



CLOSING THE WATER ACCESS GAP IN THE UNITED STATES

**A National
Action Plan**



PREFACE

Access to clean, reliable running water and safe sanitation are baseline conditions for health, prosperity, and wellbeing. However, they remain out of reach for some of the most vulnerable people in the United States: communities of color, lower-income people in rural areas, and tribal communities, among others. Today, more than two million Americans lack access to running water, indoor plumbing, or wastewater services. Better water access would allow vulnerable communities to thrive.

This report presents an analysis of the water and sanitation access challenge in the United States, leveraging both quantitative and qualitative research. It proposes a plan of action to ensure equitable water access in our lifetimes, highlighting opportunities for action by the water sector, government agencies, philanthropy, nonprofits, and the public. Finally, it showcases the promising approaches communities have developed to ensure that their residents can turn on the tap or flush the toilet without a second thought.

This report was developed through collaboration, and it demonstrates how powerful diverse stakeholders can be when they join together. As an organization working directly with communities that lack basic services, DigDeep demonstrates that it is possible to develop solutions to this urgent issue. As an organization that unites diverse interests to build a sustainable water future for all, the US Water Alliance demonstrates the potential of cross-sector partnership. A challenge of this magnitude—affecting the health and wellbeing of millions of Americans—requires the expertise, resources, and ingenuity of a broad range of leaders, united under the guidance of vulnerable communities themselves. Together, we can close the water access gap in our lifetimes.



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Support for this report was provided by the Robert Wood Johnson Foundation, the United Methodist Committee on Relief, and the Water Foundation. The views expressed here do not necessarily reflect the views of the funders.

Advisory Council

This report was developed with the guidance and insights of an Advisory Council of national leaders representing diverse sectors. The Advisory Council shared their feedback through in-person meetings and individual consultation. Their experience and knowledge greatly enriched this report. We thank the following leaders for their time and expertise.

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A diverse group of stakeholders contributed to the development of this report, through supporting the national and local research, making connections, and reviewing the document. Their experience and knowledge greatly enriched this report. We thank the following leaders for their time and expertise.

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INTRODUCTION

Today, more than two million Americans live without running water and basic indoor plumbing, and many more without sanitation. On the Navajo Nation in the Southwest, families drive for hours to haul barrels of water to meet their basic needs. In the Central Valley of California, residents fill bottles at public taps, because their water at home is not safe to drink. In West Virginia, people drink from polluted streams. In Alabama, parents warn their children not to play outside because their yards are flooded with sewage. In Puerto Rico, wastewater regularly floods the streets of low-income neighborhoods. Families living in Texas border towns worry because there is no running water to fight fires.

This is the reality for people living in the United States—right here and right now. While the majority of Americans take high-quality drinking water and sanitation access for granted, millions of the most vulnerable people in the country—low-income people in rural areas, people of color, tribal communities, immigrants—have fallen through the cracks. Their communities did not receive adequate water and wastewater infrastructure when the nation made historic investments in these systems in past decades. That initial lack of investment created a hidden water and sanitation

crisis that continues to threaten the health and wellbeing of millions of people today.

A hundred years ago, water-borne illnesses such as cholera were a leading cause of death in the United States. Recognizing the threat to public health, our government invested in modern systems that extended safe and reliable drinking and wastewater services to nearly every American. As a result, water- and sanitation-related diseases were nearly eradicated, and public health and economic outcomes improved.¹ The United States continued to fund water infrastructure through the late twentieth century with equally impressive results. Today, however, federal funding for water infrastructure is a small percentage of what it once was,² and communities that did not benefit from past investments have a harder time catching up. Some communities even report that they are losing access to services they once had, suggesting that fewer people tomorrow will have a working tap or toilet than do today. In fact, the number of people without access to complete plumbing recently increased in six states. In contrast, Ethiopia—one of the world's lowest-income countries—more than doubled the percentage of its population with access to water between 1990 and 2010.^{3,4}

Closing the water access gap in the United States is difficult because no one entity—whether a federal agency or research institution—collects comprehensive data on the scope of the problem. Though many other countries track their progress towards universal water and sanitation access, datasets in the United States are incomplete, and official data collection efforts undercount vulnerable populations like communities of color and lower-income people. The lack of consistent data makes it difficult to track the challenge and develop solutions; after all, you can't manage what you don't measure. The convergence of climate change, aging infrastructure, water contamination, and rising costs make this challenge more daunting—and more important—to solve than ever before.

This report analyzes the quantitative data available at the national level to define the scope of the problem. It brings depth and texture to those numbers through field research in six communities that are emblematic of other places in America that still lack basic access to safe drinking water and sanitation.



The Scope of the Challenge

This report focuses on US communities that lack basic access to safe drinking water and sanitation.

By that we mean:

- o Safe, reliable running water;
- o A tap, toilet, and shower in the home; and
- o A system for removing and treating wastewater.

The analysis in this report is based on American Community Survey (ACS) data from the US Census Bureau. The ACS is the only dataset on water access collected at the national level, but it has limitations—for example, the survey asks whether households have running water and indoor plumbing (a tap, toilet, and shower in the home), but it does not ask whether water service is affordable or reliable. Nor does the ACS ask whether households have wastewater services.

In order to help fill gaps in the quantitative data, this report provides qualitative data on six regions that face water and sanitation access challenges: California's Central Valley, the Navajo Nation, the Texas *colonias*, rural areas in the South, Appalachia, and Puerto Rico.

The United States is a resilient and creative nation. Communities that lack water access have shown extraordinary tenacity in the face of these challenges. In Appalachia, local food banks are using atmospheric water generation technology to get drinking water to those who need it. In rural parts of the South, communities are exploring alternative wastewater treatment strategies. And in California, local organizations are successfully advocating for transformative policy and funding changes.⁵ Some of these approaches are interim measures to protect public health; others are long-term, sustainable solutions. These communities demonstrate that with dedicated resources, ingenuity, cross-sector partnerships, increased public awareness, and political will, the water access gap can be closed for good.

This report shines a light on America's hidden water crisis and proposes a plan of action. It is the most comprehensive analysis of water and sanitation access in the United States to date, and it identifies promising, community-centered solutions that can help us extend water services to all people.

This report is organized in the following manner:

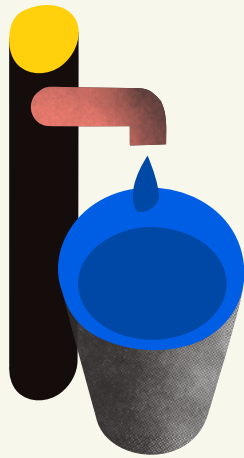
- ◆ **What the Data Tell Us** defines equitable water access and explores the scope of the challenge using quantitative data analysis;
- ◆ **Who is Affected** describes water access challenges in six diverse regions of the US, using on-the-ground qualitative research; and
- ◆ **What to Do About It** lays out four principles and priorities for action to achieve universal water access in our lifetimes.

The United States is one of the most prosperous democracies on earth, with the opportunity, the resources, and the responsibility to close the water access gap. Together, we can ensure safe water and clean sanitation for all in our lifetimes.

Part One:

WHAT THE DATA TELLS US

Defines equitable water access and explores the scope of the challenge using quantitative data analysis.



Part Two:

WHO IS AFFECTED

Describes water access challenges in six diverse regions of the US, using on-the-ground qualitative research.



Part Three:

WHAT TO DO ABOUT IT


Lays out four principles and priorities for action to achieve universal water access in our lifetimes.



**More than
2,000,000
Americans live
without basic
access to safe
drinking water
and sanitation.**



This number includes:

1.4  **million**

people in the United States lack access to indoor plumbing (hot and cold running water, a sink, a shower/bath, or a flush toilet)

250,000
people in Puerto Rico

553,000
homeless people in the United States⁶ who may lack equitable water and sanitation access



Many more people face related water challenges:

Native American households are 19 times more likely than white households to lack indoor plumbing.

More than

44,000,000

people are served by water systems that recently had health-based Safe Drinking Water Act violations.⁸



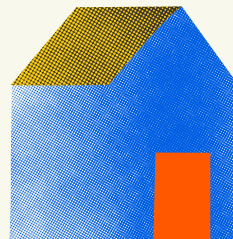
23%

of private wells tested by the United States Geological Survey showed contaminants with health concerns, including arsenic, uranium, nitrates, and E. coli.¹⁰



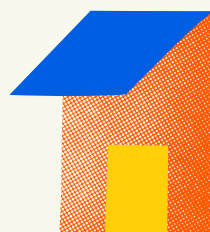
17%

of people living in rural areas report having experienced issues with safe drinking water.



12%

of people living in rural areas report issues with their sewage system.¹¹



Part One:

WHAT THE DATA TELLS US

Analyzing Water and
Sanitation Access



DEFINING EQUITABLE WATER ACCESS

The goal of this report is to spark a national response that ensures **SAFE, ACCEPTABLE, ACCESSIBLE, AFFORDABLE, and NON-DISCRIMINATORY** access to water and wastewater services to all people. Equitable water and wastewater services are:

Safe:

Water quality does not have adverse effects on human health

Water meets or exceeds safety standards set by the World Health Organization and the United States Environmental Protection Agency (EPA)

Wastewater systems effectively store and treat sewage in a manner that prevents human contact and prevents backup, overflow, flooding, or runoff that can endanger public health

Acceptable:

Hot and cold running water in the home that is acceptable in color, odor, and taste

Plumbing and sanitation facilities that are culturally appropriate to communities

Accessible:

Sink, shower or bath, and toilet in the home *

Water and wastewater services are continuous and not subject to interruptions

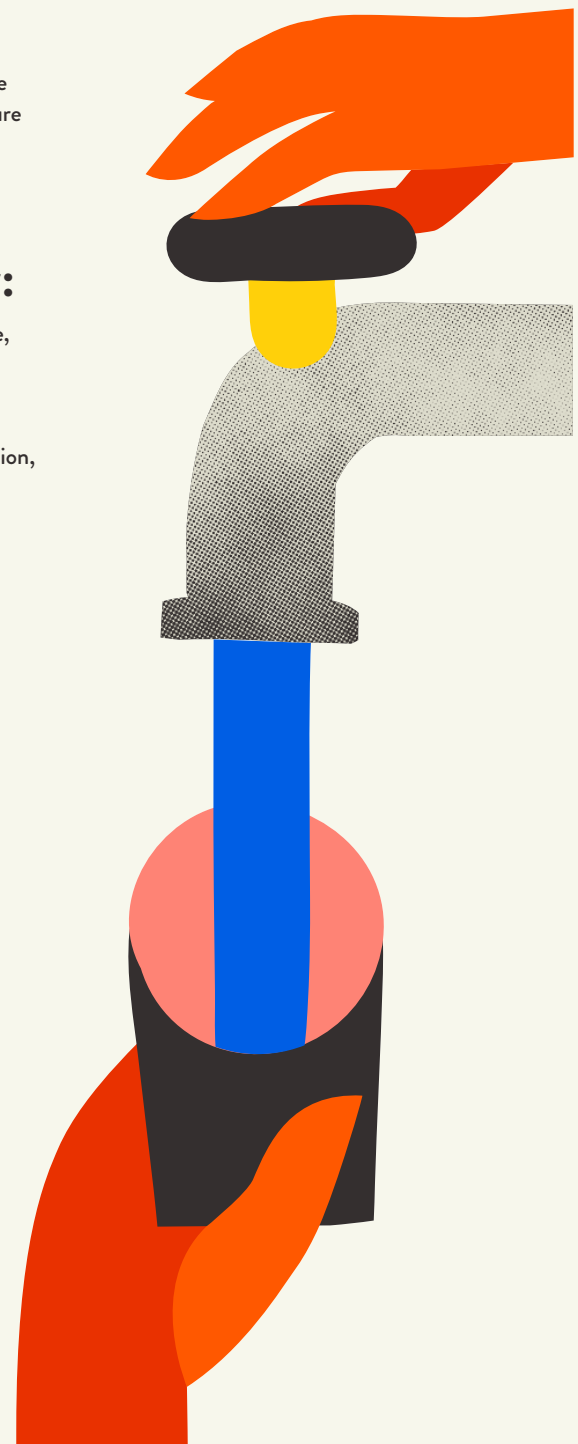
Affordable:

Water and wastewater services do not create a cost burden that limits the ability to procure other essential goods and services like food, medicine, electricity, or housing

Non-discriminatory:

Access to services is not determined by race, ethnicity, national origin, citizenship status, gender, age, income, housing situation, geography, religion, creed, disability, sexual orientation, gender identity, gender expression, or any other status

* Plumbing facilities may be shared in the case of homeless shelters or affordable housing, but must be well-maintained, clean, and safe without an unreasonable wait time to be considered accessible.



This report's definition of equitable water access builds on Sustainable Development Goal 6¹² and the United Nations' Human Right to Water and Sanitation,¹³ and tailors it to conditions in the United States. Access to running water and indoor plumbing in the home, as opposed to the vicinity, is an achievable goal that is context-appropriate and culturally expected for Americans.



Key Terms

INDOOR PLUMBING:

Indoor plumbing refers to the presence of hot-and-cold running water, a shower or bath, and a flush toilet inside the home. Until recently, the Census Bureau used the term “complete plumbing” to refer to these components. In 2016 the Census Bureau removed toilets from its definition of complete plumbing.

SANITATION:

Sanitation encompasses the conveyance, storage, treatment, and disposal of human waste. This includes toilets, pipes that remove wastewater from the home, and treatment measures.

WASTEWATER:

Wastewater refers to untreated human waste, sewage, or sludge.

WASTEWATER SERVICES:

The provision of centralized sewer systems and treatment plants, individual septic systems, or other forms of decentralized or on-site systems.

WASH:

This term refers to Water, Sanitation, and Hygiene as they relate to public health.

WATER ACCESS GAP:

The disparity in access to water and sanitation between the majority of Americans and the communities that still lack access.

VULNERABLE* COMMUNITIES:

Vulnerable communities face historic or contemporary barriers to economic and social opportunities and a healthy environment. The principal factors in community vulnerability are income, race or ethnicity, indigeneity, gender, age, disability, language ability, citizenship, and location. Vulnerable groups may include low-income people, communities of color, immigrants (especially those that are undocumented), tribal communities, women (as they are often responsible for managing household water needs), people with disabilities, and people with chronic illnesses.



In 2015, the United Nations Member States, including the US, unanimously adopted the Agenda for Sustainable Development, a platform to end poverty, reduce inequalities, and address environmental crises.¹⁴ UN members committed to meeting 17 Sustainable Development Goals (SDGs) by 2030. SDG 6 calls for clean water and sanitation for all people. It focuses on providing safe, sufficient, sustainably managed water and sanitation for 100 percent of the population in every country.¹⁵

This report provides data on the work that must still be done in the United States to meet SDG 6, as well as an action plan for achieving the 100 percent target in our lifetimes.

* We recognize that the term “vulnerable” can imply that these communities are inherently vulnerable, rather than being in vulnerable situations due to outside circumstances. There are similar issues with other terms like “marginalized” or “disadvantaged.” After much discussion, we chose to use the term vulnerable, recognizing that these terms are all imperfect.

METHODOLOGY

A note from the report's authors:

This report is informed by a multi-faceted quantitative and qualitative analysis that includes the following components:

Our research builds on *Still Living Without the Basics in the 21st Century: Analyzing the Availability of Water and Sanitation Services in the United States*, a report published by the Rural Community Assistance Partnership (RCAP) in 2004 that analyzed decennial census data on access to complete plumbing at the county level.

National-level data analysis

This report used hierarchical linear modeling (HLM) to identify the relationship between access to complete plumbing and demographic variables including race, economic status, and proximity to urban areas, using data from the 2010-2014 American Community Survey (ACS). We analyzed a variable that asks whether households have access to complete plumbing facilities, defined as hot and cold running water, a bathtub or shower, a sink with a faucet, or a flush toilet. We used the 2014 dataset because the Census Bureau removed the component of the question about toilets from the ACS in 2016, making it impossible to track changes over time past 2015. We then ran a longitudinal regression on the ACS data from 2000, 2010, and 2015 to track changes over time. We conducted this analysis at the census tract (rather than county) level for two reasons: first to provide more granular information and give us greater confidence that correlations with race, income, and other attributes were meaningful; second, to better identify the actual communities affected.

We also analyzed the Census Bureau's Integrated Public Use Microdata Series (IPUMS). The IPUMS data reports each household record, and therefore allows for aggregate statistics that compare access to plumbing by race and ethnicity, economic status, housing type, etc. IPUMS allows analysis of the individual questions that make up the index of "lacking" versus "not lacking" complete plumbing facilities. This dataset protects confidentiality by reporting from Public Use Microdata Areas (PUMAs) that are often several counties large, making it difficult to do community-level analysis.

See appendix for more details on national data analysis methodology.

Regional-level data analysis

This report used statistical analysis and literature review to identify regions with concentrations of households lacking water and sanitation access issues, and to select "hotspots" in which to conduct qualitative research. We used HLM analysis of ACS data on demographic variables and complete plumbing at the regional level to create heat maps of areas with concentrated populations lacking water access. This was supplemented by geographical data from the EPA and United States Geological Survey to provide a better understanding of regional water access issues. After identifying a number of potential focus areas, we conducted a literature review to inform our selection. This included journalistic and academic sources, agency and organization reports, and documents provided by local partners. We selected six hotspots: California's Central Valley, the Navajo Nation, the Texas *colonias*, the rural South, Appalachia, and Puerto Rico. These areas were chosen to include a diversity of geographies, populations, and water access challenges, and to be broadly representative of other regions that were not included in the report, such as Alaska, Louisiana, or the Dakotas.

Regional field research

After using regional-level data analysis to identify six regions with water and sanitation access challenges (California's Central Valley, the Navajo Nation, the Texas *colonias*, the rural South, Appalachia, and Puerto Rico), we spent over a year building relationships with local partner organizations and leaders in each place. Our research focused on the towns or counties where our partner organizations work. We determined through interviews and secondary source research that many of the challenges in those geographies are broadly representative of the larger region. In collaboration with our local partners, we defined research questions, identified participants, and conducted interviews or listening sessions with residents, local leaders, community-based organization staff, water and wastewater service providers, policymakers, and others. We conducted interviews or listening sessions with 10 to 20 residents in each area, focusing on how water and sanitation access conditions affect residents' daily life, the strategies they use to cope with these conditions, and the kinds of solutions they believe are needed. Our partners facilitated site visits to homes, water and wastewater systems, and other relevant places. Participant names have been changed to protect anonymity.

Institutional Review Board process

Our qualitative research was designed to uphold standards of ethical conduct. We submitted our field research protocols to the Michigan State University (MSU) Institutional Review Board for Human Subjects Research (IRB). Our interviewees were informed that participation was voluntary and that identifying details could be kept confidential. We protected confidentiality by using an encrypted audio recorder and storing notes, recordings, and transcripts in password-protected files. The MSU IRB designated our research as exempt from further IRB oversight. We also received approval from the Navajo Human Research Review Board and the Northern Navajo Agency Council.

Advisory Council

The report was guided by an Advisory Council of thought leaders across sectors including water management, equity, technology, public health, and community development; as well as representatives from each of the six areas who work with vulnerable communities. These advisors brought valuable insights from their respective fields to the report and recommendations through in-person collaborative design sessions and individual consultation.

NATIONAL DATA FINDINGS

The quantitative data findings on the water access gap summarized in this report are the product of research led by Michigan State University (MSU). This section describes our national quantitative findings, and the section following it describes our qualitative research.

Five Major Findings from the National Analysis:

- 1. FEDERAL DATA DOESN'T ACCURATELY MEASURE THE WATER ACCESS GAP**
- 2. RACE IS THE STRONGEST PREDICTOR OF WATER AND SANITATION ACCESS**
- 3. POVERTY IS A KEY OBSTACLE TO WATER ACCESS**
- 4. WATER ACCESS CHALLENGES AFFECT ENTIRE COMMUNITIES**
- 5. PROGRESS IS UNEVEN, AND SOME COMMUNITIES ARE BACKSLIDING**



1. FEDERAL DATA DOESN'T ACCURATELY MEASURE THE WATER ACCESS GAP

The way the federal government collects data on water and sanitation access has several limitations: it undercounts vulnerable communities, it does not include wastewater services, and it is inconsistent. In this research, Michigan State University analyzed data from the American Community Survey (ACS), a product of the US Census Bureau. The ACS asks whether households have access to complete plumbing facilities, defined as running water, a tap, shower or bath, and (until recently) a toilet. However, it does not detail whether plumbing functions well, or whether services are continuous and affordable. Within these limitations, the ACS shows that there were roughly 1.4 million people in the US without access to complete plumbing between 2010 and 2014.* In reality, the number is likely much greater. Factoring in the approximately 250,000 people that lack access to complete plumbing in Puerto Rico, and the 553,000 people that the US Department of Housing and Urban Development (HUD) estimates are experiencing homelessness, it is safe to say that more than two million people live without complete plumbing. Even that may be an underestimation. Water access issues disproportionately affect lower-income people, people of color, undocumented immigrants, and people who do not speak English—all groups that are considered Hard to Count (HTC) populations and are underrepresented in the census.¹⁶

While the ACS measures access to indoor plumbing, it does not measure whether households have access to wastewater services. The only federal dataset that gets close to that is the American Housing Survey (AHS), which identifies that about 22 million American households use septic systems rather than being connected to a centralized sewer; but not whether septic systems are functioning properly.¹⁷ The AHS is less comprehensive than the ACS and does not sample extensively in rural areas, where septic systems are commonly used. We know that access to systems that remove and treat wastewater is essential to community health, but the data in the United States on sanitation challenges is extremely limited.

Finally, federal data on water and sanitation access has not been collected consistently. The decennial census used to collect detailed information on household water and wastewater access, but the questions about wastewater were removed after 1990. The decennial census and ACS continued to collect information on access to complete plumbing (running water and toilet, tap, and shower/bath), but in 2016, the portion of the question about toilets was eliminated. These inconsistencies make it impossible to compare datasets and assess change over time.

* The 2014 ACS margin of error is $\pm 7,817$ households, suggesting that the actual number of unplumbed households is between 529,642 and 545,276. As the average household contained 2.6 individuals in 2014, we estimated that between 1,377,069 and 1,417,718 people live without full indoor plumbing facilities.

2. RACE IS THE STRONGEST PREDICTOR OF WATER AND SANITATION ACCESS

Our analysis of the American Community Survey found that race is the variable most strongly associated with access to complete plumbing. Nationwide, 0.3 percent of white households lack complete plumbing, as compared to 0.5 percent of African-American and Latinx households, and 5.8 percent of Native American households.* That means that African-American and Latinx households are nearly twice as likely to lack complete plumbing than white households, and Native American households are 19 times more likely. In fact, our analysis showed that the larger the share of Native American, African-American, Latinx, or Pacific Islander residents living in a census tract, the higher the percentage of homes that lack complete plumbing.

Native Americans are more likely to face water access issues than any other group: 58 out of every 1,000 Native American households lack complete plumbing, as opposed to three out of every 1,000 white households. For Native American and Pacific Islander** communities, race is a more significant predictor of plumbing access than any other factor. That means that these groups are equally likely to lack complete plumbing whether they are high- or low-income, and whether they live in urban or rural areas. This disparity has implications for public health: the Native American Rights Fund found that because reservations are less likely to have clean and reliable water they experience higher mortality, poverty, and unemployment rates.¹⁸

African-American and Latinx populations are also disproportionately affected by water access challenges. Five out of every 1,000 African-American or Latinx households lack complete plumbing. Racial disparities in water access for Black and Latinx populations are especially pronounced when analysis is conducted at the regional level. In parts of the South, African Americans are the group most likely to lack complete plumbing. In California and Texas, Latinx people are the most affected.

3. POVERTY IS A KEY OBSTACLE TO WATER ACCESS

While race is still the strongest predictor of plumbing access for these groups, it is not the only factor: economic status is another strong determinant of access to services. For both African-American and Latinx households, higher income and educational attainment are positively correlated with access to complete plumbing. Our analysis illustrates a correlation of complete plumbing access with household income, educational attainment (which has been shown to correlate to poverty), and unemployment rates. The analysis found that census tracts with higher average household income had lower percentages of households lacking access to complete plumbing. The analysis also found that higher percentages of residents without high school diplomas are correlated with lower levels of complete plumbing access, regardless of race.

* The census uses the following terms to refer to race/ethnicity categories: White, Black or African American, American Indian or Alaska Native, Asian, Native Hawaiian or Other Pacific Islander, and Hispanic/Latino. This report uses terms that are more commonly used or that reflect research participants' self-identification.

** Further research is needed on water access issues in Pacific Islander communities.



4. WATER ACCESS CHALLENGES AFFECT ENTIRE COMMUNITIES

The water access gap is not a matter of isolated individuals choosing to live off the grid; it is the result of a lack of adequate water infrastructure that affects whole communities. Our analysis found that entire communities lack access to water and sanitation as a result of historical and geographical factors. Populations lacking complete plumbing are clustered in certain areas. Beyond the six communities where we conducted qualitative research, water access challenges are concentrated in Alaska, the Dakotas, and northern New England (specifically Maine).¹⁹ The state with the highest proportion of the population lacking access is Alaska, at 5.75 percent, followed by New Mexico, with more than 1.6 percent. Arizona and Maine follow, with just under one percent of the population lacking access. Small pockets of communities without complete plumbing exist in every state.

Our analysis also revealed that areas that lack water and sanitation access can “hide” within wealthier counties. This phenomenon was invisible to earlier analyses that examined census water access data at the county level. By zooming in on the census tract level, we found that there are small pockets lacking water access hiding within counties with overall higher levels of access. In Coconino County, Arizona, for example, only about four percent of the population lack complete plumbing. By analyzing the census tracts within the county, we found that there are some tracts where 40 percent of people lack access.

5. PROGRESS IS UNEVEN, AND SOME COMMUNITIES ARE BACKSLIDING

There has been gradual improvement in access to water and sanitation in the United States, but certain areas have been left behind. Our analysis showed that the population without complete plumbing declined from 1.6 million in 2000 to 1.4 million in 2014. In earlier decades, lack of access decreased at a much faster rate; between 1950 and 1970 the percentage of the population lacking complete plumbing dropped from 27 percent to 5.9 percent.²⁰ This suggests that the remaining communities lacking access face particularly entrenched challenges. Michigan State University analyzed state-level data and found that the progress that has been made is unevenly distributed; while some states made improvements, others saw conditions worsen. Delaware, Idaho, Kansas, New Hampshire, Nevada, South Dakota, and Puerto Rico* all saw increases in their populations without access between 2000 and 2014. Alaska, California, and New York, on the other hand, saw significant improvements in the number of households lacking access during the same period. In Alaska, this may be due to increased technical assistance and funding from the state government and the philanthropic community, which suggests that improvement is possible through focused policy and funding. In California and New York, the improvement may be due to the fact that they are both economically prosperous states.

* The population lacking access to complete plumbing in Puerto Rico increased in the early 2000s. The census stopped collecting this data in Puerto Rico in 2007.

HISTORICAL CAUSES OF WATER ACCESS CHALLENGES

The water access challenges we face today are the result of two interrelated histories. First, vulnerable communities disproportionately lack access to water and sanitation, in part due to discriminatory practices embedded in some past water infrastructure development initiatives. Second, federal funding, once the driving force behind water infrastructure development, has declined precipitously in recent decades, reducing the support available for communities to build and maintain water and wastewater systems.

**FOR THE COMMUNITIES
THAT WERE HISTORICALLY
UNABLE TO DEVELOP
WATER INFRASTRUCTURE,
THE DECLINE IN FUNDING
MAKES IT EVEN HARDER
TO CATCH UP TO THE REST
OF THE COUNTRY.**

In the early 1900s, the federal government subsidized drinking water and irrigation for settlers in the West, often at the expense of tribes.²¹ This was a driver for water access challenges in tribal areas like the Navajo Nation. In the 1950s, Zanesville, Ohio did not construct municipal water lines in African-American neighborhoods.²²

In the 1960s, Roanoke, Virginia did not extend water and sanitation lines to neighboring Hollins, a majority African-American town.²³ In California's Central Valley, rural Latinx communities were discouraged from incorporating, and therefore did not receive the same funding to build infrastructure that neighboring towns did.²⁴ These discriminatory practices may have ceased, but vulnerable communities continue to feel their effects today.

Some discriminatory practices, however, continue to be present in water management systems. Tribal water rights exemplify this dynamic: most tribes are recognized by the US government as sovereign nations with legal rights to the water resources in their territories, yet those water rights continue to be infringed upon. Tribes are frequently overruled in water decision-making, although they are often the most senior water rights holders.²⁵ In a recent example, the Dakota Access Pipeline was built across land designated as tribal territory by an 1868 treaty but never ceded to tribal control by the federal government. Pipeline breakages pose a threat to water resources that serve tribal members.²⁶

Such examples of communities struggling to access water services contrast to the nation's overall progress on water and wastewater services. Starting in the mid-1930s, the federal government enabled the development of rural water systems through the New Deal. One New Deal program, the Public Works Administration, funded water supply and electricity projects in communities of fewer than 1,000 people.²⁷ Federal support for water and

wastewater systems continued in the post-World War II era through economic and rural development projects. The Great Society initiatives funded pilot programs to develop rural water systems in the early 1970s, leading to the establishment of the Rural Community Assistance Partnership, one of the major technical assistance providers for small water systems today.²⁸ Federal and state grant funding continued in the 1970s under the Clean Water Act (CWA), and between 1950 and 1970, the number of people without complete plumbing fell from 27 to 5.9 percent.²⁹

The water infrastructure funding landscape began shifting in the late twentieth century. Grants were widely available during the 1970s for the establishment and improvement of water and wastewater systems, but beginning in the 1980s, the federal government started placing more emphasis on loans over grants through funding offered by the United States Department of Agriculture (USDA) and State Revolving Funds.³⁰ Since then, federal water infrastructure funding has flatlined.³¹ While USDA continues to offer both loans and grants, including set-aside grants for tribal and low-income rural areas, the need for funding is vast. Tribal systems have been particularly underfunded: in 2016 the Indian Health Service estimated that it would need \$2.7 billion to provide water and sanitation infrastructure to all homes on reservations that can be reached by traditional lines, but Congress that year appropriated only \$99.4 million—less than four percent of the need.³²

IN 1977, 63 PERCENT OF TOTAL CAPITAL SPENDING FOR WATER AND WASTEWATER SYSTEMS CAME FROM FEDERAL AGENCIES; TODAY THAT NUMBER IS LESS THAN NINE PERCENT.³³

This means that the cost of expanding water and sanitation access now falls primarily on state and local government. While most communities in the United States can make infrastructure investments using revenue generated by local water rates, such investments are not always financially feasible for vulnerable communities. Rural areas, tribal communities, and low-income areas—especially communities of color—have a harder time accessing capital and covering system costs through rates.



Part Two:

WHO IS AFFECTED

Understanding the Water
Access Gap through Six
Case Studies



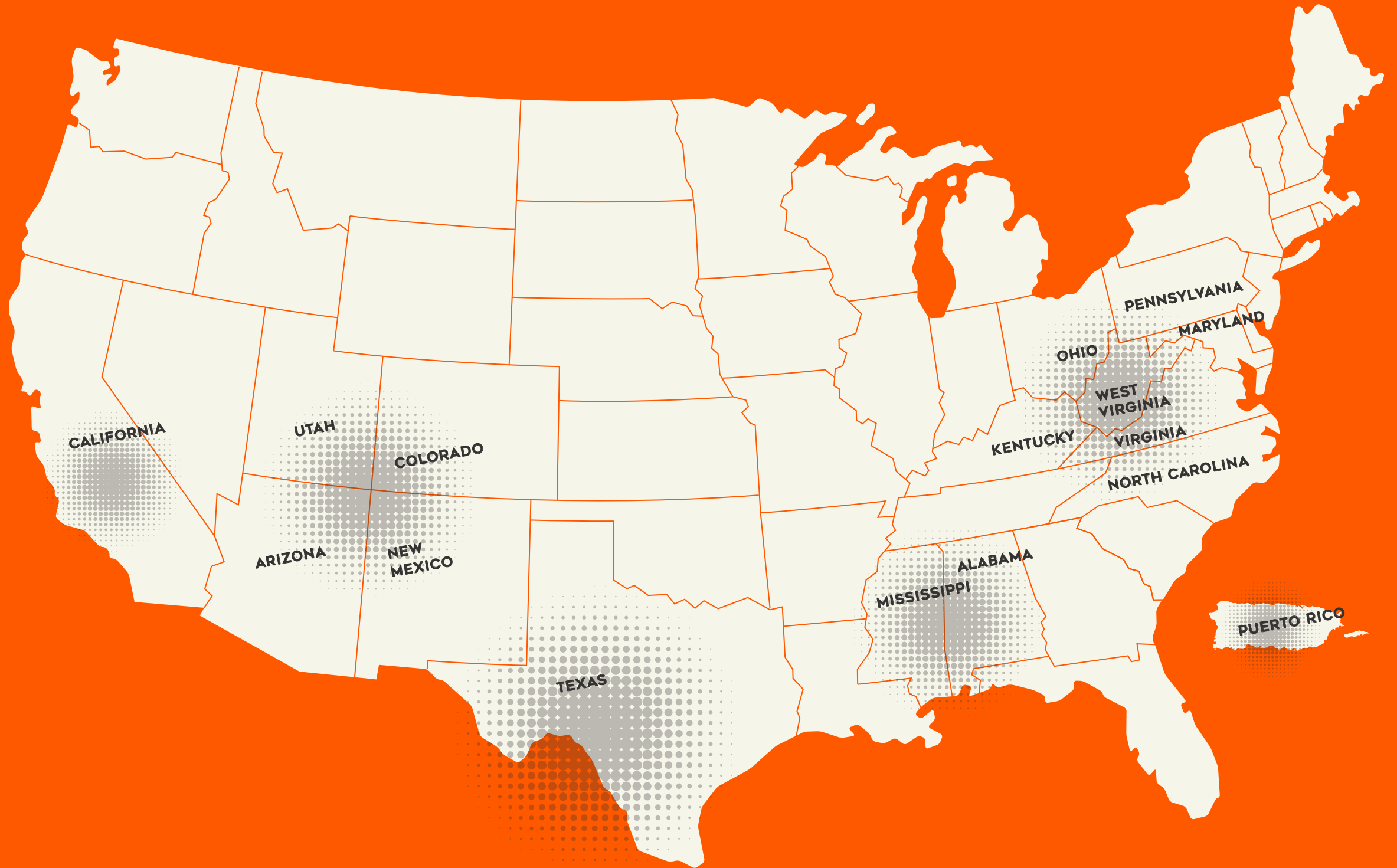
MOST PEOPLE IN THE UNITED STATES NEVER GIVE THEIR WATER AND WASTEWATER SYSTEMS A SECOND THOUGHT, BUT PEOPLE LIVING IN COMMUNITIES WITHOUT SAFE AND RELIABLE INFRASTRUCTURE HAVE TO THINK ABOUT WATER AND SANITATION ALL THE TIME.

For these people, the ability to care for their family, earn a living, and go to school depends on being able to access water. They have to dedicate significant time every day to tasks like carrying water jugs, driving to another town to use a relative's shower, or cleaning the house after a wastewater backup. These coping strategies are time-consuming, expensive, and logistically challenging.

This section summarizes the findings from a qualitative research process designed by Michigan State University to understand how water access challenges affect communities. We conducted interviews and listening sessions with residents, community leaders, service providers, policy-makers, and others in six communities that face significant water access challenges: California's Central Valley, the Navajo Nation, the Texas *colonias*, rural areas in the South, Appalachia, and Puerto Rico. The conditions in these six communities are broadly representative of other regions that were not included: for example, water access conditions on the Navajo Nation are similar to those in tribal areas in the Dakotas, and sanitation challenges in Mississippi resemble those in Louisiana.

These case studies shine a light on the daily reality for those without water access in America. While the challenges they face are significant, this section also gives inspiring examples of residents and community organizations developing solutions that are making a real difference.

Participant names in this section have been changed to protect anonymity. Statements that are not cited are drawn from interviews conducted with residents, community leaders, water and wastewater system managers, and policymakers in the six communities.





California

Research area: Tulare County, California
Local partner: Community Water Center



RESIDENTS OF EAST OROSI, CALIFORNIA, A SMALL TOWN IN THE CENTRAL VALLEY, ONCE HAD SAFE WATER AND SANITATION. NOW THEY LIVE WITHOUT EITHER.

A decade ago, tap water began to burn people’s eyes when they showered and leave white residue when they washed their cars. East Orosi’s well is contaminated by runoff from orchards surrounding the town, and from leaking septic systems. Jessica, a longtime resident, told us that she got involved in local water governance because “nothing worries [her] more than not having clean water.”³⁴

The situation worsened recently when wastewater started overflowing out of toilets and bathtubs. East Orosi uses a hybrid system of household septic tanks that separate out solids, connected to lines that transport wastewater to a nearby treatment plant, but the system’s pump broke down last year. The system backup has made residents’ bathrooms unusable and damaged their property. One resident showed us piles of carpet in her front yard that she threw away after they were soaked in sewage. East Orosi residents have been attending local water system meetings and describing the need for higher quality services.

In nearby Seville, Angela pays \$60 monthly for water that is yellow and full of debris—in addition to \$100 per month for clean, bottled water.³⁵ Residents that we interviewed stated that the expense of buying water on top of paying water bills prevents them from buying other necessities. Despite concerns over their water’s safety, residents face shutoffs and reconnection fees if they don’t pay their water bill. Angela and her neighbors have been advocating for state-level policy change for over a decade, hoping to secure better services for their children and grandchildren.³⁶

In 2013, thousands of people in California lost running water as a severe drought took domestic wells and municipal systems offline. The water is back on now, but many residents in the Central Valley still cannot drink it because their wells are contaminated with nitrates and bacteria from farm and dairy runoff, arsenic, uranium, industrial chemicals like hexavalent chromium, or pesticide ingredients like 1,2,3-Trichloropropane.³⁷ These rural communities often have poorly constructed septic systems or sewers that back up and overflow. To make matters worse, the changing climate now swings more frequently between drought and extreme rainfall.



Lower-income farmworkers in the Central Valley tend to use private wells and septic systems because they live in towns that were originally built as labor camps without adequate water systems.³⁸ Many of these towns are unincorporated, meaning that they are under the control of counties. Tulare County's 1971 general plan stated that it was not worth investing in water and sewer infrastructure in 15 unincorporated communities because they had "little or no authentic future."³⁹ Many of these primarily low-income and minority areas still face water access challenges as a result.

In towns that have water and wastewater infrastructure, systems are often managed without community involvement. Residents we spoke to worry that speaking out about water issues could lead to reprisals like service shutoffs, eviction, or immigration raids—especially with rising anti-immigrant sentiment in the Central Valley. Nevertheless, many residents that we interviewed are advocating for better services at the local and state level.

About our research area

California's Central Valley is one of the most productive agricultural regions in the world, supporting fruit, vegetable, and nut farms as well as ranches and dairies. Our research focused on the towns of East Oroquieta, East Porterville, and Seville in Tulare County. The county's population is 64 percent Hispanic or Latino.⁴⁰ Most of the residents we interviewed had annual household incomes between \$10,000 and \$20,000. Our qualitative research suggests that the water and sanitation crises we saw in Tulare County are widespread in other parts of California, including the Central Coast, the Coachella and Imperial Valleys, the Tehachapi Mountains, and mobile home parks in Riverside, San Bernardino, and Orange Counties.⁴¹

About our local partner: Community Water Center

The Community Water Center (CWC), a grassroots environmental justice organization based in the Central Valley, works to ensure that all communities have access to safe and affordable water, by providing short-term assistance and advocating for long-term change. For communities experiencing water access crises, CWC has helped provide water deliveries, point of use filters, and private well testing. CWC uses community organizing, policy advocacy, and public education to bring the voices of vulnerable communities into water decision-making, for instance by supporting community members in their bids to sit on local water boards. CWC's advocacy has contributed to statewide progress towards more equitable water access. By organizing communities affected by the devastating drought and groundwater contamination, CWC pushed policymakers to be more responsive to the issue. In recent years, the state passed legislation affirming the human right to water, created mechanisms for mandatory consolidation of water systems, and freed up state emergency funding for water deliveries.

SEVILLE

California

\$26,250

Median household income in Seville

98%

Hispanic / Latino population

52%

Poverty rate

Source: 2013-2017 American Community Survey 5-Year Estimates





Navajo Nation

Research area: Red Mesa, Arizona

Local partner: Community Outreach and Patient Empowerment (COPE)



ON THE NAVAJO NATION NEAR THOREAU, NEW MEXICO, SOME RESIDENTS DRIVE 40 MILES TO GRANTS EVERY FEW DAYS TO HAUL WATER HOME FOR DRINKING, COOKING, AND BATHING.

The area is home to many Navajo elders who live alone and do not always have support systems nearby in the event of bad roads or an illness that leaves them homebound. In Red Mesa, residents say groundwater supplies are so low in some areas that they have to visit four or five locations to collect the water they need. Female elders reported stockpiling water for emergencies and for the winter, when freezing temperatures make hauling water difficult. Local governmental units known as chapters try to deliver water to elders' homes, but this piecemeal service is not sufficient to meet residents' needs. Debra, a Red Mesa resident, said that "everything would be easier" with household water access because it would reduce the wear and tear on her car.⁴² Another resident spends \$200 a month on gas in order to get water.

Many research participants have less than ten gallons of water at home at any given time and struggle to balance hygiene and consumptive needs, sometimes using as little as two to three gallons of water per day (the average American uses 88 gallons per day⁴³). Preparing food with minimal clean water is difficult, especially for parents with young children, and some residents choose less nutritious foods that require less water. A resident in the Thoreau area worries that she is unable to wash fresh fruits and vegetables to her satisfaction. She has occasionally bartered homemade pies in exchange for water.

Households without clean running water often lack sanitation access as well. Outhouses are a common sight, and some residents use community centers' showers and bathrooms. A resident of Mexican Water said her son is embarrassed by the family's lack of water access, which often makes him late for school.⁴⁴

An estimated 30 percent of people on the Navajo Nation lack access to running water and must haul water.⁴⁵ Local officials report that the actual number may be even higher. The region itself has a wealth of water resources, but the Navajo were left out of compacts allocating water use. Although tribal water rights were recognized by the US Supreme Court in 1908 in *Winters v. United States*, their rights to water have been violated repeatedly for over a century. Water rights struggles and scarce funding make it difficult



for the Nation to develop water infrastructure. The Indian Health Service estimates that about \$200 million is needed to provide basic water and sanitation access in all Navajo homes.⁴⁶

Many households on the Navajo Nation are not good candidates for centralized water systems because extending lines to low-density, mountainous areas is expensive. Some Navajo instead rely on unregulated wells, springs, or livestock troughs to meet their daily needs, which can be unsafe because groundwater is contaminated by some 521 abandoned uranium mines. Gastric cancer rates doubled in the 1990s in some areas where uranium mining occurred.⁴⁷ At the same time, rising temperatures and declining rainfall have made groundwater the principal drinking water source, as surface water on the Navajo Nation is estimated to have decreased by 98 percent over the course of the twentieth century.⁴⁸ According to EPA, unregulated drinking water sources are the greatest public health risk on the Navajo Nation.⁴⁹

Another public health impact of water access challenges is the Navajo Nation's high rate of diabetes, due to the fact that for many inhabitants, sugary beverages are more readily available than clean water.⁵⁰ Navajo are two to four times more likely to have Type-2 diabetes than whites.⁵¹

About our research area

The Navajo Nation (Diné'tah) encompasses 27,000 square miles across New Mexico, Arizona, and Utah—an area larger than West Virginia. The Navajo Nation has had its own government since 1923, and the sovereignty of the Nation is recognized by the US Constitution. The Navajo Nation is the second-largest tribal group in the United States, with over 332,000 members.⁵² Our research focused on the Red Mesa area within the Northern Agency, located in Apache County, Arizona. Apache County's population is 90 percent Native American⁵³ with a median household income of \$32,360 and 35.9 percent of people living in poverty.⁵⁴ The unemployment rate in Apache County is over ten percent.⁵⁵

APACHE COUNTY

Arizona

\$32,360

Median household income

90%

Native American population

36%

Poverty rate

Source: 2013-2017 American Community Survey 5-Year Estimates

About our local partner: Community Outreach and Patient Empowerment

Community Outreach and Patient Empowerment (COPE) works to address structural health inequities on the Navajo Nation, including improving access to clean water and healthy food. Residents of the Navajo Nation often buy groceries at convenience stores or trading posts. COPE works with these local stores to promote clean water and ensure adequate stocking of fruits, vegetables, and traditional Diné (or Navajo) foods. COPE participates in a campaign to help families and children choose water over other beverages, drawing upon the deep importance of water in Diné culture. COPE has also partnered with early childhood education centers to increase and promote access to safe water by maintaining filtered water systems and providing self-serve beverage stations for staff and young children.





Texas Colonias

Research area: El Paso County, Texas
Local partner: AYUDA Inc



In Cochran, Texas, an isolated *colonia* in El Paso County, families haul water by car or on foot, and purchase trucked water at a cost of up to \$250 per month. Despite the high costs, interview subjects stated that they only use trucked water for bathing and cleaning because they do not know whether it is safe to drink. Families in Cochran use about 50 to 100 gallons of potable water per month for households of up to eight people, whereas the average American uses 88 gallons per day.⁵⁶ Cochran is just a ten-minute walk from existing water mains, but it is unlikely that the community will ever get connected through public funds, due to the lack of existing infrastructure and the cost per connection.

Residents of other *colonias* use unmonitored private wells that have unpredictable water quality and availability. Hector and Juana, who live in a *colonia* called Laura E. Mundy, told us that they drank their well water for 20 years before they were both diagnosed with *H. Pylori*, a water-borne infection that can cause cancer. They still use well water to shower and clean, but Hector is “very, very afraid” that the well may run dry as nearby farms compete for groundwater. Hector and Juana share a well with their neighbors, and they have to wait an hour after a neighbor showers to have running water again. Hector is also concerned about fires because the *colonia* has no fire hydrants.⁵⁷ Like Cochran, Laura E. Mundy is less than half a mile from water lines.

Residents like Hector and Juana are in a precarious position. Many *colonia* residents purchased lots from developers who sold them with the promise of installing paved roads, electricity, water, and sewage. But the developers disappeared after selling the properties, leaving owners without service connections. Parcels were often located in floodplains or on other low-value land, leaving residents with a lack of services, substandard housing, and an inability to sell their land. Many *colonias* are in unincorporated areas or “donut holes” outside the jurisdiction of nearby municipalities, utility districts, and other agencies. The counties in which they are located tend to prioritize water, sewer, and electricity projects based on the cost per connection, which is very high for *colonias* because of their small size—most have fewer than 40 households.⁵⁸ This leaves *colonia* residents without centralized water infrastructure. Some residents create makeshift connections from pipes that are used or made of unsafe materials. Makeshift water hookups can contaminate source water or cause water to stagnate in transmission lines.



Even residents of large *colonias* with piped running water at home are not guaranteed water that is safe to drink. In Webb County, Texas, the small system serving the Colorado Acres *colonia* does not have the managerial or financial capacity to maintain pumps, reverse osmosis systems, and other infrastructure necessary to providing safe water. As a result, the county trucks in water at significant cost to residents. The county’s Rio Bravo treatment plant has had ongoing issues with *Cryptosporidium*, a water-borne parasite that causes gastrointestinal illness.

About our research area

Colonias are residential areas located along the United States-Mexico border, in California, Arizona, New Mexico, and Texas. These areas began developing 70 years ago as peri-urban or rural subdivisions, and many have since been absorbed into urban or suburban communities. *Colonias* are home to about half a million people, the majority of whom are Latinx. Nearly two-thirds of adults and 94 percent of children and youth are US citizens.⁵⁹ Residents are often low-income, and many work in the informal economy. *Colonias* grew quickly because they provided affordable housing that allowed many families to achieve homeownership. There are 2,300 *colonias* in Texas, and our research focused on El Paso County.

About our local partner: AYUDA Inc

Adult & Youth United Development Association (AYUDA) Inc, an organization based in San Elizario, Texas, aims to remove barriers to water access, quality housing, and health services for residents of El Paso County *colonias*. AYUDA’s holistic approach recognizes that water access is a housing issue, and that inadequate infrastructure is one component of substandard housing. It also addresses the historic barriers to infrastructure connections in *colonias*. Many *colonia* residents cannot upgrade their homes or install adequate infrastructure because they do not have titles and cannot take out loans. AYUDA works with the Texas Department of Housing and Community Affairs to provide grants to low-income families, allowing them to obtain titles and make improvements to their household infrastructure.

TEXAS COLONIAS

\$29,928

Median household income

96%

Hispanic / Latino population

42%

Poverty rate

Source: Jordana Barton et al., “Las Colonias in the 21st Century: Progress Along the Texas-Mexico Border





Rural South

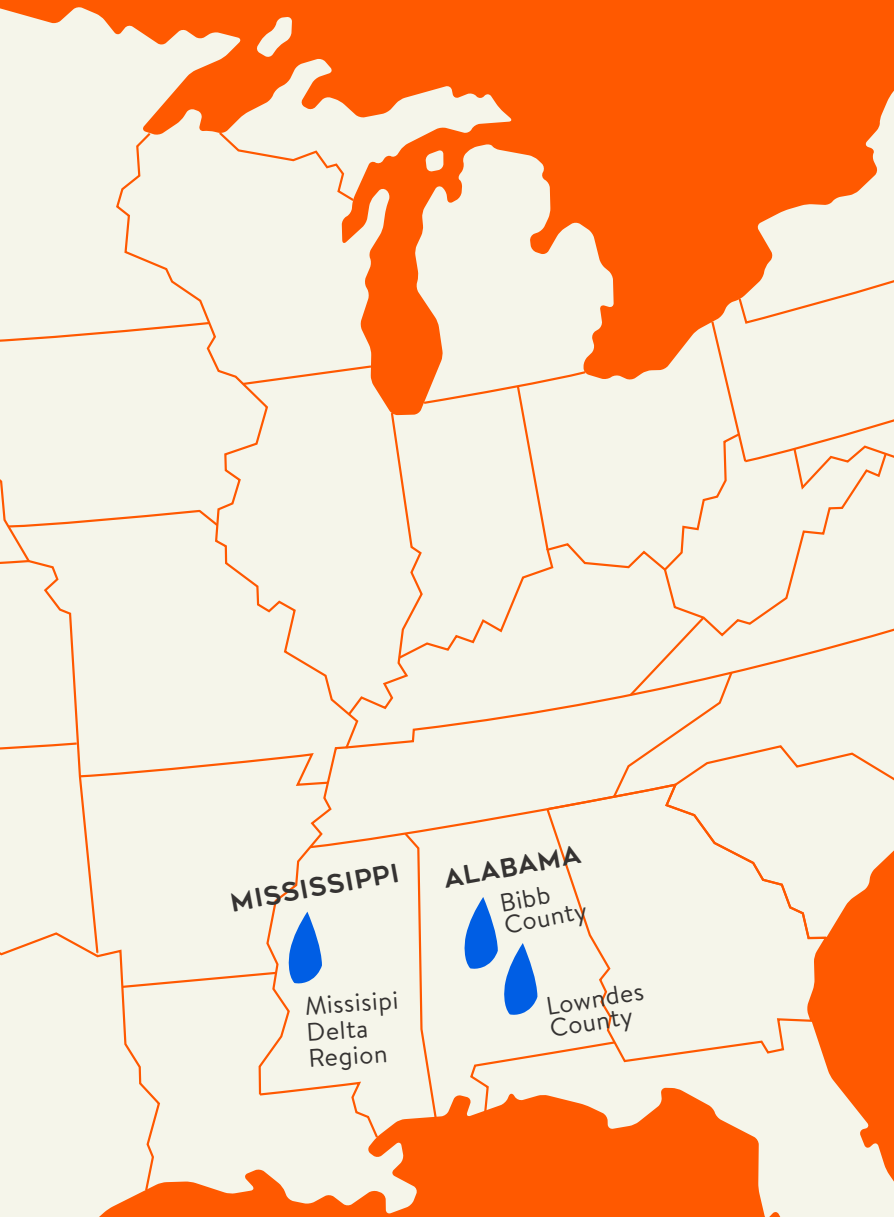
Research area: Lowndes and Bibb Counties, Alabama and Delta Region, Mississippi
Local partners: Center for Rural Enterprise and Environmental Justice and Mississippi Workers' Center for Human Rights

WASTEWATER PROBLEMS ARE COMMONPLACE IN THE BLACK BELT, A REGION STRETCHING ACROSS ALABAMA AND MISSISSIPPI THAT WAS ORIGINALLY NAMED FOR ITS DARK, CLAY SOIL, WHICH DOES NOT ABSORB WATER VERY WELL.

Bernice, who lives in an Alabama town where wastewater is piped into a lagoon, told us that when it rains “the lagoon water comes across the road right into my yard. When we hear the toilet gurgling, we know it’s coming into our house.”⁶⁰ Michael, a resident of Bibb County, Alabama, explains that his utility sprays wastewater onto a drain field. “Of course, we are in the Black Belt and water doesn’t infiltrate here. So the water pooled on the land and our whole town smelled like sewage.”⁶¹ Residents report that when they alert authorities about the issues with soil infiltration, the proposed solutions do not address the issue. Many residents speak out about their wastewater issues and push for more effective solutions.

In Winterville, Mississippi, a Delta town of less than a hundred residents, people try to use the bathroom as infrequently as possible, because more likely than not water will not drain out of toilets and tubs. The Delta’s high water table and plentiful rainfall make it difficult to get wastewater down the drain. Many homes also have leaking septic systems or cesspools. Winterville’s water association staff recently secured USDA funding to improve their well, but there are fewer resources available for wastewater systems.

Access to sanitation is the most serious water access concern in the rural South. In Lowndes County, Alabama, only 20 percent of homes are connected to sewer systems; the rest are required to install and finance septic systems.⁶² A septic system that is appropriate to the soil type can cost up to \$30,000,⁶³ in an area where the median value for a mobile home is only \$23,900.⁶⁴ Instead, some residents use PVC pipes to remove wastewater away from homes, sometimes right into their back yards, a practice known as “straight-piping.” In Alabama, homeowners with septic system violations can be fined, and for many years they were subject to arrest for unpaid fines.⁶⁵ There is still anxiety among residents about fines, jail time, or eviction as a result of seeking help with wastewater issues, as well as distrust in public authorities.





Straight-piped systems, failing septic systems, and wastewater lagoons generate considerable public health impacts, including the resurgence of water-borne illnesses believed to have been eradicated in the United States. Researchers from Baylor College of Medicine, in partnership with the Alabama Center for Rural Enterprise, conducted a study in Lowndes County that found that 34.5 percent of participating individuals tested positive for hookworm, a parasite linked to wastewater,⁶⁶ and more than 40 percent of participants reported exposure to raw sewage within the home.⁶⁷ Health risks are exacerbated by climate change as precipitation events become more intense and cause more wastewater overflow.

About our research area

Our research focused on Lowndes and Bibb Counties in Alabama, and on the Delta region in Mississippi. Lowndes County’s residents are 73 percent African American and 25 percent white.⁶⁸ The poverty rate is 25 percent⁶⁹ and median household income is \$26,000.⁷⁰ Bibb County’s residents are 74 percent white and 21 percent African American,⁷¹ and the poverty rate is 20 percent.⁷² Community vulnerability in rural areas of the South is inextricable from the legacy of slavery and the Jim Crow era; for example, Lowndes County was an epicenter of racially motivated disenfranchisement and terrorist violence in the 1960s.⁷³ The region was at the heart of the Civil Rights movement, which continues to inspire water and sanitation activists today.

About our local partners: Center for Rural Enterprise and Environmental Justice and Mississippi Workers’ Center for Human Rights

The Center for Rural Enterprise and Environmental Justice, an organization based in Alabama, aims to develop sustainable solutions to poverty and environmental crises, with a focus on low-income rural communities. The Center’s work exposes the ways that climate change exacerbates wastewater challenges in areas like the Black Belt: for example, as rainfall becomes heavier and temperatures rise, wastewater systems are

LOWNDES COUNTY Alabama

\$26,000
Median household income

73%
African American population

25%
Poverty rate

BIBB COUNTY Alabama

74%
White population

20%
Poverty rate

Source: 2013-2017 American Community Survey 5-Year Estimates

more prone to flooding, and can create breeding grounds for mosquitoes. The Center documents these challenges and brings community voices to developing solutions.

The Mississippi Workers’ Center for Human Rights, based in Greenville, Mississippi, was founded to provide legal advocacy and training for low-wage workers. The Center uses direct action and public education to create safer and healthier workplace conditions. Their involvement in water issues includes advocating for clean water access in the workplace. The Center also assists residents dealing with water and sanitation issues tied to housing. In Mississippi, many housing developments have sanitation issues, especially affordable housing. Some developers build housing units without connections to sewer lines or adequate septic systems; or fail to maintain indoor plumbing. The Center helps residents pursue legal action against developers that fail to provide adequate sanitation.





Appalachia

Research area: McDowell County, West Virginia
Local partner: Five Loaves & Two Fishes Food Bank



FOR YEARS, RESIDENTS OF O'TOOLE, WEST VIRGINIA, DEPENDED ON A RAMSHACKLE WATER SYSTEM CONSISTING OF AN UNCOVERED TANK AND A PRECARIOUS NETWORK OF PIPES.

Toilets emptied directly into streams—right next to the drinking water pipes. Running water was intermittent, because the pressure was so low, and tap water came out dirty. Local volunteer firefighters offered a temporary solution, letting residents fill jugs from county fire hydrants, but simple chores like laundry became exhausting as people spent hours each day hauling water. Some residents that we interviewed cut their daily water use to just five gallons; others showered under rain gutters during a downpour.

In nearby Mile Branch, West Virginia, water from private wells comes out cloudy or brown. It wasn't always this way; people could drink from and bathe in their creek without concern until early 2018, when they noticed a change in the water. Now the creek runs black from time to time, and residents worry that it may be related to mining and fracking operations. Longtime resident Judy has become a citizen scientist, collecting and testing water samples and educating herself about water contaminants and health risks.⁷⁴

In the town of Keystone, West Virginia, water is just one of many municipal services to break down due to the lack of a tax base: the police department was shuttered in 2018, and the remaining city employees work only a few days a week.⁷⁵ Ida, a longtime resident, told us that in her home there is just enough pressure to use one faucet at a time. She showers “reluctantly” because of the poor water quality and uses bottled water for drinking and cooking.⁷⁶ Residents often go without running water because the town cannot afford needed equipment,⁷⁷ but they are afraid to speak up about it because they fear their water will be shut off entirely.

Communities in parts of rural Appalachia face three key water challenges: lack of household water access, poor water quality, and lack of wastewater services. Some areas, like Keystone, use run-down coal camp water systems—private systems constructed by coal companies to serve their workers that were abandoned when the companies folded. Others, like Mile Branch, are not connected to systems at all, because remote locations and mountainous terrain make the cost of line extension to relatively few households untenable. Instead, residents collect water from



mine shafts or use surface runoff from mountainsides, artesian springs, and streams. These sources are often polluted by industrial runoff, and accessing them is difficult, particularly for residents who do not own a vehicle.

Many households that are not connected to sewer systems and cannot afford septic systems straight-pipe wastewater into the same water resources that other residents collect for drinking water, causing major health concerns including chronic skin rashes, MRSA and staph infections, and gastrointestinal issues like *H. Pylori*.

Communities are developing interim strategies: in Beverly, Kentucky, the Red Bird Mission offers a community water kiosk connected to a utility in the adjacent county. Some residents visit the kiosk at night to avoid being seen, an indication that life without water access still carries a stigma. In O'Toole, a crowdfunding campaign raised money to pay for the line extension to connect homes to the county water system; a local non-profit provided volunteer labor. Thanks to these contributions, residents now have access to clean, running water in their homes, although they still lack wastewater treatment.⁷⁸

About our research area

Appalachia is a region that encompasses West Virginia, eastern Kentucky, and eastern Tennessee (and is sometimes defined as including parts of New York, Pennsylvania, Ohio, the Carolinas, Mississippi, Alabama, and Georgia). Our research focused on the towns of Keystone, Mile Branch, and O'Toole in McDowell County, West Virginia, one of the nation's poorest counties with a median household income of just under \$26,000 and about a third of residents living in poverty.⁷⁹ The county's current population is 18,000,⁸⁰ down from a peak of 100,000 in 1950.⁸¹ About 90 percent of residents are white and eight percent are African American.⁸²

McDOWELL COUNTY

West Virginia

\$26,000

Median household income

90%

White population

8%

African-American population

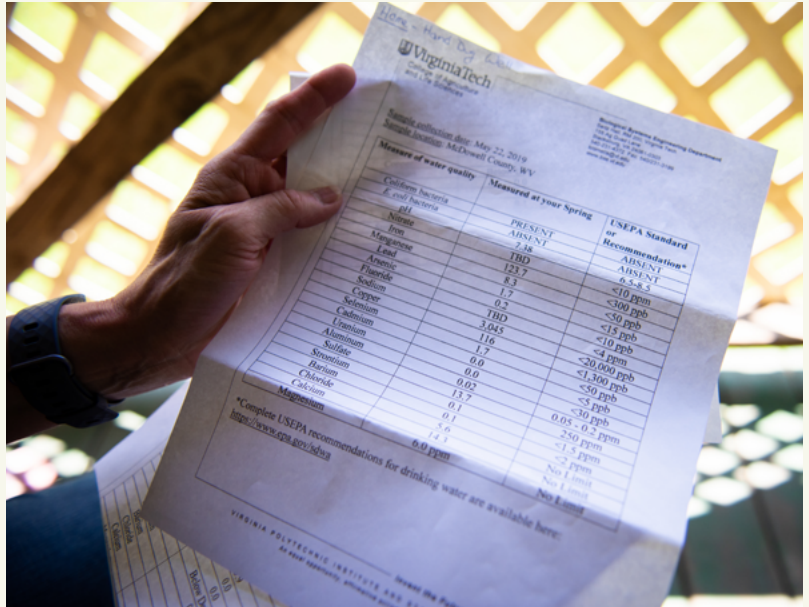
35%

Poverty rate

Source: U.S. Census Bureau QuickFacts and 2013-2017 American Community Survey 5-Year Estimates

About our local partner: Five Loaves & Two Fishes Food Bank

Five Loaves & Two Fishes Food Bank provides a critical service to residents of McDowell County, West Virginia, where there is only one grocery store. At one point, they served half the county population. But the food bank's most-requested item isn't food, but bottled water. Five Loaves & Two Fishes responds to the water crisis in McDowell County by distributing bottled water at the food bank and delivering it to more remote residents. Although the food bank was not founded with the intent of focusing on water, it has become the de facto drinking water source for residents that lack access. In many cases, the food bank is residents' only source of clean drinking water. The founders have become experts on the water crisis in West Virginia, possessing an in-depth knowledge of the water and wastewater challenges throughout the county; their causes; and how residents' health is affected.





Puerto Rico

Research area: Eastern and central Puerto Rico
Local partner: RCAP Solutions


 A graphic showing a white map of Puerto Rico on an orange background. The words "PUERTO RICO" are written in black, bold, uppercase letters across the top left of the map. A blue water drop icon is positioned to the left of the text "Eastern Puerto Rico", which is written in black, bold, uppercase letters on the right side of the map.

PUERTO RICO

Eastern
Puerto Rico

**IN A SMALL COMMUNITY
IN EASTERN PUERTO RICO,
WASTEWATER OVERFLOWS INTO
BATHTUBS, SHOWERS, YARDS, AND
STREETS WHENEVER IT RAINS—AND
EVEN ON SUNNY DAYS.**

Jorge, who has lived in the area for years, told us that “you need to mentally prepare yourself whenever it rains.”⁸³ The community uses septic systems because it is far from a sewer line, but the developer that constructed the homes installed septic systems that weren’t compatible with local environmental conditions. At the home of a large family, the septic tank overflows into the yard every day. Jorge described trying to avoid contact with the wastewater backing up into the tub while showering. Some families abandoned their homes and moved away, but most cannot afford to move. The residents that remain are actively seeking solutions.

Puerto Rico’s water systems are aging and underfunded, and vulnerable communities in both rural and urban areas face water and sanitation access challenges. The largest utility, Puerto Rico Aqueduct and Sewer Authority (PRASA), provides drinking water to 97 percent of the population and wastewater services to about half the island’s population. Puerto Rico has faced economic challenges for several decades, which has reduced PRASA’s access to funding and made it hard to add new sewer connections, even in cities. People living in informal or self-built housing face additional barriers to connecting if their homes lack titles or sit in flood zones.

Many rural areas are served by small drinking water systems known as non-PRASA systems. While many non-PRASA systems provide quality services, some are struggling. Most treat bacterial contamination with chlorination, but the cost of treatment and testing is difficult to cover through rates alone, and there are some cases of gastrointestinal illness. Our research indicated that there are also remote areas that lack water and wastewater infrastructure entirely or use informal systems, like straight-piping wastewater directly into streams. It is difficult to quantify how many communities fall into this category because they tend not to seek assistance; in some cases, because they are concerned about being fined. High bacteria rates in Puerto Rico’s surface water suggest that wastewater issues are widespread, but there is a lack of clarity about which government agency is responsible for overseeing household septic systems.



These challenges were compounded by Hurricane Maria, which hit Puerto Rico on September 20, 2017, killing thousands and causing \$90 billion in damage.^{84,85} The hurricane left a million people without power or running water for months,⁸⁶ and flooded septic systems. People relied on interim solutions such as bottled water, trucked water, and rainwater harvesting. Hurricane Maria was devastating, but many people we interviewed stated that it brought out a sense of cooperation that helped communities survive. After the storm, residents of Pueblo de Dios, a small community in central Puerto Rico, loaned the system a generator to keep the pump working, and one man put a tank in his pickup truck and delivered water to elderly neighbors while the power was out. Many water systems are rebuilding to be more resilient. For example, Guayabota, a large non-PRASA system, has installed solar panels to provide renewable energy, in partnership with global nonprofit Water Mission and the Red Cross.

About our research area

Puerto Rico is a US territory with a population of 3.4 million.⁸⁷ The population is 99 percent Latinx,⁸⁸ with 45 percent of residents living in poverty.⁸⁹ Our research focused on rural communities in eastern and central Puerto Rico. Puerto Rico's water issues are related to overarching economic challenges: the economy has declined since 1996, when the US government phased out tax incentives created to attract industry.⁹⁰ As a result, the island lost 40 percent of its manufacturing jobs,⁹¹ shrinking the tax base and making it harder to invest in water infrastructure. Puerto Rico defaulted on its debt obligations in 2015⁹² and declared bankruptcy in 2016.⁹³ The US government installed a financial oversight board with the authority to overrule local elected officials on infrastructure issues.⁹⁴

About our local partner: RCAP Solutions

RCAP Solutions, the regional branch of the Rural Community Assistance Partnership, provides technical assistance on housing and infrastructure to the northeastern United States, Puerto Rico, and the US Virgin Islands. In Puerto Rico, their work includes drinking water and wastewater infrastructure. They work closely with non-PRASA water systems to build their managerial and financial capacity, register them with the Department of Health, and enable them to comply with regulations. Through trainings and workshops on subjects like biology, chemistry, public health, regulation, and rate structures, they support water board members and operators in building their expertise. RCAP Solutions assists systems like Guayabota and Pozo de Agua through the process of applying for USDA funding for pumps, wells, and other system components. They also offer technical assistance with septic system construction and maintenance.

PUERTO RICO

\$19,775

Median household income

3.4 | 99% | 45%

Million population

Hispanic/Latino population

Poverty rate

Source: 2013-2017 American Community Survey 5-Year Estimates



Part Three:

WHAT TO DO ABOUT IT

An Action Plan



ACTION PLAN

While it may seem daunting, the United States can close the water access gap in our lifetimes. It will take dedicated resources, ingenuity, partnerships, public awareness, and political will. The following section provides a multi-faceted action plan, organized around four principles, that draws on the quantitative and qualitative research described above. It was developed through consultation with this report's Advisory Council, a cross-sector group of national leaders (see list on page 3). The Action Plan highlights promising strategies and practices that are improving water access for vulnerable communities. Everyone has a role to play in making this plan a reality: water and wastewater utilities, policymakers, regulators, funders, the private sector, nonprofits, residents of communities who lack water access, and you.



1. REIMAGINE THE SOLUTION

- ◆ Define water access as a crisis
- ◆ Provide interim measures while developing permanent solutions
- ◆ Develop alternatives to traditional infrastructure



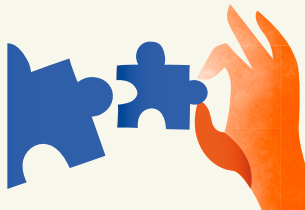
2. DEPLOY RESOURCES STRATEGICALLY

- ◆ Expand and refocus federal and state funding
- ◆ Build a domestic Water, Sanitation, and Hygiene (WASH) sector
- ◆ Create funding options for household-level infrastructure



3. BUILD COMMUNITY POWER

- ◆ Use data to bring visibility to communities
- ◆ Support community water governance
- ◆ Build relationships between communities with water access challenges



4. FOSTER CREATIVE COLLABORATION

- ◆ Support system consolidation that benefits communities
- ◆ Bring market expertise to the water access challenge
- ◆ Design multi-benefit solutions

1. REIMAGINE THE SOLUTION

The first step to developing effective solutions is recognizing that communities without access to water and sanitation are in crisis. These families are in a state of emergency: they drink unsafe water and risk exposure to raw sewage every day. They fall into two broad categories: those for whom centralized infrastructure is viable but currently unavailable; and those for whom geographic, environmental, or technical factors make centralized infrastructure prohibitively difficult to build and maintain. The former need immediate, interim aid from government, philanthropy, or other sources while sustained efforts are made to connect them to infrastructure. The latter need funding, guidance, and regulatory support to develop alternatives to traditional systems. To honor the urgency of their situation and support vulnerable communities in making real progress, we must reimagine the solutions we deploy to close the water access gap.



Redefine water access as a crisis

Lack of water access is a public health crisis. We must adopt and embrace the principle that all people deserve access to clean, safe water as their basic human right, and that water and sanitation access challenges must be solved immediately. Current funding sources and policy responses for water-related challenges are not well-suited to emergency response, because they have long time horizons and onerous requirements. The challenges outlined here will become more urgent as climate change impacts like drought, flooding, and extreme storms put additional stress on precarious infrastructure.

Many countries, along with the United Nations, have recognized the urgency of water access by passing resolutions on the human right to water and sanitation. This principle recognizes the value of water to human life and the importance of funding water infrastructure, while affirming that no one should be denied services because of inability to pay. In 2012, California passed Assembly Bill 685 recognizing the human right to water⁹⁵ and creating a policy environment that has enabled the passage of numerous laws that support equitable water access, funding, and enforcement. Passing the human right to water at the national level would enable similar progress across the nation. Alongside legislative change, quantifying the potential health and economic benefits of investing in universal water access would strengthen the case for increased funding. In the developing world, every dollar invested in water and sanitation access yields a fourfold return in reduced healthcare costs.⁹⁶ The Indian Health Service has found that every dollar spent on sanitation facilities in tribal areas in the United States has at least a twentyfold return in health benefits.⁹⁷ Similar analyses should be conducted at the national level.



Promising solutions:

The Center for Rural Enterprise and Environmental Justice, founded by Catherine Coleman Flowers, brings national attention to water and sanitation crises in rural communities. Flowers' advocacy shows that water and sanitation access is a public health emergency: rural communities are being exposed to water-borne illnesses and parasites like hookworm that were thought to have been eradicated in higher-income countries like the United States.⁹⁸ Health risks are being exacerbated by climate change, as erratic precipitation floods septic systems. Through collaboration with researchers, journalists, and universities like Baylor, Columbia, and Duke, Flowers' work illuminates the urgent need for immediate solutions to water access crises and leverages institutional resources to better understand the challenge.



Provide interim measures while developing permanent solutions



Providing immediate aid is crucial to protecting public health and quality of life while longer-term solutions are developed. Our qualitative research in six communities show that some places—like those in California or Texas—are well-suited to centralized infrastructure from an engineering perspective; while in others, this type of infrastructure is logistically unfeasible. Some communities that are good candidates for centralized infrastructure merely lack the funding or technical capacity. Targeted technical assistance and flexible funds are needed to help communities without water service develop infrastructure or consolidate with other systems.

In the interim, measures like water delivery and “point of use” filters are needed. Policymakers and funders should support grassroots direct service providers like food banks and faith-based projects, since they are often the first responders during water emergencies. These organizations are well-positioned to address water access challenges because they know the social and physical landscape, and they have built trust with communities.

Many people we interviewed expressed shame and fear of speaking out. Undocumented immigrants and low-income people of color may fear any interaction with authorities. Partnering with trusted organizations to provide emergency services can ensure that residents will use them. Despite the critical role they play, direct service providers often lack the capacity to apply for grants. Foundations can actively seek out new grantees, streamline application processes, and offer more flexible, unrestricted funding. They can nurture local water leadership by helping local organizations focus explicitly on water and sanitation.

Promising solutions:

Five Loaves & Two Fishes Food Bank distributes bottled water to the people of McDowell County, West Virginia, one of the poorest counties in the nation. Many county residents don’t have access to clean, running water, but some are wary of seeking assistance because of the stigma attached to water access issues. Five Loaves & Two Fishes has become an essential resource for people that might not otherwise seek help. Their staff make regular visits to deliver bottled water to residents who are elderly, homebound, or without access to transportation. They also use these delivery trips to check on isolated residents and connect them to other resources and services. In a context where many residents live in remote areas, the food bank’s role as a trusted community resource grants them access that other organizations might not have.



Develop alternatives to traditional infrastructure

Some communities that lack access to water and sanitation are simply too small and remote to support centralized water systems. This is especially true in the more far-flung Texas *colonias* or in isolated communities on the rural Navajo Nation. Other regions have environmental conditions that make traditional solutions prohibitively expensive. In the Black Belt region and certain parts of Puerto Rico, traditional septic systems don't work because the soil can't absorb liquid waste.

The current regulatory and funding framework favors centralized infrastructure. We need to expand options for service delivery and management that are somewhere in-between municipal utilities and individual systems. Small-scale wastewater systems that serve a cluster of homes are a promising option for areas where individual septic systems are not viable. Communities can create an on-site management entity to maintain household septic systems or test private wells. In other places, community-run collectives might deliver treated water from central wells to household cisterns. Strategies like rainwater harvesting, water reuse, graywater systems, community water kiosks, fecal sludge management, biodigesters, microgrids, or remote monitoring can be effective in extreme environments and are easier to adapt to population or climatic shifts. These approaches often have reasonable maintenance fees after an up-front investment. Regulators can create standards, guidelines, and targeted technical assistance for safe, decentralized infrastructure. Foundations, government, and the private sector can assist with start-up costs and organize communities around solutions that they may not know exist. They should also ensure that infrastructure alternatives provide dignified, acceptable services by supporting community members in leading design processes and making informed decisions.

Promising solutions:

The Navajo Water Project (NWP) brings clean, hot-and-cold running water to off-grid homes in rural New Mexico, Arizona, and Utah for the first time, using wells, water trucks, and solar-powered Home Water Systems. The project uses proven WASH strategies developed for use in lower-income countries to solve water access challenges

in the United States. Guided by a council of local leaders, the NWP installs stand-alone Home Water Systems designed by DigDeep. These include an underground water cistern, pump, filter, heater, sink, and drain. They are filled by truck from a series of regulated drinking water wells operated by local partners. Water rates are set by the local community; in some cases, water delivery is free. For off-grid homes, the systems also include solar power. Thus far, the project serves 220 households in nine chapters (local government entities) in New Mexico, and has expanded into Utah and Arizona. The NWP aims to create a low-cost, low-tech water system that is community owned, operated, and managed—creating thriving local economies, vibrant communities, and healthy ecosystems.

The Salinas Valley Distributed Water Treatment Project, a pilot being developed by the University of California, Los Angeles, Department of Chemical and Biomolecular Engineering, and Institute of the Environment and Sustainability, takes a similar approach to decentralized infrastructure. The project will provide safe and affordable drinking water for small, low-income housing developments that are far from existing water systems, through distributed reverse osmosis membrane treatment.⁹⁹



2. DEPLOY RESOURCES STRATEGICALLY

Closing the water access gap will require rethinking the axiom that all water and wastewater systems must be financially self-sufficient. Americans receive water and wastewater services in one of two ways: if you live in an area served by municipal water and sewer lines, your utility is expected to cover operations and maintenance costs using ratepayer dollars; if you are too far from municipal systems, you are responsible for installing a private well and septic system with minimal technical assistance or outside funding. Financial self-sufficiency is enshrined in nearly every law, policy, and funding program for water and wastewater systems, yet remains out of reach for many systems and homeowners because of economic, environmental, and technical challenges. This is particularly true for the communities that did not benefit from government investment in water infrastructure during the twentieth century. They need additional support from government in the form of grants, loans, and resources for operations, maintenance, and technical assistance. The philanthropic and private sectors can help by exploring new technologies and more creative funding sources.



Expand and refocus federal and state funding



The rural, low-income, and tribal communities we surveyed cannot cover operations and maintenance costs through rates alone; they require increased government support. In many places with water and wastewater systems, rates are already unaffordable for low-income residents; water rate affordability is a growing concern around the country, as the cost of maintaining aging infrastructure pushes utilities to raise rates. Affordability is a top-of-mind issue for water systems in urban areas,¹⁰⁰ and our research found that it is equally urgent for low-income people in rural areas. These communities require increased financial support from government to keep systems compliant, meet public health standards, and expand to areas that lack access.

The federal government should expand funding sources like State Revolving Funds, Community Development Block Grants, and USDA-Rural Development (RD) grants, and make them more accessible by offering larger proportions of grants (versus loans) and including operations and maintenance (O&M) funding. Agencies like USDA, EPA, and the Economic Development Administration can co-fund projects to make more grant money available. Technical Assistance (TA) providers also need increased funding. They are instrumental in helping understaffed systems navigate funding applications, manage operations, become financially sustainable, and meet regulations, but the need outpaces existing TA financial capacity. Funding should be expanded for trusted TA providers like the Rural Community Assistance Partnership, Rural Water Associations, the Indian Health Service, and Environmental Finance Centers.

Agencies can lower barriers for small systems by simplifying application and reporting processes. Agencies like USDA and EPA can streamline that process by creating a “one stop shop.” For example, the state of Montana has a single application for multiple agencies offering water and wastewater funding.¹⁰¹ Agencies can also make these application processes uniform across states, making them easier for tribal entities whose territories often cross multiple state lines. Restrictions on public funding should be loosened to allow innovative approaches like water delivery and on-site wastewater treatment to reach scale. Public funding should be made available to WASH nonprofits as well as government agencies.

Promising solutions:

In 2019, the State of California passed State Bill 200, establishing the Safe and Affordable Drinking Water Fund, which will provide \$1.4 billion over 11 years with the aim of ensuring equitable access to clean water.¹⁰² The Fund will be used for water infrastructure projects, prioritizing disadvantaged communities. It includes significant funding for operations and maintenance, which is a departure from most water funding initiatives and a crucial resource for water systems struggling to cover basic costs. SB 200 passed thanks to years of advocacy from a coalition that included the Community Water Center, Leadership Counsel for Justice and Accountability, and Clean Water Action; and with the support of a diverse array of stakeholders that included agricultural interests and communities. SB 200 strengthens the state’s commitment to the human right to water. Unlike one-time bonds, the Fund provides continuous funding, ensuring that resources for water access are not vulnerable to shifts in the political climate.



Create funding options for household-level infrastructure



Current funding and regulatory structures have a blind spot when it comes to domestic wells and septic systems. Our research found that this lack of oversight is creating a public health crisis for vulnerable communities. About 15 percent of the population, or 43 million people, supply their own water from wells or springs, and about 20 percent of households rely on septic systems.¹⁰³ Private systems are just that—private—and their owners are responsible for constructing and maintaining them. There is very little regulation for household-level infrastructure; the Safe Drinking Water Act (SDWA) does not apply to domestic wells, and water testing is often voluntary or haphazard.¹⁰⁴ Regulation for household septic systems varies from state to state, and it is often unclear which state agency is actually responsible for overseeing them.

It is time to rethink funding for household-level infrastructure, acknowledging that many vulnerable communities rely on domestic wells and septic systems. Well and septic system owners lack access to government funding and technical assistance available to community water systems. State and federal agencies should create or expand funding and technical assistance programs for these private systems, prioritizing grants and zero-interest loans for low-income Americans. Access to new household-level funding will become especially important as more stringent regulations for septic systems come into effect, as is the case in Puerto Rico, where building codes were updated after Hurricane Maria. County health departments can support domestic well and septic system users by providing technical assistance, resources, and information on health risks. Philanthropy can support organizations that drill wells, install septic systems, or maintain household-level infrastructure in the absence of state and federal programs.

Promising solutions:

USDA Rural Development offers funding for private wells through the Household Water Well System Grant Program. The program, available to rural areas, tribal areas, and the *colonias*, offers grants that enable nonprofits to set up low-interest loan funds for low-income homeowners to use

when constructing or upgrading wells.¹⁰⁵ One of the program's beneficiaries, the Water Well Trust, provides loans to low-income households that do not have access to a water system in Arkansas, Georgia, New Mexico, and other areas. They offer loans of up to \$11,000 per household for drilling wells, which can be paid back over 20 years at an interest rate of only one percent. Their funding has brought running water to the homes of families that previously relied on hauling water.¹⁰⁶ The Southeast Rural Community Assistance Partnership also receives funding from the USDA program to help low-income homeowners assess, repair, and replace their wells.¹⁰⁷



Build a domestic Water, Sanitation, and Hygiene (WASH) sector

The global WASH sector is a well-established field where government collaborates with an ecosystem of dedicated funders and implementing partners to improve water access in low- and middle-income countries. These funders and implementers often align strategies, both internationally and regionally, and their combined efforts to improve water and sanitation access have helped many countries move closer to meeting UN Sustainable Development Goal 6. Although many global WASH organizations are based in the United States, they rarely focus on domestic water access, and there is no comparable ecosystem here. Public funding is limited, and philanthropic support for domestic water access projects is insufficient, fragmented, and difficult to access. Philanthropic and private funding that is accountable to communities and responsive to their needs can be an important supplement to public funding.

Private and philanthropic WASH funders are needed to define the crisis, coordinate investment, motivate government, and support creative solutions that government does not fund. American WASH funders should intentionally build a domestic water access community that mirrors the clusters and learning groups engaged in international work. This would allow them to develop best practices, evaluate impact, and build community capacity. In places where public investment is stymied by outdated laws and practices, philanthropic investments can help communities surmount barriers to government funding; alongside advocacy to remove those legal barriers. For example, in rural communities without any infrastructure, philanthropic investment in services like roads and electricity can be used to bring down the cost per connection for other services like water and sewer lines, triggering state or county investment. Once these communities have improved services to the curb, homeowners can apply for additional funding like HUD grants to improve their dwellings and bring interior plumbing up to code.

Promising solutions:

Conditions in US communities with water access challenges like lack of indoor plumbing, contaminated wells, and water-borne illnesses are similar to those found in low-income countries. For example, using public taps during water outages is common both in Appalachia and in Brazilian favelas. Some global WASH funders and practitioners have realized that their experiences working in other countries are applicable to the United States as well. The United Methodist Committee on Relief, which implements WASH solutions around the world, is funding the installation of portable sanitation systems for Alaska Native villages that have to relocate because of climate change.¹⁰⁸ The Portable Alternative Sanitation System includes rainwater catchment, water filtration, low-flow fixtures, and a toilet that separates and treats liquid and solid waste.¹⁰⁹ Water Mission, an international development and disaster relief organization, began to work in Puerto Rico after Hurricane Maria. Drawing on expertise gained from working in 55 countries worldwide, Water Mission connects rural water systems to solar panels, ensuring that communities will be resilient to future storms.¹¹⁰ And DigDeep, an organization dedicated to providing clean running water, relocated its programs from South Sudan to the Navajo Nation in 2016, recognizing that global WASH best practices could be leveraged to solve the water access crisis in the United States.



3. BUILD COMMUNITY POWER

Equitable solutions to the water access crisis will depend on the leadership of the communities most impacted. Community-led initiatives are more successful at building local capacity, fostering collaboration, and creating feelings of ownership.¹¹¹ Community members understand the historical barriers to access better than outsiders, and are better positioned to help their neighbors navigate complex decision-making. Other stakeholders can support local leaders by bringing visibility to the issue, making water governance more inclusive, and creating opportunities for peer exchange.



Use data to bring visibility to communities

The United States does not currently have a central, reliable data source that tells us how many Americans lack water and sanitation access, meaning there is no baseline against which to track our progress towards meeting Sustainable Development Goal 6. Researchers must stitch together incompatible datasets to approximate this number. The primary sources of national water access data are the decennial census and the American Community Survey, but the data quality has deteriorated in recent years as questions were removed, and the Census Bureau undercounts the populations most likely to lack access (for further discussion of this issue, see the national data findings section on page 18). Other agencies like HUD and EPA collect data relevant to water access challenges, but it isn't standardized, creating redundancies and gaps. Incomplete data obscures the scope of the challenge, removing the sense of urgency to develop solutions.

The Census Bureau should revamp its current question on complete plumbing access to again include toilets, and add questions on wastewater services, water quality, and cost. Federal agencies should streamline data collection for water access indicators and designate one agency as the lead clearinghouse. Existing data sources can be made more relevant to water access issues. The United States Geological Survey, which collects data on water quality, groundwater levels, and water use, could release new datasets more frequently if it had more funding.¹¹² The American Housing Survey, which includes questions on plumbing access, could sample more extensively in rural areas. Centralized data would make it easier to identify communities most at risk, by analyzing factors like wells that are at risk of failing, contamination threats, and persistent Safe Drinking Water Act or Clean Water Act violations. This would create an early warning system to inform a targeted response. Federal data collection must be accompanied by outreach to vulnerable communities to assist them in using data for advocacy and designing solutions.

Promising solutions:

Data can illuminate the ways that water access crises affect community health and wellbeing. Johns Hopkins Center for American Indian Health (JHCAIH), with support from the Robert Wood Johnson Foundation and Osprey Foundation, is studying how water security impacts water consumption, sugary beverage intake, weight status, and overall health among mothers and their infants and toddlers on the Navajo Nation. The Center is also exploring the causes of water insecurity, the strategies that families use to obtain safe water, and the potential for water quality testing in homes, in order to identify solutions and influence policy change. The findings from these two efforts will support the case for improving water access on the Navajo Nation.



Support community water governance

Community leadership is key to building equitable water access. Creating pathways to meaningful participation for residents is an important step to building systems that serve everyone. Beyond just attending meetings, there are opportunities for residents to serve on local water and sewer boards and associations. Foundations and nonprofits can help communities identify opportunities for participation in governance and provide financial support for costs like transportation and childcare. No matter their level of education, residents may need help understanding complex technical systems that govern water treatment, service delivery, and rate-setting. They also may require mentorship and support to navigate the stressful and isolating aspects of serving on a water board or association. Once they've taken positions of leadership, community members should prioritize public awareness and ensure that information is widely available in languages that residents speak.



Promising solutions:

The Community Water Center Action Fund, with the support of the Water Foundation, creates pathways to water leadership from vulnerable communities. In the southern San Joaquin Valley, 75 out of 109 water boards didn't hold an election from 2014 to 2018 because seats were not contested. The lack of competitive elections meant that the same people served for decades, and they often did not reflect the constituents they're there to represent: in 2018, less than 15 percent of water board members in the region were Latinx, although the area's population is majority Latinx.¹⁴ The Community Water Center recognized that guaranteeing equitable water access depends on supporting elected officials that are accountable and responsive to their constituents. The organization formed the Action Fund, which offers information and mentoring for residents interested in running for water boards and convenes a cohort of water board and city council members focused on equitable water access. In 2018, five candidates supported by the Action Fund were elected to city councils and community services district boards in the Central Valley. Now in office, they are advocating for more equitable water services. The Action Fund's approach to water governance has the potential to redefine the role of water boards. While they are traditionally seen as mechanisms for ensuring financial and managerial capacity for water systems, they can be tools for vulnerable people to achieve a voice in governance.



Build relationships between communities with water access challenges

Building relationships between areas facing similar challenges would break down the sense of isolation and stigma caused by water access challenges and enhance visibility and agency to advocate for solutions. Foundations could offer support for building a cohort of leaders who would address water access issues around the country. They could bring these leaders together to facilitate knowledge exchange, promote context-specific solutions, and offer training. This would create opportunities for identifying strategies that could work across multiple regions. These leaders should also be in discussions that are already happening around issues like equitable housing, transportation, public health, immigration, employment, and environmental concerns like air quality.

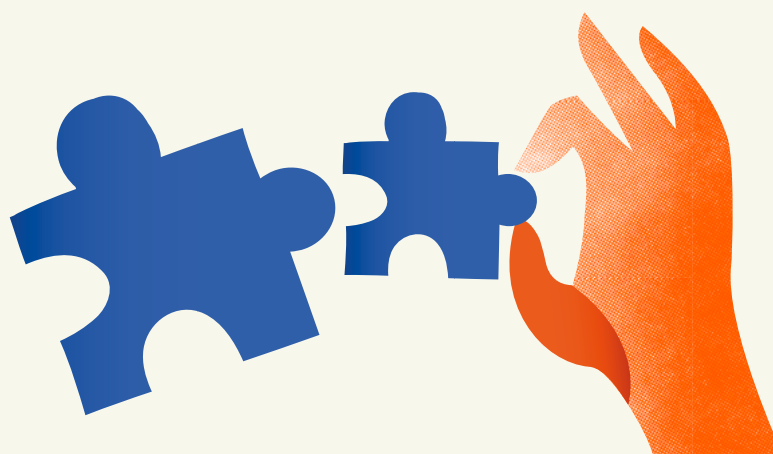


Promising solutions:

The Mni Ki Wakan (Water is Sacred): World Indigenous Peoples Decade of Water Summit is convened by Indigenous peoples and youth from diverse regions, in partnership with Indigenous organizations, environmental organizations focused on water, nonprofits, human rights advocates, and global actors. Mni Ki Wakan recognizes the fact that Indigenous peoples worldwide are stewards to 80 percent of the world's biodiversity across land and water and oversee one-fourth of the world's land outside of Antarctica. The Summit centers the expertise and traditional knowledge of Indigenous peoples, creating spaces for strategic innovations that amplify Indigenous voices on water. Mni Ki Wakan focuses on issues identified by Indigenous peoples, including water policy, Indigenous human rights, biodiversity, education, arts, food sovereignty, self-determination, collective innovation, and Indigenous knowledge. Mni Ki Wakan was announced in 2016 at the United Nations and held in 2017 in the Great Lakes Region in response to the escalating global water crisis. Since then, a growing global Indigenous community has emerged that includes delegations from the Canada First Nations, sub-Arctic region, Aotearoa/New Zealand, Hawai'i, Guam, North American Indigenous peoples, and allies. In 2019, Mni Ki Wakan urged the United Nations Expert Mechanism on the Rights of Indigenous Peoples in Geneva, Switzerland to initiate a global Indigenous water study, a global Indigenous water summit, and Indigenous coordinating water bodies.

4. FOSTER CREATIVE COLLABORATION

Water access crises are inextricably linked to other socioeconomic and environmental issues. The communities we surveyed often lack a range of services: reliable electricity, safe housing, paved roads, sidewalks, hospitals, schools, grocery stores, and community centers. Situating water access challenges within a larger context can promote solutions that address multiple challenges at once. These solutions include new forms of cooperation and mutual support between water systems, as well as a range of non-traditional partners across technology, public health, energy, food security, environmental justice, and philanthropy. We must focus on collaboration, knowledge exchange, and multi-benefit solutions.



Support system consolidation that benefits communities

The US has more than 49,000 community drinking water systems¹¹⁵ (compared to 15,000 wastewater systems), and 54 percent of them serve 500 people or fewer.¹¹⁶ While many of these small systems work well, some lack the technical, managerial, or financial capacity to provide services, due to declining funding, shrinking tax bases, persistent poverty, and understaffing. Other communities lack any infrastructure at all, despite being near functioning water systems. Communities struggling to provide services don't have to go it alone: consolidating systems or building knowledge- and resource-sharing partnerships can improve access and build economies of scale. "Consolidation" is a spectrum of practices rather than a one-size-fits-all solution—in some instances, areas that lack service are connected to neighboring systems; in other cases, two or more utilities merge to form a single system; or systems remain physically separate but consolidate management to leverage staff capacity. California recently passed Senate Bill 88, allowing the state to enact mandatory consolidation for areas without water access near functional systems; although systems generally consolidate voluntarily.

Consolidation should only be pursued if it will lead to better outcomes for all communities involved. Sometimes increased funding and technical assistance for struggling systems is more effective. If consolidation is the appropriate choice, policymakers should be aware of power dynamics and ensure that all stakeholders have a voice in negotiations. The process is more likely to succeed when there are "wins" for every community involved. If possible, states should pay for the new connections in low-income areas where they would otherwise be out of reach. Even if consolidation isn't the best option, small systems can consider other forms of collaboration to build their technical, managerial, and financial capacity. Small systems can pool resources by working together to purchase supplies or arrange staff trainings, building economies of scale without fully merging their operations.

Promising solutions:

The State of Kentucky has been a leader on regionalization of water systems, demonstrating that it can make water service more cost effective and benefit the local economy. The Logan Todd Regional Water Commission, an entity formed from the consolidation of 12 utilities, provides more reliable water services and has attracted new business to Logan County. The Commission was formed in response to several water quality challenges and water shortages in the county in the late 1980s. Under this arrangement, the 12 distribution systems share a central water treatment facility, lowering costs and managerial burden. The regionalization was made possible by a large USDA loan and benefitted from state-level policies that encourage regionalization.¹¹⁷

In California, the residents of East Porterville lost access to running water in 2014 when wells went dry due to drought. The State of California declared an emergency and used emergency response funds to deliver water to residents and cover the costs of connecting to the water system in Porterville, a neighboring town. Through this consolidation, 750 households were able to get connected in about two years. Today, East Porterville residents enjoy safe, clean, running water.

In an example of pooling resources without physical consolidation, the Alaska Native Tribal Health Consortium runs the Alaska Utility Supply Center, which provides water and wastewater utility equipment at a discount to 150 Native communities.¹¹⁸



Bring market expertise to the water access challenge

Water systems of the future will look very different than they do today. Large utilities are already experimenting with bold new technologies as they adapt to climate change, population shifts, new regulations, and rising costs. Wastewater plants in cities like Milwaukee and Chicago are generating biosolids for fertilizer. Cities like Los Angeles and Tucson are exploring water reuse. Treatment plants are moving to green energy sources to reduce their carbon footprints and become more resilient during natural disasters. These new approaches are the future, but transitioning old infrastructure will be time-consuming and expensive. Communities that lack water access are better candidates for new water and wastewater technologies because they do not have outdated systems that need to be retrofitted. With the right support, they can leapfrog old technology, moving directly from low-tech to high-tech systems. Leapfrogging to resilient infrastructure may sound daunting for low-income communities. That's where the private sector can help.

The private sector has the capacity to design and pilot new technologies to ensure that they are safe and effective, and they can work to build economies of scale that lower the costs of new technologies, making them more accessible. In the US, the private sector should leverage advances in technology like remote monitoring, atmospheric water generation, filtration, artificial intelligence, and more to solve tough water access challenges. Private companies in sectors like technology and engineering can sponsor “moonshot challenges” to encourage the development of new technologies and incorporate water access into their Corporate Social Responsibility initiatives; they should offer open-source technologies and allow communities to adapt them to their unique needs. Private sector companies can also assist in market innovation. While new technologies are important, it is equally critical to ensure that the market brings these technologies to the end user at an affordable price.



Promising solutions:

Competitions leverage private sector expertise and resources to develop new technologies and create markets for solutions to seemingly intractable problems like water access. Water Abundance XPRIZE, a moonshot competition sponsored by the Tata Group and Australian Aid, aimed to revitalize the market for atmospheric water generation. While this technology has the potential to provide safe, affordable water to vulnerable communities that lack access, it has been held back by low efficiency and lack of awareness. Industry experts analyzed the market and determined that a competition would stimulate interest in the technology and drive innovation. XPRIZE offered competitors \$1.75 million for the creation of a device that uses 100 percent renewable energy to generate at least 2,000 liters of water per day for a cost of no more than two cents per liter. Teams were required to design and test their devices and create business plans showing they were financially viable. The winning team, California-based Skysource/Skywater Alliance, improved on existing technologies to develop a system capable of generating water at a much larger scale, making it a promising option for communities that lack water access. Their system is attracting interest from investors, governments, and corporations.¹¹⁹

Design multi-benefit solutions

Water touches everything; it is inseparable from other social and environmental challenges and can be an essential part of multi-benefit solutions. Water is also a powerful engine of transformation. Investing in water access is one of the most fundamental ways to drive economic growth and put neglected rural areas on the path to stability and prosperity. Intentionally approaching related issues through the lens of water has the potential to create more resilient communities.

Organizations working for water access should partner with those focused on workforce development, public health, food security, climate resilience, and renewable energy. Building and maintaining water systems creates opportunities for jobs and new development, especially for communities that have never had infrastructure and will be building new systems. Job training and skill building programs for water systems can be tailored to small water systems—for example, by creating joint operator positions with other local services in order to offer full-time jobs,¹²⁰ or by connecting to green job initiatives. Partnering with broader rural workforce initiatives like USDA Rural Development’s Rural Workforce Innovation Network is one promising strategy. Interconnected challenges create opportunities for holistic solutions: for example, access to clean water could help West Virginians grow healthy food through hydroponic agriculture. In Puerto Rico, clean water access could build food sovereignty and reduce dependence on imports. Adapting water systems to climate change presents another opportunity to expand infrastructure and create water sector employment. Climate resilient systems are often decentralized and household-scale, allowing communities a greater degree of control and involvement.



Promising solutions:

The International Association of Plumbers and Mechanical Officials (IAPMO) is working with DigDeep and Navajo Technical University to build job skills and expand economic opportunity on the Navajo Nation. IAPMO will build a wet lab for a nationally accredited plumbing certificate program, and Navajo students will have access to classroom, lab, and field training in plumbing skills for the first time. Students will have the option of working with instructors on a plumbing project for a local household. Upon graduating, students will have several potential paths to follow, including apprenticeships with local unions, working on small residential plumbing projects within the Navajo Nation, or pursuing an advanced training certificate in plumbing. This training program, the first of its kind in the country, will help fill a critical need for plumbers on the country’s largest reservation. Current options for Navajo Nation residents in need of a plumber can be difficult and prohibitively expensive.



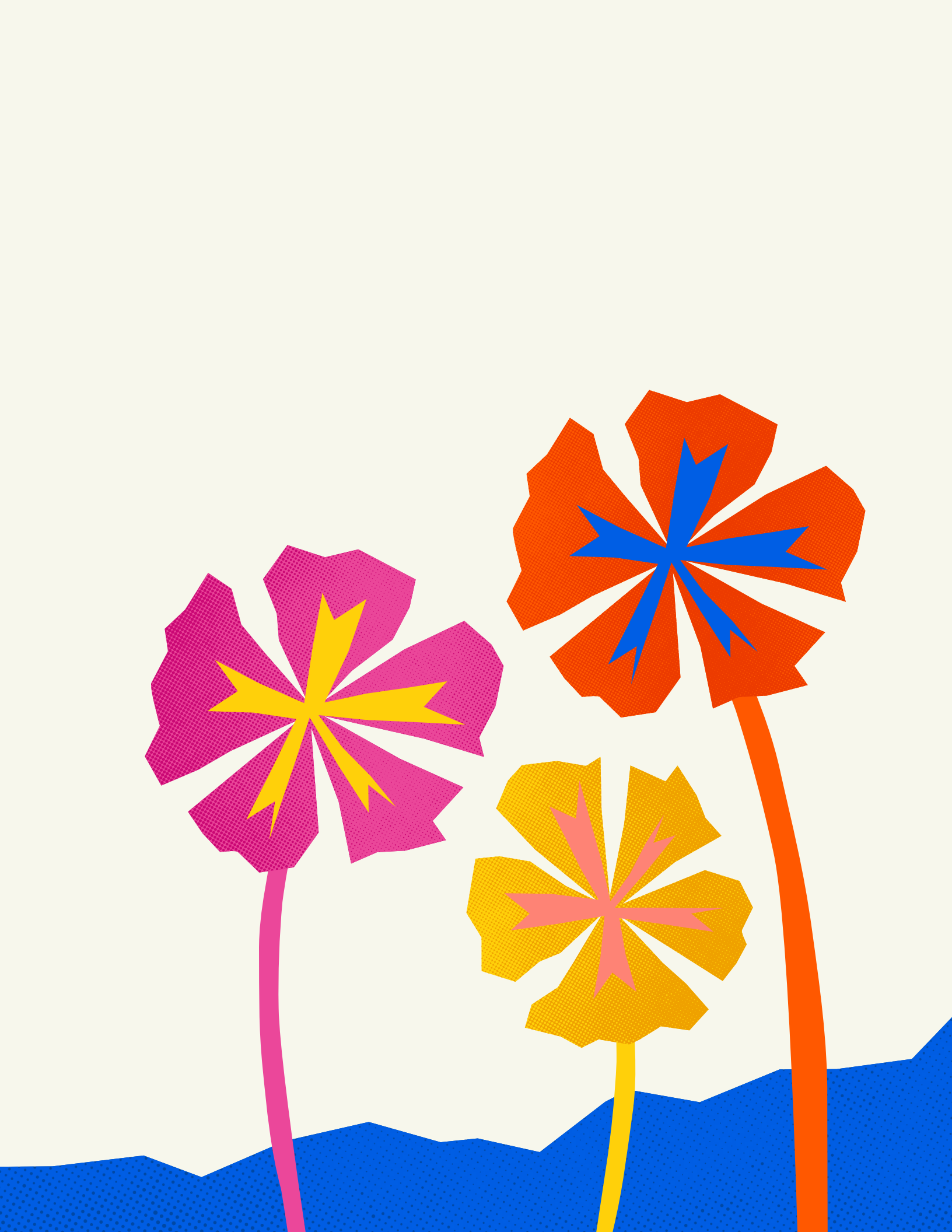
CONCLUSION

In 2013, residents of East Porterville, California, lost the running water that they, like most people in America, had always counted on. Wells went dry during a record-breaking drought, and residents lived without services for several years. In response, they dug-in and began organizing. A local charitable organization held bottled water drives and distributed water tanks to homes. Their efforts spurred the city to begin delivering water, and later the state stepped in and funded larger storage tanks. Eventually the drought subsided, and thanks to grassroots organizing and advocacy, East Porterville residents were able to connect to neighboring Porterville's water system. Today, they can turn on their taps and expect clean, safe running water again.

The ingenuity and resilience of communities like East Porterville charts a path for the rest of the nation. The United States, with its vast resources, technological expertise, and long-standing commitment to improving public health, must eliminate the water access gap by ensuring that all people can easily access safe, running water; enjoy the convenience of an indoor tap, toilet, and shower; and know that their household wastewater is treated in a safe and healthy manner. We must make sure that the hard-won gains of earlier eras are not slowly lost, and that those who possess access to clean water and sanitation today do not lose it tomorrow as a result of antiquated infrastructure, public disinvestment, and climate change.

In this report, we have not only defined the scope of the longstanding water access challenge in the United States, and explained why it has managed to stubbornly persist, but we have tried to give it a human face. This is not an abstract issue for those affected, but a daily, real-world crisis that creates great hardship in the lives of our neighbors. We have also laid out an action plan that entails reimagining the solution, deploying resources strategically, building community power, and fostering creative collaborations. For each of these steps in the action plan, we have identified some of the most promising practices and models that can be employed.

More than two million Americans have fallen into the water access gap, but that's not the end of the story. We can build a future where everyone in the United States can drink water from the tap and flush their toilet without a second thought, knowing that they have safe, reliable services. Through the collaboration of an array of supporters, from government to nonprofits to utilities to communities themselves, families in places like East Porterville can realize the health and prosperity that every American deserves.



APPENDIX

National-level data analysis

The goal of our national-level analysis was to understand the distribution, demographic, and other attributes associated with the lack of access to plumbing in the United States. We were explicitly building on the county-level analysis done in the 2004 report *Still Living Without the Basics*. We wanted, however, to better understand the sub-county dynamics, while allowing for future analysis of relationships to compliance with drinking water and water quality standards, health data, and data on governance (such as voting data). This required data that could be aggregated to the county level. We used census tract data on household access to complete plumbing facilities from the American Community Survey 2010-2014. We conducted multi-variate regression analysis—specifically hierarchical linear modeling (HLM)—to analyze the significance of the relationship between household access to complete plumbing and community level characteristics, such as the median household income, level of poverty, and percent of the population from a particular race. We report the statistically significant findings.

Significance level: Our analysis used a 0.5 level of significance, allowing for no more than a five percent chance that observed relationships were mathematical anomalies.

Observations: Our analysis included 50 states, 3,142 counties and county-equivalents, and 73,056 census tracts. We analyzed Puerto Rico separately because the census only includes data on the island through 2007.

Missing values: The number of missing values was modest with a proportion at 0.0003, with incomplete cases at 1.71 percent; the highest percentage household income (0.9 percent). Because of confidentiality concerns, the ACS did not allow us to see 940 census tracts, due to the low proportion of people lacking plumbing, which left us with 72,116 complete cases in this analysis.

IPUMS data: We used the Integrated Public Use Microdata Sample to tabulate the actual estimates of the percent of each race (including

Hispanic/Latino) who lacked complete plumbing facilities. We also used IPUMS data to disaggregate the questions that make up the estimate of household units as having or lacking complete plumbing facilities. Using this data set, we were able to estimate what percent of those lacking complete plumbing lacked a hot and cold running water, shower, or toilet. Our analysis used the Public Use Microdata Area from the year 2014 with 14,864,242 completed observations.

Variables: We analyzed the influence of race, economic status, income inequality, and proximity to urban areas on access to complete plumbing. We define these variables as follows:

- **Race:** We used the five categories specified for the US Census by the Office of Management and Budget: White, Black or African American, American Indian or Alaska Native, Asian, and Native Hawaiian or Other Pacific Islander; as well as Hispanic/Latinx and “Some Other Race” or “More than One Race” categories.
- **Economic status:** We used median household income (MHI), educational attainment (percentage without a high school diploma), and unemployment rate.
- **Income inequality:** We used the Gini Coefficient, an index of the level of income inequality measured by calculating the difference in income across income percentiles that ranges from 0 (perfect equality) to 1 (perfect inequality). In 2008-2009 the US Gini Coefficient was 0.39, compared to 0.48 for Mexico, the nation with the world’s highest inequality.¹³¹
- **Proximity to urban areas:** We used the “Urban Influence Code,” developed by the USDA Economic Research Service to rank counties based on urban proximity. The code runs from 1 (a county entirely encompassed by an urban area) to 12 (a county distant from an urban center).
- **Other variables:** We also measured the impacts of sex (percentage male or female), age (average age), and tenure (percentage homeowners or renters).

Tools: We used the program R to perform statistical analysis. Mapping was carried out using *Policy Map* which allowed us to map the ACS data for complete plumbing facilities at the national, county, and tract level.

AREAS FOR FURTHER RESEARCH

Many issues were beyond the scope of this report but deserve further research as we commit to solving this problem once and for all.

Geographical hotspots. There are many other regions with severe water access challenges that merit further research, including Native Alaskan villages, tribal areas in the Dakotas, and territories like the US Virgin Islands.

Communities on the verge of losing water and sanitation access. Our qualitative research suggested that many communities could be on the verge of losing the tenuous water and sanitation access they currently have. This could be quantified by analyzing datasets on areas with diminishing groundwater supply, increasing levels of contamination, or numerous water system violations.

Homelessness. For the 553,000 Americans estimated to be experiencing homelessness, the lack of continuous access to running water and toilets is linked to hepatitis¹²¹ and other health issues.

Workers. Truck drivers, temporary workers, call center staff, factory workers, and others may be denied access to clean water or toilets on the job, creating public health risks and violating workplace regulations.^{122 123}

Mobile homes. Mobile homes are 2.5 times more likely to lack complete plumbing,¹²⁴ and water systems serving mobile home communities are more likely to be in violation of health standards.

Substandard housing in urban areas. Urban populations in California, New York, and Texas lack sufficient water access¹²⁶ partly due to people living in low-income housing with shared bathrooms, such as Single Room Occupancy hotels.¹²⁷

Incarcerated people. US prisons have a water access problem, from California prisons limiting showers during the drought¹²⁸ to guards punishing prisoners by denying them drinking water¹²⁹—in at least one case resulting in an inmate's death from dehydration.¹³⁰

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