



 West Virginia University
BRIDGE INITIATIVE FOR SCIENCE & TECHNOLOGY
POLICY, LEADERSHIP, AND COMMUNICATIONS

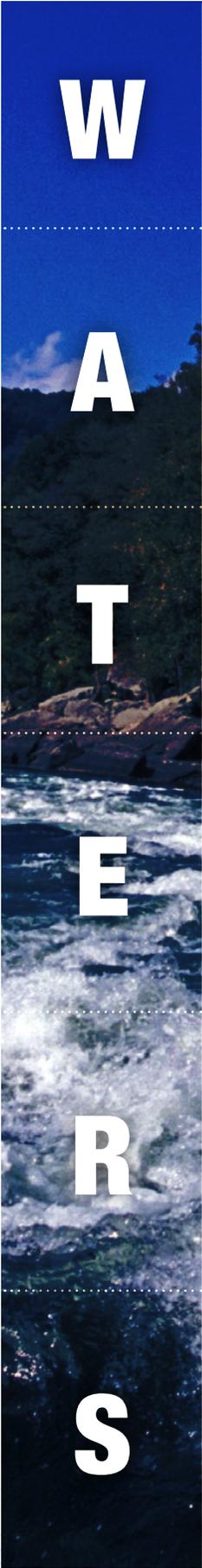
THE WATERS OF WEST VIRGINIA

A Science & Technology Policy Perspective

This policymaker’s guide is a product of West Virginia University’s [Bridge Initiative for Science and Technology Policy, Leadership, and Communications](#). The Bridge Initiative identifies challenges and opportunities facing West Virginia and provides a bridge between the science and technology expertise of WVU faculty and staff and West Virginia’s national, state, and local policymakers. In our work, we gather the views of stakeholders throughout the state to ensure we are making recommendations that serve the needs of West Virginians. This work supports WVU’s critical land-grant mission to lead “transformation in West Virginia and the world through local, state and global engagement.”

To read the full policymaker’s guide, please visit:
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**W**

Wake up to the full potential and challenges of West Virginia's abundant waters to support its people, business, industry, and job creation opportunities.

A

Advance West Virginia's water-related infrastructure so it is better prepared for ever-increasing extreme precipitation events to reduce flooding, which threatens human and economic health.

T

Together, West Virginians will work to provide access to clean and affordable water to protect and enhance public health.

E

Engage West Virginia communities to coordinate efforts to enhance the potential of water resources--which flow across political boundaries--to provide prosperity and well-being to all.

R

Revitalize West Virginia's water resources, and increase the state's resilience to meet the societal and economic needs of today's West Virginians and their future generations.

S

Showcase West Virginia's natural water resources by marketing their beauty and developing river-related recreation opportunities that increase tourism and recruit new businesses and residents.

EXECUTIVE SUMMARY

The waters of West Virginia are essential to the state's economy. From the water we drink to the rivers where we play to businesses and industries that provide our income, clean water is an essential element for West Virginia's future economic success. West Virginia's water resources are also precious to the nation. The headwaters of the Potomac and Ohio Rivers, which eventually reach 9% of the U.S. population, include waters that originate in West Virginia. These resources provide for quality of life, community development and resiliency, and economic opportunity.

Although West Virginia's water resources are the envy of others, we stand on a historical threshold where we must address the legacy of industrial and other activities that have compromised water quality and health in some of our rivers and streams, and also anticipate future challenges posed by climate change and an increased demand for water.

West Virginia is poised to stake its claim as the urban-rural nexus of the [Washington-Baltimore, DC-MD-VA-WV Consolidated Metropolitan Statistical Area \(CMSA\)](#) and the [Pittsburgh-New Castle-Weirton, PA-OH-WV CMSA](#). As a result, West Virginia can emerge as a nationwide draw for "amenity migration," where people move to places with a higher quality of natural environment to improve their quality of life.

People are increasingly drawn to West Virginia's unique Appalachian Mountain setting and superior natural amenities. The [United States Department of Agriculture's \(USDA\) new broadband initiative](#) could provide the technical resources necessary for amenity migrators. A new emphasis on West Virginia's natural resource amenities (whitewater rafting, mountain biking, rock climbing, caving, etc.) will enhance West Virginia's visibility as a [prime location for remote work](#), encouraging the [migration of new residents](#) and retaining existing residents. However, water-related amenities, such as clean drinking, surface and groundwater, quality wastewater management systems, flood prevention measures, and recreation infrastructure installation, are critical for this economic development plan to succeed.

The West Virginia University (WVU) [Bridge Initiative for Science and Technology Policy, Leadership, and Communications](#) worked with faculty and staff from across the university to examine the current state of West Virginia's water resources. This analysis incorporated the challenges and opportunities outlined above as well as the potential impact of changing climate conditions. WVU faculty and Bridge Initiative staff developed policy options based on these findings. Next, the Bridge Initiative hosted five topical roundtables to gather feedback on those options. Roundtable participants included key stakeholders interested in the waters of West Virginia from business and industry, government, and non-governmental organizations. Each roundtable was asked to review the policy options and

then prioritize them based on the criteria of effectiveness (likelihood of meeting the societal goal), efficiency ("best bang for the buck"), equity (winners and losers), and ease of political acceptability (the degree to which key policymakers and stakeholders might oppose or support the policy).

Based on this work, the WVU faculty and staff who developed this policymaker guide propose that West Virginia national, state, and local policymakers take actions that support the following principles:

- W**ake up to the full potential and challenges of West Virginia's abundant waters to support its people, business, industry, and job creation opportunities.
- A**dvance West Virginia's water-related infrastructure so it is better prepared for ever-increasing extreme precipitation events to reduce flooding, which threatens human and economic health.
- T**ogether, West Virginians will work to provide access to clean and affordable water to protect and enhance public health.
- E**ngage West Virginia communities to coordinate efforts to enhance the potential of water resources--which flow across political boundaries--to provide prosperity and well-being to all.
- R**evitalize West Virginia's water resources, and increase the state's resilience to meet the societal and economic needs of today's West Virginians and their future generations.
- S**howcase West Virginia's natural water resources by marketing their beauty and developing river-related recreation opportunities that increase tourism and recruit new businesses and residents.

The following table provides the top recommendations for each of these principles and illustrations detailing why each action is important for West Virginia.

Table 1: West Virginia University Bridge Initiative Waters of West Virginia Recommendations

ACTION	RECOMMENDATION	ILLUSTRATIONS OF WHY ACTION IS IMPORTANT TODAY
<p>Wake up to the full potential and challenges of West Virginia's abundant waters to support its people, business, industry, and job creation opportunities.</p>	<p>West Virginia's policymakers should take actions to establish or review (and, if necessary, reorganize) intercounty/ intercommunity councils to strengthen coordination and consistency, thus reducing the economic burden on local communities and enhancing their economic development.</p>	<p>West Virginia has 32 major watersheds--all of which cross political boundaries, such as county lines. Understanding watersheds is important because adverse conditions (such as pollution) that occur in one area of the watershed may flow to other parts of the watershed, impacting water quality and, consequently, drinking water and ecology. Because of this, water quality is not an isolated problem of any one water management system but is rather a concern of the region as a whole.</p> <p>West Virginia's county and municipal power and taxing authorities are limited and would benefit from reorganization and reconsideration of their authority.</p> <p>West Virginia's population is decreasing. This trend will continue unless West Virginia policymakers develop employment and economic initiatives, increase the availability of essential water-related services, and recruit a remote workforce to retain and increase West Virginia's population.</p>
	<p>West Virginia's policymakers should take action so that the state becomes an innovation leader in addressing challenges and opportunities related to water. This action should include institutional and financial support for technological innovations in wastewater systems that work for rural communities, underground pumped hydropower that utilizes abandoned coal mines, and testbeds to see if treated acid mine drainage (AMD) residue can be sold for commercial use.</p>	<p>Expansion of pumped hydropower energy storage in West Virginia could support both fossil and renewable energy sources by enhancing resiliency for West Virginia's energy utility system. Construction of such facilities could also provide an economic boost to rural development, generating jobs, economic growth, and tax revenue. These possibilities are especially promising for coal communities, where abandoned mines could be used for energy storage.</p> <p>Utilization of AMD sludge could both solve a current challenge related to storing the cleaned sludge and provide a potential revenue source to pay for AMD operations and management through use of the sludge as an economic resource. For example, the annual management cost of the Omega site near Morgantown is \$90,000 - \$100,000. The primary cost challenge is not the treatment of the water but rather the resulting sludge. If engineering methods could be found that provide beneficial uses for this sludge, then the costs of finding a home for the sludge would decrease and might even turn a profit that could help pay for AMD treatment.</p>

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<p>Advance West Virginia’s water-related infrastructure so it is better prepared for ever-increasing extreme precipitation events to reduce flooding, which threatens human and economic health.</p>	<p>West Virginia policymakers should facilitate coordination of regional approaches that bring together water and wastewater management organizations in multiple counties to improve economies of scale and reduce the cost of services to residents. Policymakers should also provide a pool of funding for the matching funds that are needed to apply for federal grants.</p> <p>These regional collaborations should write proposals for federal funding, manage and prioritize the allocation of the available matching funds, encourage brownfield development, and support investment on behalf of rural and disenfranchised counties and communities in their regions.</p>	<p>West Virginia’s small, rural communities often lack the financial, management, and technical staff to operate their current infrastructure and apply for grants and other support to improve their infrastructure.</p> <ul style="list-style-type: none"> » These small, rural communities often pay a higher cost for basic drinking water and wastewater services due to the smaller population from which to draw the revenue needed to build and maintain these facilities, or because they need to purchase their water and wastewater services from another entity. » Often, community members do not recognize the cost involved to produce clean drinking water, nor do rates cover the true cost of producing and transporting treated water. According to the West Virginia Public Service Commission (WVPSC), the cost for these sewer utility services can range from \$8 to \$92 for the same services, depending on location and circumstances specific to each system. <p>Functional drinking water and wastewater systems are important in making a good first impression on new visitors and businesses to West Virginia. For example, West Virginia’s New River Gorge National Park is called a “haven for hiking, climbing, and rafting” by National Geographic. The area surrounding it, however, can emit foul odors due to an insufficient wastewater management system. Similarly, Thurmond is a small, historical town with rave reviews on TripAdvisor and interest from new businesses and the National Park Service in commercial property and housing. The challenge for those interested? A lack of wastewater infrastructure. Without access to this vital infrastructure, development that would bring jobs to the region is at a standstill.</p>



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<p>Together, West Virginians will work to provide access to clean and affordable water to protect and enhance public health.</p>	<p>West Virginia policymakers should require that West Virginia Parks and Recreation take actions to educate and protect West Virginians and tourists from vector-borne diseases, such as Lyme's Disease, that are likely to become more prevalent due to increased extreme precipitation and heat.</p> <p>They should also require that the Department of Health and Human Services (DHHR) increase its surveillance and reporting; develop physician, healthcare provider, and public education materials; and implement a long-term Wastewater-Based Epidemiology (WBE) system to provide early warning of potential infectious disease outbreaks.</p>	<p>According to the Centers for Disease Control, the changing climate is likely to increase the presence of ticks and other vectors, thereby increasing the prevalence of vector-borne diseases:</p> <p>From 2000-2014, there were over 1,283 reported cases of Lyme Disease in West Virginia. According to the DHHR, "The number of counties reporting Lyme disease cases has increased in recent years." This reflects a nation-wide trend. According to the Environmental Protection Agency (EPA), "The incidence of Lyme disease in the United States has nearly doubled since 1991, from 3.74 reported cases per 100,000 people to 7.21 reported cases per 100,000 people in 2018.</p> <p>The EPA states the same conclusion: "Studies provide evidence that climate change has contributed to the expanded range of ticks."</p>



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<p>Engage West Virginia communities to coordinate efforts to enhance the potential of water resources-- which flow across political boundaries-- to provide prosperity and well-being to all.</p>	<p>West Virginia policymakers should take action to establish a grant program for communities to support outdoor recreation initiatives and a “bridge” bill to facilitate public access to West Virginia waterways.</p>	<p>Volunteers throughout West Virginia work together to develop and maintain the waterways in their regions through volunteer organizations such as Mon River Towns and the Elk River Trail Foundation. These organizations, however, need financial resources to undertake their work, which provides vitality, stability, sustainability, and prosperity to the surrounding region.</p> <p>This financial support is particularly important in currently distressed regions so these communities can attract new businesses and jobs. In Utah, for example, every dollar in state money spent to support outdoor recreation opportunities resulted in an additional seven dollars coming to communities from private sources. The result: 700 outdoor jobs were supported, primarily in rural Utah, over five years.</p>
	<p>West Virginia policymakers should propose that the USDA-funded Cooperative Extension Service and the Appalachian Community Technical Assistance and Training (ACTAT) programs support and educate rural communities on water-related economic development opportunities; provide guidance on the management of drinking water and wastewater; identify water recreation opportunities to enhance economic development; augment the water-focused curriculum in K-12 education; and work with community colleges to train staff for work in drinking water, waste water, and recreational water jobs.</p>	<p>The ACTAT team has provided training to over 163 small water and wastewater utilities from West Virginia, Kentucky, and Tennessee, positively impacting over 513,050 citizens. Training focuses on helping utility staff develop sustainable management practices in areas such as infrastructure stability, employee and leadership development, and financial viability.</p> <p>ACTAT works with small water systems from across West Virginia and other Appalachian states to advance the implementation of sustainable best management practices. For example, many small utilities lack a digital record of the location and condition of buried water and wastewater infrastructure and must rely on paper records or institutional knowledge to maintain this critical information. The ACTAT team works with utilities to digitize these records to improve system operation, using methods such as hydraulic modeling, which can support identification of leaks or other operational issues.</p> <p>ACTAT also supports utilities in conducting water audits and reducing the amount of water lost due to pipeline leaks. Less water loss means a more efficient and less costly water utility system.</p>

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<p>Revitalize West Virginia’s water resources, and increase the state’s resilience to meet the societal and economic needs of today’s West Virginians and their future generations.</p>	<p>West Virginia policymakers should request that the USDA fund a 5-year study led by an independent party, such as a university, that would bring together stakeholders to identify, assess, and prioritize corrective water management infrastructure and flood inundation mapping actions in response to the changing climate. This study should include an assessment to determine whether West Virginia employs a sufficient number of engineers with the expertise to inspect dams.</p> <p>Policymakers should encourage Federal Emergency Management Agency to prioritize remapping West Virginia’s flood plains given the state’s propensity for catastrophic flooding. Federal and state agencies should work together to take action on water-related infrastructure, particularly dams, drainage, culvert systems, and green infrastructure.</p> <p>In addition, the West Virginia Emergency Management agency should review its flood early warning system (FEWS) to ensure that it incorporates the most up-to-date “internet of things” (IOT) technology and that it monitors not only large rivers but small rivers as well.</p>	<p>According to West Virginia’s 2018 Statewide Standard Hazard Mitigation Plan Update 2018, “All counties in West Virginia were ranked as having a high level of risk for flooding.” Yet only 16% of particularly vulnerable structures are covered by flood insurance. FEMA’s flood plain maps are often inadequate and inaccurate for West Virginia. This deficiency puts homeowners and businesses at risk, as not all homeowners who need insurance know that they could obtain it. When flood insurance is purchased, it is often insufficient to meet the purchaser’s needs. Renters’ properties are not covered by FEMA flood insurance or a typical renter’s policy.</p> <p>West Virginia’s June 2016 “extreme rainfall” flood, in which 8-10 inches fell in twelve hours, led to a state of emergency in 44 of West Virginia’s 55 counties. Twenty-three lives were lost, over 2,300 people stayed overnight in shelters, and 1,700 families requested long-term help.</p> <p>West Virginia’s 30 federal dams are now more than 50 years old. These dams were designed for last century’s climate and are potentially undersized for current and future predicted precipitation regimes. Most dams in West Virginia (278) are privately owned, and many (203) are owned by local governments. The West Virginia state government has only three engineers to monitor the safety of all the dams in the state.</p> <p>Two West Virginia communities, Martinsburg (where 30% of the city lacks stormwater infrastructure) and Huntington (an area prone to flash-flooding), have demonstrated green infrastructure projects that could serve as models for other communities. As indicated by the Huntington project leader, “Uncertainties around flooding can make companies and private investors wary of spending on improvements that might be washed away in the next flood.”</p>
<p>Showcase West Virginia’s natural water resources by marketing their beauty and developing river-related recreation opportunities that increase tourism and recruit new businesses and residents.</p>	<p>West Virginia policymakers should introduce a “West Virginia Headwaters Legacy Act” that would provide a federal-designation and protect West Virginia’s scenic rivers to ensure water quality is maintained or enhance a river’s special values.</p>	<p>West Virginia has the greatest density of whitewater runs in the country, some of the best climbing in the eastern U.S., and thousands of miles of trails for hiking, trail running, backpacking, nature watching, and mountain biking. However, in 2019, outdoor recreation contributed only 1.9% to the state’s overall state GDP, compared to rates of 4.7% in Montana, 3.3% in Utah, and 3.1% in Colorado.</p>

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This policymaker's guide was developed by the WVU faculty, staff, and students listed below under the Bridge Initiative for Science and Technology Policy, Leadership, and Communications, directed by Joan Centrella. John Deskins, Jennifer Hause, and Nicolas Zegre led the working groups that developed the content for this guide. Deborah Stine was the study director as a consultant to WVU, and Jay Cole was the Study Advisor.

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