher tier, the applicant's *service area* must have a population of no more than 4,000 and an MHI of no more than $40,000. Projects within Tier One are scored based on six **affordability** factors. Tier Two applications must have a *project area* that earns at least one Affordability Factor point. After calculating the affordability scores, both tiers are then ranked based on service area MHI and service area population. After ranking determined by category and affordability (subsidy list only), readiness to proceed and alignment with the Mississippi Basin Management approach are considered (Appendix Table L.10, page 243).[19]

Onsite System Management

Private Wells

The Mississippi Department of Environmental Quality's Office of Land and Water Resources regulates private well permitting. Well drillers must be water well contractors licensed in Mississippi.[20] Mississippi State Department of Health provides free private well sampling to test for bacteriological contamination. Any other types of contamination must be tested through a private laboratory, for which the homeowner is responsible.[21]

Septic Systems

The On-Site Wastewater program, a group of the Mississippi State Department of Health, develops on-site wastewater policies and regulations and manages on-site wastewater permitting and professional certifications. Their staff can conduct soil and site evaluations to provide recommendations for appropriate systems during the permitting process.[22]

Appendix Table L.10: Summary of Priority Ranking Criteria for the State of Mississippi

Priority Ranking Category	Included in Which SRF Program?		Additional Relevant Details About Points Awarded within Category
	Drinking Water	Clean Water	
Tier One			
Priority System Categories (Project Type)	x	x	All projects in the first category are funded before funding any in the second category, and so forth, regardless of final project scores according to Tier 2.
Tier Two			
Benefit/Cost	x		This ratio is calculated as the number of benefiting connections divided by the total eligible cost of improvements. The benefit/cost value is incorporated into the majority of DWSRF criteria.
Affordability	x	x	Points are awarded according to an affordability assessment. For DWSRF: Calculated as the ratio of the community MHI compared to the state MHI times the cost/benefit ratio For CWSRF: Subsidy List only and includes per capita income, % unemployed, % vacant households, % living below poverty level, % not speaking English, % receiving SNAP benefits
Consolidation	x		
System Capacity	x		Points are awarded if the system is currently overloaded or will reach maximum capacity within two years.
Participation in Short-Term and Long-Term Technical Assistance Programs	x		Points are awarded for participation in the programs. TA provided at no cost to communities through an agreement between MSDH and the Mississippi State University Extension Service.
Asset management plan	x		
Readiness to Award		x	
Coordination with Mississippi Basin Management Approach		x	

Source: State of Mississippi Local Governments and Rural Water Systems Improvements Board, State of Mississippi Drinking Water Systems Improvements Revolving Fund Loan Program FFY-2025 Intended Use Plan; Mississippi Commission on Environmental Quality, Fiscal Year 2024 Intended Use Plan (IUP) for the Water Pollution Control Revolving Loan Fund Program

[1] See funding tables for links to all funding program websites.

[2] "Permitting and Monitoring," Mississippi Department of Environmental Quality, Accessed March 18, 2025, https://www.mdeq.ms.gov/water/permitting-and-monitoring/; "Bureau of Public Water Supply," Mississippi State Department of Health, Accessed March 18, 2025, https://msdh.ms.gov/page/30,0,76.html; "Groundwater Permit Guidance," Mississippi Department of Environmental Quality, Accessed March 6, 2025, https://www.mdeq.ms.gov/permits/water-availability-and-use/forms/groundwater-permit-guidance/; Guidance for Water Pollution Control Revolving Loan Fund Projects Funding Beginning Federal FY 2016 (October 1, 2015 and After) (2015), Mississippi Department of Environmental Quality, https://www.mdeq.ms.gov/wp-content/uploads/2017/06/FY-2016-Project-Guidance-With-Attachments.docx; "Applications and Forms," Mississippi Department of Environmental Quality, Accessed April 8, 2025, https://www.mdeq.ms.gov/permits/environmental-permits-division/applications-forms/.
[3] "Bureau of Public Water Supply," Mississippi State Department of Health, Accessed April 8, 2025, https://msdh.ms.gov/page/30,2061,76.html.
[4] "Private Well Water Testing," Mississippi State Department of Health, Accessed March 6, 2025, https://msdh.ms.gov/page/30,0,76,762.html; "On-Site Wastewater.," Mississippi State Department of Health, Accessed March 6, 2025, https://msdh.ms.gov/page/30,0,78.html.
[5] "About the Department," MS State Auditor, Accessed April 3, 2025, https://www.osa.ms.gov/about; Water and Sewer," Mississippi Public Utilities Staff, Accessed April 3, 2025, https://www.mpus.ms.gov/mpus/water-sewer; State of Mississippi Local Governments and Rural Water Systems Improvements Board, *State of Mississippi Drinking Water Systems Improvements Revolving Fund Loan Program FFY-2025 Intended Use Plan* (Mississippi State Department of Health, 2025), https://www.msdh.ms.gov/msdhsite/index.cfm/44,20373,127,pdf/DWSRF_Intended_Use_Plan_FY2025.pdf.
[6] "Water and Sewer," Mississippi Public Utilities Staff, Accessed April 3, 2025, https://www.mpus.ms.gov/mpus/water-sewer; "Mississippi Public Service Commission," Mississippi Public Service Commission, Accessed March 18, 2025, https://www.psc.ms.gov/home/home.
[7] "Water and Sewer," Mississippi Public Utilities Staff, Accessed April 3, 2025, https://www.mpus.ms.gov/mpus/water-sewer.
[8] "Composition and Functions," Mississippi Public Utilities Staff, Accessed April 3, 2025, https://www.mpus.ms.gov/mpus/functions.
[9] Miss. Code Ann. § 77-1-1 (2024).
[10] "Senate Bill 2455," Mississippi Legislature 2024 Regular Session, Updated March 5, 2024, https://billstatus.ls.state.ms.us/2024/pdf/history/SB/SB2455.xml; Miss. Code Ann. § 77-1-1 (2024).
[11] State of Mississippi Local Governments and Rural Water Systems Improvements Board, *State of Mississippi Drinking Water Systems Improvements Revolving Fund Loan Program FFY-2025 Intended Use Plan* (Mississippi State Department of Health, 2025), https://www.msdh.ms.gov/msdhsite/index.cfm/44,20373,127,pdf/DWSRF_Intended_Use_Plan_FY2025.pdf.
[12] Miss. Code Ann. § 41-3-16 (2024).
[13] "Commission on Environmental Quality," Mississippi Department of Environmental Quality, Accessed April 3, 2025, https://www.mdeq.ms.gov/about-mdeq/commission-on-environmental-quality/; Miss. Code Ann. § 49-2-5 (2024).
[14] Mississippi Commission on Environmental Quality, *Fiscal Year 2024 Intended Use Plan (IUP) for the Water Pollution Control Revolving Loan Fund Program* (Mississippi Department of Environmental Quality, 2024), https://www.mdeq.ms.gov/wp-content/uploads/2024/10/FY24-IUP_Final.pdf.
[15] "About the Department," MS State Auditor, Accessed April 3, 2025, https://www.osa.ms.gov/about.
[16] "Water and Sewer," Mississippi Public Utilities Staff, Accessed April 3, 2025, https://www.mpus.ms.gov/mpus/water-sewer.
[17] State of Mississippi Local Governments and Rural Water Systems Improvements Board, *State of Mississippi Drinking Water Systems Improvements Revolving Fund Loan Program FFY-2025 Intended Use Plan* (Mississippi State Department of Health, 2025), https://www.msdh.ms.gov/msdhsite/index.cfm/44,20373,127,pdf/DWSRF_Intended_Use_Plan_FY2025.pdf; Mississippi Commission on Environmental Quality, *Fiscal Year 2024 Intended Use Plan (IUP) for the Water Pollution Control Revolving Loan Fund Program* (Mississippi Department of Environmental Quality, 2024), https://www.mdeq.ms.gov/wp-content/uploads/2024/10/FY24-IUP_Final.pdf.
[18] State of Mississippi Local Governments and Rural Water Systems Improvements Board, *State of Mississippi Drinking Water Systems Improvements Revolving Fund Loan Program FFY-2025 Intended Use Plan* (Mississippi State Department of Health, 2025), https://www.msdh.ms.gov/msdhsite/index.cfm/44,20373,127,pdf/DWSRF_Intended_Use_Plan_FY2025.pdf.
[19] Mississippi Commission on Environmental Quality, *Fiscal Year 2024 Intended Use Plan (IUP) for the Water Pollution Control Revolving Loan Fund Program* (Mississippi Department of Environmental Quality, 2024), https://www.mdeq.ms.gov/wp-content/uploads/2024/10/FY24-IUP_Final.pdf.
[20] "Groundwater Permit Guidance," Mississippi Department of Environmental Quality, Accessed March 6, 2025, https://www.mdeq.ms.gov/permits/water-availability-and-use/forms/groundwater-permit-guidance/.

[21] "Private Well Water Testing," Mississippi State Department of Health, Accessed March 6, 2025, https://msdh.ms.gov/page/30,0,76,762.html.
[22] "On-Site Wastewater.," Mississippi State Department of Health, Accessed March 6, 2025, https://msdh.ms.gov/page/30,0,78.html.

Governance Profile: New York

Distribution of Roles Across Governance Entities

- Four state agencies, plus the Environmental Facilities Corporation, administer funding for water and wastewater infrastructure projects in New York (Appendix Table L.11).[1]
- The Department of Homes and Community Renewal houses a state bond bank (Appendix Table L.11).[2]
- The Department of Environmental Conservation conducts environmental reviews as required by funding programs. It is also responsible for permitting related to the public water supply and National Pollution Discharge Elimination System permits (Appendix Table L.11).[3]
- Both state agencies and local governments support regulation of the public water supply and onsite system management (Appendix Table L.11).[4]
- Two entities provide financial oversight: the Office of the State Comptroller and the Financial Restructuring Board for Local Governments (Appendix Table L.11).[5]
- The Department of Public Service supports rate and service regulation of water and wastewater utilities through the Public Service Commission (Appendix Table L.11).[6]

Appendix Table L.11: Distribution of Roles Across Governance Entities, New York

ENTITY NAME	ENTITY TYPE					ENTITY ROLES: FUNDING						PERMITTING			REGULATION				OVERSIGHT				OTHER	
	State Agency/Department	State Office	Legislative Department	Local Government	Other Entity	Admin, SRF	Admin, ARC	Admin, CDBG	Admin, Other	Provision, Grants/Loans	Provision, Bond Bank	Public Water Supply	Private Wells	Septic	Public Water Supply	Private Wells	Septic	WWW Rate-Setting and Service Provision	Financial/Funding	Onsite Systems	General Water Resources	Conducts State Env. Reviews	Well Water Testing	Provides Technical Assistance
Dept. of Env. Conservation	x					x			x			x	x			x						x		
Dept. of Health	x					x									x	x								
Dept. of State	x						x		x															
Dept. of Public Service	x																	x						
Homes and Community Renewal	x							x			x													
Office of the State Comptroller		x																	x					
County Health Departments				x									x	x	x		x							x
Financial Restructuring Board for Local Governments					x														x					
Environmental Facilities Corp.					x	x			x															x

Source: See endnotes embedded in text for this section.

Relationships and Efficiencies

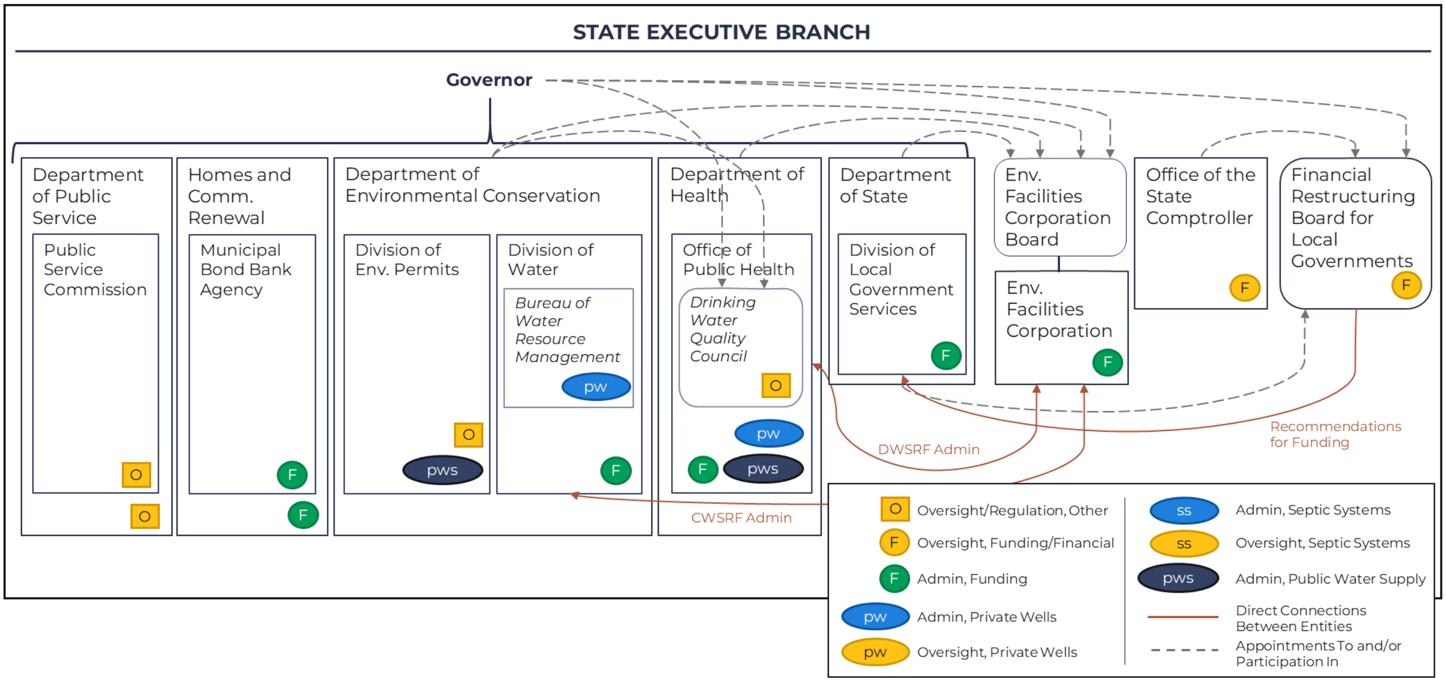
The governor, with the advice and consent of the Senate, appoints four out of seven board members of the **Environmental Facilities Corporation,** which is a public benefit corporation that provides financial and technical assistance to communities with environmental infrastructure projects. The remaining members are designated by their governor-appointed positions: the Commissioner of Environmental Conservation, the Commissioner of Health, and the Secretary of State. Appointed members serve staggered six-year terms (Appendix Figure L.6, page 248).[7]

The governor also appoints six out of ten members of the **Financial Restructuring Board for Local Government**, who serve at the pleasure of the governor. Two of the governor's appointments are recommended by the state legislature. The remaining members are determined by their positions: the Budget Director (governor-appointed), the State Comptroller, the Attorney General, and the Secretary of State (governor-appointed) (Appendix Figure L.6, page 248).[8] The Board can recommend grants and/or loans of up to $5 million through the Local Government Performance and Efficiency Program, which is managed by the Division of Local Government Services within the Department of State.[9]

The **Department of Health jointly oversees public drinking water systems with 36 counties** and solely oversees public drinking water systems in the remaining 21 counties.[10] The Drinking Water Quality Council within the Department of Health makes recommendations to the department regarding drinking water quality concerns. The governor appoints eight of twelve members, four of whom are recommended by the state legislature. Two members are designated by their positions, the Commissioner of Health and the Commissioner of Environmental Conservation, each of whom designates one additional member (Appendix Figure L.6, page 248).[11]

The Department of Public Service is the staff arm of the **Public Service Commission**, which regulates rates and services of private water companies in the state. The governor appoints all seven members of the Commission (with confirmation from the Senate) for six-year terms (Appendix Figure L.6, page 248).[12]

Appendix Figure L.6: Graphical Depiction of Governance Entity Roles and Relationships, New York



Source: See endnotes embedded in text for this section.

Financial Regulation and Oversight

Municipal and regional water and sewer authorities and certain municipalities are required to obtain approval from the State Comptroller before selling certain bonds or notes at private or negotiated sales.[13] The Financial Restructuring Board for Local Governments provides a comprehensive review of any Fiscally Eligible Municipality and makes recommendations to improve financial stability, management, and delivery of public services.[14]

Key Aspects of New York's State Revolving Fund (SRF) Programs

Administration and Application Process

New York has **joint and split administration** of SRF programs between the Environmental Facilities Corporation (EFC) and two agencies: the Department of Health (DOH) for DWSRF and the Department of Environmental Conservation for CWSRF.[15] For the DWSRF, the Department of Health is responsible for managing the DWSRF IUP, so applicants submit their projects to be listed through the DOH and then apply for funding through the EFC.[16] No significant differences in the New York CWSRF application process compared to other Appalachian states were identified.

Ranking Criteria

New York's DWSRF priority ranking system incorporates **consolidation,** and both the DWSRF and CWSRF incorporate **affordability** (community MHI compared to statewide MHI) (Appendix Table L.12, page 249).[17] While no points are directly awarded for having an asset management plan, communities are strongly encouraged to submit one for DWSRF and it may be required if the community has not proven it has sufficient TMF capacity to fulfill the project requirements.

Additionally, New York maintains two priority lists: the Annual List and the Multi-Year List. To be on the Annual List, applicants must have submitted all necessary documents, including an engineering report and construction schedule (as applicable). Projects must be on the Annual List to receive funding in a given year.[18]

Appendix Table L.12: Summary of Priority Ranking Criteria for the State of New York

Priority Ranking Category	Included in Which SRF Program?		Additional Relevant Details About Points Awarded within Category
	Drinking Water	Clean Water	
MCL/treatment Technique Violations	x		This category includes lead line replacement projects.
Other Sanitary Code Violations	x		
System Reliability/Dependency Issues	x		
Government Needs	x		This category includes system consolidation projects.
Financial Needs	x	x	This category incorporates community MHI as compared to state MHI.
Existing Source		x	Existing source is defined as a critical, significant, or potential source of pollution
Water Quality		x	
Consistency with DEC-Approved Management Plans		x	
Intergovernmental Needs		x	Examples of intergovernmental needs include abating water pollution, maintaining SPDES compliance, or aquiring high priority lands.
Economic Need Based on Service Provided to Empire Zones		x	

Source: New York State Department of Health and the Environmental Facilities Corporation, FINAL Intended Use Plan for the New York State Drinking Water State Revolving Fund (2024); New York Environmental Facilities Corporation and the Department of Environmental Conservation, FINAL INTENDED USE PLAN Clean Water State Revolving Fund (2024)

Onsite System Management

Private Wells

Private drinking water wells must be drilled by a registered Department of Environmental Conservation (NYDEC) contractor and must follow Department of Health construction standards. Contractors are responsible for submitting a completion report to NYDEC. Permits are only required from the New York Department of Environmental Conservation in specific instances.[19] However, local approvals may be required through the county's health department.[20] Well owners are responsible for testing their water and must use a laboratory certified by the New York State Department of Health Environmental Laboratory Approval Program.[21]

Septic Systems

Septic system construction is approved by county health departments through a Notice of Intent to Construct, Enlarge, or Convert a Facility. Plans for the septic installation must be completed by a Professional Engineer or Registered Architect. County health departments may also investigate complaints and provide technical assistance related to on-site systems.[22]

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[1] See funding tables for links to all funding program websites; "What We Do," New York State Environmental Facilities Corporation, Accessed March 20, 2025, https://efc.ny.gov/what-we-do.

[2] "Municipal Bond Bank Agency," Homes and Community Renewal, Accessed April 7, 2025, https://hcr.ny.gov/municipal-bond-bank-agency-mbba.

[3] State Environmental Quality Review Act (SEQR)", New York State Department of Environmental Conservation, Accessed March 20, 2025, https://dec.ny.gov/regulatory/permits-licenses/seqr; "Water Withdrawal Permits and Reporting," New York State Department of Environmental Conservation, Accessed March 20, 2025, https://dec.ny.gov/environmental-protection/water/water-quantity/water-withdrawal-permits-reporting; "State Pollutant Discharge Elimination System (SPDES) Permit Program, Accessed April 8, 2025, https://dec.ny.gov/regulatory/permits-licenses/wastewater-stormwater-water-withdrawal/spdes-permit-program.

[4] "Need a Water Well Drilled or Repaired? Water Well Consumer Protection Guide," New York Department of Environmental Conservation, Accessed March 10, 2025, http://www.ongov.net/health/env/documents/NYSDECNeedaWaterWellDrilledorRepaired.pdf; Saratoga County, Individual Water Supply Wells - Fact Sheet #6 (2018), https://www.saratogacountyny.gov/wp/wp-content/uploads/2023/08/DoH-IndividualWaterSupplies-FactSheet6.pdf; "Individual Water Supply Wells – Fact Sheet #3," New York State Department of Health, Updated July 2024, https://pl.health.ny.gov/environmental/water/drinking/regulations/fact_sheets/fs3_water_quality.htm; "Onsite Wastewater Treatment Systems," Saratoga County Department of Health. Accessed March 10, 2025, https://www.saratogacountyny.gov/departments/health/environmental/onsite-wastewater-treatment-systems/; ; "Drinking Water Program: Frequently Asked Questions," New York State Department of Health, Updated May 2024, https://www.health.ny.gov/environmental/water/drinking/faq_def.htm.

[5] Office of the New York State Comptroller, *Debt Issuance Approval Policy Statement and Guidelines* (2025), https://www.osc.ny.gov/files/debt/pdf/debt-policy-statement-and-guidelines.pdf; "Financial Restructuring Board for Local Governments," New York State, Accessed April 7, 2025, https://frb.ny.gov/.

[6] "About Us," New York State Department of Public Service, Accessed March 20, 2025, https://dps.ny.gov/about-us; "Water," New York State Department of Public Service, Accessed March 20, 2025, https://dps.ny.gov/water.

[7] "What We Do," New York State Environmental Facilities Corporation, Accessed March 20, 2025, https://efc.ny.gov/what-we-do; "Board of Directors," New York State Environmental Facilities Corporation, Accessed March 20, 2025, https://efc.ny.gov/board-directors.

[8] N.Y. Loc. Fin. Law § 160.05 (2024).

[9] "Financial Restructuring Board for Local Governments," New York State, Accessed April 7, 2025, https://frb.ny.gov/.

[10] "Drinking Water Program: Frequently Asked Questions," New York State Department of Health, Updated May 2024, https://www.health.ny.gov/environmental/water/drinking/faq_def.htm.

[11] N.Y. Pub. Health Law § 1113 (2024).

[12] "About Us," New York State Department of Public Service, Accessed March 20, 2025, https://dps.ny.gov/about-us; "Water," New York State Department of Public Service, Accessed March 20, 2025, https://dps.ny.gov/water.

[13] Office of the New York State Comptroller, *Debt Issuance Approval Policy Statement and Guidelines* (2025), https://www.osc.ny.gov/files/debt/pdf/debt-policy-statement-and-guidelines.pdf.

[14] "Financial Restructuring Board for Local Governments," New York State, Accessed April 7, 2025, https://frb.ny.gov/.

[15] "Drinking Water State Revolving Fund," Environmental Facilities Corporation, Accessed March 20, 2025, https://efc.ny.gov/dwsrf; New York Environmental Facilities Corporation and the Department of Environmental Conservation, *FINAL INTENDED USE PLAN Clean Water State Revolving Fund* (2024), https://efc.ny.gov/system/files/documents/2024/10/final-2025-cwsrf-iup.pdf.

[16] "Apply for the Drinking Water State Revolving Fund," Environmental Facilities Corporation, Accessed March 20, 2025, https://efc.ny.gov/dwsrf-apply.

[17] New York State Department of Health and the Environmental Facilities Corporation, FINAL Intended Use Plan for the New York State Drinking Water State Revolving Fund (2024), https://health.ny.gov/environmental/water/drinking/iup/docs/final_intended_use_plan_2025.pdf; New York Environmental Facilities Corporation and the Department of Environmental Conservation, FINAL INTENDED USE PLAN Clean Water State Revolving Fund (2024), https://efc.ny.gov/system/files/documents/2024/10/final-2025-cwsrf-iup.pdf.

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[18] New York State Department of Health and the Environmental Facilities Corporation, FINAL Intended Use Plan for the New York State Drinking Water State Revolving Fund (2024), https://health.ny.gov/environmental/water/drinking/iup/docs/final_intended_use_plan_2025.pdf.
[19] "Need a Water Well Drilled or Repaired? Water Well Consumer Protection Guide," New York Department of Environmental Conservation, Accessed March 10, 2025, http://www.ongov.net/health/env/documents/NYSDECNeedaWaterWellDrilledorRepaired.pdf.
[20] Saratoga County, Individual Water Supply Wells - Fact Sheet #6 (2018), https://www.saratogacountyny.gov/wp/wp-content/uploads/2023/08/DoH-IndividualWaterSupplies-FactSheet6.pdf.
[21] "Individual Water Supply Wells – Fact Sheet #3," New York State Department of Health, Updated July 2024, https://pl.health.ny.gov/environmental/water/drinking/regulations/fact_sheets/fs3_water_quality.htm.
[22] "Onsite Wastewater Treatment Systems," Saratoga County Department of Health. Accessed March 10, 2025, https://www.saratogacountyny.gov/departments/health/environmental/onsite-wastewater-treatment-systems/.

Governance Profile: North Carolina

Distribution of Roles Across Governance Entities

- Two state agencies administer funding for water and wastewater infrastructure projects in North Carolina (Appendix Table L.13).[1]
- The Department of Environmental Quality conducts environmental reviews as required by funding programs. It is also responsible for the regulation of and permitting related to the public water supply as well as National Pollution Discharge Elimination System permits (Appendix Table L.13).[2]
- Both state agencies and local governments support onsite system management (Appendix Table L.13).[3]
- Three entities provide financial oversight relevant to water and wastewater utilities: the Local Government Commission (LGC) within the Department of the State Treasurer, the Rural Infrastructure Authority (RIA) within the Department of Commerce, and an independent body, the State Water Infrastructure Authority (SWIA) (Appendix Table L.13).[4]
- Two entities support rate and service regulation of privately-owned water and wastewater utilities, the North Carolina Utilities Commission (NCUC) and Public Staff of the Utilities Commission (Appendix Table L.13).[5]

Appendix Table L.13: Distribution of Roles Across Governance Entities, North Carolina

ENTITY NAME	ENTITY TYPE					ENTITY ROLES: FUNDING						PERMITTING			REGULATION				OVERSIGHT				OTHER	
	State Agency/Department	State Office	Legislative Department	Local Government	Other Entity	Admin, SRF	Admin, ARC	Admin, CDBG	Admin, Other	Provision, Grants/Loans	Provision, Bond Bank	Public Water Supply	Private Wells	Septic	Public Water Supply	Private Wells	Septic	W/WW Rate-Setting and Service Provision	Financial/Funding	Onsite Systems	General Water Resources	Conducts State Env. Reviews	Well Water Testing	Provides Technical Assistance
Dept. of Environmental Quality	x					x		x	x			x			x						x	x		x
Dept. of Commerce	x						x		x										x					
Dept. of Health and Human Services	x																			x				
Dept. of State Treasurer	x																		x					
Public Staff of the Utilties Commission	x																	x						
County Health Departments				x									x	x		x	x						x	
State Water Infrastructure Authority					x														x					
Utilities Commission					x													x						

Source: See endnotes embedded in text for this section.

Relationships and Efficiencies

The **Division of Water Infrastructure** (DWI) within the Department of Environmental Quality, which administers six funding programs, has a single funding application for all programs.[6] DWI administers Community Development Block Grant (CDBG) funding specifically for water and wastewater infrastructure projects while the Department of Commerce administers funding for all other types of CDBG projects.[7] DWI also administers the Viable Utility Program (VUP). The VUP defines a viable utility as " a long-term, self-sufficient business enterprise, establishes organizational excellence, and provides appropriate levels of infrastructure maintenance, operation, and reinvestment that allow the utility to provide reliable water services now and in the future."[8] Units that do not meet this definition are designated as distressed by the LGC and SWIA (Appendix Figure L.7, page 254).[9] Units designated as distressed have increased access to funding administered by DWI and can receive technical assistance at no cost from DWI.[10]

The **LGC** consists of nine members. Four members are identified by their positions: the State Treasurer, the State Auditor, the Secretary of State, and the Secretary of Revenue (the latter is appointed by the governor). The remaining five positions are appointed, three by the governor and two by the state General Assembly (Appendix Figure L.7, page 254). Appointed members serve four-year terms.[11]

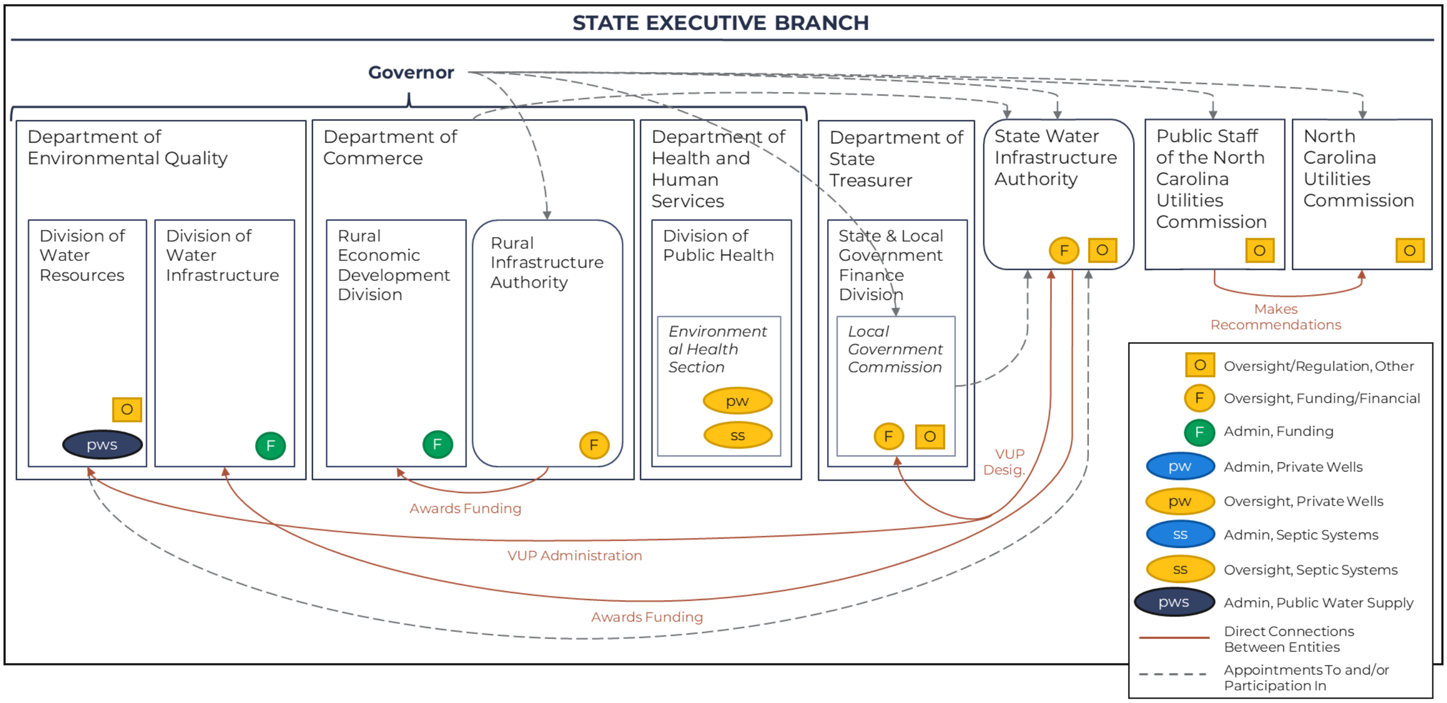
SWIA is an independent body charged with awarding state funding for state water and wastewater infrastructure projects and developing the state water infrastructure master plan.[12] The State Water Infrastructure Authority also has nine members. Three are designated by their positions: the Director of the Division of Water Infrastructure at NCDEQ, the Secretary of Commerce (appointed by the governor), and the Director of the LGC. The remaining members are appointed, two by the governor, two by the state Senate, and two by the state House (Appendix Figure L.7, page 254). Appointed members serve two-year terms.[13]

RIA is an appointed board within the Department of Commerce that awards funding for several grant programs that support water and wastewater infrastructure projects.[14] RIA has seventeen members: the Secretary of Commerce (appointed by the governor), eight appointments by the General Assembly, and eight appointments by the governor (Appendix Figure L.7, page 254). Appointed members serve three-year terms.[15]

NCUC regulates rates and services of privately owned water and wastewater utilities.[16] The Commission has seven members serving six-year terms. All members are appointed by the governor with confirmation by the General Assembly (Appendix Figure L.7, page 254).[17]

The **Public Staff of the North Carolina Utilities Commission** is a separate agency charged with representing the public and making recommendations to the Utilities Commission regarding the reasonableness of rates and adequacy of service provided by utilities regulated by the Commission.[18] The Executive Director is appointed by the governor for a term of six years and confirmed by the General Assembly (Appendix Figure L.7, page 254).[19]

Appendix Figure L.7: Graphical Depiction of Governance Entity Roles and Relationships, North Carolina



Source: See endnotes embedded in text for this section.

Financial Regulation and Oversight

In North Carolina, all local governments applying for debt (e.g., loans or bonds) must get approval from the Local Government Commission (LGC), which sits within the Department of the State Treasurer. Local governments must also submit annual audits to the LGC.[20]

Key Aspects of North Carolina's State Revolving Fund Programs

Administration and Application Process

North Carolina has **sole administration** of the drinking water and clean water SRF programs through the Department of Environmental Quality's Division of Water Infrastructure (DWI).[21] DWI has a single application for all funding programs. Funding is officially awarded by SWIA.[22]

Ranking Criteria

North Carolina's ranking system for both SRF programs includes **consolidation/regionalization** in two categories, **asset management planning**, **PFAS**, and **affordability** (Appendix Table L.14).[23]

Appendix Table L.14: Summary of Priority Ranking Criteria for the State of North Carolina

Priority Ranking Category	Included in Which SRF Program?		Additional Relevant Details About Points Awarded within Category
	Drinking Water	Clean Water	
Project Purpose	x	x	Specific project purposes listed include lead line replacement (DW), PFAS, consolidation of nonviable systems, and the provision of service to disadvantaged areas.
Project Benefits	x	x	Types of project benefits include regionalization (mergers, regionalization, partnerships, interconnections), infrastucture to address PFAS contamination, lead line replacement (DW), and the elimination of malfunctioning onsite systems (CW).
System Management	x	x	This category includes points for having an asset management and/or capital improvement plan.
Affordability	x	x	The affordability component incorporates the number of residential connections, combined utility rates, local government unit indicators, and benefit to disadvantaged areas.

Source: Division of Water Infrastructure (Department of Environmental Quality), North Carolina Drinking Water State Revolving Fund (Base DWSRF) and Infrastructure Investment and Jobs Act DWSRF General Supplement Funds (IIJA DWSRF-GS) Intended Use Plan Fiscal Year 2025 Draft for Public Review; Division of Water Infrastructure (Department of Environmental Quality), North Carolina Clean Water State Revolving Fund (Base CWSRF) and Infrastructure Investment and Jobs Act CWSRF General Supplement Funds (IIJA CWSRF-GS) Intended Use Plan Fiscal Year 2025 Draft for Public Review

Onsite System Management

Private Wells

For private drinking water well permits, county health departments are liable for permits, inspections, and enforcement. County health departments may set their own permitting fees and may provide water quality sampling for a fee.[24] The On-Site Water Protection Branch of the North Carolina Department of Health and Human Services is responsible for state-wide regulatory oversight of onsite systems. It provides regulatory and technical assistance services to local health departments and other clients and also develops and implements new, revised, or amended regulations applicable statewide.[25]

Septic Systems

Septic systems and other on-site wastewater systems are permitted and inspected exclusively by county-level environmental health groups within county health and human service departments.

Homeowners may pay for private, independent site or soil evaluations and assistance with permitting.[26] The On-Site Water Protection Branch of the North Carolina Department of Health and Human Services is responsible for state-wide regulatory oversight of onsite systems. It provides regulatory and technical assistance services to local health departments and other clients and also develops and implements new, revised, or amended regulations applicable statewide.[27]

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[1] See funding tables for links to all funding program websites.
[2] "Water Resources," North Carolina Environmental Quality, Accessed April 4, 2025, https://www.deq.nc.gov/about/divisions/water-resources; "Environmental Review," North Carolina Environmental Quality, Accessed April 4, 2025, https://www.deq.nc.gov/about/divisions/water-resources/drinking-water/plan-review/environmental-review; "NPDES Wastewater," North Carolina Environmental Quality, Accessed April 8, 2025, https://www.deq.nc.gov/about/divisions/water-resources/permitting/npdes-wastewater.
[3] "On-Site Water Protection Branch," N.C. Department of Health and Human Services, Updated September 30, 2024, https://ehs.dph.ncdhhs.gov/oswp/index.htm; On-Site Water Protection Branch, *Private Wells Frequently Asked Questions* (NC Department of Health and Human Services, 2015), https://ehs.dph.ncdhhs.gov/oswp/docs/PrivateWellsFrequentlyAskedQuestions.pdf; "NC Septic System Permitting Process," Rowan County On-Site Waste Water Program, Accessed March 7, 2025, https://www.rowancountync.gov/1860/NC-Septic-System-Permitting-Process.
[4] "Local Government Commission," Bradford B. Briner State Treasurer of North Carolina, Accessed April 4, 2025, https://www.nctreasurer.com/divisions/state-and-local-government-finance/local-government-commission; "Rural Infrastructure Authority," North Carolina Department of Commerce, April 4, 2025, https://www.commerce.nc.gov/about-us/boards-commissions/rural-infrastructure-authority; 'State Water Infrastructure Authority," North Carolina Environmental Quality, Accessed April 4, 2025, https://www.deq.nc.gov/about/divisions/water-infrastructure/state-water-infrastructure-authority.
[5] "About the NC Utilities Commission,'" North Carolina Utilities Commission, Accessed April 4, 2025, https://www.ncuc.gov/Aboutncuc.html; About the Public Staff," Public Staff North Carolina Utilities Commission, Accessed April 4, 2025, https://publicstaff.nc.gov/about-us.
[6] "Application Forms and Additional Resources (for Spring 2025)," North Carolina Environmental Quality, Accessed April 4, 2025, https://www.deq.nc.gov/about/divisions/water-infrastructure/i-need-funding/application-forms-and-additional-resources.
[7] "Infrastructure | Federal CDBG Economic Development," North Carolina Department of Commerce, Updated May 16, 2024, https://www.commerce.nc.gov/grants-incentives/public-infrastructure-funds/infrastructure-federal-cdbg-economic-development.
[8] "Viable Utilities," North Carolina Environmental Quality, Accessed April 4, 2025, https://www.deq.nc.gov/about/divisions/water-infrastructure/viable-utilities#WhataretheAssessmentandIdentificationCriteria-3844.
[9] "Viable Utilities," North Carolina Environmental Quality, Accessed April 4, 2025, https://www.deq.nc.gov/about/divisions/water-infrastructure/viable-utilities#UnitsDesignatedUnderIdentificationCriteria-3845.
[10]"Viable Utilities," North Carolina Environmental Quality, Accessed April 4, 2025, https://www.deq.nc.gov/about/divisions/water-infrastructure/viable-utilities#BenefitsoftheViableUtilityProgram-3904.
[11] "Board and Committees," Bradford B. Briner State Treasurer of North Carolina, Accessed April 4, 2025, https://www.nctreasurer.com/about/transparency/boards-committees#LocalGovernmentCommission-399; N.C. Gen. Stat. § 159-1 (2023).
[12] "State Water Infrastructure Authority," North Carolina Environmental Quality, Accessed April 4, 2025, https://www.deq.nc.gov/about/divisions/water-infrastructure/state-water-infrastructure-authority.
[13] "Authority Members," North Carolina Environmental Quality, April 4, 2025, https://www.deq.nc.gov/about/divisions/water-infrastructure/state-water-infrastructure-authority/authority-members; N.C. Gen. Stat. § 159G-70 (2023).
[14] "Rural Infrastructure Authority," North Carolina Department of Commerce, April 4, 2025, https://www.commerce.nc.gov/about-us/boards-commissions/rural-infrastructure-authority.
[15] N.C. Gen. Stat. § 143B-472.128 (2023).
[16] "Water/Wastewater," North Carolina Utilities Commission, Accessed April 4, 2025, https://www.ncuc.gov/Industries/water/water.html.

[17] "About the NC Utilities Commission,'" North Carolina Utilities Commission, Accessed April 4, 2025, https://www.ncuc.gov/Aboutncuc.html.
[18] "About the Public Staff," Public Staff North Carolina Utilities Commission, Accessed April 4, 2025, https://publicstaff.nc.gov/about-us.
[19] N.C. Gen. Stat. § 62-15 (2023).
[20] "Local Government Commission," Bradford B. Briner State Treasurer of North Carolina, Accessed April 4, 2025, https://www.nctreasurer.com/divisions/state-and-local-government-finance/local-government-commission.
[21] Application Forms and Additional Resources (for Spring 2025)," North Carolina Environmental Quality, Accessed April 4, 2025, https://www.deq.nc.gov/about/divisions/water-infrastructure/i-need-funding/application-forms-and-additional-resources.
[22] "State Water Infrastructure Authority," North Carolina Environmental Quality, Accessed April 4, 2025, https://www.deq.nc.gov/about/divisions/water-infrastructure/state-water-infrastructure-authority.
[23] Division of Water Infrastructure, *North Carolina Drinking Water State Revolving Fund (Base DWSRF) and Infrastructure Investment and Jobs Act DWSRF General Supplement Funds (IIJA DWSRF-GS) Intended Use Plan Fiscal Year 2025 Draft for Public Review* (North Carolina Department of Environmental Quality, 2025), https://files.nc.gov/deq/documents/2025-02/Draft%20IUP%20-%20FY2025%20DWSRF%20-%20Base%20and%20IIJA%20General%20Supplemental%20-%20March%202025.pdf?VersionId=RghalcA6Ji7ztZblw4WHmpgPY6oX.ULS; Division of Water Infrastructure, *North Carolina Clean Water State Revolving Fund (Base CWSRF) and Infrastructure Investment and Jobs Act CWSRF General Supplement Funds (IIJA CWSRF-GS) Intended Use Plan Fiscal Year 2025 Draft for Public Review* (North Carolina Department of Environmental Quality, 2025), https://files.nc.gov/deq/documents/2025-02/Draft%20IUP%20-%20FY2025%20CWSRF%20-%20Base%20and%20IIJA%20General%20Supplemental%20-%20March%202025_0.pdf?VersionId=60XWj4e.MoTE3_XVKFGmCwcfO9vLzRqS.
[24] On-Site Water Protection Branch, *Private Wells Frequently Asked Questions* (NC Department of Health and Human Services, 2015), https://ehs.dph.ncdhhs.gov/oswp/docs/PrivateWellsFrequentlyAskedQuestions.pdf.
[25] "On-Site Water Protection Branch," N.C. Department of Health and Human Services, Updated September 30, 2024, https://ehs.dph.ncdhhs.gov/oswp/index.htm.
[26] "NC Septic System Permitting Process," Rowan County On-Site Waste Water Program, Accessed March 7, 2025, https://www.rowancountync.gov/1860/NC-Septic-System-Permitting-Process.
[27] "On-Site Water Protection Branch," N.C. Department of Health and Human Services, Updated September 30, 2024, https://ehs.dph.ncdhhs.gov/oswp/index.htm.

Governance Profile: Ohio

Distribution of Roles Across Governance Entities

- Four entities administer funding for water and wastewater infrastructure projects in Ohio: two state agencies, the Water Development Authority (WDA), and the Public Works Commission (Appendix Table L.15).[1]
- The Water Development Authority also serves as a state bond bank (Appendix Table L.15).[2]
- The Department of Natural Resources conducts environmental reviews as required by funding programs (Appendix Table L.15).[3]
- The Ohio Environmental Protection Agency is responsible for the regulation of and permitting related to the public water supply as well as National Pollution Discharge Elimination System permits (Appendix Table L.15).[4]
- One state agency and local governments support onsite system management (Appendix Table L.15).[5]
- The Auditor of State provides financial oversight (Appendix Table L.15).[6]
- The Public Utilities Commission regulates for-profit water and wastewater companies in Ohio (Appendix Table L.15).[7]

Appendix Table L.15: Distribution of Roles Across Governance Entities, Ohio

ENTITY NAME	ENTITY TYPE					ENTITY ROLES: FUNDING						PERMITTING			REGULATION				OVERSIGHT				OTHER	
	State Agency/Department	State Office	Legislative Department	Local Government	Other Entity	Admin, SRF	Admin, ARC	Admin, CDBG	Admin, Other	Provision, Grants/Loans	Provision, Bond Bank	Public Water Supply	Private Wells	Septic	Public Water Supply	Private Wells	Septic	W/WW Rate-Setting and Service Provision	Financial/Funding	Onsite Systems	General Water Resources	Conducts State Env. Reviews	Well Water Testing	Provides Technical Assistance
Environmental Protection Agency	x					x						x			x									
Development Services Agency	x							x																
Department of Health	x															x								x
Dept. of Natural Resources	x																					x		
Auditor of State		x																	x					
County/City Health Districts				x									x	x		x	x							
Public Utilities Commission					x													x						
Water Development Authority					x	x				x	x													
Public Works Commission					x				x															x

Source: See endnotes embedded in text for this section.

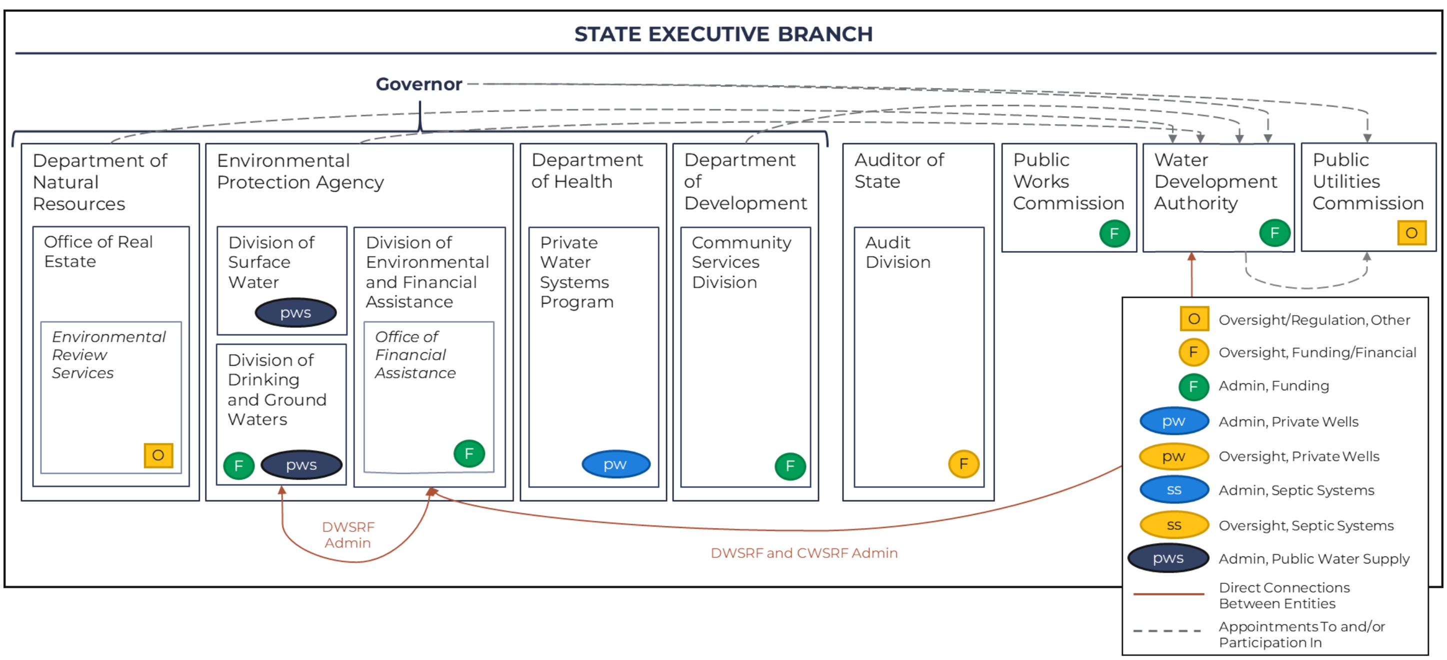
Relationships and Efficiencies

The governor appoints five out of eight members of the **Ohio Development Authority** with the advice and consent of the Senate, though no more than three can represent the same political party. The remaining three members are determined by their positions (Director of the Departments of Natural Resources, Environmental Protection, and Development); however, the governor appoints all three positions (Appendix Figure L.8).[8]

The governor also appoints all five members of the **Public Utilities Commission** from a list submitted by a 12-person nominating council. The nominating council includes six people determined by their positions (including the Director of the Water Development Authority) as well as appointees of the Ohio Department on Aging, the president of the Ohio Senate, the speaker of the Ohio House, and the governor. The governor appoints three people representing the utility industry, the business community, and organized labor (Appendix Figure L.8). Commissioners serve rotating five-year terms.[9]

The state legislature appoints seven members of the Ohio **Public Works Commission** for four-year terms. The remaining members are defined by their positions, but are nonvoting: the Director of Transportation, the Director of Environmental Protection, the Director of Development, the Director of Natural Resources, and the Ohio Development Authority chair (Appendix Figure L.8).[10]

Appendix Figure L.8: Graphical Depiction of Governance Entity Roles and Relationships, Ohio



Source: See endnotes embedded in text for this section.

Financial Regulation and Oversight

Ohio is a home-rule state, and local governments may pass laws to govern themselves as long as they align with the state and federal constitutions.[11] Municipalities and water and sewer authorities are empowered to enter into debt under state law.[12] The Auditor of State conducts financial audits of all public offices.[13]

Key Aspects of Ohio's State Revolving Fund (SRF) Programs

Administration and Application Process

Ohio has **joint administration** of both SRF programs via the Ohio Environmental Protection Agency (Ohio EPA) and the Water Development Authority. Two divisions within the Ohio EPA help administer the DWSRF: the Division of Environmental and Finance Assistance and the Division of Drinking and Groundwater.[14] No significant differences in the Ohio SRF application process compared to other Appalachian states were identified.

Ranking Criteria

Ohio's DWSRF priority ranking system includes **regionalization/consolidation** and **PFAS** contamination, and projects addressing these issues are *prioritized for principal forgiveness*. Although affordability is not a category in the ranking criteria, Ohio EPA considers several socio-economic factors when determining if a community is disadvantaged, including water and sewer rates compared to MHI. Projects that benefit disadvantaged communities are also prioritized for principal forgiveness. No points are awarded for asset management plans, but all projects undergo an asset management screening that may ultimately affect eligibility for funding.[15] The CWSRF priority ranking system incorporates **affordability**. *Both regionalization/consolidation and disadvantaged community projects are prioritized for principal forgiveness* (Appendix Table L.16).[16]

Appendix Table L.16: Summary of Priority Ranking Criteria for the State of Ohio

Priority Ranking Category	Included in Which SRF Program?		Additional Relevant Details About Points Awarded within Category
	Drinking Water	Clean Water	
Public Health Issues	x		This category includes PFAS contamination.
System Improvements	x		
Regionalization	x		
Human Health		x	
Water Resources		x	
Economic Need		x	Economic need is determined by system size (<10,000) and an MHI less than that of state. Those applicants qualify for a hardship interest rate of either 0% or 1% depending on system size.

Source: Division of Environmental and Financial Services (Ohio Environmental Protection Agency), Drinking Water Assistance Fund (DWAF) Program Year 2025 Program Management Plan (2024); Division of Environmental and

Appendix L, A Twenty-Year Review: Revisiting the Drinking Water and Wastewater Infrastructure Funding Needs and Gaps in the Appalachian Region

Financial Services (Ohio Environmental Protection Agency), Water Pollution Control Loan Fund Program Year 2024 Program Management Plan (2024)

Onsite System Management

Private Wells

Local county or city health districts are responsible for permitting and inspecting private water wells. Individuals working on private water systems must be registered with the Ohio Department of Health. Water quality result interpretation is available through the Ohio State University Extension, though no testing is provided by the state or local governments.[17] The Department of Health regulates private wells and provides technical assistance on the construction, operation, and maintenance of private wells.[18]

Septic Systems

Local county or city health districts are responsible for permitting and inspection of on-site systems. Some health districts may provide site/soil evaluations or systems design reviews, but it varies locally.[19]

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[1] See funding tables for links to all funding program websites; Mission Statement," Ohio Water Development Authority, Accessed March 20, 2025, https://www.owda.org/mission-statement; "DEFA Financial Assistance," Ohio Environmental Protection Agency, Accessed March 20, 2025, https://epa.ohio.gov/divisions-and-offices/environmental-financial-assistance/financial-assistance; "About Us," Ohio Public Works Commission, Accessed March 20, 2025, https://publicworks.ohio.gov/about.
[2] "Mission Statement," Ohio Water Development Authority, Accessed March 20, 2025, https://www.owda.org/mission-statement; .
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[4] "Public Water Systems," Ohio Environmental Protection Agency, Accessed March 20, 2025, https://epa.ohio.gov/divisions-and-offices/drinking-and-ground-waters/public-water-systems; "NPDES General Permits," Ohio Environmental Protection Agency, Accessed April 8, 2025, https://epa.ohio.gov/divisions-and-offices/surface-water/permitting/npdes-general-permits.
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[6] "Financial Audits," Ohio Auditor of State, Accessed March 20, 2025, https://ohioauditor.gov/financial.html.
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[10] Ohio Rev. Code Ann. § 164.02 (2024).
[11] "Local Government," Ohio.gov, Published May 22, 2024, https://ohio.gov/government/resources/local-government-rosters.
[12] Ohio Municipal Advisory Council, The Guide to Ohio Municipal Debt (2019), Ohio Municipal Advisory Council, http://www.ohiomac.com/Rates/GuideToMunicipalDebt.pdf.
[13] "Financial Audits," Ohio Auditor of State, Accessed March 20, 2025, https://ohioauditor.gov/financial.html.
[14] "DEFA Financial Assistance," Ohio Environmental Protection Agency, Accessed March 20, 2025, https://epa.ohio.gov/divisions-and-offices/environmental-financial-assistance/financial-assistance; "Water Supply Revolving Loan Account," Ohio Environmental Protection Agency, Accessed March 20, 2025, https://epa.ohio.gov/divisions-and-offices/environmental-financial-assistance/financial-assistance/wsrla.

[15] Division of Environmental and Financial Services, *Drinking Water Assistance Fund (DWAF) Program Year 2025 Program Management Plan* (2024), Ohio Environmental Protection Agency, https://dam.assets.ohio.gov/image/upload/epa.ohio.gov/Portals/29/documents/ofa/DWAF-PMP-2025.pdf.
[16] Division of Environmental and Financial Services, *Water Pollution Control Loan Fund Program Year 2024 Program Management Plan* (2024), Ohio Environmental Protection Agency, https://dam.assets.ohio.gov/image/upload/epa.ohio.gov/Portals/29/documents/ofa/WPCLF-PMP-2024.pdf.
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Governance Profile: Pennsylvania

Distribution of Roles Across Governance Entities

- Four entities administer funding for water and wastewater infrastructure projects in Pennsylvania: two state agencies, the Pennsylvania Infrastructure Investment Authority (PENNVEST), and the Public Utility Commission (Appendix Table L.17).[1]
- PENNVEST also provides some loans directly and offers a Credit Enhancement Assistance program in which participants are eligible to accept bond and/or loan guarantees for the repayment of third-party loans or bonds (Appendix Table L.17).[2]
- The Department of Environmental Protection conducts environmental reviews as required by funding programs. It is also responsible for the regulation of and permitting related to the public water supply as well as National Pollution Discharge Elimination System permits (Appendix Table L.17).[3]
- One state agency and local governments support onsite system management (Appendix Table L.17).[4]
- The Department of Community & Economic Development provides financial oversight through the administration of the Local Government Unit Dept Act (Appendix Table L.17).[5]
- The Public Utility Commission regulates the rates and services of more than 150 water and wastewater utilities, some of which are municipally owned. However, the Commission does not regulate authorities (Appendix Table L.17).[6]

Appendix Table L.17: Distribution of Roles Across Governance Entities, Pennsylvania

ENTITY NAME	ENTITY TYPE					ENTITY ROLES: FUNDING						PERMITTING			REGULATION				OVERSIGHT				OTHER	
	State Agency/Department	State Office	Legislative Department	Local Government	Other Entity	Admin, SRF	Admin, ARC	Admin, CDBG	Admin, Other	Provision, Grants/Loans	Provision, Bond Bank	Public Water Supply	Private Wells	Septic	Public Water Supply	Private Wells	Septic	WWW Rate-Setting and Service Provision	Financial/Funding	Onsite Systems	General Water Resources	Conducts State Env. Reviews	Well Water Testing	Provides Technical Assistance
Dept. of Environmental Protection	x					x						x			x					x		x		
Dept. of Community & Economic Development	x						x	x	x										x					
Local government units				x										x			x							
Infrastructure Investment Authority (PENNVEST)					x	x			x	x														
Public Utility Commission					x				x									x						

Source: See endnotes embedded in text for this section.

Relationships and Efficiencies

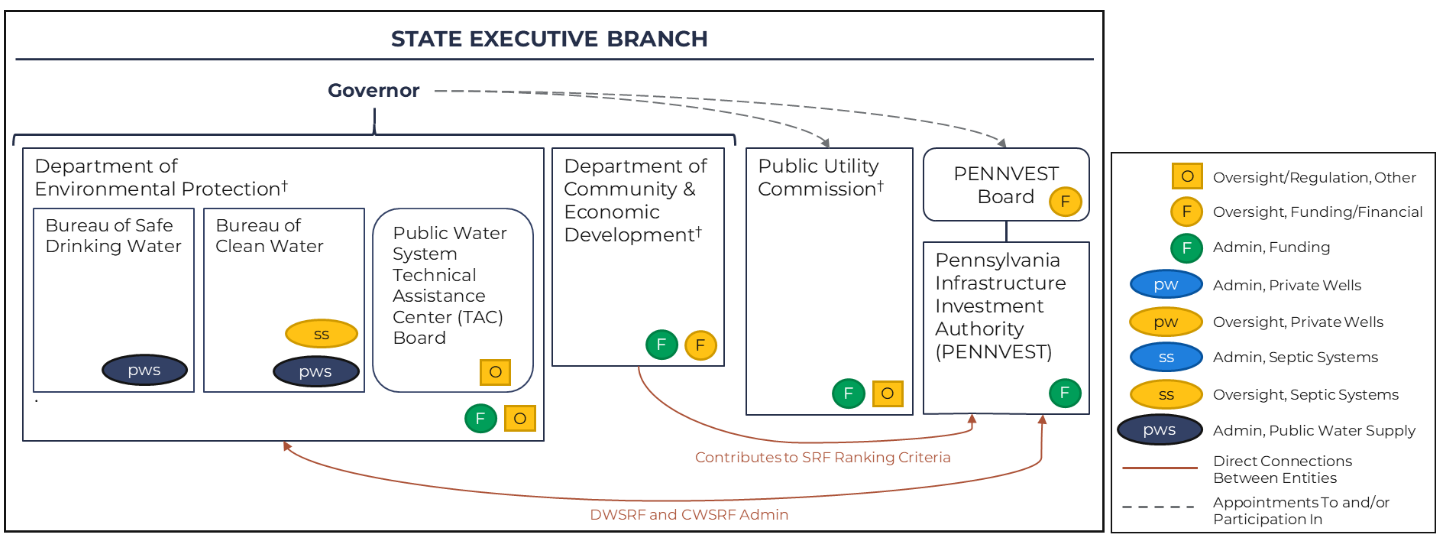
In Pennsylvania, the **Community Action Team (CAT)** selects communities on which to focus financial and technical resources. CAT members include DCED, DEP, the PA Department of Transportation, the Public Utility Commission, and others (Appendix Figure L.9). Projects serving CAT communities are awarded additional points for state revolving fund programs (SRF).[7]

The **Public Water System Technical Assistance Center Board** within the Department of Environmental Protection advises the department via comments on all policies, guidance, and regulations affecting public water systems, with a particular focus on small systems (Appendix Figure L.9).[8]

PENNVEST has a single application for all funding programs and, like many state agencies, uses the Pennsylvania Keystone login.[9] The PENNVEST Board of Directors includes five elected officials (the governor, two state senators, and two state house representatives). Five additional board members are determined based on their positions (the Secretary of Environmental Resources, the Secretary of Commerce, the Secretary of Community Affairs, the Secretary of General Services, and the Secretary of the Budget), all of which are appointed by the governor. The remaining board member seats (three) are appointed by the governor for 2-year terms (Appendix Figure L.9).[10]

All **Public Utility Commissioners** are appointed by the governor and serve 5-year terms (Appendix Figure L.9).[11]

Appendix Figure L.9: Graphical Depiction of Governance Entity Roles and Relationships, Pennsylvania



† Contributes members to the Community Action Team

Source: See endnotes embedded in text for this section.

Financial Regulation and Oversight

State law requires local government units to follow the Local Government Unit Debt Act (LGUDA), which is administered by the Department of Community and Economic Development. The Act establishes local government units' borrowing limits, and it provides the lawful procedural steps that local government units must follow to issue debt and tax anticipation notes.[12]

Key Aspects of Pennsylvania's State Revolving Fund (SRF) Programs

Administration and Application Process

Pennsylvania has **joint administration** of both SRF programs via PENNVEST and the Department of Environmental Protection (DEP).[13] Interested applicants need to schedule an introductory meeting with the PENNVEST project specialist assigned to their region to go over the application process and permit requirements for their specific project. As noted above, a Pennsylvania Keystone login is required. New registrations may take 2-3 days to process.[14] Applicants may be required to provide a cost-effective analysis of alternatives as part of their application.[15]

Ranking Criteria

Three entities contribute to SRF project ranking in Pennsylvania. DEP provides an initial score, which is augmented by PENNVEST. The Department of Community and Economic Development contributes information to the PENNVEST scoring process. The PENNVEST Board of Directors approves projects to receive funding. The ranking criteria include consolidation (and types of **regionalization**), **asset management**, **PFAS** (DWSRF only), and **affordability**. PENNVEST also performs a rate study for applicants to determine the final funding package available to the applicant (Appendix Table L.18).[16]

Appendix Table L.18: Summary of Priority Ranking Criteria for the State of Pennsylvania (continued on next page)

Priority Ranking Category	Included in Which SRF Program?		Additional Relevant Details About Points Awarded within Category
	Drinking Water	Clean Water	
Public Health*	x	x	For DWSRF, this category includes PFAS contamination.
Compliance*	x	x	
Community Health*	x	x	This category includes consolidation and green projects. In the CWSRF, additional points are awarded for small systems.
Source Water Protection*	x		
Infrastructure Health*	x	x	This category includes asset management.
Aquatic Health*		x	
Affordability Rating	x	x	The affordability rating is calculated as a comparison of project costs sans funding to target user rate.
Economic Development	x	x	This information is provided by DCEP.
Distressed Community	x	x	This information is provided by DCEP.
Infill	x	x	This category is defined as "…projects that serve a city, borough, or township of the first class. Redevelopment of existing population centers is a priority."
Brownfield	x	x	This category is for designated brownfield sites.

Appendix Table L.18 (continued): Summary of Priority Ranking Criteria for the State of Pennsylvania

Priority Ranking Category	Included in Which SRF Program?		Additional Relevant Details About Points Awarded within Category
	Drinking Water	Clean Water	
Community Action Team Projects	x	x	DCEP adds points for projects in CAT communities.
Comprehensive Planning	x	x	DCEP adds points for communities with a comprehensive plan in alignment with its respective county's comprehensive plan.

Source: Commonwealth of Pennsylvania, "Traditional Construction Funding Program"
Notes: DEP-scored criteria are denoted with an asterisk.

Onsite System Management

Private Wells

Pennsylvania does not have any statewide regulations for the construction, maintenance, or testing of drinking water wells. Homeowners are solely responsible for their drinking water well. Penn State Extension's Drinking Water Program offers free water testing for some private well owners.[17]

Septic Systems

Pennsylvania's Department of Environmental Protection certifies sewage enforcement officers, who are responsible for reviewing septic applications, issuing permits, and inspecting constructed systems. Sewage enforcement officers are employed by local government units (e.g., municipalities, a group of municipalities, or county health departments) or may be contracted out.[18] PENNVEST, in partnership with the Pennsylvania Housing Finance Authority, provides loans to homeowners to improve, replace, or repair individual septic systems, repair malfunctioning connections to public sewage systems, or connect to a public sewage system to address public health and environmental safety concerns.[19]

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[1] See funding tables for links to all funding program websites; "About Us," Commonwealth of Pennsylvania, Accessed March 21, 2025, https://www.pa.gov/agencies/pennvest/about-us; "Act 13 Impact Fee," Pennsylvania Public Utility Commission, Accessed March 21, 2025, https://www.puc.pa.gov/filing-resources/issues-laws-regulations/act-13-impact-fee/.

[2] "About Us," Commonwealth of Pennsylvania, Accessed March 21, 2025, https://www.pa.gov/agencies/pennvest/about-us; "Funding Programs," Commonwealth of Pennsylvania, Accessed March 24, 2025, https://www.pa.gov/agencies/pennvest/programs-and-services/funding-programs.html.

[3] Environmental Review," Commonwealth of Pennsylvania, Accessed March 21, 2025, https://www.pa.gov/agencies/dep/programs-and-services/water/clean-water/infrastructure-finance/environmental-review.html; "Public Water Systems Permits," Commonwealth of Pennsylvania, Accessed March 21, 2025, https://www.pa.gov/agencies/dep/programs-and-services/water/bureau-of-safe-drinking-water/public-water-systems-permits.html; "Bureau of Clean Water," Commonwealth of Pennsylvania, Accessed March 21, 2025, https://www.pa.gov/agencies/dep/programs-and-services/water/clean-water.html.

[4] Pennsylvania Department of Health, *Private Well Water* (2022), https://www.pa.gov/content/dam/copapwp-pagov/en/health/documents/topics/documents/environmental-health/Private%20Well%20Water%20Factsheet.pdf; "Who is My SEO?," The Pennsylvania Association of Sewage Enforcement Officers, Accessed March 21, 2025, https://pa-seo.org/who-is-my-seo/; "Homeowner Sewage Program," Commonwealth of Pennsylvania, Accessed March 24, 2025, https://www.pa.gov/agencies/pennvest/programs-and-services/funding-programs/homeowner-sewage-program.html.

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[5] "Local Government Unit Debt Act," Pennsylvania Department of Community & Economic Development, Accessed March 21, 2025, https://dced.pa.gov/local-government-unit-debt-act-lguda/.
[6] "Water/Wastewater," Pennsylvania Public Utility Commission, Accessed March 21, 2025, https://www.puc.pa.gov/water-wastewater/.
[7] Pennsylvania Department of Environmental Protection, *Final Ranking Framework for PENNVEST Wastewater Projects* (2014), https://files.dep.state.pa.us/Water/BPNPSM/InfrastructureFinance/StateRevolvFundIntendUsePlan/2022/2022_CWSRF_IUP_Attachment_3_Wastewater_Project_Ranking_Criteria.pdf; Pennsylvania Department of Environmental Protection, Attachment 1: Drinking Water State Revolving Loan Fund Intended Use Plan (IUP) Ranking Framework for PENNVEST Drinking Water Projects (2024), https://files.dep.state.pa.us/Water/BPNPSM/InfrastructureFinance/StateRevolvFundIntendUsePlan/2024/2024_Attachment_1-Drinking_Water_Ranking_Framework.pdf.
[8] "Public Water System Technical Assistance Center (TAC) Board," Commonwealth of Pennsylvania, Accessed March 21, 2025, https://www.pa.gov/agencies/dep/public-participation/advisory-committees/water-advisory-committees/public-water-system-technical-assistance-center-board.html.
[9] PA PENNVEST, "PENNVEST Funding Application Process Webinar Recording, September 12, 2023, Online. 55:14, https://www.youtube.com/watch?v=P1JadSkATqA&t=8s.
[10] 35 Pa. Stat. § 751.1.
[11] "Commissioners," Pennsylvania Public Utility Commission, Accessed March 24, 2025, https://www.puc.pa.gov/about-the-puc/commissioners/.
[12] "Local Government Unit Debt Act," Pennsylvania Department of community & Economic Development, Accessed March 21, 2025, https://dced.pa.gov/local-government-unit-debt-act-lguda/.
[13] "State Revolving Fund Intended Use Plan," Commonwealth of Pennsylvania, Accessed March 21, 2025, https://www.pa.gov/agencies/dep/programs-and-services/water/clean-water/infrastructure-finance/state-revolving-fund-intended-use-plan.html.
[14] "Apply for PENNVEST Funding," Commonwealth of Pennsylvania, Accessed March 24, 2025, https://www.pa.gov/agencies/pennvest/apply-online.html.
[15] "Infrastructure Finance," Commonwealth of Pennsylvania, Accessed March 24, 2025, https://www.pa.gov/agencies/dep/programs-and-services/water/clean-water/infrastructure-finance.html.
[16] "Traditional Construction Funding Program," Commonwealth of Pennsylvania, Accessed March 24, 2025, https://www.pa.gov/agencies/pennvest/programs-and-services/funding-programs/traditional-construction-funding-program.html.
[17] Pennsylvania Department of Health, *Private Well Water* (2022), https://www.pa.gov/content/dam/copapwp-pagov/en/health/documents/topics/documents/environmental-health/Private%20Well%20Water%20Factsheet.pdf.
[18] "Who is My SEO?," The Pennsylvania Association of Sewage Enforcement Officers, Accessed March 21, 2025, https://pa-seo.org/who-is-my-seo/.
[19] "Homeowner Sewage Program," Commonwealth of Pennsylvania, Accessed March 24, 2025, https://www.pa.gov/agencies/pennvest/programs-and-services/funding-programs/homeowner-sewage-program.html.

Governance Profile: South Carolina

Distribution of Roles Across Governance Entities

- Two state agencies and the Rural Infrastructure Authority (RIA) administer funding for water and wastewater infrastructure projects in South Carolina (Appendix Table L.19).[1]
- The Department of Environmental Services conducts environmental reviews as required by funding programs and supports onsite system management. It is also responsible for the regulation of and permitting related to the public water supply as well as National Pollution Discharge Elimination System permits (Appendix Table L.19).[2]
- The Office of Regulatory Staff provides financial oversight of privately-owned utilities (Appendix Table L.19).[3]
- The Public Service Commission regulates rates and service provision of privately-owned utilities (Appendix Table L.19).[4]

Appendix Table L.19: Distribution of Roles Across Governance Entities, South Carolina

ENTITY NAME	ENTITY TYPE					ENTITY ROLES: FUNDING						PERMITTING			REGULATION				OVERSIGHT				OTHER	
	State Agency/Department	State Office	Legislative Department	Local Government	Other Entity	Admin, SRF	Admin, ARC	Admin, CDBG	Admin, Other	Provision, Grants/Loans	Provision, Bond Bank	Public Water Supply	Private Wells	Septic	Public Water Supply	Private Wells	Septic	W/WW Rate-Setting and Service Provision	Financial/Funding	Onsite Systems	General Water Resources	Conducts State Env. Reviews	Well Water Testing	Provides Technical Assistance
Dept. of Environmental Services	x					x						x	x	x	x		x					x	x	x
Dept. of Commerce	x						x	x																
Office of Regulatory Staff		x																	x					
Public Service Commission					x													x						
Rural Infrastructure Authority					x	x			x															

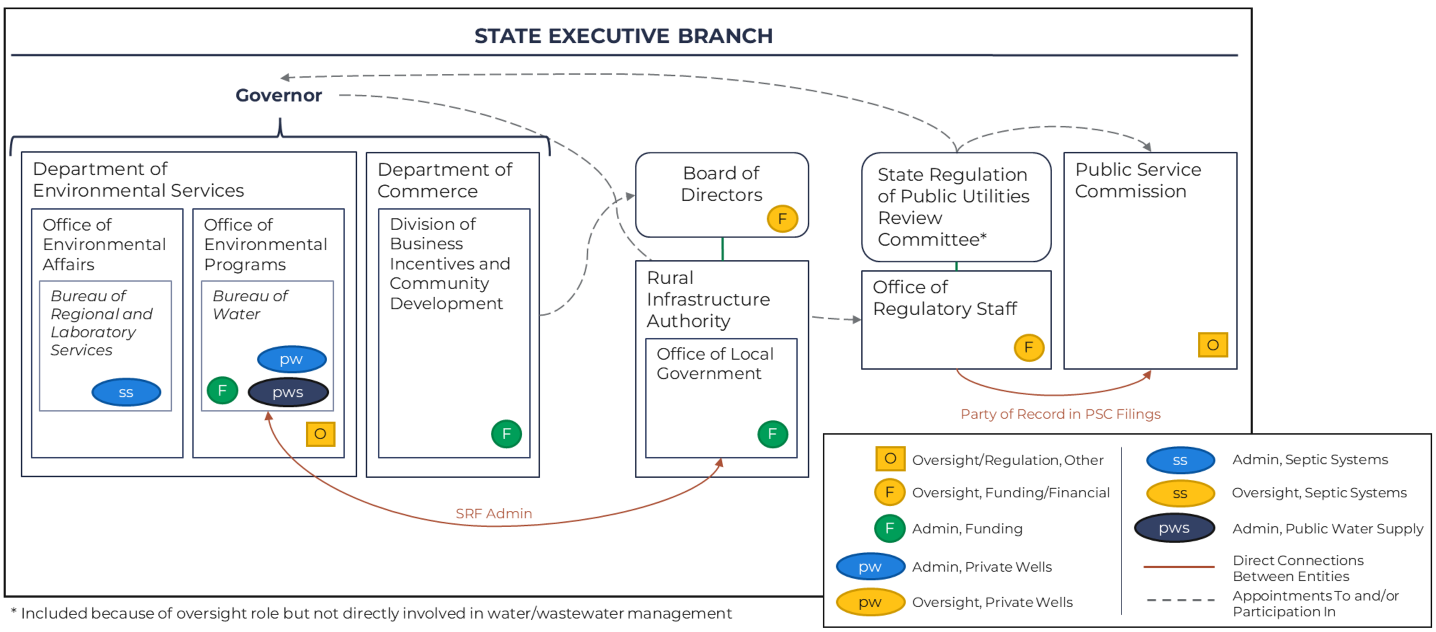
Source: See endnotes embedded in text for this section.

Relationships and Efficiencies

RIA has one application for all grant programs (but does not include SRF loans).[5] The Secretary of Commerce, appointed by the governor, serves as the Chairman of the Board of Directors. Six additional members represent distressed, less developed counties (Appendix Figure L.10).[6]

The **Public Service Commission** consists of seven members (one from each U.S. Congressional District) nominated by the State Regulation of Public Utilities Review Committee and elected by the South Carolina General Assembly for four-year terms.[7] The same committee nominates candidates for the Executive Director of the **Office of Regulatory Staff**, who is then appointed by the governor.[8] The Office of Regulatory Staff must be a party of record in all business before the Public Service Commission (Appendix Figure L.10).[9]

Appendix Figure L.10: Graphical Depiction of Governance Entity Roles and Relationships, South Carolina



Source: See endnotes embedded in text for this section.

Financial Regulation and Oversight

Privately owned water and wastewater utilities are required to submit annual operations and financial reports to the South Carolina Office of Regulatory Staff.[10] While the state constitution places limits on general obligation debt incurred without a voter referendum, there are no limits on a municipality's issuance of revenue bonds payable through tax revenues.[11]

Key Aspects of South Carolina's State Revolving Fund (SRF) Programs

Administration and Application Process

South Carolina has **joint administration** of both SRF programs via the South Carolina Department of Environmental Services (SCDES)[xx] and RIA.[12] Municipalities, counties, special purpose districts, commissions of public works, and joint regional entities are eligible for funding from both programs.[13] Non-profit, non-community systems are eligible for DWSRF only. Applicants first submit a project questionnaire to SCDES and then contact RIA to discuss the financial qualifications needed for assistance.[14]

Ranking Criteria

In South Carolina, both DWSRF and CWSRF ranking systems incorporate **consolidation or regionalization**. Consolidation or regionalization projects that include a nonviable system are awarded additional points. Even more points are awarded if the nonviable system has had operational or maintenance deficiencies or violations of primary drinking water standards. Only the DWSRF ranking criteria include **affordability** (Appendix Table L.20).[15]

Appendix Table L.20: Summary of Priority Ranking Criteria for the State of South Carolina (continued on next page)

Priority Ranking Category	Included in Which SRF Program?		Additional Relevant Details About Points Awarded within Category
	Drinking Water	Clean Water	
Addresses an Acute Risk to Public Health	x		
Addresses a Chronic Risk to Public Health	x		
Aquifer Contamination Affecting Private Wells	x		Points are award if system is violating National Primary Drinking Water Regulations.
Addresses Secondary Drinking Water Standards	x		
Replacing or Rehabilitating Existing Infrastructure	x		Points are awarded if project addresses issues before they become a non-compliance problem.
Relocation Because of Road Widening or Any Other Eligible Project Not Addressed in Other Criteria	x		
Affordability	x		Affordability is measured as a percentage of MHI (varies annually).
Small Community	x		Projects serving a population of less than 10,000 are awarded points in this category.

[xx] Note that the SCDES used to be part of the SC Department of Health and Environmental Control. That department was divided into the SCDES and SC Department of Public Health in 2024. Not all RIA website information is updated to reflect that change.

Appendix Table L.20 (continued): Summary of Priority Ranking Criteria for the State of South Carolina

Priority Ranking Category	Included in Which SRF Program?		Additional Relevant Details About Points Awarded within Category
	Drinking Water	Clean Water	
Regionalization/ Consolidation	x	x	
Growth		x	Projects with a majority of funding being used to support growth are not evaluated via other criteria and are automatically ranked last.
Specially Designated		x	
Impaired Water Bodies (303(d) list)		x	
Located in EPA-Identified Priority Watershed		x	
Implementation of Approved TMDL		x	
Section 319 Funded Water Quality Improvements		x	Points awarded for projects that reduce nonpoint source pollutants
Source Water Protection		x	The system has a documented Source Water Protection Plan.
SC 208 Water Quality Management Plan		x	

Source: Bureau of Water (Department of Environmental Services), South Carolina's Priority Ranking System for Wastewater and Nonpoint Source Projects (2010); Bureau of Water (Department of Environmental Services), South Carolina's Priority Ranking System for Drinking Water Projects (2010)

Onsite System Management

Private Wells

South Carolina's Department of Environmental Services regulates private drinking water wells through permit provision. Homeowners must submit a notice of intent to get coverage under the general permit. Local department inspectors may verify compliance. In South Carolina, a well serving more than one household (or a business) is considered a public water supply and must go through the state's public water supply permitting process.[16] Although the Department of Environmental Services does not regulate private water quality, it provides sampling kits and runs analyses at a charge to homeowners. There are some situations in which the cost of testing may be lowered or waived.[17]

Septic Systems

South Carolina's Department of Environmental Services directly manages septic permitting, site visits, and inspections statewide. On-site systems must be installed by a licensed installer.[18]

[1] See funding tables for links to all funding program websites; "Apply for a State Grant,' South Carolina Rural Infrastructure Authority, Accessed March 24, 2025, https://ria.sc.gov/grants/how-to-apply/.

[2] SC Department of Environmental Services, State Environmental Review Procedure for the South Carolina State Revolving Fund Program (2024), https://des.sc.gov/sites/des/files/Documents/BOW/SRF/SERP.pdf; "Complying with Drinking Water Laws," SC Department of Environmental Services, Accessed March 24, 2025, https://des.sc.gov/programs/bureau-water/drinking-water/complying-drinking-water-laws; "Drinking Water Permitting and Monitoring – Overview," SC Department of Environmental Services, Accessed March 24, 2025, https://des.sc.gov/programs/bureau-water/drinking-water/drinking-water-permitting-and-monitoring-overview; "Private Drinking Water Wells," SC Department of Environmental Services, Accessed March 24, 2025, https://des.sc.gov/programs/bureau-water/residential-wells/private-drinking-water-wells; "Well Water Quality Testing Services," SC Department of Environmental Services, Accessed March 24, 2025, https://des.sc.gov/programs/bureau-water/residential-wells/well-water-quality-testing-services; "Septic Tanks – Residential, Single Home Builder," SC Department of Environmental Services, Accessed March 24, 2025, https://des.sc.gov/permits-regulations/septic-tanks/permits-licenses/septic-tanks-residential-single-home-builder; "NPDES Overview," S.C. Department of Environmental Services, Accessed April 8, 2025, https://www.des.sc.gov/programs/bureau-water/national-pollutant-discharge-elimination-system-npdes/npdes-overview.
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[12] "State Revolving Fund Program," SC Department of Environmental Services, Accessed March 27, 2025, https://des.sc.gov/programs/bureau-water/state-revolving-fund-srf-program.
[13] "Grants," SC Rural Infrastructure Authority, Accessed March 27, 2025, https://ria.sc.gov/about/faqs/#loans.
[14] "Apply for a Loan," SC Rural Infrastructure Authority, Accessed March 27, 2025, https://ria.sc.gov/loans/apply-for-a-loan/.
[15] Bureau of Water, South Carolina's Priority Ranking System for Wastewater and Nonpoint Source Projects (2010), South Carolina Department of Health and Environmental Control, https://des.sc.gov/sites/des/files/docs/HomeAndEnvironment/Docs/srf_prscw.pdf; Bureau of Water, South Carolina's Priority Ranking System for Drinking Water Projects (2010), South Carolina Department of Health and Environmental Control, https://des.sc.gov/sites/des/files/docs/HomeAndEnvironment/Docs/srf_prsdw.pdf.
[16] "Private Drinking Water Wells," SC Department of Environmental Services, Accessed March 24, 2025, https://des.sc.gov/programs/bureau-water/residential-wells/private-drinking-water-wells.
[17] "Well Water Quality Testing Services," SC Department of Environmental Services, Accessed March 24, 2025, https://des.sc.gov/programs/bureau-water/residential-wells/well-water-quality-testing-services.
[18] "Septic Tanks – Residential, Single Home Builder," SC Department of Environmental Services, Accessed March 24, 2025, https://des.sc.gov/permits-regulations/septic-tanks/permits-licenses/septic-tanks-residential-single-home-builder.

Governance Profile: Tennessee

Distribution of Roles Across Governance Entities

- Two state agencies and the Tennessee Local Development Authority (TLDA) administer funding for water and wastewater infrastructure projects in Tennessee (Appendix Table L.21).[1]
- TDLA can also issue bonds and notes for water and sewer debt (Appendix Table L.21).[2]
- The Department of Environment & Conservation conducts environmental reviews as required by funding programs. It is also responsible for the regulation of and permitting related to the public water supply as well as National Pollution Discharge Elimination System permits (Appendix Table L.21).[3]
- One state agency and local governments support onsite system management (Appendix Table L.21).[4]
- Two entities provide financial oversight: the Comptroller of the Treasury and the Board of Utility Regulation (Appendix Table L.21).[5]
- The Board of Utility Regulation also provides oversight for water and wastewater utilities by approving the formation of new utility districts, addressing complaints, and establishing parameters for water accountability (Appendix Table L.21).[6]

Appendix Table L.21: Distribution of Roles Across Governance Entities, Tennessee

ENTITY NAME	ENTITY TYPE					ENTITY ROLES: FUNDING						PERMITTING			REGULATION				OVERSIGHT				OTHER	
	State Agency/Department	State Office	Legislative Department	Local Government	Other Entity	Admin, SRF	Admin, ARC	Admin, CDBG	Admin, Other	Provision, Grants/Loans	Provision, Bond Bank	Public Water Supply	Private Wells	Septic	Public Water Supply	Private Wells	Septic	WWW Rate-Setting and Service Provision	Financial/Funding	Onsite Systems	General Water Resources	Conducts State Env. Reviews	Well Water Testing	Provides Technical Assistance
Dept. of Environment & Conservation	x					x			x			x		x	x		x			x		x		
Dept. of Economic and Community Development	x						x	x																
Comptroller of the Treasury		x																	x					
County Governments				x										x			x							
County Health Departments				x									x											
Tennessee Local Development Authority					x	x				x														
Board of Utility Regulation					x													x	x					

Source: See endnotes embedded in text for this section.

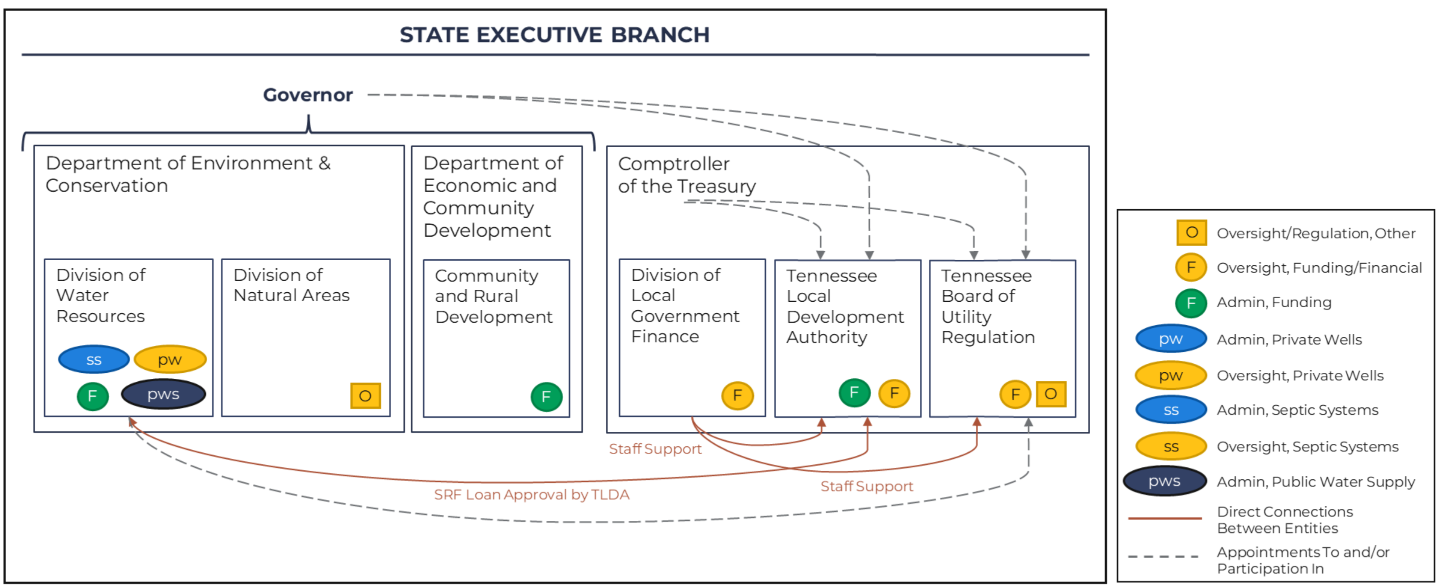
Relationships and Efficiencies

The governor serves as the chair of the **TLDA**. Two additional members are appointed by the state house and senate (both current appointees are mayors). The remaining members are determined by their position (Secretary of State, Comptroller of the Treasury, State Treasurer, and the Commissioner of Finance and Administration). The governor appoints the Commission of Finance and Administration. The other positions are appointed by the Tennessee General Assembly.[7] TDLA approves all SRF loans (Appendix Figure L.11).[8]

The State Comptroller (appointed by the General Assembly) appoints two seats (including the chair) of the **Tennessee Board of Utility Regulation**. The Commissioner of the Department of Environment & Conversation (appointed by the governor) appoints the vice chair. The state house and state senate each appoint one person to the board. The governor appoints the remaining five seats (Appendix Figure L.11). All appointees serve four-year terms.[9]

The **Division of Local Government Finance** serves as staff to the Tennessee Board of Regulation and TLDA (Appendix Figure L.11).[10]

Appendix Figure L.11: Graphical Depiction of Governance Entity Roles and Relationships, Tennessee



Source: See endnotes embedded in text for this section.

Financial Regulation and Oversight

State law requires local governments to notify the State Comptroller's Office within 45 days of the issuance of debt. Certain types of debt also require approval from the State Comptroller's Office.[11]

Key Aspects of Tennessee's State Revolving Fund (SRF) Programs

Administration and Application Process

Tennessee has **sole administration** of both SRF programs via the Department of Environment & Conservation.[12] However, the Tennessee Local Development Authority approves all SRF loans.[13] The project team did not find any significant differences between the Tennessee SRF application process compared to other Appalachian states.

Ranking Criteria

Tennessee's ranking system for DWSRF is based on the project type and severity of the problem. Projects addressing acute health issues are given the maximum number of points. All other projects are ranked based on the problem severity and system compliance status. Regionalization is an eligible project, but simply submitting a project utilizing a regional solution does not guarantee additional points. The CWSRF ranks projects based on a project criteria factor combined with a priority point value. The project criteria factor awards points based on project type. Additional points are awarded for CWA Section 212 projects that address specific issues and for those in counties with an approved growth plan.[14] The priority point value is calculated using a receiving stream hydraulic factor, a severity of pollution factor, and a water quality improvement factor.[15] For both DWSRF and CWSRF, Tennessee incorporates **affordability** in cases of a tie in project scores using an Ability to Pay Index (ATPI). This index is also used to determine the final interest rate offered to the applicant (Appendix Table L.22).[16] The ATPI factors in several socio-economic concerns, including the community's MHI, unemployment rates, food stamp dependence, poverty rate, community assets, revenues, debt, expenditures, and change in population. However, it does not particularly reference the cost of water and wastewater services in the community.[17]

Appendix Table L.22: Summary of Priority Ranking Criteria for the State of Tennessee (continued on next page)

Priority Ranking Category	Included in Which SRF Program?		Additional Relevant Details About Points Awarded within Category
	Drinking Water	Clean Water	
Acute Health Issues	x		
Problem Severity	x		
System Compliance	x		
Affordability	x	x	Affordability is considered in the event of a tie.
Population Served	x	x	In the event of a tie, the ranking system prioritizes projects for small or disadvantaged communities.
Project Type		x	
CWA Section 212 Associated with Nonpoint Source Projects		x	Additional points awarded on top of those awarded for project type for projects meeting this criterion.
CWA Section 212 with Preservation of Green Space		x	Additional points awarded on top of those awarded for project type for projects meeting this criterion.
CWA Section 212 with Riparian Buffer Zones		x	Additional points awarded on top of those awarded for project type for projects meeting this criterion.
CWA Section 212 with Enforced Buffer Zone Ordinance		x	Additional points awarded on top of those awarded for project type for projects meeting this criterion.

Appendix Table L.22 (continued): Summary of Priority Ranking Criteria for the State of Tennessee

Priority Ranking Category	Included in Which SRF Program?		Additional Relevant Details About Points Awarded within Category
	Drinking Water	Clean Water	
Growth		x	Additional points awarded on top of those awarded for project type for projects meeting this criterion.
(PPV) Receiving Stream Hydraulic Factor		x	This factor is calculated as the ratio of plant discharge to stream flow.
(PPV) Severity of Pollution Factor		x	This category accounts for violations of wastewater treatment plant permit limits.
(PPV) Water Quality Improvement Factor		x	This category incorporates impacts on recreation, fish and aquatic life, and domestic water supply.

Source: Tennessee Department of Environment & Conservation, Intended Use Plan: Drinking Water State Revolving Fund (2024); Tennessee Department of Environment & Conservation, Intended Use Plan: Clean Water State Revolving Fund (2024)
Notes: PPV stands for Priority Point Value.

Onsite System Management

Private Wells

County health department water quality branches oversee the application for and permitting of private water wells.[18] Tennessee does not regulate private well water quality and does not provide resources to test water quality. New wells must be drilled by a licensed driller (certification provided by the Department of Environment & Conservation) and according to standards.[19]

Septic Systems

The State of Tennessee's Department of Environment & Conservation regulates septic permitting through the Division of Water Resources Septic System Assistance program. Soil consultants, installers, and pumpers are all licensed by the same division. However, nine counties manage their own septic permitting independent of the state process.[20]

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[1] See funding tables for links to all funding program websites; "Finance Functions," Tennessee Comptroller of the Treasury, Accessed March 27, 2025, https://comptroller.tn.gov/about-us/learn-about-our-office/financefunctions.html. (Click the State Government Finance dropdown menu).
[2] "Finance Functions," Tennessee Comptroller of the Treasury, Accessed March 27, 2025, https://comptroller.tn.gov/about-us/learn-about-our-office/financefunctions.html. (Click the State Government Finance dropdown menu)
[3] "Environmental Review," TN Department of Environment & Conversation, Accessed March 27, 2025, https://www.tn.gov/environment/program-areas/na-natural-areas/na-environmental-review.html; "Drinking Water," TN Department of Environment & Conservation, Accessed March 27, 2025, https://www.tn.gov/environment/program-areas/wr-water-resources/water-quality/drinking-water-redirect.html; "Water Permits," TN Department of Environment & Conservation, Accessed April 8, 2025, https://www.tn.gov/environment/permit-permits/water-permits.html.
[4] "Construction Permit for Subsurface Sewage Disposal Systems (SSDS)," Tennessee Department of Environment & Conservation, Accessed March 11, 2025, https://www.tn.gov/environment/permit-permits/water-permits1/septic-systems-permits/ssp/permit-water-septic-system-construction-permit.html; Tennessee Department of Environment & Conservation, "Water Supply Program - Well Water," www.tn.gov, April 18, 2024, https://www.tn.gov/environment/program-areas/wr-water-resources/water-quality/well-water.html; "Water Well

Permitting Process," Shelby County Health Department, Accessed March 11, 2025, https://www.shelbytnhealth.com/180/Water-Well-Permitting-Process.

[5] Division of Local Government Finance, Tennessee Debt Manual for Local Governments (2023), Tennessee Comptroller of the Treasury, https://comptroller.tn.gov/content/dam/cot/lgf/documents/manuals/LocalGovernmentDebtManualFinal.pdf; "Tennessee Board of Utility Regulation," Tennessee Comptroller of the Treasury, Accessed March 27, 2025, https://comptroller.tn.gov/about-us/learn-about-our-office/utility-boards.html

[6] "Tennessee Board of Utility Regulation," Tennessee Comptroller of the Treasury, Accessed March 27, 2025, https://comptroller.tn.gov/about-us/learn-about-our-office/utility-boards.html.

[7] "Membership," Tennessee Local Development Authority, Accessed March 27, 2025, https://comptroller.tn.gov/boards/tennessee-local-development-authority/tlda-information/membership.html.

[8] TN Department of Environment & Conservation, *Intended Use Plan: Drinking Water State Revolving Fund* (2024), https://www.tn.gov/content/dam/tn/environment/water/srf/wr_srf_sfy2025-iup-drinking-water.pdf.

[9] "Board Members," Tennessee Board of Utility Regulation, Accessed March 27, 2025, https://comptroller.tn.gov/boards/utilities/board-information/board-members.html.

[10] "Finance Functions," Tennessee Comptroller of the Treasury, Accessed March 27, 2025, https://comptroller.tn.gov/about-us/learn-about-our-office/financefunctions.html. (Click the Local Government Finance dropdown menu)

[11] Division of Local Government Finance, Tennessee Debt Manual for Local Governments (2023), Tennessee Comptroller of the Treasury, https://comptroller.tn.gov/content/dam/cot/lgf/documents/manuals/LocalGovernmentDebtManualFinal.pdf.

[12] "State Revolving Fund Program," TN Department of Environment & Conservation, Accessed March 28, 2025, https://www.tn.gov/environment/program-areas/wr-water-resources/srfp.html.

[13] TN Department of Environment & Conservation, *Intended Use Plan: Drinking Water State Revolving Fund* (2024), https://www.tn.gov/content/dam/tn/environment/water/srf/wr_srf_sfy2025-iup-drinking-water.pdf.

[14] TN Department of Environment & Conservation, *Intended Use Plan: Clean Water State Revolving Fund* (2024), https://www.tn.gov/content/dam/tn/environment/water/srf/wr_srf_sfy2025-iup-clean-water.pdf.

[15] Tennessee Department of Environment and Conservation, "Chapter 0400-46-01 Priority Ranking System," in *Rules of the Tennessee Department of Environment and Conservation Water Resources Division* (2013), https://publications.tnsosfiles.com/rules/0400/0400-46/0400-46-01.20131215.pdf.

[16] TN Department of Environment & Conservation, *Intended Use Plan: Drinking Water State Revolving Fund* (2024), https://www.tn.gov/content/dam/tn/environment/water/srf/wr_srf_sfy2025-iup-drinking-water.pdf; TN Department of Environment & Conservation, *Intended Use Plan: Clean Water State Revolving Fund* (2024), https://www.tn.gov/content/dam/tn/environment/water/srf/wr_srf_sfy2025-iup-clean-water.pdf.

[17] "Ability To Pay Index," TN Department of Environment & Conservation, Accessed March 28, 2025, https://www.tn.gov/environment/program-areas/wr-water-resources/srfp/srf-home/srf-subsidy-and-ability-to-pay-index.html.

[18] "Water Well Permitting Process," Shelby County Health Department, Accessed March 11, 2025, https://www.shelbytnhealth.com/180/Water-Well-Permitting-Process.

[19] Tennessee Department of Environment & Conservation, "Water Supply Program - Well Water," www.tn.gov, April 18, 2024, https://www.tn.gov/environment/program-areas/wr-water-resources/water-quality/well-water.html.

[20] "Construction Permit for Subsurface Sewage Disposal Systems (SSDS)," Tennessee Department of Environment & Conservation, Accessed March 11, 2025, https://www.tn.gov/environment/permit-permits/water-permits1/septic-systems-permits/ssp/permit-water-septic-system-construction-permit.html.

Governance Profile: Virginia

Distribution of Roles Across Governance Entities

- Three state agencies and the Virginia Resources Authority (VRA) administer funding for water and wastewater infrastructure projects in Virginia (Appendix Table L.23).[1]
- VRA also serves as a state bond bank (Appendix Table L.23).[2]
- The Department of Environmental Quality conducts environmental reviews as required by funding programs. It is also responsible for permitting related to the public water supply as well as National Pollution Discharge Elimination System permits.[3] The Department of Health regulates the public water supply (Appendix Table L.23).[4]
- Both state agencies and local governments support onsite system management (Appendix Table L.23).[5]
- Two entities provide financial oversight: the State Water Control Board within the Department of Environmental Quality and the Auditor of Public Accounts (Appendix Table L.23).[6]
- The State Corporation Commission regulates public utilities, including water and wastewater (Appendix Table L.23).[7]

Appendix Table L.23: Distribution of Roles Across Governance Entities, Virginia

ENTITY NAME	ENTITY TYPE					ENTITY ROLES: FUNDING						PERMITTING			REGULATION				OVERSIGHT				OTHER	
	State Agency/Department	State Office	Legislative Department	Local Government	Other Entity	Admin, SRF	Admin, ARC	Admin, CDBG	Admin, Other	Provision, Grants/Loans	Provision, Bond Bank	Public Water Supply	Private Wells	Septic	Public Water Supply	Private Wells	Septic	W/WW Rate-Setting and Service Provision	Financial/Funding	Onsite Systems	General Water Resources	Conducts State Env. Reviews	Well Water Testing	Provides Technical Assistance
Dept. of Health	x					x									x					x				x
Dept. of Environmental Quality	x					x			x			x							x		x	x		
Dept. of Housing and Community Development	x						x	x																
Auditor of Public Accounts			x																x					
County Dept. of Health				x									x	x		x	x							
Virginia Resources Authority					x	x			x		x													
State Corporation Commission					x													x						

Source: See endnotes embedded in text for this section.

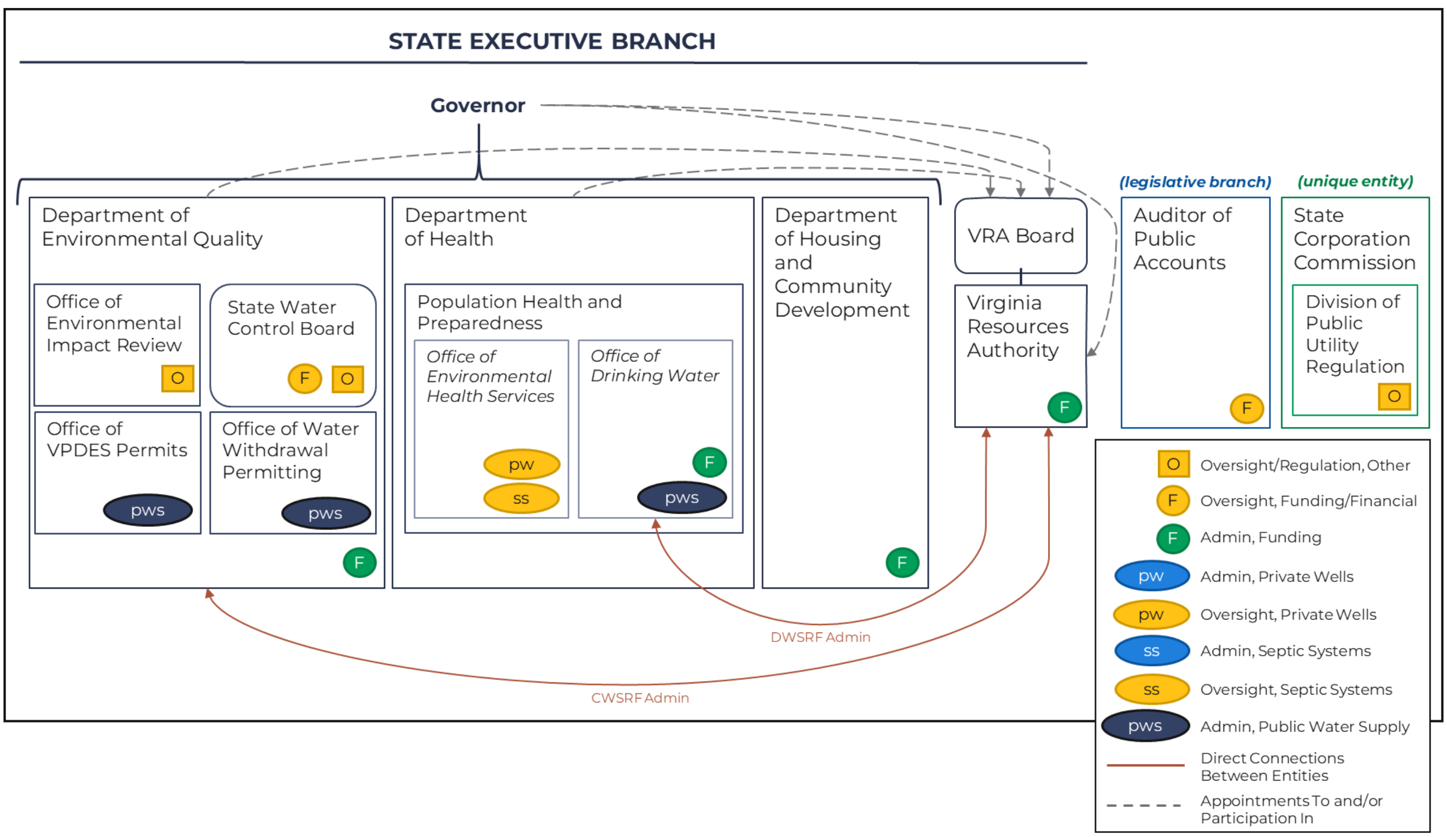
Relationships and Efficiencies

The governor appoints seven members of the **VRA Board**, who are confirmed by the General Assembly and serve staggered four-year terms. The governor also designates the chair of the VRA Board. Four additional members are defined by their governor-appointed positions: the State Treasurer, the State Health Commissioner, the Director of the Department of Environmental Quality, and the Director of the Department of Aviation (Appendix Figure L.12).[8]

The **State Corporation Commission** is an independent department of the state government with constitutionally delegated administrative, legislative, and judicial powers. Plaintiffs can appeal decisions made by the Commission to the Virginia Supreme Court.[9] Commissioners are elected by the General Assembly and serve six-year terms (staggered). The position of chair rotates between the three commissioners annually (Appendix Figure L.12).[10]

The **State Water Control Board** is a Citizen Board within the Department of Environmental Quality that administers the Virginia Water Control Law (Appendix Figure L.12). Within its broad range of responsibilities is “determining requirements for treating sewage and industrial waste and for the recovery and reuse of wastewater” and “issuing procedures governing financial assistance for construction of publicly owned wastewater treatment works.”[11]

Appendix Figure L.12: Graphical Depiction of Governance Entity Roles and Relationships, Virginia



Source: See endnotes embedded in text for this section.

Financial Regulation and Oversight

The Auditor of Public Accounts improves accountability and financial management for local governments through a variety of oversight functions, including defining requirements for audits of local governments, developing guidelines to assist local governments in maintaining compliance with accounting and reporting requirements, and performing quality control reviews of local government audits performed by public accounting firms.[12]

Key Aspects of Virginia's State Revolving Funds (SRF) Programs

Administration and Application Process

Virginia has both **split and joint administration** of SRF programs. The Department of Environmental Quality (VADEQ) and the Department of Health (VDH) administer the programmatic aspects of the CWSRF and DWSRF, respectively. The VRA handles the financial administration of both programs.[13] The project team did not identify any significant differences between the Virginia SRF application process and that of other Appalachian states.

Ranking Criteria

Virginia's DWSRF incorporates **regionalization/consolidation**, **affordability**, and **asset management plans**. An asset management plan may be required on a case-by-case basis, depending on the outcome of the Capacity Development's Technical, Managerial, and Financial Review. VDH may require small systems to regionalize as a condition of receiving funding.[14] Information on the priority ranking system for the CWSRF is very limited but it includes **affordability**. The affordability criteria may also be used to evaluate eligibility for principal forgiveness (Appendix Table L.24). [15]

Appendix Table L.24: Summary of Priority Ranking Criteria for the State of Virginia **(continued on next page)**

Priority Ranking Category	Included in Which SRF Program?		Additional Relevant Details About Points Awarded within Category
	Drinking Water	Clean Water	
SDWA Compliance	x		
Public Health Projects: Cross-Connection Reduction and Public	x		
Public Health Projects: Water Regulation Compliance	x		
Public Health Projects: Regionalization/ Consolidation	x		
Other Considerations: Readiness to Proceed	x		
Other Considerations: Other Funding Available	x		

Appendix Table L.24 (continued): Summary of Priority Ranking Criteria for the State of Virginia

Priority Ranking Category	Included in Which SRF Program?		Additional Relevant Details About Points Awarded within Category
	Drinking Water	Clean Water	
Other Considerations: Asset Management Plan	x		
Other Considerations: Green Project Reserve	x		
Other Considerations: Affordability	x	x	The DWSRF incorporates affordabilty by calculating if the average water rate is above 1% of the community's MHI. For CWSRF, the affordability consideration includes reasonable sewer cost per household based on MHI, unemployment, and population trends.
Project Type		x	
Environmental Concerns		x	
Fiscal Stress		x	
Readiness to Proceed		x	

Source: Office of Drinking Water (Virginia Department of Health), Commonwealth of Virginia Drinking Water State Revolving Fund Program Design Manual; Virginia Department of Environmental Quality, Commonwealth of Virginia Clean Water Revolving Fund Capitalization Grant Request Draft Intended Use Plan for FY 2024

Onsite System Management

Private Wells

A county's Department of Health's Environmental Health Division is responsible for permitting private wells. There is a standard statewide application provided by the Virginia Department of Health, but applications are reviewed at the county level. Applications must be accompanied by supporting work from a licensed private sector consultant.[16] Virginia Department of Health personnel can conduct the required sanitary survey if an applicant meets certain hardship guidelines.[17] Neither the state nor county health departments offer well water testing; owners must rely on private labs. However, the Virginia Household Water Quality Program of the Virginia Cooperative Extension offers low-cost annual well water testing clinics.[18]

Septic Systems

A county's Department of Health's Environmental Health Division is responsible for permitting on-site wastewater systems. There is a standard statewide application provided by the Virginia Department of Health, but applications are reviewed at the county level. Applications must be accompanied by supporting work from a licensed private sector consultant.[19]

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[1] See funding tables for links to all funding program websites; "Welcome to Virginia Resources Authority," Virginia Resources Authority, Accessed March 28, 2025, https://www.virginiaresources.gov/.

[2] "Welcome to Virginia Resources Authority," Virginia Resources Authority, Accessed March 28, 2025, https://www.virginiaresources.gov/.

[3] "Environmental Impact Review," Virginia Department of Environmental Quality, Accessed March 28, 2025, https://www.deq.virginia.gov/our-programs/environmental-impact-review; "Water Permits," Virginia Department of Environmental Quality, Accessed March 28, 2025, https://www.deq.virginia.gov/permits/water; "Discharge to Surface Waters – Virginia Pollutant Discharge Elimination System," Virginia Department of Environmental Quality, Accessed April 8, 2025, https://www.deq.virginia.gov/permits/water/surface-waters-vpdes.

[4] "About ODW", Virginia Department of Health, Updated June 2023, https://www.vdh.virginia.gov/drinking-water/about-us-2/.

[5] "About ODW", Virginia Department of Health, Updated June 2023, https://www.vdh.virginia.gov/drinking-water/about-us-2/; "Onsite Program (Well and Septic)," Virginia Department of Health, Updated October 20, 2021, https://www.vdh.virginia.gov/southside/environmental-health-services/onsite-program-well-and-septic/.

[6] "Local Government," Commonwealth of Virginia Auditor of Public Accounts, Accessed March 28, 2025, https://www.apa.virginia.gov/local-government; Virginia Department of Environmental Quality, State Water Control Board Overview (n.d.), https://www.deq.virginia.gov/home/showpublisheddocument/1761/637422736289600000.

[7] "About the SCC," State Corporation Commission, Accessed March 28, 2025, https://www.scc.virginia.gov/about-the-scc/.

[8] "Board of Directors," Virginia Resources Authority, Accessed March 28, 2025, https://www.virginiaresources.gov/about-vra/board-of-directors/.

[9] "About the SCC," State Corporation Commission, Accessed March 28, 2025, https://www.scc.virginia.gov/about-the-scc/

[10] "About the Commissioners," State Corporation Commission, Accessed March 28, 2025, https://www.scc.virginia.gov/about-the-scc/about-the-commissioners/.

[11] Virginia Department of Environmental Quality, State Water Control Board Overview (n.d.), https://www.deq.virginia.gov/home/showpublisheddocument/1761/637422736289600000.

[12] "Local Government," Commonwealth of Virginia Auditor of Public Accounts, Accessed March 28, 2025, https://www.apa.virginia.gov/local-government.

[13] "Clean Water Financing and Assistance Program," Virginia Department of Environmental Quality, Accessed March 28, 2025, https://www.deq.virginia.gov/our-programs/water/clean-water-financing-and-assistance; "Drinking Water State Revolving Fund (DWSRF)," Virginia Department of Health, Updated December 4, 2023, https://www.vdh.virginia.gov/drinking-water/dwsrf/; "Welcome to the Virginia Resources Authority," Virginia Resources Authority, Accessed March 28, 2025, https://www.virginiaresources.gov/.

[14] Office of Drinking Water, Commonwealth of Virginia Drinking Water State Revolving Fund Program Design Manual (Virginia Department of Health, 2025), https://www.vdh.virginia.gov/content/uploads/sites/14/2025/02/Program-Design-Manual_2025-02-25.pdf.

[15] *Commonwealth of Virginia Clean Water Revolving Fund Capitalization Grant Request Draft Intended Use Plan for FY 2024* (Virginia Department of Environmental Quality), https://www.deq.virginia.gov/home/showpublisheddocument/18865/6386346652567000.

[16] "Onsite Program (Well and Septic)," Virginia Department of Health, Updated October 20, 2021, https://www.vdh.virginia.gov/southside/environmental-health-services/onsite-program-well-and-septic/; Virginia Department of Health, *Permits to Construct A Sewage Disposal System and/or Private Well* (2021), https://www.vdh.virginia.gov/content/uploads/sites/129/2021/07/2021-2022-Combined-EH-Onsite-Application-Package.pdf.

[17] "Private Well Program," Virginia Department of Health, Updated February 5, 2025, https://www.vdh.virginia.gov/environmental-health/private-well-program/.

[18]Office of Environmental Health Services, *It's Your Health: Private Well Testing* (Virginia Department of Health, n.d.), https://www.vdh.virginia.gov/content/uploads/sites/20/2017/03/I-am-concerned-about-my-well-water-quality.pdf.

[19] "Onsite Program (Well and Septic)," Virginia Department of Health, Updated October 20, 2021, https://www.vdh.virginia.gov/southside/environmental-health-services/onsite-program-well-and-septic/; Virginia Department of Health, *Permits to Construct A Sewage Disposal System and/or Private Well* (2021), https://www.vdh.virginia.gov/content/uploads/sites/129/2021/07/2021-2022-Combined-EH-Onsite-Application-Package.pdf.

Governance Profile: West Virginia

Distribution of Roles Across Governance Entities

- Two state agencies and the West Virginia Water Development Authority (WDA) administer funding for water and wastewater infrastructure projects (Appendix Table L.25).[1]
- WDA also serves as a revenue bond bank for water and wastewater facility construction (Appendix Table L.25).[2]
- The Department of Environmental Protection conducts environmental reviews as required by funding programs and issues National Pollution Discharge Elimination System permits (Appendix Table L.25).[3]
- The Department of Health regulates the public water supply (Appendix Table L.25).[4]
- Both state agencies and local governments support onsite systems (Appendix Table L.25).[5]
- The State Auditor, the Infrastructure & Jobs Development Council, the Public Service Commission (PSC), and the Municipal Bond Commission provide financial oversight (Appendix Table L.25).[6]
- The PSC also provides rate and service oversight and technical assistance to both public and private water and wastewater utilities (Appendix Table L.25).[7]

Appendix Table L.25: Distribution of Roles Across Governance Entities, West Virginia

ENTITY NAME	ENTITY TYPE					ENTITY ROLES: FUNDING						PERMITTING			REGULATION				OVERSIGHT				OTHER	
	State Agency/Department	State Office	Legislative Department	Local Government	Other Entity	Admin, SRF	Admin, ARC	Admin, CDBG	Admin, Other	Provision, Grants/Loans	Provision, Bond Bank	Public Water Supply	Private Wells	Septic	Public Water Supply	Private Wells	Septic	WWW Rate-Setting and Service Provision	Financial/Funding	Onsite Systems	General Water Resources	Conducts State Env. Reviews	Well Water Testing	Provides Technical Assistance
Dept. of Health	x													x	x		x							x
Dept. of Environmental Protection	x					x														x		x		
Dept. of Economic Development	x						x	x																
State Auditor		x																	x					
Local Health Departments				x									x				x						x	
Water Development Authority					x	x					x													
Infrastructure & Jobs Development Council					x														x					
Public Service Commission					x													x	x					x
Municipal Bond Commission					x														x					

Source: See endnotes embedded in text for this section.

Relationships and Efficiencies

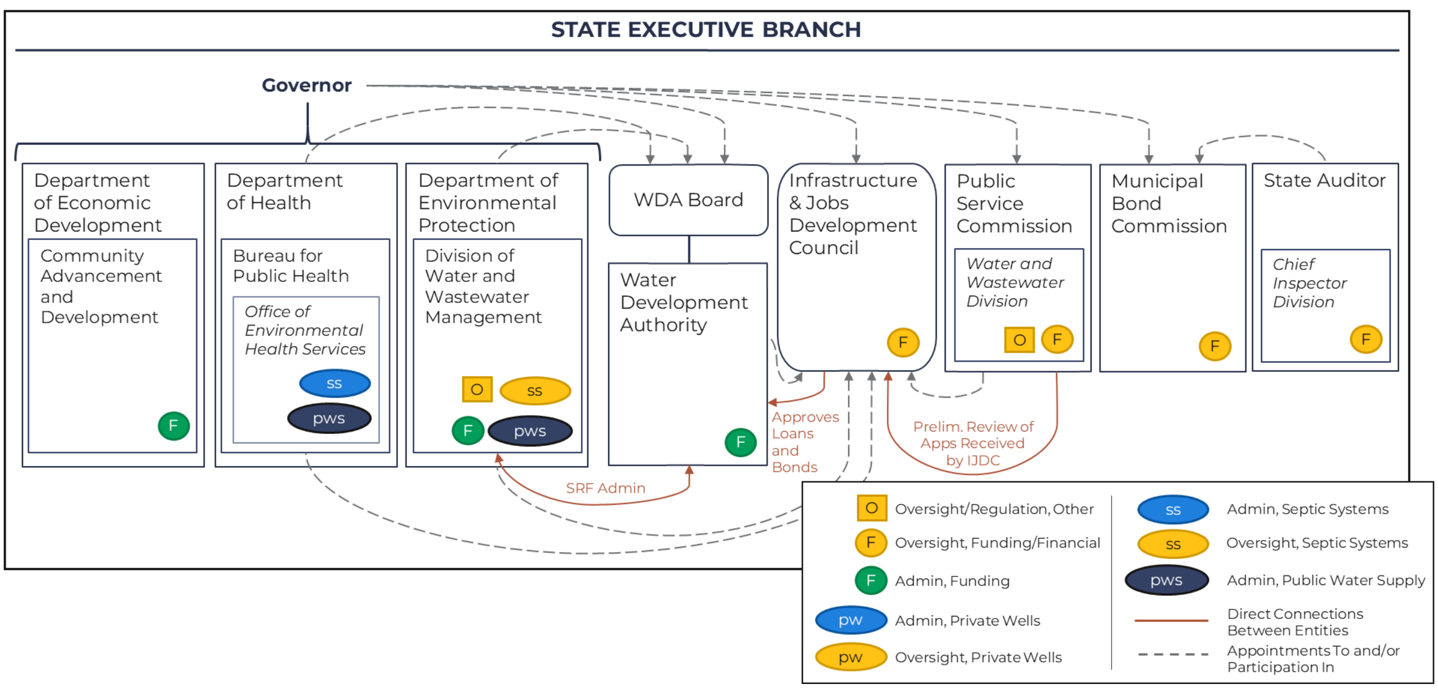
The governor serves as the chair of the **West Virginia Water Development Authority (WDA)**. The Director of Environmental Engineering at the Bureau of Public Health (Department of Health (DH)) and the Director of the Division of Water and Waste Management at the Department of Environmental Protection (DEP) also serve on the board. The governor appoints four additional members to six-year terms (Appendix Figure L.13).[8]

The governor also serves as the chair of the **Infrastructure and Jobs Development Council (IJDC)** and appoints six additional members from the general public (at least one from each congressional district). The remaining members represent specific positions: Executive Director of the Housing Development Fund, Director of the Division of Environmental Protection, Director of the Economic Development Authority, Director of the Water Development Authority, Director of the Bureau for Public Health (Department of Health), and the Chairman of the Public Service Commission. The governor appoints all of these positions except the Director of the Economic Housing Authority.[9] The IJDC approves loans and bonds issued by WDA (Appendix Figure L.13).[10]

The **Public Service Commission (PSC)** completes a preliminary review of applications received by the IJDC for funding approval.[11] The Commission consists of three members appointed by the governor with the advice and consent of the state senate (Appendix Figure L.13). They serve six-year terms.[12]

The governor also appoints two members to the **Municipal Bond Commission (MBC)** (though they cannot represent the same political party), who serve four-year terms. The other three members are state offices: the State Tax Commissioner (governor-appointed position), Treasurer, and Auditor (Appendix Figure L.13).[13]

Appendix Figure L.13: Graphical Depiction of Governance Entity Roles and Relationships, West Virginia



Source: See endnotes embedded in text for this section.

Financial Regulation and Oversight

The MBC is the fiscal agent for revenue bond issues of municipal utilities, including water and wastewater utilities. The MBC works closely with several other state entities in the management of water and wastewater projects: the West Virginia Infrastructure and Jobs Development Council, the Water Development Authority, the Department of Environmental Protection, and the Bureau of Public Health.[14] The Chief Inspector Division of the State Auditor conducts and/or oversees annual audits of local government units throughout the state.[15]

Key Aspects of West Virginia's State Revolving Fund (SRF) Programs

Administration and Application Process

West Virginia has **joint administration** of the DWTRF (i.e., DWSRF) and CWSRF via the Department of Environmental Protection and the Water Development Authority.[xxi] The IJDC may also review and approve emergency DWTRF projects.[16] The project team did not identify any significant differences between the West Virginia SRF application process and that of other Appalachian states.

Ranking Criteria

DWTRF. Since 2009, West Virginia's DWTRF has required applicants to have an approved **asset management plan** (AMP). Systems that have maintained, updated, and implemented their AMPs are eligible for a reduction in loan interest rates.[17] The DWTRF criteria incorporate **affordability** using the rate of 3,400 gallons as a percentage of MHI and use this measure to calculate reduced interest rates (Appendix Table L.26).[18] Very few details are available about West Virginia's DWTRF ranking criteria.

CWSRF. The CWSRF uses the same affordability measure as the DWTRF to calculate reduced interest rates.[19] The project team was unable to locate a public source for the CWSRF priority ranking criteria.

Appendix Table L.26: Summary of Priority Ranking Criteria for the State of West Virginia

Priority Ranking Category	Included in Which SRF Program?		Additional Relevant Details About Points Awarded within Category
	Drinking Water	Clean Water	
Public health	x		
Regulatory compliance	x		
Affordability	x		Points are awarded using the rate of cost of 3,400 gallons as percent MHI.

Source: West Virginia Drinking Water Treatment Revolving Fund, *FY2025 Intended Use Plan* (2024)

[xxi] The West Virginia legislature transferred the administration of the DWTRF from the DPH to DEP at the start of fiscal year 2024. DEP works with DPH and oversees expenditures of set-aside funds by DPH. The DPH website is not updated to reflect this change but the change is noted in the FY25 DWTRF Intended Use Plan (https://dep.wv.gov/WWE/Programs/SRF/Documents/Fiscal%20Year%202025%20Drinking%20Water%20Intended%20Use%20Plan.pdf).

Onsite System Management

Private Wells

Private drinking water wells are regulated by local health departments and must be drilled by a licensed well driller. Local health departments can also complete a water quality analysis for a fee.[20]

Septic Systems

West Virginia's Department of Health's On-Site Sewage Program (under the Environmental Health Services division) provides rule interpretation and technical assistance related to on-site wastewater systems. This program manages system installer trainings and certification. They are also responsible for issuing permits for on-site systems that require a surface water discharge permit (NPDES).[21] County-level health departments are responsible for on-site system permitting.[22] Septic tank owners are required to pay a Septic Tank Seal Registration fee to the Department of Environmental Protection.[23]

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Appendix M. Case Studies of Successful Financial Management Strategies

Given the unique combination of physical landscape and economic challenges throughout Appalachia, the project team developed a series of case studies highlighting successful strategies for water and wastewater utility management that may be replicable in the region (Appendix Table M.1).

Appendix Table M.1: Case Study Subjects and Central Topics

State	Community/Utility	Central Topic
Alabama	City of Cullman	Completion of a major capital project (new reservoir) to plan for future growth
Kentucky	Letcher County Water and Sewer	Improving (and extending) services by adding centralized infrastructure
Maryland	Allegany County	Strategies for both securing and spending funding
Mississippi	Starkville Utilities	Cultivating consistent investment in infrastructure from local government leaders and customers
North Carolina	Yadkin Valley Sewer Authority	How regionalization improved managerial and operational capacity, ultimately increasing success in obtaining
North Carolina	Mars Hill	Leveraging local partnerships in response to extreme weather events
Ohio	Ironton Public Utilities	Asset management plans as living documents
Tennessee	City of Baxter	Balancing planning for growth with maintaining viability
Virginia	Wise County Public Service Authority	The foundations for consolidation
West Virginia	Mercer County Public Service District	Strategies for connecting decentralized systems in extremely rural areas

Built to Last: Strategies from Cullman, Alabama

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The Project Team would like to thank **Dale Greer,** Economic Development Director for Cullman, Alabama**; Mayor Woody Jacobs; Wesley M. Moore,** City Clerk**; Allison Bright,** Chief Executive Officer, Cullman Utilities Board**;** and the **Cullman Parks and Recreation Department** for their significant contributions to this case study.

Setting the Stage

Cullman, Alabama, founded in the 1870s, is the largest city in Cullman County and serves as the county seat.[1] It is located between two major economic centers in the state: Huntsville, about 55 miles north, and Birmingham, about 50 miles south. According to the 2020 Census, Cullman has a population of approximately 19,251. The city's population skews older than the state average and the median household income is just under $60,000, roughly in line with the state median. Cullman County has a population of around 92,000 and has grown more than 3% since 2020.[2] The Appalachian Regional Commission classifies the county's economy as "transitional," indicating a mix of strengths and challenges.[3]

Cullman has a particularly strong water system for a community of its size, made even more robust with the addition of the 640-acre Duck River Reservoir. This new reservoir supplements Lake Catoma, which was built in the 1960s and served as the city's only reservoir for over four decades. The city's water and sewer services are managed by the Cullman Utilities Board under a supply agreement with the city, which purchases all of the water produced and covers its production costs. The city then supplies water to retail businesses and eight wholesale customers. One key wholesale customer is the Cullman County Water Department, the third-largest water utility in Alabama. It serves roughly 150,000 people as well as many businesses and industrial sites across Cullman and parts of Morgan, Walker, and Winston counties.[4]

Cullman's geography presents challenges for water sourcing. The city is located on the Brindley Mountain Plateau, where water supply options are limited. In the 1960s, city leaders responded to this challenge by constructing Lake Catoma, at a time when many residents still lacked access to running water.[5]

Water availability has long been critical to Cullman's economy, which historically relied on water-intensive industries like poultry and beef production. Today, over 80 poultry operations operate within the watershed. More recently, the county has attracted significant industrial investment, with over $489 million in capital expenditures in 2023 alone.[6] This economic growth is closely linked to the city's long-standing efforts to expand and secure its water infrastructure.

Capital Investment for the Future

The Cullman Utilities Board, City Council, and Mayor have long focused on securing Cullman County's water and wastewater independence. Recognizing Cullman's strategic location between Huntsville and Birmingham, city leaders saw an opportunity for economic growth—if they planned ahead. That foresight led to a series of major infrastructure investments to support future demand. The most ambitious of these was the Duck River Reservoir, a project that took 27 years to complete. It more than doubled the city's water supply and improved drought resilience, establishing Cullman's reputation as a city capable of managing large-scale infrastructure projects.[7]

In 1992, Cullman received a $5 million grant from the Appalachian Regional Commission (ARC) to begin planning an emergency water supply for local industries. The funding made it possible to study about 15 possible sites for a new reservoir and navigate expensive environmental and regulatory reviews. "It would have been impossible for a town our size to vet all those sites," said Dale Greer, Cullman's longtime Economic Development Director.[8]

A severe drought in 2006 underscored the limitations of Lake Catoma, prompting movement on the Duck River project. By 2011, with a projected cost of $58 million, the Cullman Utilities Board devised a creative funding plan. They offered water systems in Cullman County the option to invest in the project upfront by purchasing a share of future water capacity. When the towns chose not to take on the debt directly, the Utilities Board issued the debt itself and signed long-term service agreements with each town. These agreements committed the towns to buying water from Cullman until the reservoir is fully paid off.[9]

Cullman sells water not only to its own residents but also to eight wholesale providers, including the Cullman County Water Department. A key part of Cullman's strategy is that it does not add a markup to the water it sells wholesale. "They get their water at cost," explained City Clerk Wesley Moore. "We all share in the same cost. A third party recalculates the rate each year based on expenses."[10] This structure encourages wholesale customers to join Cullman's system, increasing participation and spreading out costs to create economies of scale—an uncommon approach for a small city.

This cost-sharing approach is just one example of how Cullman builds trust and cooperation with neighboring towns. City staff also share economic development leads and collaborate across jurisdictional lines. The county's tax structure reinforces this spirit of partnership: no matter where someone makes a purchase, tax revenues are shared among the City of Cullman, each municipality, and the county. This cooperative model has enabled the creation of shared resources like a regional library, animal shelter, and airport.[11]

The Duck River Reservoir would not have been possible without this regional collaboration. The project faced major legal challenges, including two federal lawsuits—one attempting to block the dam and another from county commissioners trying to form a separate utility.

Despite these hurdles, Cullman pushed forward and officially opened the reservoir on July 17, 2018, with long-term financing secured through binding agreements with its wholesale customers.[12]

After completing the reservoir, the Utilities Board turned its attention to upgrading the city's aging sewer system, particularly to fix inflow and infiltration issues. By October 2024, most of the system had been replaced, and depreciation had been reduced to about 25%.[13] This continued investment shows Cullman's commitment to long-term infrastructure planning and regional cooperation.

Key Takeaways from Cullman

The success of the Duck River Reservoir Project exemplifies effective, strategic relationship building and the outcomes it can make feasible. Cullman's leadership has maximized the city's potential opportunities by prioritizing the big projects necessary to support economic growth, thinking strategically about financing and building relationships with allies and partners in the region to make those projects possible.

An eye toward the future can solidify that vision.

Cullman's leadership recognized the potential for a prosperous economic future and kept that vision at the forefront of their decision-making. When a city, and by extension, its utility, clearly determines its trajectory, it establishes a guiding star to direct its efforts and inform its choices. Building a culture to maintain that focus can be key to a sustainable future. Asset Management Plans are a great way to standardize the big-picture priorities of a utility.

Building trust can lead to big successes.

One key to Cullman's success has been leveraging populations beyond its jurisdictional boundaries, which required long-term trust-building efforts. Building relationships can lay the groundwork for economies of scale that can have many benefits. In Cullman's case, it enabled the construction of a 100-million-dollar project, but it could be as simple as sharing an operator. Regardless of a utility's specific requirements, regional cooperation is often greater than the sum of its parts.

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Adding Infrastructure to Increase Efficiency: A New Plant for Letcher County Water and Sewer

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Setting the Stage

Letcher County, designated as “distressed” by the Appalachian Regional Commission, is located in eastern Kentucky along the Kentucky-Virginia border.[1] It is home to approximately 20,000 residents, largely rural, and encompasses the towns of Whitesburg (the county seat), Jenkins, and Neon. Notably, nearly one-quarter (23.8%) of residents live below the poverty line compared to about 16% for the state overall.[2]

At present, Letcher County Water and Sewer (LCWS) provides water to 3,000 customers. This represents significant progress since 2011, when the system served only 770 customers. Funding from ARC has supported waterline extensions to multiple communities in recent years, including Loggy Hollow, Kremlin, and Millstone. The office is presently staffed by a manager, two office assistants, and four line operators, and maintains an all-volunteer (i.e., unpaid) water board. Appointed by the fiscal court (the county governing body), the present board is staffed by two retired mining engineers, a retired college professor, a land surveyor, and a small town mayor from a local community outside the immediate service area.[3]

Although Letcher County has steadily increased service coverage throughout the county, LCWS has faced issues of water loss and decreased financial stability in recent years because of its dependence on purchased water to meet needs. LCWS purchases the majority of its source water across the county border from the Knott County Public Service District, with occasional purchases from Jenkins and Whitesburg. The distribution system is quite large for only 3,000 customers. The piped network encompasses an area equivalent in size to the City of Louisville, with water traveling distances of up to 29 miles. The general manager notes that it takes as long as 47 minutes to drive the service area end to end.[4]

Investing in New Infrastructure

High travel times make it challenging to maintain adequate chlorine residuals without generating excessive disinfection byproducts, such as trihalomethanes. Leaks and pipe breaks are especially concerning. Purchasing treated source water is costly, and because water rates are regulated at the state level by the Kentucky Public Service Commission, revenues recovered through rates are not always sufficient for necessary improvements to such a large and complex system. As manager Mark Lewis puts it, "Leaks are always our biggest concern because water on the ground means that you have money pouring out." Due to these issues, the utility relies on employees to manually flush hydrants rather than using autoflushers, which could malfunction and cause additional water loss. To more effectively manage chlorine levels, the utility is currently installing 20 new water meters as part of a zone meter project funded by ARC.[5]

To reduce reliance on purchased water and improve long-term financial resiliency, the utility is in the early stages of designing a $14 million new water treatment plant permitted to treat up to 2 million gallons of surface water per day. The Kentucky River Development District spearheaded the project with funds provided by the Kentucky Infrastructure Authority, Abandoned Mine Lands, USDA Direct Loans and Grants, and ARC. Garnering support for this project took a great deal of patience. Given that most rural regions are presently consolidating existing infrastructure systems to maximize economies of scale and coverage by trained, licensed operators, there was some skepticism that a new small to medium-sized plant was needed in the region. The utility applied five times for the same grant over the past six to seven years, incorporating feedback with each revision, before winning approval. Present estimates suggest this project will be a solid return on investment, with $175,000 in saved revenue for LCWS during just the first twelve months of operation.[6]

To gain approval for this project, the utility highlighted the potential for a significant new industry in the county in addition to demonstrated gains in efficiency and revenue. A new federal prison is planned for Letcher County, housing nearly 6,000 inmates between two complexes. Construction is slated to begin the year following the acquisition of all remaining land parcels. The prison will construct its own wastewater treatment facility, which will be managed by LCWS, and will receive water from the new planned water treatment plant. Federal funds will cover the cost of additional upgrades to the plant necessitated by changes to the prison plans.[7]

In Letcher County, the construction of a new medium-sized water treatment plant will reduce reliance on purchased water, enabling the utility to operate more efficiently and effectively. The resulting savings can then be redirected toward fully staffing the utility and extending service lines to areas currently without access. According to the general manager, approximately 41% of county residents remain unserved; he himself resides in a small community of around 350 homes that depend on private wells and septic systems for their water and wastewater needs. Apart from billing issues, most resident inquiries and complaints to the Water Board relate to the lack of centralized service across large portions of the county. Residents are frequently so enthusiastic about proposed expansions that they contact the utility seeking information about project timelines before funding has even been finalized. Additionally, the new plant may create opportunities to consolidate other local water treatment systems, including those serving Whitesburg, Jenkins, and Neon.[8]

Key Takeaways from Letcher County

The design and construction of new central water infrastructure can offer tangible new opportunities for communities, including revenue reinvestment, consolidation of additional local facilities, and extension of services to new rural areas. This last factor is particularly critical for Letcher County, where there is a perception that it has remained "behind" in providing centralized water and sewer services to much of the population in comparison to adjacent counties.

Securing funding for the best pathway forward may take persistence.

Contrary to current trends, adding new infrastructure—or deconsolidation—may be the most efficient way to improve services in some situations. Obtaining funding for such efforts requires patience and persistence through the grant (re)application process. The potential to attract new industries and jobs to the county can be a major catalyst in demonstrating that long-term capital investments in new infrastructure are justified.

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[7] Mark Lewis, interview, November 8, 2024.
[8] Mark Lewis, interview, November 8, 2024.

Securing and Spending the Funds: Strategies from Allegany County, Maryland

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Setting the Stage

Home to about 70,000 people, Allegany County, Maryland sits entirely within the Appalachian Mountains, bordered by West Virginia to the south and Pennsylvania to the north. The county boasts thriving healthcare, education, and manufacturing industries, along with many tourism opportunities. With Frostburg State University, the University of Maryland Center for Environmental Science, and Allegany College of Maryland located within the county, the population is relatively young. Only 16% of residents are 65 or older and the median age is about 41 years. The median household income is just over $55,000.[1] Allegany County has an "at-risk" economic distress designation by the Appalachian Regional Commission.[2]

Eighty-five percent of the county's residents have access to public water and sewer via the county, city/town municipal systems, or the LaVale Sanitary Commission. Allegany County Utilities Division provides water and sewer services to about 15,000 residential and commercial customers, serving Rawlings (water only) and Barton, Flintstone, Lonaconing, McCoole, Midland, and Oldtown (sewer only). The Division maintains and operates water distribution systems, wastewater collection systems, and the wastewater treatment system (155 miles of water lines, 195 miles of sewer lines, five WW treatment plants, eight water pump stations, 22 WW pump stations, and 11 water storage tanks). The Division does not maintain records of septic systems as those are regulated through the county health department.[3] The water systems receive their water from lakes in Pennsylvania, a reservoir in Garrett County, or wells located in Allegany County. Allegany County government only purchases water from the City of Cumberland and the City of Frostburg. These two cities own their water supplies and only supply water within Allegany County.[4]

For many years, Allegany County officials have viewed water and wastewater services as the backbone of economic and residential development.[5] Given this priority, Allegany County staff have become particularly successful in both securing funding and implementing projects.

Securing Funding: Building Relationships and Leveraging Knowledge

Allegany County is fortunate to sit at the nexus of interest of four major funders: the Appalachian Regional Commission (ARC), the US Department of Agriculture (USDA), the Maryland Department of the Environment (MDE), and the Maryland Department of Housing and Community Development (which administers Community Development Block Grants (CDBG)). Each funder has its own strategic priorities, and the crux of the Utilities Division's success is careful alignment of proposed projects with funder priorities.[6]

Understanding funder priorities helps county staff be strategic in pursuing funding, and they have cultivated long-standing relationships with staff at each of these funding agencies. They know that ARC is interested in Allegany County because it is one of only three Appalachian counties in Maryland. However, ARC's main priority is economic development, so they typically pitch projects that support business growth. USDA wants to support rural areas, so county staff would not pitch projects focused on the urban centers to USDA. CDBG focuses on lower-income areas, so projects involving high-end neighborhoods are avoided. Finally, MDE is primarily interested in addressing problems associated with sewer pollution and water quality. However, while knowing its funders is essential, perhaps the best-known secret to the Utilities Division's success is leveraging access to an annual event in Maryland called "Positive Attitudes Change Everything (PACE)." Hosted by the Cumberland Allegany County Industrial Foundation, PACE takes place at the start of the state legislative session each year. Allegany County Utilities Division holds an event they call "Pre-PACE," in which representatives from funding agencies gather in one room to hear division staff pitch projects. David Nedved — the Community, Economic, and Community Development Representative for Allegany County — attributes much of the County's success in obtaining funding to piecing together funding from different sources. Pre-PACE is a very efficient way to identify which projects each funder would support as well as how much funding might be available. Because funders tend to respond more positively to a project if another funder has already committed funds or is at least interested in supporting aspects of the project, this event has the added benefit of facilitating conversations directly between funders. Funders hear a project pitch simultaneously and then openly discuss which aspects of the project would fit their agency's priorities. Utilities Division staff then identify the best strategy to get a particular project funded and know how to tailor applications to each funder's interests.[7]

Simultaneously, Allegany County staff are very intentional about garnering public support before applying for funds. They never pursue funding for a project that does not have support from a majority of the project recipients. Staff conduct a survey to determine interest in the project and provide information on an estimated cost per customer. If enough customers express concern about the cost, staff may engage one or more potential funders in conversation about the possibility of receiving grant funding instead of loan funding to alleviate some of the cost burden. They also work efficiently. For example, if they know they are applying for CDBG funding, they will couple the required income survey with the interest survey and seek letters of support at the same time. Finally, they commonly hold community town halls at local venues, both before they apply for funding and at the start of the project.[8]

But of course, community support is much easier to generate for a strong project and Nedved was quick to credit the Public Works staff within the Utilities Division with coming up with good ideas and selling them. "They've come up with great projects over the years that I can get excited about. We're giving water to people that haven't had municipal water ever or giving them sewer that they've never had. And in some cases, the water they were getting was not good." Good projects fill a need at a cost acceptable to the community.[9]

Operationalizing Funding: Planning Is Key

Securing funding is important, but being able to effectively spend the money and implement projects successfully is critical to demonstrating that a municipality or utility is a good steward of funding. Allegany County has a good track record. Again, Nedved pointed to a strong Public Works staff as the key to success for Allegany County. They manage the implementation of most projects along with funding reimbursement requests from MDE and USDA. (Nedved handles the reimbursement process for ARC and CDBG.)[10] For substantial projects, the County has the financial capacity to contract out project management. Krista Sweitzer of Allegany County and Brynn Laird of the Utilities Division agree that the thorough planning that goes into a project, including community engagement, is really the key to smooth implementation. They have also been consistently successful in obtaining funding to hire contractors for the design phase of the project, ensuring well-done design and accurate cost estimates.[11][xxii]

Key Takeaways from Allegany County

Allegany County staff are fortunate to have the capacity to cultivate relationships with their primary funders and engage in thorough project planning. Pre-PACE offers a unique opportunity to gain an inside understanding of how to piece together funding for projects from multiple sources. At the same time, staff engage the community to ensure support and experts to ensure thorough project design. This pre-work enables staff to maximize efficiency in obtaining funding and minimize challenges in project implementation.

Knowing funders leads to effective strategies.

Cultivating relationships with funders and understanding their priorities helps Allegany County staff develop effective and efficient strategies for pursuing funding.

Thorough planning pays off.

Allegany County staff are able to do their homework. While the county is fortunate to have a unique event like Pre-PACE to talk with funders, staff can invest time and resources into securing community support and contract with experts to ensure solid design and accurate cost estimates. Together, these actions set county staff up for smooth project execution.

[xxii] Sweitzer is also a former Utilities Division employee.

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Cultivating Consistent Investment: Putting Starkville on the Path to a Sustainable Future

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Setting the Stage

Home to about 24,000 residents and Mississippi State University, Starkville is nestled in the southernmost reaches of the Appalachian Mountains.[1] MSU is the state's largest institute of higher learning and the University is also the city's largest employer.[2] Enrollment has steadily grown over the last ten years.[3] Starkville is within Okibbeha County, which has a "distressed" economic designation by the Appalachian Regional Commission.[4]

Starkville Utilities is a municipally owned and operated electric and water utility serving approximately 16,000 residences, businesses, and industries in the Starkville, Mississippi area along with Mississippi State University.[5] Drinking water services extend beyond the city's limits, but wastewater services are entirely within the city's boundaries. However, neither service area covers 100% of the city's footprint.[6]

The Starkville area is growing, and Starkville Utilities has been able to continually grow its investment in long-term improvements over the past decade in response. Edward Kemp, General Manager of Starkville Utilities, emphasizes the role local leadership plays in making long-term changes a reality. "We have really strong leadership at the local level that understands the value of utilities and what it does for your community. They have been very supportive of all the initiatives that help our organization meet the growing demand and develop the workforce of the future." But he also notes that, in turn, local officials have high expectations of the Utility.[7] How does the Utility meet these expectations and generate consistent investment?

Cultivating Consistent Investment

When Edward Kemp transitioned from a City Engineer with the City of Starkville to the General Manager of Starkville Utilities almost three years ago, ensuring the department was investing in infrastructure improvements that would meet the utility's highest needs was a top priority in his eyes.[8] Starkville Utilities had already executed a major capital investment in its wastewater treatment plant, which included installing innovative upgrades to make its dewatering process more environmentally sustainable and create a usable byproduct from the sludge.[9] Shortly after his arrival at Starkville Utilities, Kemp initiated a comprehensive evaluation of the wastewater treatment plant to evaluate the plant's current and future capacity, treatment processes and technology, and the overall facility needs. A similar exercise was initiated for the water production and treatment function of the organization. Further, because Starkville is one of the few areas in Mississippi currently experiencing growth, Kemp wanted to understand future capacity needs to start planning for those improvements today. While incredibly valuable, these types of evaluations ultimately outline short- and long-term improvements that come with a substantial price tag. Starkville Utilities is currently developing a long-term financial plan and was able to cover some of the immediate project costs with a customer rate increase.

Regular review and adjustment of rates are key to ensuring the financial stability and sustainability of any utility. Starkville's Mayor and Board of Aldermen approved water and wastewater rate increases in 2020, 2022, and again in 2024. These rate increases have supported the evaluation of the utility's water and wastewater assets and will support future capital improvements.[10] Kemp believes the Board will evaluate rates again in the summer of 2025 after the upcoming municipal elections to address additional needs and projects.[11]

Kemp also knows that Starkville Utilities benefits from a level of support from local government officials that many utilities simply do not have. However, he notes this probably wasn't always the case. Fifteen or so years ago, there was generally lower interest in supporting infrastructure investment, a circumstance that usually leads to a system that is over-depreciated without the funding needed to support necessary improvements. That changed when the previous manager started making decisions based on data and implemented capital planning. Kemp has built upon his predecessor's approach so today, Starkville Utilities is data-driven on many fronts—from rates to customer information and billing to asset evaluation—and relies on experts to generate that data. Rate increases are based on rate study recommendations, and Starkville Utilities leverages those increases to not only pay for infrastructure investments directly but also to pay for the studies that identify those investments as top priorities. The results of this most recent evaluation informed the 2024 rate increase, which will support recommended construction projects.[12] This data-driven approach makes it easier to "sell" rate increases to both the local officials, who must approve them, and their customers, who ultimately pay at least some of the cost.

Because Starkville Utilities is municipally owned, having public officials who understand the value quality water and wastewater services bring to the community is critical to its long-term planning, but community support is equally important. Providing quality services is also a top priority for Starkville Utilities, and staff know there is always room for improvement. "Our approach to it – my approach really to everything – is that you always want to try to make things better, every aspect of it. You can always improve in some way, whether it be large or small. But the end result is ultimately trying to provide the very best service to the customers," says Kemp. Because Mississippi State University is within Starkville Utilities' service area, the customer base is more diverse and has different expectations than other municipalities of similar size in Mississippi. Meeting these expectations (e.g., providing a variety of payment options, communication preferences, and reliability) helps the utility establish a reputation for being a quality service provider. Combined with upfront and clear communication about infrastructure needs based on data and why those improvements are necessary, Starkville Utilities is able to foster customer support for the rate increases needed to maintain functionality now and in the future.[13]

Seeking external funding also plays a role in obtaining support for long-term investment in infrastructure from both public officials and customers. Staff are quick to pursue any external funding source available. "If there is an opportunity to apply for funding, we have been trying to put an application together because we have so many needs...funding utilities seems to be something that people are interested in right now from a national perspective. I think they are many starting to understand that utilities are the lifeblood of a community and a key catalyst for economic development," shared Kemp. Currently, the utility relies on its engineers to apply for funding, but Kemp is exploring the possibility of adding a full-time staff member to identify funding opportunities, determine which projects are likely to be most successful in obtaining funding, and submit grant and loan applications.[14] If the utility is unable to bring someone on staff full-time, he notes that having access to a group that would know details and strategies around funding would make the utility more effective in securing external funding.[15] Knowing that Starkville Utilities prioritizes leveraging external funding to support capital needs helps the utility demonstrate it is a good partner for the community in providing these important services.

Finally, Kemp acknowledges that Starkville's relative proximity to a community with significant drinking water service issues likely plays a role in having community support, from both officials and the public writ large. These issues partially stem from a lack of investment in utility infrastructure and the impact on community members has been substantial. [16]

Key Takeaways from Starkville Utilities

Overall, Starkville Utilities is an excellent example of how to cultivate support for consistent investment in water and wastewater utility infrastructure. This buy-in allows the utility to request regular rate evaluations and be proactive in planning for infrastructure maintenance and improvements. While the utility has the valuable benefit of high support from local government officials, its staff work hard to ensure that support is well-earned through investments in quality data, the delivery of high-quality services, and the consistent pursuit of external funding.

Investing in good data drives good investment in infrastructure.

Starkville Utilities can approach conversations with both local officials and their customers with confidence because the staff know they are presenting information based on data gathered by experts. Staff can readily communicate what investments are needed to maintain infrastructure functionality and ensure the delivery of quality services.

Excellent customer service and communication lead to solid customer support.

By providing excellent customer service, quality service delivery, and clear communication about the value of these services, Starkville Utilities garners public support for the rate increases required to support long-term investment in infrastructure.

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Improving Resiliency Through Partnership: Lessons from Mars Hill, North Carolina

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Setting the Stage

Mars Hill is a town of around 2,700 in the southern portion of Madison County, North Carolina, located approximately twenty miles north of Asheville and designated as “transitional” by the Appalachian Regional Commission.[1] The town owns and operates its water and wastewater systems, providing service to just over 1,000 metered customers for water and around 860 customers for sewer. The largest customer demand on the water and wastewater systems is from Mars Hill University.[2]

On Friday, September 27, 2024, Tropical Storm Helene reached western North Carolina as a Category 4 storm. In the days leading up to Helene, the region experienced heavy, continuous rainfall—known as a “Predecessor Rain Event”—which saturated the ground and caused rivers and streams to rise rapidly.[3] By the time the storm passed, the region had received over eight inches of rain and several counties recorded 1,000-year flood events. The storm significantly impacted water and sewer infrastructure across western North Carolina, affecting over 160 systems and causing an estimated $3.7 billion in damage.[4]

Mars Hill, by some combination of luck and geography, was spared from significant harm apart from a few downed trees. “We’re lucky we weren’t on a river,” explains Town Manager Nathan Bennett, who joined Mars Hill's staff in 2019 and has lived in the area for nearly fifty years. Neither the town nor its water and wastewater assets are located on or near rivers, which swelled from heavy rainfall and caused massive flood damage in the surrounding areas.[5] Their neighboring towns and counties were not so fortunate. Just ten miles south of Mars Hill is the Town of Weaverville, a community with a population of around 4,600.[6] Weaverville experienced widespread damage to both private homes and public infrastructure, including its roads and water system.[7] Weaverville’s water treatment plant is located directly beside the Ivy River, which flooded the plant with eight feet of water. The floodwaters filled the “intake works” with sand, silt, and debris, rendering it nonfunctional.[8]

"They [also] lost their water storage [due to a major water line break]," recalls Bennett. "They had no way to manufacture their own water… so they contacted us." In the wake of Tropical Storm Helene, there were widespread telecommunication outages due to damaged internet, cellular, and landline infrastructure, so as soon as the roads were passable on Sunday, September 29, Weaverville staff drove to the Mars Hill Fire Department to request they open a nearly twenty-year-old interconnection between the Mars Hill and Weaverville water systems that allows potable water to move between the two towns. By the following morning, safe drinking water was once again flowing through Weaverville's system. It was the first time the interconnection had been activated—and it was used for the exact opposite of its original purpose.[9]

From Drought to Deluge: Improving System Resiliency

In 2007, North Carolina experienced a severe drought that left nearly two-thirds of the state under "Exceptional Drought (D4)" conditions, the most acute category classified by the U.S. Drought Monitor. The drought was especially severe in western North Carolina.[10] Mars Hill owns the Laurel Creek Watershed, which feeds the two surface-water reservoirs that supply the town's water system. Mars Hill staff noticed that the levels of their reservoirs were falling due to reduced stream inflow. The reservoirs never shrank to critical levels, which would have triggered consumption limits as outlined in the town's Water Shortage Response Plan, but the deficit was significant enough to prompt concern from Mars Hill staff about the town's existing and future water supply.[11]

In response, Mars Hill proactively developed a plan to supplement its watershed resources and mitigate the impacts of future drought events. The town staff considered many options, including constructing their own intake from the nearby Ivy River, the same body of water used by Weaverville. This option sparked conversations between Mars Hill and Weaverville about water supply planning, culminating in a joint project to construct an interconnection between the towns' water systems. Mars Hill was intended as the main beneficiary of the project because its water source is more likely to be depleted during a drought than Weaverville's. However, to enhance redundancy for both systems, the interconnection allows for a bi-directional flow of water. The project was deemed the most viable, cost-efficient, and advantageous solution to Mars Hill's water supply concerns. It saved Mars Hill the expense of building an additional water treatment plant along the Ivy River, since Weaverville's plant had already installed an intake, and provided both towns with a short-term emergency water supply. Mars Hill staff worked closely with Weaverville staff to secure grant funding, including funds from the Appalachian Regional Commission (ARC). Construction on the interconnection was completed in 2009. For over a decade, it was unused and somewhat forgotten. In August 2024, Bennett met with Dale Pennell, Weaverville's public works director, to plan a test of the interconnection the following month. They were not able to complete a planned test ahead of Hurricane Helene, but, as Bennett says, "We tested it all right. And it worked."[12]

In the aftermath of Helene, Mars Hill was uniquely positioned to provide emergency water to surrounding communities because its water system remained fully functional. Mars Hill supplied 600,000 gallons of water to Weaverville via their interconnection in the days immediately after the storm, which was mostly used to clear debris from Weaverville's water treatment plant. By October 3, Weaverville's system was back online, and the interconnection was shut off.[13] Mars Hill also provided another one million gallons of water by tanker to many of its neighbors, including Asheville, Burnsville, Fletcher, Spruce Pine, and Swannanoa as late as October 16. Mars Hill's water treatment plant typically operates twelve hours a day, seven days a week, but to keep up with the added demand in the immediate aftermath of the storm, the town ran the plant between eighteen and twenty-four hours a day for about three days.

Bennett believes Helene will have a lasting impact on emergency preparedness in western North Carolina by highlighting the critical need to reinforce water system resiliency. In some cases, this urgency may induce conversations between systems or hasten existing plans along. The Town of Marshall, located just ten miles west of Mars Hill, was also devastated by Helene.[14] In January 2024, well before the storm, Mars Hill and Marshall, with the support of Madison County, signed an interlocal agreement initiating development of an interconnection that will indirectly connect Marshall with Weaverville. Though Weaverville and Marshall are only ten miles apart, they are separated by mountains and other intervening geographic features that make it difficult to connect their systems directly. Once completed, the interconnection will allow treated water to flow from Weaverville, through Mars Hill's system as an intermediary, and eventually to Marshall in an emergency.

Before Helene, there was some hesitancy to interconnect multiple systems, perhaps due to the cost or the perception that their water would somehow be "stolen." "The storm has softened that conversation," says Bennett. Before, people might have questioned why interconnections should be prioritized when there are already so many competing infrastructure needs. Now, the benefit is indisputable. "This will really open up that dialogue," says Bennett, and lead to more opportunities for coordination between systems.[15]

From Resiliency to Growth: Maximizing Project Benefits

The primary objective of the interconnection project was to secure an emergency water supply for Mars Hill in anticipation of future natural disasters, not to prepare for future economic development. However, as Bennett explains, thoughtful planning of infrastructure projects can accomplish these objectives simultaneously by incorporating future goals into strategies developed to meet current needs. The interconnection between Mars Hill and Weaverville extended Mars Hill's water distribution infrastructure to an area adjacent to Interstate 26, a major traffic corridor. The town considers this area a strong candidate for future development due to its proximity to Asheville. The area is currently outside the town's existing municipal and utility service boundaries, but with its distribution infrastructure nearby and accessible, the town has positioned itself to readily extend service to future customers.[16] "When [the interconnection] project was done—and about any other project we do—we plan to be able to use it [and] to be able to expand it for other purposes," says Bennett. "This [project] is built to a capacity that we didn't necessarily need at the time… because we know growth is coming."[17] The Mars Hill staff recognized the potential for future growth and were proactive about incorporating that potential into their current infrastructure project.

Key Takeaways from Mars Hill

After a severe drought shrank its reservoirs to near-critical levels, Mars Hill constructed an emergency interconnection with a neighboring water system to secure a supplemental water source. The town's proactive planning enhanced the resiliency of both its own water system and its partner, Weaverville's, to natural disasters—even unanticipated ones. When Helene flooded Weaverville's treatment plant, Mars Hill activated the interconnection, which was pivotal to rapidly repairing Weaverville's plant and restoring the town's water treatment capacity. The interconnection also ensured Weaverville had access to safe drinking water while its treatment system was offline.

Cultivating partnerships with neighboring utilities may reduce vulnerability.

Short of formal regionalization, cultivating partnerships with neighboring utilities and connecting isolated water and wastewater systems may enhance each system's ability to withstand or recover from natural disasters. Establishing emergency water supply contingencies ensures that one system may help restore or provide continuity of service when another system experiences a disaster that renders its treatment system inoperable or reduces its water supply.

Careful planning can bolster resiliency and prepare for growth.

Investments made to improve resiliency can be leveraged to support future growth. Mars Hill staff capitalized on the opportunity presented by the interconnection project to ensure its system is ready to extend service to a new area ripe for development.

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Consolidating Utilities: Lessons from Yadkin Valley Sewer Authority

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Setting the Stage

Elkin, Jonesville, and Ronda are small communities near the edge of the North Carolina Blue Ridge Mountains with stories that resonate with many in Appalachia. Elkin originated as a company town, supporting an industry that employed thousands from the town and the surrounding counties, but that company has since shut down. These communities are still contending with the loss of their largest employer, which has led to stagnant population growth. Of the combined towns' population, about 23% are 65 years or older. The median household income (MHI) is slightly over $39,000 compared to about $97,000 for the state overall.[1] The surrounding counties are all designated as "transitional" by the Appalachian Regional Commission.[2]

Independently, the towns struggled to generate enough revenue via wastewater user charges to simultaneously cover expenses and keep rates affordable for their customers. As a result, they were losing money, and their aging assets were falling into disrepair.[3]

The situation was unsustainable. In 2006, the towns agreed to consolidate their systems into a central sewer authority with a single treatment facility and one discharge site into the Yadkin River. The goal was to enhance the cost-efficiency of the systems and provide adequate, affordable service to the residents of the three towns. Combining their resources and sharing costs across a larger base of rate-paying customers seemed to be a better option than going it alone. Four years later, on July 1, 2010, the Yadkin Valley Sewer Authority (YVSA) opened its doors and has "kept it flowing" ever since.[4]

Given where they are today, YVSA's success seems certain. However, it was far from it.

"We couldn't afford things those first few years," explains YVSA Executive Director Nicole Johnston, who was hired in September 2009 to coordinate between the towns and prepare YVSA to take over their sewer systems. The infrastructure costs of the regionalization project totaled over $6 million, mainly to decommission Jonesville's wastewater treatment plant (WWTP) and build a force main and pump station to connect Jonesville's collection system to Elkin's. The project was funded through a mix of loans and grants from the North Carolina Land and Water Fund (NCLWF) and the NC Rural Center. The upfront cost of consolidating the systems was so high that the towns had limited financial capacity to help YVSA get off the ground.[5] According to the interlocal agreement that established the Authority, the towns provided a $400,000 loan at 0% interest for the first three years to aid with the transition. "That's not a lot of money," says Johnston, especially considering the age and condition of the infrastructure YVSA inherited.[6]

YVSA's biggest challenge was dealing with the consequences of deferred maintenance. "Everything we had was old and dilapidated," says Johnston, referring to the physical assets YVSA took over from the towns—including vehicles and equipment, the collection infrastructure, and even their offices. YVSA lacked sufficient startup funds to maintain and repair the entire system.[7] While YVSA had more customers generating more revenue than any individual town, they also had even greater expenses, and not just those associated with launching a new authority and repairing or replacing failing infrastructure. "You're making things more efficient, but you're also inheriting all the debt that the towns already had," explains Benjie Thomas, an engineer at West Consultants, PLLC.[8]

For the first two years, the challenge of managing these inherited expenses was exacerbated because YVSA did not adjust user rates. This meant that the expected revenue growth from an increasing number of rate-paying customers was not materializing. According to the governance structure outlined in the interlocal agreement between the towns, YVSA's Board of Directors holds sole authority to set user rates. However, they were concerned about how raising rates would impact their primarily low-income customers. They decided to maintain Elkin's existing rates, which were affordable but insufficient to cover the town's operation and maintenance costs even prior to the consolidation.[9]

This decision created financial challenges for YVSA. They required additional revenue and needed to secure funding to bridge the gap between their net income and the cost of essential capital improvements to make the system operational. While forming the authority did not create or even worsen the fundamental issues with the towns' sewer systems, it did highlight them more clearly. By consolidating the systems, YVSA was also better positioned to tackle these challenges than the towns could on their own.[10]

Leveraging Increased Managerial Capacity to Access Funding

By the third year, as YVSA's expenses steadily climbed and its revenues remained constant, it became clear that action was needed. "I finally convinced the Board: we've got to move," says Johnston. "We're not making any money here. We've got to raise rates."

First, she explained that regularly raising user rates often “scores points” on applications for grant and loan programs in North Carolina, which would make YVSA more competitive when applying for funding. Raising rates would also help generate additional revenue to keep pace with inflation and cover the Authority’s expenses, the largest and most critical of which was repairing the system’s aging infrastructure. Johnston’s task was to gather evidence and persuade the Board of the need for repairs and upgrades—even big, expensive projects. Her strategy: “Document *everything*.”

Under Johnston’s direction, YVSA staff photographed failing pump stations, damaged manholes, and clogged pipes. The crew diligently recorded every instance of sanitary sewer overflows (SSOs) in accordance with NC regulations.[11] This effort was made possible by the formation of YVSA. On their own, the towns lacked the resources and personnel to consistently gather and report information about their systems. Consolidating into the YVSA enhanced the system’s managerial capacity. The YVSA was able to employ individuals with greater expertise to efficiently collect the documentation necessary to persuade decision-makers of the need for investment in capital improvements.

Since Johnston and her team began documenting and sharing their evidence, YVSA’s Board of Directors has approved annual rate increases that have kept the system “in the black” for over a decade.[12] YVSA acknowledges that user rates have significantly risen over time, but emphasizes that these increases were essential to fund capital improvements aimed at enhancing the efficiency and reliability of the system. YVSA effectively conveys to ratepayers which improvements the increases will support and often refers to its capital improvement plan in these communications.[13]

Consistent rate increases were not the only source of greater revenue for YVSA. In the early 2010s, Pittsburgh Glass Works (PGW), an automotive glass manufacturer, opened a facility in Elkin. It was a boon for the community, creating more jobs and establishing itself as YVSA’s largest customer. To ensure they had the capacity to service a Significant Industrial User (SIU), YVSA needed to replace lines and pump stations to safely transport the high flow from the facility to the WWTP. This project cost $2.7 million, significantly more than YVSA could afford without seeking external funding.[14]

To complete the PGW Sewer Improvement project, YVSA successfully sought out grant funds from the Appalachian Regional Commission (ARC), the NC Rural Center, the Department of Commerce Industrial Development Fund (DOC-IDF), and the Economic Development Administration (EDA). The Authority was better positioned to hire staff with the expertise to identify, apply for, and successfully access funding compared to the individual towns. Completing this project was pivotal for ensuring YVSA’s long-term success. PGW, which has since been acquired by glass manufacturer Vitro Architectural, currently accounts for about 25% of YVSA’s revenue.[15]

As of 2024, YVSA has invested over $29 million in capital improvement projects. Sixty-three percent of those funds were sourced from grants, 32% from loans, and only 5% from YVSA’s cash reserves.[16] The key to successfully accessing external funds has proven to be the same as convincing YVSA’s Board of the need to raise user rates: documentation. “Find and fix” projects, which start by providing evidence of failing, damaged, or aging infrastructure, make for competitive applications in North Carolina.[17]

Today, YVSA manages approximately 87.8 miles of gravity sewers, 14.2 miles of force main, 23 lift stations, and a wastewater treatment plant with a capacity of 1.8 million gallons per day (MGD), serving around 3,250 customers across three counties: Surry, Wilkes, and Yadkin. YVSA employs ten full-time staff members and is actively looking for additional operators and support staff. They own a robust fleet of equipment, including a "camera van" sporting technology that maps the sewer system and efficiently identifies and repairs damaged lines. YVSA consistently maintains compliance with state and federal regulations. As of November 2024, the Authority is managing six active projects to assess or improve its system utilizing funding from at least five separate sources, including various grant and loan programs.[18] As a regional solution, YVSA's enhanced financial, managerial, and physical capacity allows for ongoing investment in system improvements that ensure its customers receive safe, reliable, and affordable services.

Key Takeaways from Yadkin Valley Sewer Authority

One of the drivers for creating the YVSA was becoming more competitive when seeking external funding. The expanded managerial capacity made possible by consolidating into a regional authority ensured that the YVSA could provide data-driven evidence to demonstrate the need for repairing or rehabilitating system infrastructure in poor condition. It also enabled them to successfully access funding to implement the improvements.

Regional solutions can increase managerial capacity and improve financial sustainability.

Consolidating multiple small systems may enhance the combined system's managerial capacity to identify funding opportunities and gather the documentation necessary to obtain funds successfully. Documentation is also key to helping governing boards make better-informed decisions about rate-setting and capital improvement investments. Further, a consolidated system may be better prepared to take on significant industrial users that generate revenue for the utility and create economic growth for the community.

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Creating a Living Asset Management Plan: Strategies from Ironton, Ohio

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Setting the Stage

Ironton is the county seat of Lawrence County, the southernmost county in Ohio along the Ohio River. It is located just 20 miles from Huntington, West Virginia, and is set in the heart of Appalachia. As of 2020, its population was slightly over 10,000. The city's origin, unsurprisingly, is rooted in the rise of the iron industry, and at one time, Ironton was one of the largest iron producers in the world. Unfortunately, the decline of the iron industry in the first half of the 20th century created an economic vacuum that is still felt today. Lawrence County has an "at-risk" economic distress designation by the Appalachian Regional Commission.[1]

The Ironton water and wastewater system is operated by the Ironton Public Utilities Department and serves roughly 4,000 residential and 340 commercial connections.[2] Demographically, the city is considerably older than Ohio overall, with 22.6% of residents over 65 compared to 17.9% statewide. It also has a significantly higher poverty rate, about twice that of the state. Like many Appalachian cities and towns, these realities present serious challenges that must be overcome to successfully operate a water utility that meets the complex needs of its citizens.[3]

A Living Document

Despite facing major challenges, Ironton is widely viewed by both its Local Development District (LDD) and state officials as running a smart, well-managed water utility. When asked why the city has earned such a strong reputation, Mayor Sam Cramblit credits one thing: preparation. "We've always got [water and wastewater projects] ready to go. We're not just saying, 'There's funding available. Let's put something together.' We are planning way ahead strategically to do projects."[4]

The Mayor is referring to a common but reactive approach many towns take—waiting for funding opportunities and then rushing to create projects. Ironton, by contrast, has built a culture of proactive planning. Working with the Ironton-Lawrence Community Action Organization (ILCAO) and Arcadis Engineering, the city created a strong asset management plan (AMP). This plan guides every major decision about the utility and is treated as a living document—one that is regularly updated and used daily.[5]

With help from long-time city engineer Kevin Wood, Ironton updates the AMP on an ongoing basis. This approach delivers both short-term and long-term value: it supports better financial planning, strengthens communication, and preserves institutional knowledge even through leadership changes. It also ensures the city is ready to pursue new funding opportunities the moment they become available.

The AMP helps the city identify and address issues with its water and wastewater systems before they become crises. It also allows Ironton to phase in rate increases gradually to match rising operational and capital needs. These rate decisions are based on third-party studies that assess how much money is needed and how much can realistically be raised through rates—an especially important step given the city's older population and income levels.[6]

One reason residents have not strongly opposed rate increases is the city's steady, transparent approach. Rather than implementing large, unexpected rate hikes after emergencies, Ironton uses the AMP to plan ahead 2–3 years and communicate small annual increases. Because this plan is public, customers can anticipate changes and budget accordingly. Mayor Cramblit notes that this approach has paid off: "Over the past few years since we've implemented [the AMP and rate changes] and it's not been as much pushback as I think they see the return in where their money is going."[7]

Affordability is also central to Ironton's planning. The city uses a local affordability index to make sure rates stay within what residents can reasonably pay.[8] When customers still struggle, the city works with the LDD and organizations like ILCAO to connect them with support programs that promote long-term financial stability.[9]

The AMP also ensures city officials stay aware of the utility's financial health. Leadership turnover can lead to lost knowledge, but by regularly reviewing the AMP with city engineers, new officials quickly get up to speed on key projects, financial status, and long-term needs. This helps prevent delays and keeps projects on track.

Another benefit of maintaining an up-to-date AMP is managing debt wisely. Because the city tracks future projects, it can forecast borrowing needs and compare them against existing debt. This helps Ironton maintain a healthy debt service ratio and avoid financial surprises that could put the city in a difficult position.

Finally, the AMP has made Ironton more competitive for grants. Funding opportunities often open suddenly and close quickly. By having a list of shovel-ready projects, Ironton can apply immediately, while other towns may still be planning.

Ironton's commitment to long-term planning now extends beyond its water utility. Mayor Cramblit is applying asset management practices to other city-owned buildings and systems. As he puts it, "it just makes it so much easier to plan."[10]

Key Takeaways from Ironton

As more states are pushing for required asset management plans, many cities and towns find themselves at a crossroads. Building an AMP is a significant investment of staff time and funds. However, Ironton demonstrates clearly that even in a city with very real and very complex problems, investing time and energy into crafting a *living* asset management plan that can grow with a city or town will pay dividends in the long run.

Asset management plans can drive everything.

A long-lasting AMP can simultaneously inform rate increases, grant planning, and public communication. It can even alleviate the pain of turnover in town hall by serving as a throughline that ties decades of staff and elected officials to the same plan of action.

The strongest asset management plans are living documents.

As with many mandated "box-check" documents, many AMPs are likely written to fulfill a requirement but then forgotten. Consistently reviewing and updating an AMP can yield benefits similar to those seen in Ironton.

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Balancing Growth and Viability: Strategies from Baxter, Tennessee

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Setting the Stage

The City of Baxter, Tennessee is situated off Interstate 40 in western Putnam County between Knoxville and Nashville. Putnam County has a “transitional” economic distress designation by the Appalachian Regional Commission.[1] Baxter purchases water from the neighboring utility of Cookeville and distributes it to approximately 2,100 residential customers inside and outside its municipal boundaries. The city owns and operates a wastewater system, including a wastewater treatment plant and a collection system comprised of underground gravity sewer pipes and pump stations, serving approximately 850 residential customers mostly within city limits. The water system was built in the late 1960s, and the wastewater system was constructed following the enactment of the Clean Water Act of 1972.[2] Like many systems throughout Tennessee, Baxter’s existing water and wastewater infrastructure is aging and needs to be replaced. Spurred by regulatory requirements, the city has relied on a capital improvement plan to identify and prioritize rehabilitation efforts for its water and wastewater systems, including the wastewater treatment plant, for the last fifteen years.[3]

In December 2018, tile manufacturer Portobello America announced plans to open a new manufacturing facility in Baxter. The news brought about rapid growth in the community, exceeding expectations for development based on historical population trends.[4] High population growth has been a common trend in Southern Appalachia since 2010, though the drivers of this growth vary. Baxter staff attribute the rapid growth in their city to the rise of new industries, but many other communities are seeing growth due to their popularity as retirement destinations. Over the last decade, Putnam County’s population has increased by nearly 12%, far surpassing the Appalachian Region’s population growth of 3.4% and the national population growth of 7.7%.[5] “Baxter used to be a sleepy little town,” says Mayor Danny Holmes, who was elected to office in August 2024 after serving as Baxter’s police chief for fourteen years.[6] These days, the city is bustling with residential development in addition to its new industry and is reaping the economic benefits of a growing population. The Portobello America facility, which opened in July 2023, single-handedly created over 200 new jobs.[7] In 2018, the median household income was just under $36,000, but by 2023, it had climbed to nearly $57,000 and the unemployment rate was less than 2%.[8] However, as Mayor Holmes says, “Anytime you have growth, you have challenges.”[9] For small utilities such as Baxter, extending water and wastewater services to new customers, especially large industrial users, often requires capital investments to upsize existing water distribution and wastewater collection lines or expand treatment plants. Additionally, developing and implementing an expanded capital improvement plan to accomplish these infrastructure projects requires considerable time, effort, and expertise, which may cause strain for a utility with a small staff. Finally, having more customers also increases demand, raising operation and maintenance costs.[10]

Although Baxter’s staff were accustomed to using a capital improvement plan, their planning process became more complicated once the area started growing. They realized that the city was likely to face increased planning, capital, and operating and maintenance costs to accommodate incoming residential and industrial development. They also recognized the opportunity presented by this growth. If they were able to sufficiently expand their systems’ capacity, they would be prepared to meet the demands of current and future population growth and capitalize on the economic benefits of having a larger customer base. Economic growth would also benefit the community overall. Their challenge was determining how to fund expansion projects in addition to high-priority rehabilitation projects. “Before the growth even starts, communities [like Baxter] are at a deficit in terms of their infrastructure,” explains Thomas Bennett, president of Bennett Associates, Inc., the engineering firm that has served as Baxter’s technical lead on water and sewer projects for the last decade. By the time Baxter started seeing a surge of new development in the 2010s, the city’s aging water and wastewater assets were nearing the end of their useful life. Baxter’s most urgent infrastructure needs included replacing suspected lead service lines across the entire water system and extensively rehabilitating the sewer system, including the nearly fifty-year-old wastewater treatment plant. Fortunately, Baxter was in a strong position to adapt to rapid growth while managing its existing needs.

Finding the Balance: Planning for Growth While Maintaining Viability

Internally, the city has regularly assessed its water and sewer rates to ensure they cover operation and maintenance costs, including depreciation, and are comparable to those of neighboring utilities.[11] However, the aging systems’ rehabilitation needs are so great that it would be impossible for a utility of Baxter’s size to generate enough revenue from customer rates and fees alone to cover the capital expenses of the projects identified in its capital improvement plan. “We’re talking about a system that, up until five years ago, had 575 customers,” says Bennett. “The city must look to external funding sources for every capital project they have.”[12]

The funding gap seemed even more daunting once Baxter considered expanding system capacity to accommodate new development. Nevertheless, the city quickly and efficiently incorporated expansion projects into its capital improvement plan by leveraging its existing planning efforts and well-established strategic partnerships with technical experts. Among these partners are Bennett and Tommy Lee, the Deputy Director of the Upper Cumberland Development District (UCDD).[13] UCDD is one of seventy-four Local Development Districts (LDDs) in the Appalachian Region, which provide resources and technical assistance to communities to promote economic development.[14] Helping Baxter identify, access, and spend external funding is one way the community's engineer and LDD staff provide support.[15] They also play a crucial role in project prioritization, helping to strike that balance between maintaining the old and building the new.

Since Portobello America's announcement in December 2018, Baxter has secured more than $5 million from major funders, including the Appalachian Regional Commission (ARC), the Economic Development Administration (EDA), and the Tennessee Department of Environment and Conservation (TDEC) via the State Water Infrastructure Grants (SWIG) Program. These funds have been used for rehabilitation projects, including replacing all water service lines and expanding water and sewer capacity to accommodate current and future growth.[16] As part of Baxter's expansion efforts, the city was awarded $1 million in grant funding to upsize the water main and extend sewer infrastructure to the new Portobello America facility.[17] Funding these projects in tandem demonstrates Baxter's commitment to balancing infrastructure maintenance with system expansion to accommodate growth.

Key Takeaways from Baxter

One of Baxter's biggest challenges has been balancing capital investments to rehabilitate existing infrastructure and ensure regulatory compliance with those needed to manage growth. Baxter must continue investing in maintaining, repairing, and replacing its aging water and wastewater infrastructure to guarantee that its systems provide reliable services. At the same time, the recent surge of residential and industrial development in Baxter has prompted the city to expand its systems' capacity to meet the demands of current and future population growth, generate more revenue by broadening its customer base, and encourage economic development in the community. Baxter has managed to keep pace with the demands of an aging and growing system by leveraging its existing long-term planning efforts and well-established partnerships, which have helped the city plan, prioritize, and carry out capital improvements.

Existing partnerships and planning efforts assist small utilities in realizing growth opportunities.

When Baxter started experiencing rapid growth, the city had an existing capital improvement plan, regular rate-setting policies, and well-established relationships with an engineering partner and representatives from its Local Development District (LDD). This prepared Baxter to efficiently incorporate new, growth-oriented projects into their long-term planning efforts and secure funding to implement capital improvements to maintain system viability and accommodate growth.

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Planning for Expansion: Strategies from Wise County Public Service Authority

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Setting the Stage

Wise County, VA, is situated in the southwest corner of Virginia and shares its western border with Kentucky. The county's population is about 35,000, and the independent city of Norton (population of about 3,500) is located in the county.[1] Wise County and Norton City, hereafter "Wise County", is classified as "distressed" by ARC (FY 2025).[2] The county spans 403 square miles, with a population density of roughly 90 people per square mile, and is also home to the towns of Appalachia, Big Stone Gap, Coeburn, Pound, St. Paul, and Wise. The median household income in Wise County is $50,740 (2023 dollars), and the poverty rate (2018-2022) is 20.8%.[3] Established in 1969, the Wise County Public Service Authority (PSA) operates multiple water and wastewater utilities in the county. The PSA currently serves approximately 6,000 customers, roughly 95% of whom are residential. Starting in 2021, the Wise PSA also began to offer solid waste collection services for county residents.[4]

In rural and lower-income regions across Appalachia, many small water and wastewater utilities are increasingly struggling to serve customers, adequately maintain equipment and infrastructure, and comply with water and wastewater regulations. Situations such as this can result in circumstances wherein utilities regularly discharge untreated or insufficiently treated wastewater into local surface waterways, creating risks for both public health and ecological health.

This was the case for the small Town of Pound in the northwest region of Wise County. "For years, the town council had known that its wastewater system had problems...Untreated sewage was being released into the Pound River, and in 2016, the town signed a consent order with the [Virginia] Department of Environmental Quality and agreed to pay a civil fine of $7,770 and complete $3 million worth of repairs... Five years after the consent order was signed, nothing had changed..." As such, in 2021, the town council was given a choice by the state Attorney General's office: "Either agree to hand over its water and sewer operations to the Wise County Public Service Authority, or it could face up to $30 million in civil penalties.

Criminal charges were a possibility. That afternoon, the council voted unanimously to consolidate its water and sewer operations with the PSA."[5]

Wise PSA has a proven history of expanding public water service throughout the county and continues to reach households relying on private wells or spring sources. Its strong financial management has been key to this success and enabled the PSA to take on the consolidation of the Town of Pound's water services.

Town of Pound Health Advisory Notice (left) and WWTP Entrance (right) Before Consolidation

Source: News Channel 11, *www.wjhl.com/news/local*

Thinking Long-Term: Planning for Expansion

Long-term planning has been critical. An eight-member Board of Directors, selected by the Wise County Board of Supervisors, governs the PSA. The Board is responsible for oversight and setting policy. With regards to the PSA's financial management approach, Executive Director McElroy explained: "I think everything starts with accountability of our staff to our customers. We understand the area in which we live intimately and the responsibility we shoulder to provide a reliable, reputable utility for our customers. The financial best management practices are top-down, beginning with the policies set by the Board. Next, when we develop our budget and rates, we focus on what is needed for operations today and tomorrow. We have multiple layers of checks and balances in our financing practices. We have found that mastering simple things such as zero-balance budgets, reserves, capital planning, asset management, and investing in our staff have returned dividends which directly impact our customers. At the same time, we aren't afraid to think outside the box to leverage multiple avenues to increase our financial stability."[6]

PSA staff take the lead on developing capital and longer-term plans and work with the Board to incorporate its feedback in the process. The PSA conducts regular asset inventory and assessments to ensure its capital improvement plan accounts for rehabilitation and maintenance needs, along with plans for expansion. It maintains a running list of prioritized projects to expand services, which incorporates requests from communities and community members as well as costs, logistics, and funding availability.[7]

Wise PSA has a full-cost recovery model for operations completely funded from rates, but also plans to buffer its finances for future debt services. With an appreciation for the importance of balancing priorities and maintaining affordable rates, the PSA raises rates as gradually as possible to keep up with inflation while avoiding sudden, large rate increases, which are challenging for many of the lower-income households in the county. The Board makes final decisions on rate increases following public hearings and a time period to allow community members to comment.[8]

Wise PSA has also benefited from regional collaboration with other utilities through shared technical and management assistance, mutual aid for repairs, and the coordinated use of interconnections with neighboring systems. "A great realization for folks is to understand that we need to know when to seek help in the areas we lack expertise," says McElroy. "We have partnered with the Virginia Department of Health's Office of Drinking Water, the Virginia Rural Water Association, Virginia Tech, the LENOWISCO Planning District Commission, and consultants. "The planning district has played a critical role in helping the PSA apply for and secure funding from a range of sources, including the Revolving Loan Fund programs for water and sewer, USDA Rural Development, the Appalachian Regional Commission, Community Development Block Grants, and regional non-profits such as the Coalfield Water Development Fund.[9]

Managing the Challenges of Consolidation

Consolidations are becoming more common in southwest Virginia, though they come with significant challenges. "Consolidation or regionalization can be a great option when it makes sense for the utilities involved," says Director McElroy. "The hardest part, in my opinion, is how long the process takes. In the case of the Town of Pound, the systems had been in disrepair for years before state-level intervention pushed for consolidation. That long period of neglect and underinvestment led to much higher costs to bring the systems into compliance than would have been necessary with more consistent upkeep. Given the condition of the infrastructure and other obstacles, it could take up to 10 years to get the town's utilities to where we want them to be."[10]

Because the consolidation of Pound's water and wastewater systems was triggered by a consent order, Wise PSA received financial and technical assistance from the state and other sources to support infrastructure rehabilitation. However, as is often the case, rate increases were still necessary. The town had not raised rates adequately in previous years, and rising costs from the COVID-19 pandemic and recent inflation further strained available funding. In many cases, the grants the PSA secured no longer covered the full scope of planned improvements by the time they were awarded.[11]

Despite these hurdles, Wise PSA has already made substantial improvements to operations at the Pound water and wastewater treatment plants. As service reliability and water quality improve, many residents may begin to regain trust in their utility—potentially easing concerns about the rate increases. Ultimately, Wise PSA hopes the community sees the value in having their systems managed by a larger, better-staffed, and more capable utility that is committed to reinvesting in the infrastructure and the future of the town.[12]

Key Takeaways from Wise PSA

Strong financial management and regional partnerships enable sustainable expansion.

Wise PSA's success in expanding services and managing utility consolidation is rooted in sound financial practices, including capital planning, asset management, and a full-cost recovery model. These practices, combined with steady, incremental rate adjustments and strong oversight from an engaged Board, have positioned the PSA to pursue long-term infrastructure goals while maintaining affordability. Regional partnerships—with state agencies, universities, nonprofits, and neighboring utilities—have also been essential, providing critical technical assistance, mutual aid, and access to diverse funding streams.

Consolidation can deliver long-term benefits but requires significant investment and patience.

The consolidation of the Town of Pound's utilities illustrates both the promise and complexity of regionalization. Years of underinvestment led to deteriorated infrastructure and costly compliance gaps that delayed progress and increased the ultimate cost of rehabilitation. Even with outside funding, rate increases were unavoidable due to historical underpricing and inflationary pressures. Nonetheless, Wise PSA has made notable operational improvements, and as service reliability grows, community trust and support for the consolidated system are expected to increase.

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Focusing on the Gaps: Extending Service to Challenging Areas in Mercer County Public Service District

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Setting the Stage

Mercer County, West Virginia is located on the state's southern border with Virginia. With a population of approximately 58,000 and a poverty rate of 19.7%, it is currently designated as an "at-risk" county by the Appalachian Regional Commission (ARC).[1] Mercer County comprises some urban and peri-urban communities, including the county seat of Princeton (population roughly 5,600) and Bluefield (population roughly 9,200). However, large portions of the county are quite rural, most notably along the I-77 corridor. Most households are low-income and/or wholly dependent on fixed incomes such as Social Security.[2]

Eight permitted community water systems currently serve the county, which represent a mix of publicly owned and operated systems, systems managed and run by West Virginia American Water (a private entity), and public-private partnerships. However, residents in the most rural areas primarily depend on private drinking water systems (e.g., household wells) or water hauling from roadside springs to fill household cisterns. One Mercer County Public Service District board member is currently 80 years old and has been hauling water to fill his household cistern for 60 years. These residents also rely on either onsite wastewater disposal via septic systems or straight pipes. In addition to household water and sanitation challenges, this lack of access to centralized water infrastructure presents a safety concern for fire control. During the 2015-2016 winter, two major house fires in the Mercer County community of Dunns resulted in three fatalities. Fighting these fires was hampered by a lack of local water lines as the closest hydrant was located seven miles uphill.[3]

Providing centralized water and wastewater service to such rural Appalachian communities presents a multifaceted challenge, combining extremely difficult topography with low population density and largely low-income communities. Because the West Virginia Public Service Commission sets water rates at the state level, community water systems cannot charge higher rates to cover these more expensive projects. In addition, to quote the Mercer

County Public Service District chairman, “No one wants to take over some used car with all sorts of problems you don’t know about.” These realities led Mercer County to take an innovative approach to filling these gaps in connectivity to centralized service.[4]

Establishing a Public Service District to Fill the Gaps

In 2019, the Mercer County Commission created the Mercer County Public Service District (MCPSD) to extend water and wastewater services to the county’s most difficult-to-reach unserved areas. These communities are often too costly for existing systems to serve due to geographic barriers or limited local resources. Because many community water systems are hesitant to expand to areas of significant challenge that might compromise their financial security, establishing a separate entity focused solely on addressing these service gaps increased the chances of success. The MCPSD board meets monthly and is staffed by longtime residents who are personally familiar with local challenges and deeply committed to improving living conditions. Their local knowledge and dedication position them to find both creative and practical solutions.[5]

Popular Roadside Spring Water Hauling Location in Mercer County Where Residents Fill "Water Cubes" or Tankers to Supply Home Cisterns

Source: Leigh Anne Krometis

In addition to extending service, MCPSD rehabilitates aged and struggling systems while seeking long-term solutions (often consolidation with larger systems). To quote board chairman Mike Kennett, “We take the used car, fix it up so it’s running properly, and hand off the keys.” Although MCPSD’s primary goal is to act as a catalyst or facilitator between existing systems, it also directly manages the operation and maintenance of some county systems, such as the one serving Matoaka, West Virginia. Now home to only about 170 people, Matoaka lost its charter and had a customer base that could not pay sufficient rates to upgrade its system. Some sewer collection pipes had degraded to “Swiss cheese.” Because these pipes ran along a local creek, they were either filling with creek water that added to treatment needs or leaking untreated sewage directly into surface water, depending on the weather. Under the direction of the WV Department of Environmental Protection, MCPSD took control of this area’s sewerage system, which serves 75 homes, with the long-term goal of merging with the community of Hiawatha and others under the direction of a regional sewer plant. The plant would serve 2,000 customers, a more sustainable core service population.[6]

However, innovative solutions can be challenging to fund. Requirements for some grants and loan programs can limit creativity. Notably, public-private partnerships do not qualify for some federal loan programs, significantly restricting funding options for these types of solutions. Further, funding that bases qualifications on county-level needs fails to recognize the heterogeneity of local conditions. Counties that are not distressed can be home to rural communities that are very poor. Board members also noted that a focus on economic development is helpful but, “[t]here are wants and there are true needs.” Extension of broadband internet, for example, will certainly make areas more attractive to businesses, but these businesses will not move into the county unless water and wastewater access are secured. Because the MCPSD’s primary goal is to fill the gaps, the board can spend more time developing and funding projects than on day-to-day utility operations. Funding for MCPSD projects, whether to extend service or rehabilitate existing infrastructure, comes from a variety of local, state, and federal sources, including the County Commission, the WV Infrastructure and Jobs Development Council, USDA loans, USEPA, Abandoned Mine Lands, and Housing and Urban Development. There is current interest in expanding funding streams to include foundations and nonprofits. MCPSD has not yet received money from ARC; however, they have participated in joint cross-border initiatives with adjacent Raleigh County, West Virginia.[7]

Key Takeaways from MCPSD

In Appalachia, aging infrastructure, limited household incomes, and difficult terrain—such as steep slopes and low population density—often make it financially unfeasible for existing water and wastewater systems to expand service. The creation of the MCPSD, with a specific mandate to focus on the most underserved areas, represents a unique and targeted approach. This strategy is successfully bringing water infrastructure to some of the region’s most rural communities.

Being able to focus on the gaps may increase success.

Creating a public service district—or a similar entity—specifically tasked with repairing failing systems and filling service gaps allows local knowledge to be concentrated on addressing a region’s most pressing challenges.

Centralized access helps, but doesn’t solve everything.

Residents who rely on private wells are especially vulnerable during droughts, but fluctuations in baseflow can also threaten centralized water systems. For example, Bluestone Lake Reservoir—built with ARC funding nearly 50 years ago—has experienced low water levels in recent years due to reduced snowfall. At the other extreme, severe flooding events highlight the need for system redundancies to maintain service. During Hurricane Helene, the absence of backup generators led to pump failures, forcing residents to rely on hauled or bottled water.

[1] Classifying Economic Distress in Appalachian Counties," Appalachian Regional Commission, Accessed April 18, 2025, https://www.arc.gov/classifying-economic-distress-in-appalachian-counties/.
[2] "American Community Survey Data," U.S. Census Bureau, Accessed March 18, 2025, https://www.census.gov/programs-surveys/acs/data.html.
[3] Mike Kennett, Roscoe Odell, and Leo Lester, interview, Fall 2024.
[4] Mike Kennett, Roscoe Odell, and Leo Lester, interview, Fall 2024.
[5] Mike Kennett, Roscoe Odell, and Leo Lester, interview, Fall 2024.
[6] Mike Kennett, Roscoe Odell, and Leo Lester, interview, Fall 2024.
[7] Mike Kennett, Roscoe Odell, and Leo Lester, interview, Fall 2024; Classifying Economic Distress in Appalachian Counties," Appalachian Regional Commission, Accessed April 18, 2025, https://www.arc.gov/classifying-economic-distress-in-appalachian-counties/.