1
Introduction

This report analyzes the conditions of water and wastewater services in the Appalachian Region and attempts to assess the financial requirements and strategies available to improve the quality of drinking water and wastewater services in the region, particularly in the areas that face chronic economic distress and clear deficiencies in these services. A better understanding of the water and wastewater capital funding challenges and the strategies to address those challenges could make a significant difference in quality of life for the thousands of Appalachians now living in poverty and for thousands more who may be affected by environmental problems related to the integrity of the region's waters.

The report takes the congressional definition of the Appalachian Region as its starting point in determining the jurisdictions for study (see Figure 1-1, which outlines the region by county and highlights the most economically distressed counties).[2] The analyses are based on major data sources compiled by the Environmental Protection Agency (EPA), the U.S. Geological Survey, and the U.S. Census Bureau, as well as private credit-rating agencies. In addition, detailed case studies are developed to examine specific community-level services, issues, and practices.

The way in which water and wastewater services are funded in the United States changed dramatically from the 1970s to the early 2000s. The country moved from a sizable federal grant program that accompanied the passage of the 1972 Clean Water Act to a more complex system in which a smaller amount of funding is delivered through grants and loans administered by a wide variety of federal and state agencies. Around 2000, several national studies concluded that the level of spending on water and wastewater services in this new, more complex system is inadequate to meet the nation's needs.

Between 1997 and 2003, the Appalachian Regional Commission (ARC) invested $129 million in water and wastewater infrastructure for Appalachia, and it leveraged about $562 million more from other federal, state, and local government agencies. As a result of these public-sector investments in improved drinking water and wastewater services, Appalachian communities were able to attract $1.3 billion in private investment for commercial, residential, and industrial site development.

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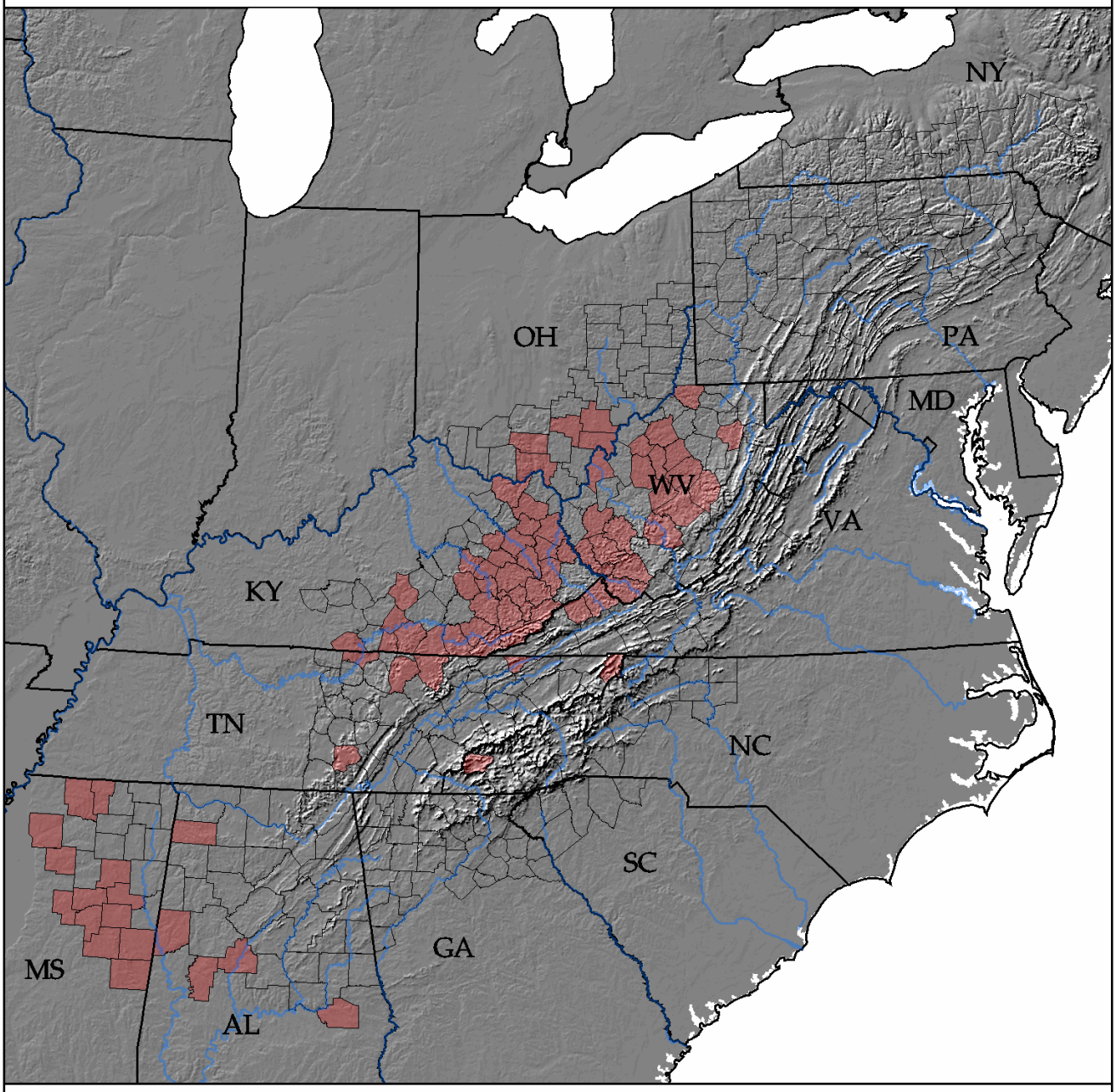
[2] For ARC purposes, "Appalachia" has a precise definition. See the section in this chapter headed Background on the Appalachian Regional Commission.

Figure 1-1. Economically Distressed Counties of Appalachia



Data Source: Prepared using U.S. Geological Survey data and 2005 ARC Economic Status data

Appalachian River

Distressed County

According to the ARC,

> these public investments have helped Appalachian localities meet their most critical water and sewer needs . . . Yet many rural Appalachian communities lack even the most basic services . . . and many more communities rely on private septic and private well water systems that are poorly regulated and . . . may present serious environmental problems.[3]

The analyses of national needs issuing from various national agencies at the time were calling attention to the gaps between current levels of spending and projected costs over the first two decades of the twenty-first century:

> These analyses highlight that replacement of aging infrastructure, rising [operating and maintenance] costs to deal with deterioration of the capital stock, increasing environmental regulations, and a lack of research and innovation in management of these systems will likely drive capital investment and [operating and maintenance] expenditures higher compared to current historical levels.[4]

One of the analyses expressed the opinion that "management efficiencies are possible" and higher rates can be absorbed by customers. Yet it conceded that "smaller, rural systems face higher investment costs" and might need additional technical, managerial, and financial assistance.[5]

In June 2003, ARC issued a request for proposals to assess the needs and the gaps in funding for water and wastewater infrastructure in Appalachia. ARC's purpose in contracting for the research was "to provide policy makers and local officials with detailed information on future water and sewer investment requirements and financial strategies to meet these needs, given the fiscal capacity of their communities." ARC also hoped that the findings of the research would "enable state and local officials to target financial assistance and develop strategies for smaller communities to meet their financing needs."[6]

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[3] Appalachian Regional Commission, "Request for Proposals for Assessing Water and Sewer Infrastructure Needs and Gaps in Appalachia" (Washington, D.C.: ARC, June 30, 2003), 2.

[4] *Ibid.*, 3.

[5] *Ibid.*

[6] *Ibid.*, 1.

The University of North Carolina Environmental Finance Center (UNCEFC) submitted a proposal in response to ARC's request, and UNCEFC was selected to undertake the work. This report presents UNCEFC's findings and recommendations.

Background on Appalachia

Since 1965, regional development has diminished some of the differences between Appalachia and the nation.[7] However, the region still confronts a legacy of poverty and uneven development, as well as the competitive challenges of an internationalized economy. When ARC was established, about 33 percent of Appalachians lived in poverty—a rate 50 percent higher than the national rate of 22 percent. By 2000 the regional poverty rate had been reduced to 13.6 percent, and the spread between Appalachia and the nation had narrowed to 1.2 percentage points. From 1960 to 1980, the number of "distressed counties" in Appalachia (see the next section for a technical definition) declined steadily, but over the ensuing twenty years, it increased slowly, reaching 121 in 2003. In 2004, however, the number decreased sharply to 91, largely because of the impact of the newly available decennial poverty statistics on the calculation methodology.

Appalachia's population is geographically distributed across the urban-rural spectrum, from large urban areas in metropolitan counties to small, remote counties lacking even little urban concentrations. Fifty-six percent of the population lives in metropolitan counties, 27 percent in counties adjacent to metropolitan counties, and 17 percent in remote, rural locations.

Background on the Appalachian Regional Commission

In 1965, Congress passed the Appalachian Regional Development Act, creating ARC, a federal-state partnership to promote the economic and social development of Appalachia. The act, as amended in 2002, defines the region as 410 counties, encompassing all of West Virginia and parts of Alabama, Georgia, Kentucky, Maryland, Mississippi, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, and Virginia—an area of 200,000 square miles and about 23 million people.[8] To promote

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[7] The background information on Appalachia and ARC in this and the next section is drawn from ARC, "Request for Proposals," 6–8, and from ARC staff.

[8] Appalachia has undergone several changes in the number of counties officially constituting it for ARC purposes. In 1965, after the inclusion of the New York Appalachian region, it encompassed 373 counties in twelve states (excluding Mississippi). In 1967 twenty counties from Mississippi were added, along with 2 from Alabama, 1 from New York, and 1 from Tennessee, bringing the total to 397. In 1990 a

local planning and implementation of its initiatives, ARC established seventy-two local development districts made up of groups of counties within each of the thirteen states.

For forty years ARC has funded a wide range of programs in Appalachia, including highway corridors; community water and wastewater facilities and other physical infrastructure; health, education, and human resource development; economic development programs and local capacity building; and leadership development.

In 1982, ARC first defined the region's most distressed counties so that the agency could target its resources to the areas of greatest need. ARC's measures of "distressed" evolved, and in 1997, ARC defined four broad categories of county economic status based on comparisons of individual counties with national unemployment and poverty rates and per capita market incomes.[9] In fiscal year 2005, ARC designated Appalachia's 410 counties as follows:

- "Distressed"—82 counties were distressed because they experienced high rates of poverty and unemployment (150 percent or more of the national average) and low rates of per capita market income (67 percent or less of the national average).
- "Transitional"—300 counties were transitional, having higher-than-average rates of poverty and unemployment and lower rates of per capita market income (49 of these transitional counties might be characterized as at risk of returning to distressed status).
- "Competitive"—22 were nearly at parity with national socioeconomic norms.
- "Attainment"—8 counties reached or exceeded national norms.

Preliminary numbers for fiscal year 2006 indicate incremental improvements, with 77 counties designated as distressed, 303 as transitional, 20 as competitive, and 8 as attainment.[10]

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county in Ohio was added, and in 1991 another county in Mississippi was added, raising the total to 399. In 1999, seven more counties were added, 2 in Alabama, 2 in Georgia, 1 in Mississippi, and 3 in Virginia, for a total of 406. In 2003, four more counties joined the region, 2 in Kentucky and 2 in Mississippi, for a current total of 410. Greg Bischak, ARC, memorandum to Jeff Hughes, UNCEFC, 2 February 2005.

[9] "Per capital market income" is per capita income less transfer payments.

[10] For more details, visit ARC's website, at www.arc.gov.

The rationale for ARC's Area Development program is to provide the basic building blocks that will enable Appalachian communities to create opportunities for self-sustaining economic development and improved quality of life. The strategic goals for these efforts were agreed on after a yearlong strategic planning process involving federal, state, and local officials and citizens. The process focused investment in four goal areas:

- Increase job opportunities and per capita income in Appalachia to reach parity with the nation
- Strengthen the capacity of the people of Appalachia to compete in the global economy
- Develop and improve Appalachia's infrastructure to make the region economically competitive
- Build the Appalachian Development Highway System to reduce Appalachia's isolation

Area Development funds are allocated to the Appalachian states on a formula basis and each state has wide discretion in deploying its funds across the four goal areas on the basis of local needs and state priorities. However, an overarching policy mandated by Congress is that ARC resources be targeted at the distressed counties.

Study Goals and Research Questions

The two primary goals of the study undertaken by UNCEFC were (1) to provide information and insight on water and wastewater investment requirements in Appalachia and (2) to recommend financial management and funding strategies to policy makers and practitioners who work with and on behalf of Appalachian communities. These policy makers and practitioners include local, state, and federal elected officials and managers; regulators; funders; economic developers; finance officers; utility officials; and environmental public interest groups.

To achieve these goals, the UNCEFC research team set out to answer six basic questions:

- What is the current state of water and wastewater services in Appalachia?
- What is the size and the scope of the region's need for investment in water and wastewater infrastructure?

- What capital funding sources are being used in the region to meet these needs?
- What funding gaps exist, and what is the capacity of communities in the region to bridge those gaps?
- Which community financial management and funding strategies are likely to have the biggest impact on water and wastewater services in the region?
- What policies and measures can funding agencies and technical assistance providers implement to have the biggest impact on services and infrastructure in the region?

Levels of Analysis

To address the study's research questions, the UNCEFC research team carried out analyses at three geographical levels:

- **Appalachian regionwide level:** The team compiled and integrated data for the entire region as defined by ARC. This level of analysis draws out the differences among various parts of the region and highlights the characteristics of the region that distinguish it from other areas of the country.
- **Appalachian subregional and state level:** The team analyzed issues and trends for particular subregions of Appalachia. The availability of some data varies widely across the region. For example, in some states and substate regions, detailed data on water and wastewater rates and utility financial reports are available, whereas in other areas of the region, they are not. This report presents the available data. For some purposes, such as environmental setting and hydrology, the important breakdown is by physiographic region. For other purposes it is by political jurisdiction.
- **Community and system level (case studies):** Macro analyses and subregional analyses are not sufficient to understand all the practices and challenges facing individual communities. Although communities in the region have many similarities, they also have significant differences, which affect their infrastructure needs and their strategies for addressing those needs. To offer an in-depth view, this report presents assessments and analyses of infrastructure finance practices in seven communities selected to cover a broad range of challenges.

Study Components

The study had five major components, as follows. The study drew on a wide variety of data sets, some compiled by state and federal agencies, others created uniquely for the study.

- **An assessment of water and wastewater services.** Using federal, state, and local data sources, the UNCEFC research team conducted a qualitative and quantitative assessment of current water and wastewater services in the region. Major data sources were the Safe Drinking Water Information System (SDWIS), the databases of the Clean Watersheds Needs Survey (CWNS, formerly referred to as the Clean Water Needs Survey), the Drinking Water Needs Survey (DWNS), and the National Pollutant Discharge Elimination System (NPDES), all coordinated by EPA; U.S. Geological Survey databases and atlases; U.S. Census publications; state utility commission databases; and state reports on capacity development and regulation. **Chapter 2** describes the state of water and wastewater services in the region.

- **An inventory of needs studies and assessments**. The UNCEFC research team reviewed and extracted data from more than fifteen national and state needs assessment reports to characterize and analyze the infrastructure needs of Appalachian communities. To understand the region's ability to meet its needs, the team also collected information on the fiscal capacity of communities, including credit ratings and measures of households' ability to pay. **Chapter 3** summarizes the different approaches to needs assessments used by different studies. **Chapter 4** presents a picture of the capital needs in Appalachia using documented, inventoried, and modeled needs from the assessments. **Appendix A** presents needs information available for individual counties in Appalachia.

- **A comprehensive inventory of public funding.** To document the extent and the importance of public funding in the region, the UNCEFC research team compiled a comprehensive inventory of nonlocal public funding programs currently available to some or all of the 410 counties in the region. It identified all the major programs managed or operated by federal or state governments that operate in the region, and requested county-level funding information from those programs covering January 1, 2000–December 31, 2003. Using these data, the team created a Master Funding Database that includes at least 24,000 records from more than forty-eight funding agencies and offices. **Chapter 5** summarizes analyses that the team carried out using this database. **Appendix B** presents funding information for each county in Appalachia.

- **Consultations with public officials and policy makers**. The UNCEFC research team conducted in-person meetings, telephone interviews, site visits, and structured discussion forums with hundreds of public officials who work for local communities, funding agencies, regulatory agencies, and advocacy groups. The team used information from these consultations to identify needs, challenges, and strategies; cross-

check data; test hypotheses; and identify local communities with particularly noteworthy funding experiences or challenges. The team also sent an Internet-based survey to representatives of 121 funding programs serving the region, to gather funding program managers' opinions and information about current funding policies and trends. Seventy-two respondents (representing a 60 percent response rate) provided information on eighty-six funding programs. Information from the different consultations appears throughout the report. **Appendix C** contains a partial list of the organizations and the individuals that were consulted. It also summarizes the various purposes of the discussion forums that were held and identifies the people who attended. **Appendix D** contains a copy of the survey and a summary of the responses.

- **A selective inventory and case studies of best practices and financial management challenges and strategies.** The UNCEFC research team selected a number of communities in Appalachia whose experiences illustrated the range of needs, challenges, and financial management strategies in the region. They used information and experiences from these communities to cross-check and complement information from public consultations and data analyses. These local-level studies were particularly helpful in identifying and analyzing the community financial management practices presented in **chapter 6**. For example, for each of the communities, actual needs as reported by local practitioners were compared with needs data in state- and national-level needs assessments. Seven of these communities were selected for in-depth study and have been written up in detailed case studies that are included in **appendix E**.

Study Limitations

Limitations on the strength of this study's conclusions are explained throughout the report, where appropriate. Two large categories of limitations are inherent in the scope of the study, however, and are discussed here. The first concerns the size and the breakdown of the region, and the second concerns limits on available data.

The Scope of the Region

As noted earlier, this report presents analyses of water and wastewater funding needs and trends at three geographical levels:

- Appalachia as a whole
- Some selected subregions, including political jurisdictions such as states and counties, and physiographic provinces as defined by the geology, the topography, and the rivers of the region
- Some particular water and wastewater systems and the communities they serve

The question of the appropriate geographical size of Appalachia has long been debated, without any consensus emerging from scholars of the region. Thomas R. Ford traced the physiographic divisions used in his encyclopedic study of the southern Appalachians to a 1935 U.S. Department of Agriculture publication.[11] David E. Whisnant has charted the comings and goings of Appalachian boundaries for his classes on the representation of folk culture in the region. His maps are available on the Internet.[12] John Alexander Williams's influential study of the region, published in 2002, presents an even longer historical view of the debate. Williams notes that "Appalachia has no agreed-upon boundaries—nothing comparable to the Mason-Dixon Line or the Hudson River." However, he pragmatically accepts the 1965 boundaries used in the formation of ARC, trying at the same time to define a "core" within these boundaries and to emphasize the importance of physiographic subregions inside the core.[13] Williams also notes that for some purposes, focusing on subregions of Appalachia is useful. This report refers to the region as defined by ARC for the simple reason that a major purpose of the study was to facilitate policy decisions and evaluation that involve ARC funding.

For context in understanding the comparisons presented in this report, Appalachia as defined by ARC consists of widely varying percentages of the thirteen states that occupy some part of the region, from 100 percent of both the population and the area of West Virginia, to 47 percent of the population and 81 percent of the area of Pennsylvania, to 4 percent of the population and 16 percent of the area of Maryland (see Table 1-1). Overall, as noted earlier, in 2000 the region contained about 23 million people—8 percent of the U.S. population and 24 percent of the population of the thirteen states in the region.

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[11] Thomas R. Ford, ed., *The Southern Appalachian Region: A Survey* (Lexington: University of Kentucky Press, 1967), citing U.S. Department of Agriculture, *Economic and Social Problems and Conditions of the Southern Appalachians*, Misc. Pub. No. 205 (Washington, D.C.: USDA, 1935).

[12] David E. Whisnant, Online Syllabus for Hillbilly Highway: Appalachia and America, junior seminar, University of North Carolina at Chapel Hill, Fall 1997, available at www.unc.edu/~whisnant/appal/Sylfal97.htm. Links to the maps are under Class 2, Defining the Region I.

[13] John Alexander Williams, *Appalachia: A History* (Chapel Hill: University of North Carolina Press, 2002), 9.

Table 1-1. Population and Area of Each Appalachian State in Comparison with Rest of State

State	Pop. in App. Counties (2000)	Percentage of Pop. in App. Counties	Area of App. Counties (sq. miles)	Percentage of Area in App. Counties	Pop. Density (App. Counties : Rest of State)
Ala.	2,837,224	64	26,469	51	107 : 64
Ga.	2,207,531	27	11,601	20	190 : 127
Ky.	1,141,511	28	17,907	44	64 : 129
Md.	236,699	4	1,567	16	151 : 619
Miss.	615,452	22	12,567	26	49 : 64
N.C.	1,526,207	19	12,016	24	127 : 176
N.Y.	1,072,786	6	11,909	25	90 : 488
Ohio	1,455,313	13	14,338	35	101 : 369
Pa.	5,819,800	47	36,899	81	158 : 764
S.C.	1,028,656	26	3,991	13	258 : 111
Tenn.	2,479,317	44	19,736	47	126 : 144
Va.	665,177	9	10,369	26	64 : 218
W.Va.	1,808,344	100	24,229	100	75 : —
Appalachia	**22,894,017**	**24**	**203,598**	**38**	**112 : 219**

Source: Data from Census Bureau, Census 2000, Summary File 1, Table GCT-PH1-R. Population, Housing Units, Area, and Density: 2000 (last visited 12 May 2005), available at http://factfinder.census.gov/.

Pennsylvania residents constitute the largest proportion of the Appalachian regional population (25 percent), distantly followed by Alabama (12 percent), Tennessee (11 percent), and Georgia (10 percent). Maryland has the smallest proportion (1 percent).

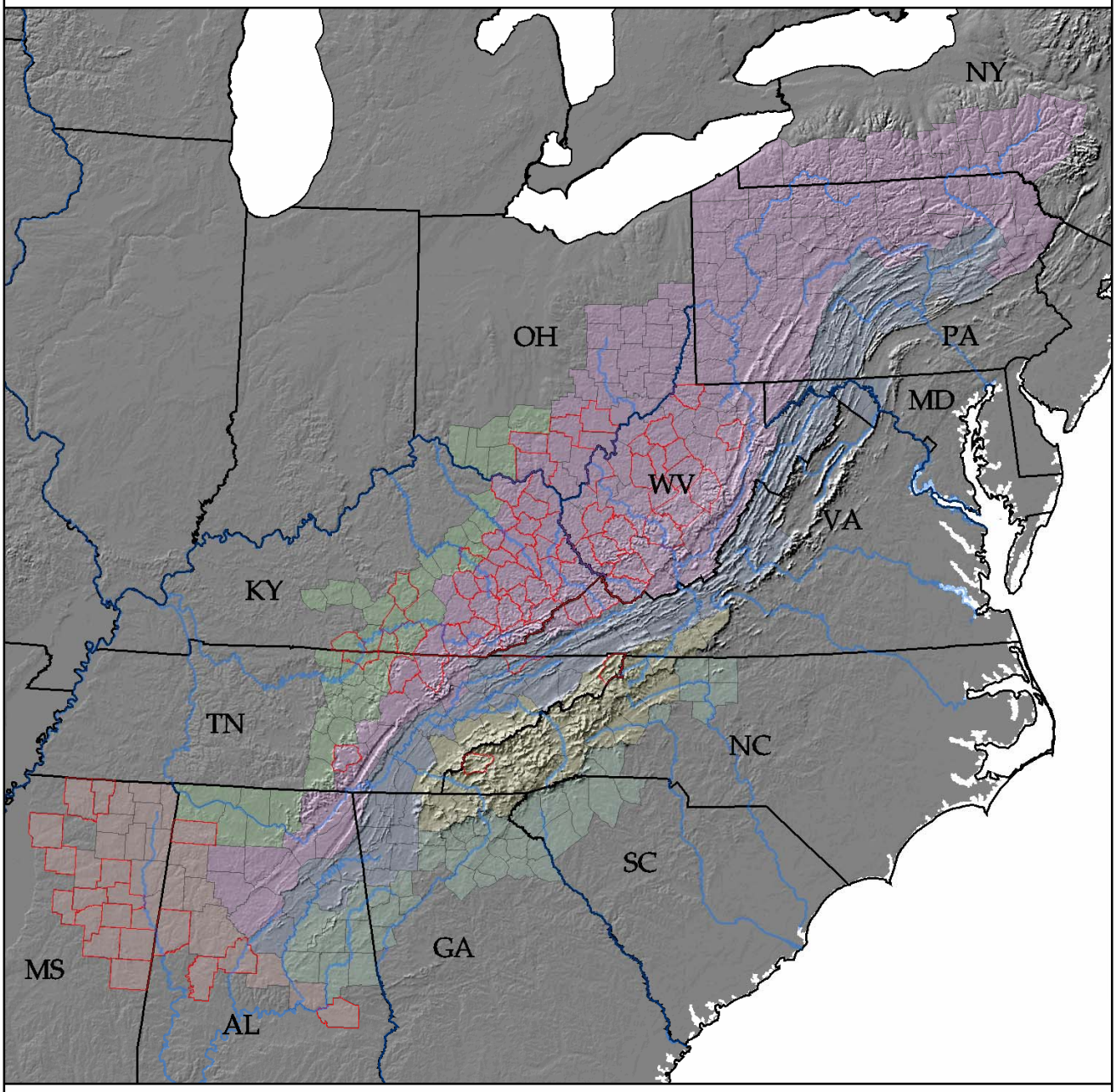
The region as a whole, some 200,000 square miles in area, includes water and wastewater systems at every scale and level of funding and sophistication present in the contemporary United States. Appalachia clearly is not homogeneous. Its large size makes statements about watersheds in the region as a whole necessarily broad and often over generalized. In conjunction with this study, ARC staff laid U.S. Geological Survey data over an ARC county-by-county delineation to produce a map of "physiographic provinces" in Appalachia. On the largest scale, these are the Appalachian Highlands, the Interior Plains, and the Atlantic Plain. They can be broken down further into seven provinces (see Figure 1-2):

<u>Appalachian Highlands</u>
- Appalachian Plateaus
- Valley and Ridge
- Blue Ridge
- Piedmont

<u>Interior Plains</u>
- Interior Low Plateaus
- Central Lowland

<u>Atlantic Plain</u>
- Coastal Plain

Figure 1-2. Physiographic Regions of Appalachia



Data Source: Prepared using U.S. Geological Survey data, 2005 ARC Economic Status data and a county-by-county delineation of Appalachia

- Appalachian Plateaus
- Atlantic Plain
- Blue Ridge
- Interior Plains
- Piedmont
- Valley and Ridge
- Distressed County

The UNCEFC research team made use of this division for some calculations of needs and some discussions of environmental setting. It should serve as an independently useful device for further analysis of Appalachian issues related to the environment.

Political jurisdictions, particularly states and counties, also are important analytic units in this report. Much of the relevant data that the research team has analyzed is collected by these jurisdictions. Integrating the data with data on physiographic provinces or comparing them in any way with the data collected by other jurisdictions is difficult. However, the data often are the only and best data available on a given issue of environmental finance. Furthermore, much of the policy making and evaluation that this report aims to assist is and will be done by state and local jurisdictions, for whom these political jurisdictional boundaries are important.

This report occasionally refers to river basins and smaller watershed units, particularly in discussing issues of ambient water quality in the region. On the smallest scale, the report discusses the problems and the projects of particular utility systems and communities. Water and wastewater services themselves represent a juncture between human activity, which is delimited by politically defined service boundaries, and the environment, which is delimited by physiographic boundaries. So different views of the region and its subregions are needed for a useful discussion of water and wastewater services.

Limits of the Data

Much of the effort behind this report went into integration of various databases that describe water and wastewater funding needs and sources across the region, as well as community and household characteristics. These databases have typically been compiled by different agencies, for different purposes, with different methodologies, and sometimes they have different degrees of reliability. The UNCEFC research team has tried to note, where appropriate, particular problems with data sets and the integration of databases.

Even assuming that data from these disparate sources can be reliably integrated, there are overall conceptual limitations that the reader should understand. First, in the context of water and wastewater services, definitions of "need" vary widely. Most compilations of needs estimates focus exclusively on existing centralized systems, ignoring the needs of private well users and others not on centralized systems. Few data are available on unserved areas. In the scattered Appalachian places where careful surveys have been made—for example, in Weaverville, North Carolina (as reported in the case study in appendix E)—substantial numbers of people have failing onsite systems or no wastewater treatment systems at all. Appalachia has particularly high

needs outside existing centralized systems, so it is reasonable to assume that the national and state needs surveys that the research team has integrated into this report underreport overall needs for the region, perhaps substantially. Historically, to the extent that studies of Appalachia focused on water and wastewater issues at all, they tended to be concerned mostly with plumbing and little with wastewater handling, water quality, or drinking-water quality.

Finally, the study reported here (as well as all the state and federal studies of funding gaps of which the research team is aware) focuses primarily on capital financing, not on operational funding. There is an important relationship between capital needs and operational funding: the better a system's assets are operated and maintained, the longer they last, and the lower the capital funding the system will need over time. Many water and wastewater professionals would say that the human capital needs for system operation and maintenance—that is, the needs for hiring and retaining skilled operators—are the biggest determinants of the adequacy of water and wastewater services. However, neither this study nor the needs databases and reports to which it refers really grapple with the human capital needs of Appalachian systems or their ongoing problems with funding for operations and maintenance. This does not suggest that these issues are not critical, but the extant databases give little insight into them.

Similarly this report mentions but does not dwell at length on (1) the need for adequately funded regulatory systems to ensure that water and wastewater collection and treatment systems are working as they are supposed to work; (2) the magnitude of funding needed to restore watersheds and groundwater that are impaired by past pollution or uncontrolled development; and (3) the similar magnitude of funding needed for improved handling of stormwater, both to lessen the risk of flooding and to reduce the pollutant loading of the region's streams from surface runoff. These are all important components of the full picture of water and wastewater system needs for the region and the country, but they are not adequately captured in the data that the UNCEFC research team has integrated to arrive at capital needs estimates. Once again, then, the estimates in this report quite likely underestimate the true needs, probably by a large amount.