

Protection and Restoration by Watershed:

Mississippi River Basin Spotlight



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“[E]ach river system, from its headwaters in the forest to its mouth on the coast, is a unit and should be treated as such.”

*Theodore Roosevelt, Inland Waterways Commission (1908)*¹

Water bodies often serve as the political boundary between countries, states, counties, or local governments; however, it is far more common that they cross political boundaries. That reality complicates the assessment of problems, engagement with individuals and communities who are impacted by upstream activities, identification and development of strategies that address problems, and the development of plans for improving the management of contributing activities.

The “Watershed Approach” organizes all of these steps by watershed. Coordination at a watershed scale can facilitate learning from previous work, leveraging of funds and activities, efficiencies of scale, and effective measurement of progress for a host of goals that can include reducing pollutants, restoring habitat, rectifying injustices, or developing long-term working relationships.

The following synthesis of history, applications, and tools makes the case for embracing the watershed approach in addressing our 21st century challenges. This endeavor requires highlighting, sharing, and replicating examples, re-energizing programs that are watershed-based, and identifying additional programs where the watershed approach can be applied to a valuable end.

This report provides roadmaps to apply existing watershed plans and processes, take advantage of existing watershed collaborations, encourage cross-community watershed communication, and invest in watershed-based measures of success.

¹ U.S. ARMY CORPS OF ENG’RS, NEW DIRECTIONS IN WATER RESOURCES PLANNING FOR THE U.S. ARMY CORPS OF ENGINEERS 11 (1999), <https://nap.nationalacademies.org/catalog/6128/new-directions-in-water-resources-planning-for-the-us-army-corps-of-engineers>.

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OVERVIEW

This report provides a history of the watershed approach and the core principles and practices that have commonly been part of a recipe for success in its application.

Examples tell the best stories, and, in the following pages, examples demonstrate the ways that funding, regulatory programs, and voluntary programs have been organized along watershed lines. The examples are grouped under five contemporary priorities:

- Climate change mitigation, adaptation, and resilience
- Equitable and just management of water resources
- Protection of drinking water source waters
- Promotion of nature-based solutions
- Breaking down silos in water resources management

Numerous tools, both cutting-edge and well-established, can help us understand watersheds and better participate in the programs highlighted here. A selection of tools is explained following the examples and programs.

The report concludes with ideas for and examples of measuring success at the watershed scale, as well as takeaway messages from the research.

This research is intended to amplify watershed-based concepts and approaches that have been around for a long time, remind readers of the principles that have been part of their success, and propose fresh applications that include new participants, respect generations-old relationships with waters, and address the priorities of our time. It does not attempt to present an exhaustive examination of watershed approaches at all scales in every state in the Mississippi River Basin, nor across the country. Instead, we hope this research will spark a creative curiosity to reimagine the value of the watershed approach in efforts to tackle today’s natural resource challenges in a more holistic way.

“The watershed approach has changed the way that the U.S. Environmental Protection Agency (EPA) and other federal, [T]ribal and state agencies formerly managed water resources programs. We now generally recognize that the critical environmental issues facing society are so intertwined that a comprehensive, ecosystem-based and community-based approach is needed. We also recognize that solving environmental problems depends increasingly on local governments and local citizens. Thus, the need to integrate across traditional water program areas (e.g., flood control, wastewater treatment, nonpoint source pollution control) and to cooperate across levels of government (federal, state, [T]ribal, local) and across public and private sectors is leading toward a watershed approach.

Public and private organizations, academic institutions, and citizens and their governments in thousands of communities across the nation are forming partnerships and learning new ways to manage their watersheds together.”²

² ENV’T PROT. AGENCY, EPA 841-R-97-004, INFORMATION MANAGEMENT FOR THE WATERSHED APPROACH IN THE PACIFIC NORTHWEST (1997), https://www.epa.gov/sites/default/files/2015-06/documents/2008_09_12_watershed_wacademy_its06_infomgmtpacificnw.pdf.

INTRODUCTION

In order to understand what preceded the current perspective on watersheds in the U.S., it is helpful to look back thousands of years. For millennia, Indigenous cultures in the United States and beyond have sustainably managed their relationship with the natural resources they depend on for food, shelter, ceremony, and spiritual needs, out of both necessity and cultural responsibility. This relationship has been described as a symbiotic kinship.

There is a great deal one can learn from this extremely long-term perspective – looking backward and forward. We must ask whether anything but a watershed approach can sufficiently consider the relationships between the land and flowing water, between human activities and their cumulative impacts, and among the species on land and in the water.

At the end of the 19th century and into the 20th century, references to managing water resources at a basin scale had more to do with a water body's value to society in the form of water supply, navigation, power, or irrigation than with the watershed approaches to water quality assessment, pollution control, or restoration of historic hydrology or habitat that we think of today.⁴

“Cherokees acted as riverkeepers to these fast-flowing waterways, ensuring that the shifting riverbanks and seasonal floods nourished the watershed landscapes they lived with. Cherokees therefore kept a close watch on the health of the rivers, rivulets, creeks, whirlpools, waterfalls, shoals, and rapids – all teeming with biological and spiritual life.”³

In the 1870s, the concept of using major river basins as administrative units was proposed for the western United States by John Wesley Powell.⁵ In 1908, President Theodore Roosevelt promoted river basin planning in his address to the Inland Waterways Commission, claiming “each river system, from its headwaters in the forest to its mouth on the coast, is a unit and should be treated as such.”⁶ Franklin Delano Roosevelt, in his message to Congress in 1933 suggesting the creation of the Tennessee Valley Authority, stated that the “power development of war days leads logically to national planning for a complete river watershed involving many States and the future lives and welfare of millions.”⁷ The Natural Resources Planning Board was created in

³ Gregory D. Smithers, *Water Stories: Deep Histories of Climate Change, Ecological Resilience and the Riverine World of the Cherokees*, 9(6) J. BRITISH ACAD. 27, 33 (2021),

<https://www.thebritishacademy.ac.uk/documents/3477/JBA-9s6-03-Smithers.pdf>.

⁴ See Francois Molle, *Planning and Managing Water Resources at the River-Basin Level: Emergence and Evolution of a Concept*, INST. OF RSCH. FOR DEV., Jan. 2006,

https://www.researchgate.net/publication/42765396_Planning_and_Managing_Water_Resources_at_the_River-Basin_Level_Emergence_and_Evolution_of_a_Concept and FRANCOIS MOLLE, PLANNING AND MANAGING WATER RESOURCES AT THE RIVER-BASIN LEVEL: EMERGENCE AND EVOLUTION OF A CONCEPT: COMPREHENSIVE ASSESSMENT RESEARCH REPORT 16 (2006),

https://www.iwmi.cgiar.org/assessment/files_new/publications/CA%20Research%20Reports/CARR16.pdf.

⁵ *River Basin Planning*, ENCYCLOPEDIA.COM, <https://www.encyclopedia.com/science/news-wires-white-papers-and-books/river-basin-planning> (last visited Apr. 4, 2024).

⁶ U.S. ARMY CORPS OF ENGINEERS, NEW DIRECTIONS IN WATER RESOURCES PLANNING FOR THE U.S. ARMY CORPS OF ENGINEERS 11 (1999), <https://nap.nationalacademies.org/catalog/6128/new-directions-in-water-resources-planning-for-the-us-army-corps-of-engineers>.

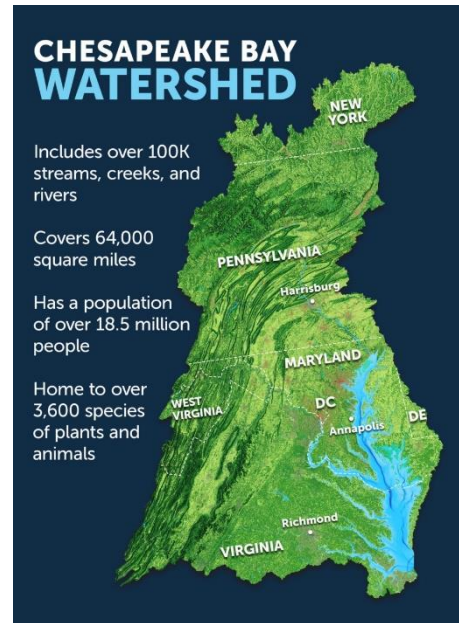
⁷ Message from President Roosevelt to Congress Suggesting the Tennessee Valley Authority (Apr. 10, 1933), <http://docs.fdrlibrary.marist.edu/odtvacon.html>.

1933 to implement his wishes, and regional planning commissions that followed pursued comprehensive river basin planning.⁸

Early Basin Programs

The concept of assessing problems and crafting solutions at a watershed scale gained interest and traction in the 1970s. Some of the earliest work at the Environmental Protection Agency (EPA) following its creation in 1970 involved establishment of the Chesapeake Bay Program and the Great Lakes Program.

In Chesapeake Bay, problems with the fisheries led to analysis of excessive nutrient runoff. The initial Chesapeake Bay Agreement signed in 1983 called upon Maryland, Pennsylvania, Virginia, and the District of Columbia to work in partnership to address the Bay’s pollution problems.⁹ This partnership was later expanded to include the headwaters states of Delaware, New York, and West Virginia.



Source: Chesapeake Bay Program

In the Great Lakes, concerns about industrial sources of pollution and hot spots of toxic contamination led to the Great Lakes Water Quality Agreement, which required Lakewide Action and Management Plans to coordinate assessment and action across states, local authorities, Tribes, First Nations, and Canadian provinces.¹⁰

National Estuary Program

The 1987 Clean Water Act Amendments established the National Estuary Program (NEP) with a focus on science and partnerships that drew from the best qualities of the Chesapeake Bay and the Great Lakes programs. This non-regulatory program has invested in 28 designated estuaries of national significance that were selected through an intense and locally driven nominating process. Each NEP has developed and updated long-term plans focused on the watershed of the estuary. The plans address challenges and commit to actions identified by local stakeholders across all sectors.¹¹

⁸ *Bonneville Power Administration: History*, NORTHWEST POWER AND CONSERVATION COUNCIL, <https://www.nwcouncil.org/reports/columbia-river-history/bpahistory/> (last visited Apr. 4, 2024).

⁹ *Our History*, CHESAPEAKE BAY PROGRAM, <https://www.chesapeakebay.net/who/bay-program-history> (last visited Jan. 29, 2024).

¹⁰ *Great Lakes Water Quality Agreement (GLWQA)*, ENV’T PROT. AGENCY, <https://www.epa.gov/glwqa> (last visited Jan. 29, 2024).

¹¹ *Overview of the National Estuary Program*, ENV’T PROT. AGENCY, <https://www.epa.gov/nep/overview-national-estuary-program> (last visited Jan. 29, 2024).

The Barataria-Terrebonne National Estuary Program is the only NEP in the Mississippi River Basin. The priority problems addressed in its management plan include hydrologic modification, sediment reduction, habitat loss, changes in living resources, eutrophication, pathogens, and toxic substances,¹³ many of which are also problems in subwatersheds throughout the Mississippi River. Not all waterbodies lead to estuaries, nor can the stakeholders in every water body secure the same level of funding and support from the federal government that has allowed each NEP to create the program structure and build necessary relationships. The NEP offers us lessons from decades of work on consensus-building, education and engagement of key stakeholders and the public, investment in science to inform decision making, and commitment to measurement and communication of results.¹⁴

Four cornerstones of the National Estuary Program:

- Focus on the watershed.
- Integrate science into the decision-making process.
- Foster collaborative problem solving.
- Include the public.¹²

Watershed Approach Framework

EPA formally drafted and released a Watershed Approach Framework in 1996. This framework articulated the foundational principles tested with the NEP - partnerships, geographic focus, and management techniques based on strong science and data - and broadened the relevance to all watersheds.¹⁵ It also called out the work already going on beyond the NEP that embraces these principles, such as source water protection efforts, Chesapeake Bay teams, and watershed-based alliances formed under many local, state, and federal programs. EPA committed to internal changes to facilitate the watershed approach, and in the 1998 State of the Union address, President Clinton announced his Clean Water Action Plan and \$568 million annually in new resources, \$2.3 billion over 5 years, to carry out the initiative.¹⁶

In 2000, one action item in the Clean Water Action Plan, a “Unified Federal Policy,” was published in the Federal Register. This broader commitment of eight federal entities (the Departments of Agriculture, Commerce, Defense, Energy, and the Interior, EPA, Tennessee Valley Authority, and the Army Corps of Engineers) to the watershed approach sought to build

¹² ENV'T PROT. AGENCY, EPA 842-B-05-003, COMMUNITY-BASED WATERSHED MANAGEMENT HANDBOOK (2005) (Ch. 1: The National Estuary Program), https://www.epa.gov/sites/default/files/2015-09/documents/2007_04_09_estuaries_neprimeruments_chapter1.pdf.

¹³ *Estuary Issues*, BARATARIA-TERREBONNE NATIONAL ESTUARY PROGRAM, <https://btnep.org/estuary-issues/> (last visited Jan. 29, 2024).

¹⁴ See ENV'T PROT. AGENCY, EPA 842-B-05-003, COMMUNITY-BASED WATERSHED MANAGEMENT HANDBOOK (2005), <https://www.epa.gov/nep/community-based-watershed-management-handbook>.

¹⁵ ENV'T PROT. AGENCY, EPA 840-S-96-001, WATERSHED APPROACH FRAMEWORK (1996), <https://www.epa.gov/sites/default/files/2015-06/documents/watershed-approach-framework.pdf>.

¹⁶ *President Clinton Announces the Clean Water Action Plan*, ENV'T PROT. AGENCY (Feb. 19, 1998), <https://www.epa.gov/archive/epa/aboutepa/president-clinton-announces-clean-water-action-plan.html>.

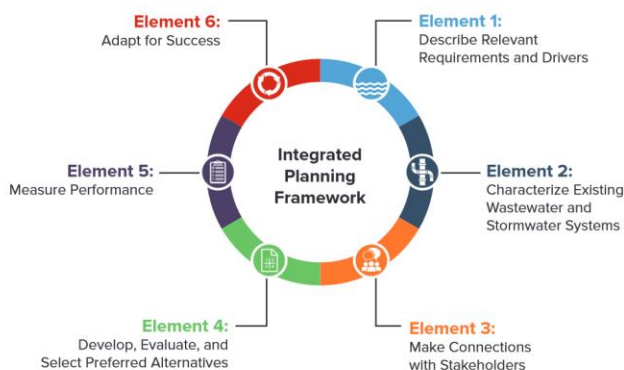
on existing efforts with two goals:

- 1) use a watershed approach to prevent and reduce pollution of surface and ground waters resulting from Federal land and resource management activities, and
- 2) accomplish this in a unified and cost-effective manner.¹⁷

Integrating Water Management

In 2006, EPA released “Integrating Water and Waste Programs to Restore Watersheds,” a manual that furthered the Agency’s commitment to internalizing the watershed approach. The manual was the product of ideas generated at a coordinating meeting of staff from EPA’s water, solid waste, and emergency response divisions. It laid out a framework for coordination among the divisions by summarizing regulatory authorities, funding opportunities, and case studies with the intention of streamlining requirements to improve efficiencies in watershed assessments and cleanups. The final version of the manual was released in 2007, and it provides a thorough look at applying the watershed approach to address cleanup of contaminated water resources.¹⁸

Today, a contemporary “One Water”¹⁹ approach to integrated water management²⁰ generally refers to work that breaks down silos across the planning, funding, and management of infrastructure for water supply, wastewater control, and stormwater management. EPA is joined by water, wastewater, and stormwater utilities, nongovernmental organizations, private foundations, and businesses across the country in their commitment to integration of water infrastructure programs. This work is often, but not always, undertaken at a watershed scale.



Source: EPA 832-F-21-001, *Integrated Planning in Action*

Modernizing the Review of Water Resource Development Projects

The U.S. Army Corps of Engineers’ (Corps’) Principles, Requirements, and Guidelines dictate how proposed water resource development projects are evaluated by federal agencies. The Water Resources Development Act of 2007 required that these instructions to federal agencies include “the assessment and evaluation of the interaction of a project with other water resources projects

¹⁷ Unified Federal Policy for a Watershed Approach to Federal Land and Resource Management, 65 Fed. Reg. 62566 (Oct. 18, 2000), <https://www.federalregister.gov/documents/2000/10/18/00-26566/unified-federal-policy-for-a-watershed-approach-to-federal-land-and-resource-management>.

¹⁸ ENV’T PROT. AGENCY, EPA 540K07001, INTEGRATING WATER AND WASTE PROGRAMS TO RESTORE WATERSHEDS: A GUIDE FOR FEDERAL AND STATE PROJECT MANAGERS (2007), <https://semsub.epa.gov/work/HQ/175870.pdf>.

¹⁹ *State of the One Water Field*, US WATER ALLIANCE, <https://uswateralliance.org/resources/state-of-the-one-water-field/> (last visited Apr. 9, 2024).

²⁰ *Integrated Planning for Municipal Stormwater and Wastewater*, ENV’T PROT. AGENCY, <https://www.epa.gov/npdes/integrated-planning-municipal-stormwater-and-wastewater> (last visited Apr. 9, 2024).

and programs within a region or watershed.”²¹ As of June 2024, the Corps is pursuing rulemaking to finalize its agency-specific procedures that will incorporate this commitment to the watershed approach.

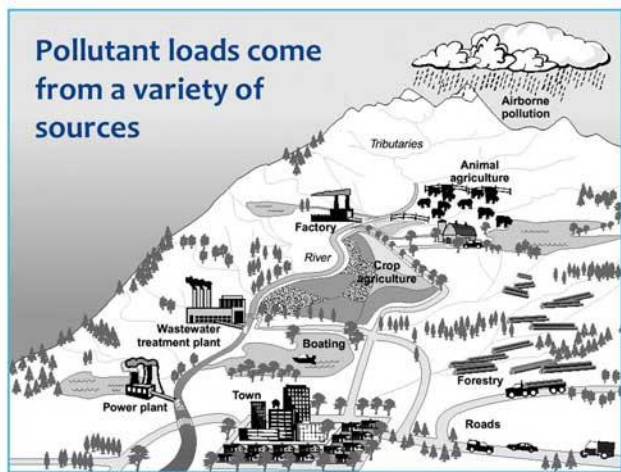
Urban Waters Program

In 2011, EPA launched an Urban Waters Program focused on reconnecting often-underserved urban communities with their waterways. This program established the Urban Waters Federal Partnership,²² now involving 15 federal agencies in 20 pilot cities, and it has attracted private and public sector funding. A foundational component in the program’s success, echoed from earlier watershed-based efforts, is the focus on local leadership, capacity building, partnerships, economies, and job creation in a way that leads to community revitalization.

Watershed Approach Today

Today, many examples of and guidance for applying the watershed approach have trickled down to the state and local levels. Layers of watershed planning, funding, assessment, management, and implementation can be found across scales and problem areas, including in the Mississippi River Basin.

The watershed approach has matured into an adaptable framework for *organizing* any and all efforts that affect water quality, water quantity, aquatic resources, and communities, whether along water bodies or not. Every community is in a watershed, and land use decisions as well as water management decisions are likely to affect water bodies nearby and downstream.



Source: EPA, Watershed Academy

Our reference to the “watershed approach” also now features the involvement of the stakeholders who are affected by problems in the watershed and those who want to have input into plans or proposed changes to the way things are currently done.

²¹ U.S. ARMY CORPS OF ENG’RS, RIN 0710-AB41, REGULATORY IMPACT ANALYSIS FOR THE PROPOSED RULE, U.S. ARMY CORPS OF ENGINEERS AGENCY SPECIFIC PROCEDURES TO IMPLEMENT THE PRINCIPLES, REQUIREMENTS, AND GUIDELINES FOR WATER RESOURCES INVESTMENTS (2024), <https://api.army.mil/e2/c/downloads/2024/02/01/edb8b709/regulatory-impact-analysis-corps-asps-for-prg-nprm-01-feb-2024.pdf>.

²² *Urban Waters Federal Partnership*, ENV’T PROT. AGENCY, <https://www.epa.gov/urbanwaterspartners> (last visited Jan. 29, 2024).

So, what *is* the watershed approach?

There are many perspectives on exactly what constitutes a watershed approach. Synthesizing the sources above, we distilled the following fundamental components:

- **Focus on the watershed** – The geographic boundaries of a watershed define the scope of the outreach, monitoring, problem identification, analysis, implementation of solutions, and evaluation.
- **Involvement of community and affected parties** – The people, businesses, and communities who are affected by watershed problems and who are likely to be affected by proposed solutions must be in the process from start to finish.
- **Commitment to relationship and trust building** – Funding and committing the time needed to build relationships and form partnerships is vital, and it will lead to better understanding of watershed problems. Collaborative work to solve these problems can cultivate a shared passion for protecting and restoring watersheds.
- **Science brings credibility** – Involvement of technically skilled experts and peer-reviewed data, information, and concepts in watershed projects and initiatives will translate into greater credibility when reaching out to stakeholders.
- **Transparent tracking, evaluation, reporting, and learning from results** – Transparency with and involvement of stakeholders in evaluation of projects and programs will go a long way toward building trust with those impacted by the problems and proposed solutions.
- **Relevant messaging and communication** – The ability to talk about this work in ways that resonate at the community level is critical for success. How the watershed approach leads to improvements in a family’s health (drinking water, safe swimming), community safety (flood, drought, pollution disasters), and local economic vitality (businesses that depend on the health of the water body and aquatic community) must be clearly communicated.

Tennessee’s Watershed Approach is an example of adoption at the state level.

Core elements in Tennessee are:

- 1) identifying and prioritizing water quality challenges in the watershed,
- 2) developing increased public involvement,
- 3) coordinating activities with other agencies, and
- 4) measuring success through increased and more efficient monitoring and other data gathering.²³

²³ *Watershed Management Approach*, TENN. DEP’T OF ENV’T & CONSERVATION, <https://www.tn.gov/environment/program-areas/wr-water-resources/watershed-stewardship/watershed-management-approach.html> (last visited Jan. 29, 2024).

PROMOTING A NEW GENERATION OF WATERSHED-FOCUSED PROGRAMMING

A lot has changed over the last 50 years. To name a few specific changes, the condition of the nation's watersheds has improved in some places and worsened in others; demands on watersheds to assimilate human-caused pollution have increased; and threats facing watershed health and communities nearest pollution hotspots are finally receiving overdue financial resources and technical assistance. Contemporary opportunities to apply a watershed lens include coordination with efforts to address or employ:

- Impacts of climate change such as flooding, drought, and extreme events,
- Equity/environmental justice concerns,
- Community-based research and engagement,
- Nature-based strategies for water management,
- Integrated water resources management strategies,
- Community science education, involvement, and action, and
- Socioeconomic valuation of water resources, floodplain management, and buffers.

The complexity of our problems *requires* stakeholders, including affected communities, to be involved in articulating problems and their impact, collecting data and information, formulating and implementing strategies to solve problems, and evaluating progress. That recipe is the foundation of the watershed approach. What follows are examples of programs and projects within the Mississippi River Basin and beyond that embrace the watershed approach, organized by contemporary areas of interest.

TYPES OF PROGRAMS

Within each area of interest, opportunities exist to focus on or organize around watersheds when (a) funding projects, (b) implementing regulatory programs, or (c) promoting and supporting voluntary programs. We first make the case for using the watershed approach in each type of program and then elaborate with specific ways to do so within each area of interest.

Grant Programs

Many federal and state programs provide funding to develop watershed plans, convene stakeholders and partners to wrestle with problems within a watershed, or to develop nature-based solutions at a watershed scale. Understanding the landscape of these programs at different scales and across multiple sectors and jurisdictions can be helpful for securing sufficient funding, especially leveraging different funding sources for matching dollars. For example, the ability to match state funds with federal funds, or vice versa, can frequently make or break a project.

There are a wide variety of programs that offer funding for watershed-based collaborations, specific projects in a water body, or efforts that *could* be organized by watershed. For example,

funds from the Inflation Reduction Act (IRA) have been channeled to many programs within EPA’s Environmental and Climate Justice Program and the U.S. Department of Agriculture’s Regional Conservation Partnership Program, and some of the applicants to those programs have structured their projects within watershed boundaries.

A few of the programs listed here were time limited, and most of them face the uncertainties of the federal appropriations process; however, the stories help us understand what has been previously funded.

Examples and explanations of funding programs are laid out within each area of interest below. More programs and examples are found in Appendices A and B.

Regulatory Programs and Requirements

The watershed approach does not apply to all water regulatory programs. Understanding where it has been applied or required, however, provides a valuable backdrop for coordination with voluntary watershed-based efforts. For example, NPDES permitting renewals, which are required on a 5-year rotation, are accomplished in Tennessee by watershed. This watershed-level coordination is not required, yet permit writers benefit when they understand the cumulative permitted pollution discharges in a watershed and can more accurately assess the impact of a new or renewing discharge.

Water Quality Restoration Plans or Total Maximum Daily Loads (TMDLs) are usually required when water quality impairments are demonstrated. When required, these plans must address each pollutant in each segment of an impaired water body. They are increasingly developed for multiple pollutants at the watershed scale, which allows for a more comprehensive analysis of sources, causes, and reduction strategies. For example, Louisiana has chosen to combine seven subsegments in the Upper Terrebonne Basin into one TMDL for biochemical oxygen-demanding (BOD) substances.²⁴

Additional examples and explanations of regulatory programs follow within each area of interest below, and more detail can be found in Appendices A and B.

Voluntary Programs

Several voluntary federal programs have been designed to focus on watersheds. For example, the National Estuary Program, discussed above in more detail, is entirely watershed-driven, as is the Healthy Watersheds Program. Many programs that offer funds to proactively protect drinking water sources, reduce flood risks, address agricultural pollution, or clean up abandoned toxic waste sites along rivers also have technical assistance components that offer agency expertise rather than, or in addition to, funds granted or loaned. USDA NRCS conservation programs funded by the Farm Bill offer several of these examples – such as the Environmental Quality Incentives Program (EQIP), the Regional Conservation Partnership Program (RCPP), and the

²⁴ *TMDL Reports and Models*, LA. DEP’T OF ENVIRONMENTAL QUALITY, <https://www.deq.louisiana.gov/page/tmdl-reports-and-models> (last visited Apr. 4, 2024).

Emergency Watershed Program (EWP). All of these programs could incorporate a watershed approach more intentionally in their implementation.

Specific examples of voluntary programs that address the areas of interest can be found below. More details on programs and examples are in Appendices A and B.

AREAS OF CURRENT INTEREST

In order to motivate individuals, organizations, or local, state, Tribal, and federal government agencies to embrace the watershed approach for the first time or to re-invigorate a commitment to organizing their work by watersheds, it is necessary to demonstrate how relevant and powerful that focus can be. The following five sections organize examples and programs by areas of interest that are currently being prioritized by many government agencies, community organizations, elected officials, and non-governmental organizations. Each section is subdivided into examples that draw on existing grant programs, regulatory program requirements, and voluntary program guidance.

1. Climate Change Mitigation, Adaptation, and Resilience

Attention to the differing impacts of climate change throughout a watershed can lead to better understanding of where the watershed will be more resilient, and why. A holistic view may offer more opportunities for attenuating flood waters, early identification of hazardous materials that are vulnerable to extreme events, and a broader perspective on which communities will be most at risk, for example. The following examples illustrate the watershed approach at work.

GRANT PROGRAMS

Grant programs may incentivize applicants to use a watershed approach to tackle climate-related challenges. At times, the watershed may be the applicant's choice for context and scale.

From 2011-2013, Iowa experienced flooding that affected 73 counties (more than 70% of the state) and received eight presidential disaster declarations.²⁵ The frequency and intensity of storms are expected to increase due to climate change. In 2016, Iowa invested \$96.9 million in funds they were awarded from the Department of Housing and Urban Development's (HUD's) Disaster Resilience Competition in the [Iowa Watershed Approach](#) to restore the state's natural resilience to floods, improve water quality, and engage stakeholders through agricultural stewardship.²⁶

More than five years later, nearly 800 structures have been built across rural Iowa to reduce flooding and improve water quality. The HUD Disaster Resilience Competition provided significant capacity building assistance early in the process, which resulted in the submittal of scientifically sound proposals with significant community engagement. Nearly \$1 billion in

²⁵ U.S. DEP'T OF HOUSING AND URBAN DEVELOPMENT, NATIONAL DISASTER RESILIENCE COMPETITION GRANTEE PROFILES (2016), <https://www.hud.gov/sites/documents/NDRCGRANTPROFILES.PDF>.

²⁶ IOWA WATERSHED APPROACH, <https://iowawatershedapproach.org/> (last visited Apr. 4, 2024).

disaster recovery funds were awarded to 13 states and communities from the more than \$7 billion in proposals that were received.²⁷

The Kentucky River Palisades Watershed Protection Project, led by Bluegrass Land Conservancy, takes advantage of the [Regional Conservation Partnership Program](#) run by USDA’s Natural Resources Conservation Service.²⁸ This program promotes development of public/private partnerships to solve agricultural water quality problems. In this case, investment of almost \$23 million for permanent protection of at least 18 miles of riparian corridor and 6,000 acres of contiguous land in the Kentucky River Palisades and Elkhorn Creek will lessen impacts of climate change and urban sprawl on plant and animal migration in these watersheds.²⁹

The Mississippi River Basin Cities and Towns Initiative (MRBCTI) has combined the voices of mayors up and down the river into a powerful force for collective action and change. The initiative has compiled information on collective losses from extreme events, coordinated assessment of vulnerability to future events, coordinated investments in natural infrastructure, and collectivized the power of its members to influence federal legislation.

The Safeguarding Tomorrow through Ongoing Risk Mitigation Act of 2021 (STORM Act),³⁰ a disaster resilience and adaptation program that brings together multiple program investments,³¹ is an example of the fruits of the MRBCTI collaboration at the federal level. The Initiative contributed to this effort by clearly communicating ways the fund would be applied in the Mississippi River Basin. Their advocacy led to a greater than four-fold increase of the previously existing Pre-Disaster Mitigation Grant Program, and it added a 10-state Mississippi corridor option to the fund.³²

REGULATORY PROGRAMS

Most regulatory programs focus on a particular facility, activity, or segment of a watershed. Impacts of climate change on watersheds, such as changes in precipitation patterns and intensity, may not be incorporated into the assumptions and calculations involved in permit-writing,

²⁷ *National Disaster Resilience Competition*, U.S. DEP’T OF HOUSING AND URBAN DEVELOPMENT, https://www.hud.gov/program_offices/economic_development/resilience/competition (last visited Apr. 4, 2024).

²⁸ *Regional Conservation Partnership Program*, NAT. RES. CONSERVATION SERV., <https://www.nrcs.usda.gov/programs-initiatives/rcpp-regional-conservation-partnership-program> (last visited Feb. 1, 2024).

²⁹ *Regional Conservation Partnership Program 2023 Awarded Projects*, NAT. RES. CONSERVATION SERV., <https://www.nrcs.usda.gov/programs-initiatives/rcpp-regional-conservation-partnership-program/regional-conservation> (last visited Apr. 4, 2024) (Kentucky River Palisades Watershed Protection Project).

³⁰ *Safeguarding Tomorrow through Ongoing Risk Mitigation*, Pub. L. 116-284 (2021); *Safeguarding Tomorrow Revolving Loan Fund Program*, FED. EMERGENCY MGMT AGENCY, <https://www.fema.gov/grants/mitigation/storm-rlf> (last visited Apr. 4, 2024).

³¹ Pre-Disaster Mitigation Grants, Hazard Mitigation Grants, Land & Water Conservation Fund, Conservation Innovation Grants, Section 319 Water Pollution Grants, Water State Revolving Loan Funds, and Upper River Restoration Programs.

³² MISSISSIPPI RIVER CITIES AND TOWNS INITIATIVE, DISASTER RESILIENCE AND ADAPTATION PROGRAM, <https://static1.squarespace.com/static/5845a70859cc6819f2dfdb9e/t/5a1da14f085229dccc1f57c6/1511891306301/Disaster+Resilience+Prog+1-pager%5B2567%5D.pdf> (last visited May 21, 2024).

development of water quality standards, or development of water quality restoration plans (otherwise known as Total Maximum Daily Loads). For example, most state agencies are using decades-old precipitation data to model controls on wastewater discharges. Below is an example of a watershed-based permit that explicitly addresses the increased frequency and intensity of storms.

In the early 2000s, EPA developed guidance documents³³ that specifically encouraged watershed-based NPDES permits as an implementation of the Agency’s watershed framework and a necessary component to addressing the complex mix of sources of pollution affecting the nation’s water bodies.

“Integrating implementation of CWA programs on a watershed-basis, rather than focusing on individual programs, pollutant sources, and waterbody segments, will enhance all stakeholders’ efforts to protect watersheds from the cumulative impacts of a multitude of activities.”

EPA Watershed-Based Guidance³⁴

In Wisconsin’s Menomonee River, a [watershed-based municipal stormwater NPDES permit](#) was developed to control phosphorus, bacteria, sediment, and chloride throughout the water body.³⁵ The seeds of this permit were planted in the trust built among eight jurisdictions through their implementation of a joint municipal stormwater permit. Milwaukee Metropolitan Sewerage District led 11 localities, Wisconsin Department of Natural Resources, the Southeastern Wisconsin Regional Planning Commission, and several non-governmental organizations through a collaborative process to develop the framework for the watershed-based permit.

The resulting permit has both individual and shared responsibilities. The pollutant reductions for phosphorus, sediment, and bacteria in the Milwaukee River Total Maximum Daily Load (finalized in 2018 and including the Menomonee River) were incorporated into the watershed-based permit. This permit, as well as all stormwater permits, must address the increased frequency and intensity of storms associated with climate change. As these municipal jurisdictions coordinate their efforts for the benefit of the Menomonee River, they are dealing with conveyance of numerous pollutants beyond phosphorus, sediment, and bacteria through best management practices, public education and outreach, and nature-based solutions.

³³ *Id.*; ENV’T PROT. AGENCY, EPA 833-B-03-004, WATERSHED-BASED NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMITTING TECHNICAL GUIDANCE (2003), https://www.epa.gov/sites/default/files/2015-09/documents/watershedpermitting_finalguidance.pdf.

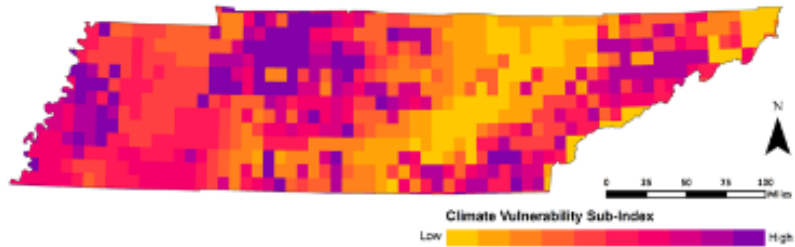
³⁴ ENV’T PROT. AGENCY, EPA 833-B-07-004, WATERSHED-BASED NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMITTING TECHNICAL GUIDANCE 3 (2007), https://www.epa.gov/sites/default/files/2015-09/documents/watershed_techguidance_entire.pdf.

³⁵ ENV’T PROT. AGENCY, EPA 833-F-22-004, WATERSHED-BASED PERMITTING CASE STUDY – MENOMONEE RIVER WATERSHED, WISCONSIN (2023), <https://www.epa.gov/system/files/documents/2023-03/menomonee.pdf>.

VOLUNTARY PROGRAMS

Beyond the grant programs and regulatory requirements, numerous voluntary programs that directly or indirectly address climate change impacts offer guidance, technical assistance, collaboration, monitoring, data, or innovations, and they may frame that assistance on a watershed scale.

EPA created the Healthy Watersheds Protection Program³⁶ to raise attention to and invest in the protection of high-quality waters, as called for by the CWA. The Healthy Watersheds Initiative National Framework and Action Plan led to Healthy Watersheds Integrated Assessments in several states, including Tennessee and Wisconsin.³⁷



Tennessee Climate Vulnerability Sub-Index, Source: Tennessee Integrated Assessment of Watershed Health

Key to this assessment is the paired analysis of the watershed health index with the watershed vulnerability index to help determine the areas that are currently healthy but are in greatest need of protection. The watershed vulnerability index includes measures of storm intensity or frequency and temperature extremes. In the assessment performed in [Tennessee](#), climate change vulnerability focused on factors of drought and heat intensity, which are considered to have the greatest impact on aquatic ecosystems.³⁸ A short-lived [Healthy Watersheds Consortium Grants Program](#) (2016-19) invested in watershed projects across the country.³⁹

2. Equitable and Just Management of Water Resources

Organizing work around watersheds can lead to better outcomes for downstream communities. Whether focusing on grants that provide critical investment for water infrastructure, making sure that permits control pollutants at levels protective of sensitive populations, or transparent collection and reporting of data, framing the effort at a watershed scale has multiple benefits that include coordination among stakeholders, economies of scale, and learning from successful models.

³⁶ EPA Healthy Watersheds Protection Program, ENV'T PROT. AGENCY, <https://www.epa.gov/hwp> (last visited Feb. 27, 2024).

³⁷ ENV'T PROT. AGENCY, EPA 841-R-11-005, HEALTHY WATERSHEDS INITIATIVE NATIONAL FRAMEWORK AND ACTION PLAN (2011), https://www.epa.gov/sites/default/files/2015-10/documents/hwi_action_plan.pdf

³⁸ ENV'T PROT. AGENCY, EPA 841-R-15-002, TENNESSEE INTEGRATED ASSESSMENT OF WATERSHED HEALTH (2015), https://www.epa.gov/sites/default/files/2015-10/documents/tn_hwp_report_final_october2015.pdf.

³⁹ 2019 Healthy Watersheds Consortium Grant Awards, ENV'T PROT. AGENCY, <https://www.epa.gov/hwp/2019-healthy-watersheds-consortium-grant-awards-0> (last visited Jan. 31, 2023).

GRANT PROGRAMS

The [Inflation Reduction Act](#) (IRA) provided EPA much-needed grant resources to help communities most burdened by environmental harms begin to address them.⁴⁰ EPA’s [Environmental and Climate Justice Program](#) provides financial and technical assistance funded by the IRA through the following individual grants programs.⁴¹

- [Environmental and Climate Justice Community Change Grants Program](#)⁴²
- [Environmental Justice Thriving Communities Grantmaking Program](#)⁴³
- [Environmental Justice Collaborative Problem Solving Cooperative Agreement Program](#)⁴⁴
- [Environmental Justice Government-to-Government Program](#)⁴⁵

These programs are heavily place-based to reach communities that have been disproportionately impacted by climate change, legacy pollution, and historical disinvestments. Eligibility for the funding is guided by EPA’s [Disadvantaged Communities map](#) layer, which does not recognize watershed boundaries;⁴⁶ however, watershed-based organizations have received money from these programs. whose work is focused on watershed boundaries. The IRA investments seek to leverage other routine funding sources and to provide baseline resources for community engagement, education, and capacity building that is critical to community-driven solutions.

One 2023 recipient of the Environmental Justice Government-to-Government Program, the Rhode Island Department of Environmental Management, will be using the funds to partner with community-based organizations to build community capacity for involvement in environmental policy decisions in the Upper Narragansett Bay Watershed.⁴⁷ The agency plans to invest in workshops and “toxic tours” along four urban rivers to improve community understanding of the

⁴⁰ Inflation Reduction Act, Pub. L. No. 117-169 (2022); See THE WHITE HOUSE, BUILDING A CLEAN ENERGY ECONOMY: A GUIDEBOOK TO THE INFLATION REDUCTION ACT’S INVESTMENTS IN CLEAN ENERGY AND CLIMATE ACTION (2023), <https://www.whitehouse.gov/cleanenergy/inflation-reduction-act-guidebook/>.

⁴¹ *Inflation Reduction Act Environmental and Climate Justice Program*, ENV’T PROT. AGENCY, <https://www.epa.gov/inflation-reduction-act/inflation-reduction-act-environmental-and-climate-justice-program> (last visited Apr. 5, 2024).

⁴² *Id.*

⁴³ *The Environmental Justice Thriving Communities Grantmaking Program*, ENV’T PROT. AGENCY, <https://www.epa.gov/environmentaljustice/environmental-justice-thriving-communities-grantmaking-program> (last visited Apr. 5, 2024).

⁴⁴ *The Environmental Justice Collaborative Problem – Solving Cooperative Agreement Program*, ENV’T PROT. AGENCY, <https://www.epa.gov/environmentaljustice/environmental-justice-collaborative-problem-solving-cooperative-agreement-5> (last visited Apr. 5, 2024).

⁴⁵ *The Environmental Justice Government-to-Government Program*, ENV’T PROT. AGENCY, <https://www.epa.gov/environmentaljustice/environmental-justice-government-government-program> (last visited Apr. 5, 2024).

⁴⁶ *Inflation Reduction Act Disadvantaged Communities Map*, ENV’T PROT. AGENCY, <https://www.epa.gov/environmentaljustice/inflation-reduction-act-disadvantaged-communities-map> (last visited Apr. 4, 2024).

⁴⁷ ENV’T PROT. AGENCY, 2023 ENVIRONMENTAL JUSTICE GOVERNMENT-TO-GOVERNMENT (EJG2G) PROGRAM PROJECT SUMMARIES 6 (2023), https://www.epa.gov/system/files/documents/2023-10/2023-government-to-government-ejg2g-project-summaries_1.pdf.

impact of pollutants on the environment and people, increase community engagement in agency decision-making, and reduce the divide between impacted communities and government.

The Grand Traverse Band of Ottawa & Chippewa Indians received funding through the [Regional Conservation Partnership Program](#) (RCPP), run by USDA’s Natural Resources Conservation Service, to address escalating development pressures along the water bodies managed for commercial and subsistence purposes in the upper part of Lower Michigan and the ancestral home of the Anishinaabeg people.⁴⁸ The title “Tribal Stream and Michigan Fruitbelt Collaborative” calls out the attention to streams, and the description identifies vital ground water resources and maintaining rainwater infiltration as intended goals.

An example of a grant program that has equitable principles woven into it, though is not specifically designed for the purpose of advancing equity, is EPA’s [Nonpoint Source Management Program](#), which administers Section 319 grants.⁴⁹ These grants primarily provide technical support for nonpoint source implementation projects; however, watershed plans are required when applying for the funds.⁵⁰ The plans must include Public Understanding and Participation, which is described as “an information and education component used to enhance public understanding of the project and encourage their early and continued participation in selecting, designing, and implementing the nonpoint source management measures that will be implemented.”⁵¹ By incorporating community participation into the process, a more equitable analysis of problems and development of community-friendly projects is more likely.

Wisconsin is one of many states that has developed a [Citizens Guide to Watershed Planning](#).⁵² This guide describes requirements for CWA Section 319 grants that frame watershed planning through a grassroots approach, emphasizing the engagement of the people of the watershed.

REGULATORY PROGRAMS

Regulatory programs do not typically do a good job of identifying communities harmed by pollution. When permits and restoration plans are based on a watershed or basin scale, they are better able to document and address multiple sources of pollution in the regulatory instrument. Identification of cumulative downstream impacts and notification of downstream communities is more likely, though not guaranteed, when a watershed approach is used.

⁴⁸ *Regional Conservation Partnership Program 2023 Awarded Projects*, NAT. RES. CONSERVATION SERV., <https://www.nrcs.usda.gov/programs-initiatives/rcpp-regional-conservation-partnership-program/regional-conservation> (last visited Apr. 5, 2024).

⁴⁹ ENV’T PROT. AGENCY, NONPOINT SOURCE PROGRAM AND GRANT GUIDELINES FOR STATES AND TERRITORIES 18 (2013), <https://www.epa.gov/sites/default/files/2015-09/documents/319-guidelines-fy14.pdf>.

⁵⁰ ENV’T PROT. AGENCY, EPA 841-B-08-002, HANDBOOK FOR DEVELOPING WATERSHED PLANS TO RESTORE AND PROTECT OUR WATERS (2008), https://www.epa.gov/sites/default/files/2015-09/documents/2008_04_18_nps_watershed_handbook_handbook-2.pdf.

⁵¹ ENV’T PROT. AGENCY, EPA 841-B-08-002, HANDBOOK FOR DEVELOPING WATERSHED PLANS TO RESTORE AND PROTECT OUR WATERS 2-16 (2008), https://www.epa.gov/sites/default/files/2015-09/documents/2008_04_18_nps_watershed_handbook_handbook-2.pdf.

⁵² DANIEL ZERR, UNIVERSITY OF WISCONSIN-MADISON, A CITIZEN’S GUIDE TO WATERSHED PLANNING IN WISCONSIN, <https://fyi.extension.wisc.edu/watershedplanning/> (last visited Apr. 4, 2024).

In January 2024, EPA released a [Program Policy Addressing Environmental Justice and Equity in NPDES Permitting](#) that articulates principles to guide how EPA and states are expected to mitigate potential adverse and disproportionate environmental impacts when implementing the NPDES program.⁵³ The Policy also highlights that permitting decisions must not discriminate on the basis of race, color, national origin, disability, age, or sex.⁵⁴

Tennessee’s Department of Environment and Conservation (TDEC) embarked on its Watershed Management Approach in the 1990s to improve the efficiency, effectiveness, and equity of permitting, planning, and monitoring. The state’s embrace of the watershed approach includes efforts to increase public involvement through cooperation with local organizations and coordinated review of permitted dischargers at the watershed scale, both of which result in measurable improvements to water quality.⁵⁵

Tennessee watersheds are organized into five groups and they cycle through TDEC’s following activities:

1. planning & data review,
2. water quality monitoring,
3. water quality assessment,
4. water quality restoration planning (TMDLs), and
5. permit issuance.

Stakeholder engagement is a critical component of all activities in the watershed management cycle.⁵⁶

In 2013, Wisconsin passed a [law](#) that allows consideration of cumulative impacts on a watershed.⁵⁷ While this is not a required approach, it represents a different way to protect downstream communities from multiple harms that are typically reviewed and regulated separately.

⁵³ ENV’T PROT. AGENCY, NPDES PROGRAM POLICY: ADDRESSING ENVIRONMENTAL JUSTICE AND EQUITY IN NPDES PERMITTING (2024), <https://www.epa.gov/system/files/documents/2024-01/npdes-ej-program-guidance-principles-recommended-practices-january-2024.pdf>.

⁵⁴ *Id.*; Memorandum from the Env’t Prot. Agency Assistant Administrator for Water to Regional Water Division Directors (Jan. 29, 2024), <https://www.epa.gov/system/files/documents/2024-01/memorandum-transmitting-npdes-ej-policy-january-2024.pdf> (Transmittal of the Program Policy Addressing Environmental Justice and Equity in NPDES Permitting).

⁵⁵ *Watershed Management Approach*, TENN. DEP’T OF ENV’T & CONSERVATION, <https://www.tn.gov/environment/program-areas/wr-water-resources/watershed-stewardship/watershed-management-approach.html> (last visited Apr. 4, 2024).

⁵⁶ *Watershed Management Cycle*, TENN. DEP’T OF ENV’T & CONSERVATION, <https://www.tn.gov/environment/program-areas/wr-water-resources/watershed-stewardship/watershed-management-approach/watershed-management-cycle.html> (last visited Apr. 4, 2024).

⁵⁷ *Protecting Our Waters with a Watershed Approach (SB 190)*, WIS. CONSERVATION VOTERS, <https://conservationvoters.org/victories/protected-our-waters-with-a-watershed-approach> (last visited Apr. 5, 2024).

VOLUNTARY PROGRAMS

Water programs that are not mandatory are often structured to increase public awareness and engagement, improve collaboration, and share results. When community members are more engaged, they are more likely to share their experiences and the challenges they face with the status quo. Encouraging community engagement at a watershed scale facilitates the telling of a more complete cause-and-effect story around pollution sources.

EPA’s [Technical Assistance to Brownfields Communities](#) (TAB) is an example of an important voluntary program that is built on engaging communities and improving the conditions for communities living near contaminated lands.⁵⁸

Around the country, EPA has funded particular entities to be service providers to this program. In Dover-Foxcroft, Maine, town officials were helped by a TAB provider, the New Jersey Institute of Technology (NJIT), to ensure community engagement during redevelopment of a contaminated former mill and tannery along the Piscataquis River. The TAB assistance facilitated the process that resulted in consensus on using the site as a 36-acre park. The activities in the park take advantage of all the river has to offer, such as canoeing, kayaking, and year-round use of trails.⁵⁹



Source: EPA, *RI Success Story: Mayo Mill, Dover-Foxcroft, Maine*

3. Protection of Drinking Water Source Waters

Source water protection is stronger when planned and implemented at a watershed scale. Upstream threats to downstream water intakes, or groundwater threats to water supply sources (surface water or wellfields), must be considered when assessing drinking water system vulnerability. Examples below include programs and initiatives where watershed organizing has been used to improve strategies and outcomes.

GRANT PROGRAMS

There are many sources of funding available for source water protection at federal, Tribal, state, and local levels. While a watershed approach is not explicitly called for in any programs reviewed here, any requirements to identify sources of risk that are upstream or upgradient inherently apply principles of the watershed approach. When source water protection planning is involved, it may often be undertaken at various watershed scales. Examples of source water

⁵⁸ *Technical Assistance*, ENV’T PROT. AGENCY, <https://www.epa.gov/brownfields/technical-assistance> (last visited Apr. 4, 2024) (brownfields).

⁵⁹ *RI Success Story: Mayo Mill, Dover-Foxcroft, Maine*, ENV’T PROT. AGENCY, <https://www.epa.gov/brownfields/r1-success-story-mayo-mill-dover-foxcroft-maine> (last visited June 3, 2024).

protection planning in a watershed context follow, though perhaps not always taking the full watershed into account.

The [Drinking Water State Revolving Fund](#) (DWSRF) is administered by EPA and run by entities within each state.⁶⁰ This fund has specific set-asides for Tribal projects,⁶¹ source water protection programs, and planning. These set-asides are used for a range of activities, including loans for land conservation, public outreach and education, implementing source water protection plans, delineating source water protection areas, developing wellhead protection programs, planting cover crops, facilitating septic system surveys and replacement, developing local ordinances, and managing state programs.

In Washington State, the Skagit Public Utility District (PUD) relies on the Gillian Creek area of the Cultus Mountain Watershed for 45 percent of the water they provide to residents of Skagit County. The PUD used DWSRF set-aside funds for an appraisal and survey of 250 acres of critical land around Gillian Creek that was ultimately purchased from timber companies to protect their source water.⁶²

The Natural Resources Conservation Service developed a [Source Water Protection](#)⁶³ program with set-asides from many of the 2018 Farm Bill conservation programs.⁶⁴ The [Cedar River Source Water Partnership](#) in Iowa is an example of this program that provided financial and technical support to foster an urban-rural partnership between Cedar Rapids and farmers in the watershed that was focused on reducing nitrate runoff from fields to improve drinking water quality.⁶⁵ Conservation practices that may qualify for cost-share through this program include cover crops, no-till/strip till, bioreactors, saturated buffers, wetlands creation, enhancement, or restoration, and prairie strips.⁶⁶

A [Septic Tank Remediation Program](#) run by the Illinois River Watershed Partnership⁶⁷ provides grants and zero-interest loans with funds from the Natural Resources Division of the Arkansas

⁶⁰ *Drinking Water State Revolving Fund (DWSRF)*, ENV'T PROT. AGENCY, <https://www.epa.gov/dwsrf> (last visited Apr. 5, 2024).

⁶¹ *Drinking Water Infrastructure Grants – Tribal Set-Aside Program*, ENV'T PROT. AGENCY, <https://www.epa.gov/tribaldrinkingwater/drinking-water-infrastructure-grants-tribal-set-aside-program> (last visited May 20, 2024).

⁶² ENV'T PROT. AGENCY, EPA 816-F-19-003, PROTECTING SOURCE WATER WITH THE DRINKING WATER STATE REVOLVING FUND SET-ASIDES (2019), https://www.epa.gov/sites/default/files/2019-10/documents/protecting_source_water_with_the_dwsrf_-_final.pdf.

⁶³ *Source Water Protection*, NAT. RES. CONSERVATION SERV., <https://www.nrcs.usda.gov/programs-initiatives/source-water-protection> (last visited Feb. 5, 2024).

⁶⁴ The 2018 Farm Bill instructed USDA to encourage the protection of drinking water sources by dedicating at least 10 percent of the total funds available for RCPP, EQIP, ACEP, CSP to source water protection each year from 2019-2023, among other activities. *Source Water Protection*, NAT. RES. CONSERVATION SERV., <https://www.nrcs.usda.gov/programs-initiatives/source-water-protection> (last visited Apr. 4, 2024).

⁶⁵ CEDAR RAPIDS & NAT. RES. CONSERVATION SERV., CEDAR RIVER SOURCE WATER PARTNERSHIP, https://cms8.revize.com/revize/cedarrapids/document_center/Utilities/8.5x11%20CRSWP%20Handout.pdf (last visited Apr. 4, 2024).

⁶⁶ *Id.*

⁶⁷ The Illinois River Watershed drains from northwest Arkansas westward into northeast Oklahoma.

Department of Agriculture.⁶⁸ One of the intended purposes of the program is to protect private wells that are vulnerable to the unique karst geology⁶⁹ on the Arkansas side of the Illinois River.

REGULATORY PROGRAMS

When pollution discharges, dredge and fill activities, or water quality restoration plans (TMDLs) are proposed for a water body that is a source of drinking water, a higher level of scrutiny should always come into play. Without a watershed approach, impacts to nearby or downstream source waters may not be evaluated.

Missouri began its statewide [watershed planning](#) in 2012.⁷⁰ The Department of Natural Resources supports watershed planning through its Nonpoint Source Management and Source Water Protection Programs. The [Upper Little Sac River Watershed Management Plan](#) was developed to address bacteria, mercury, and algae impairments as well as a loss of biotic diversity in the southwest Missouri watershed.⁷¹ The plan identifies two aquifers that lie under the watershed and supply municipal, agricultural, and industrial water as well as three lakes in the watershed that are public drinking water supplies for the Springfield area. The aquifers are characterized by the karst geology of the region, which makes them especially vulnerable to pollution sources. Total Maximum Daily Loads developed to address algae and bacteria impairments contributed valuable information to the watershed planning process. The TMDLs address both nonpoint source pollution from agricultural and urban runoff and point source pollution from Springfield’s wastewater treatment plant.

VOLUNTARY PROGRAMS

The majority of source water protection planning and protection efforts occurs not because funds are available or regulatory mechanisms require it, but because it is understood to be critically important to communities’ health and welfare.

The Beaver Watershed Alliance (BWA),⁷² a stakeholder group in northwestern Arkansas representing interests in conservation, education, water utilities, science, business, agriculture, recreation, and local government, was established to protect Beaver Lake, the drinking water source for 20 percent of Arkansans. A program of BWA, called Smart Growth for Source Water Protection, recognizes the potential impact on the watershed from projected population growth in

⁶⁸ *Septic Tank Remediation Program (STRP)*, ILL. RIVER WATERSHED PARTNERSHIP, <https://www.irwp.org/septic> (last visited Apr. 5, 2024).

⁶⁹ ILLINOIS RIVER WATERSHED PARTNERSHIP & ARKANSAS NATURAL RESOURCES COMMISSION, *WATERSHED-BASED MANAGEMENT PLAN FOR THE UPPER ILLINOIS RIVER WATERSHED, NORTHWEST ARKANSAS 2-2* (2012), <https://static1.squarespace.com/static/60340fef633126034cdb3b02/t/60cc21b40de6511b6fe3dc89/1623990720752/UIRW-Watershed-Based-Plan-2012-11-30-Final.pdf>.

⁷⁰ *Watershed Planning*, MO. DEP’T OF NAT. RES., <https://dnr.mo.gov/water/what-were-doing/watershed-planning> (last visited Apr. 5, 2024).

⁷¹ *Upper Little Sac River Watershed Management Plan Summary – PUB3078*, MO. DEP’T OF NAT. RES. (Oct. 30, 2023), <https://dnr.mo.gov/document-search/upper-little-sac-river-watershed-management-plan-summary-pub3068/pub3068>.

⁷² BEAVER WATERSHED ALLIANCE, <https://www.beaverwatershedalliance.org/> (last visited Apr. 4, 2024).

the region, land conversion, and changing weather patterns.⁷³ The program calls on voluntary adoption of tools and practices to protect the high quality source water and resiliency of Beaver Lake. The tools provided include information on urban riparian protection, native plants, rain gardens, no-mow practices, examples of local low impact development, model codes and ordinances, and EPA resources.

The only National Estuary Program (NEP) in the Mississippi River Basin, Barataria-Terrebonne National Estuary Program (BTNEP), lists protection of drinking water sources as a priority in its action plan.⁷⁴ The NEP is a forum for stakeholders in an estuary to come together to identify problems, formulate solutions, and pursue implementation of the action items collaboratively. EPA provides funding, guidance, and technical assistance to the NEPs, but it is a non-regulatory program that accomplishes far more than the seed money from EPA could ever achieve on its own. In the case of the BTNEP, the drinking water protection action item calls for delineation of all drinking water sources in the estuary, identification of potential sources of contamination, engagement of citizens in active protection, and use of best management practices to diminish or eliminate problems, among other activities.⁷⁵

4. Promotion of Nature-Based Strategies

Nature-based solutions focus on protecting, sustainably managing, and restoring natural and modified ecosystems and can help address climate change, human health concerns, food and water security, and biodiversity loss in the process.⁷⁶ Planning, raising funds for, and implementing nature-based projects at a watershed scale enhances thinking about connectivity, function, and impact.

Guidance and support from federal agencies and the Biden White House underscore the current national interest in nature-based solutions. In May 2021, the [Green Infrastructure Federal Collaborative](#) was re-launched, encouraging cooperation among federal agencies, the Council on Environmental Quality, and the American Association for the Advancement of Science.⁷⁷ In November 2022, the White House released a report to the National Climate Task Force, [Opportunities to Accelerate Nature-Based Solutions: A Roadmap for Climate Progress, Thriving Nature, Equity, and Prosperity](#).⁷⁸

Below are examples of nature-based solutions that have embraced a watershed context.

⁷³ *Id.*; *Smart Growth for Source Water Protection*, BEAVER WATERSHED ALLIANCE, <https://www.beaverwatershedalliance.org/smart-growth-for-source-water-protection/> (last visited Apr. 4, 2024).

⁷⁴ *CCMP Action Plan List*, BARATARIA-TERREBONNE NAT. ESTUARY PROGRAM, <https://btnep.org/about-btnep/ccmp-action-plan-list/> (last visited Apr. 4, 2024).

⁷⁵ *Id.*

⁷⁶ *Nature-based Solutions*, INT'L UNION FOR CONSERVATION OF NATURE AND NATURAL RESOURCES, <https://www.iucn.org/our-work/nature-based-solutions> (last visited Apr. 4, 2024).

⁷⁷ *Green Infrastructure Federal Collaborative*, ENV'T PROT. AGENCY, <https://www.epa.gov/green-infrastructure/green-infrastructure-federal-collaborative> (last visited Apr. 5, 2024).

⁷⁸ WHITE HOUSE COUNCIL ON ENV'T QUALITY ET AL., *OPPORTUNITIES TO ACCELERATE NATURE-BASED SOLUTIONS: A ROADMAP FOR CLIMATE PROGRESS, THRIVING NATURE, EQUITY, & PROSPERITY* (2022), <https://www.whitehouse.gov/wp-content/uploads/2022/11/Nature-Based-Solutions-Roadmap.pdf>.

GRANT PROGRAMS

As mentioned above, EPA established a limited-duration [Healthy Watersheds Consortium Grants](#)⁷⁹ program as part of its [Healthy Watersheds Protection Program](#)⁸⁰ to support states, Tribes, and other entities working to protect healthy watersheds through holistic strategies. The Beltrami Soil and Water Conservation District in Minnesota received \$150,000 in 2019 to protect the high quality waters in the Mississippi River Headwaters through conservation of 10,000 forested acres and establishment of a watershed protection model that focuses on lakes of outstanding biological significance, priority wild rice lakes, and lakes with exceptional fish biological integrity. This model was replicated and led to development of a Mississippi Headwaters Watershed Comprehensive Plan that identifies needs of \$51 million for protection and stewardship.⁸¹

In response to the 2011 Las Conchas Wildfire in New Mexico, the Army Corps of Engineers worked with the Santa Clara Pueblo Tribal government as well as other federal agencies to employ nature-based solutions to reduce risks to residents in the Santa Clara watershed that could be associated with future floods and other potential disasters.⁸² The solutions were guided by Indigenous knowledge and included limited access to sacred springs and use of locally-available materials to construct control check dams.

REGULATORY PROGRAMS

Nature-based solutions can be employed in many ways in permits and restoration plans to prevent pollutants from getting to water bodies. Memoranda and guidance on how this is accomplished in municipal stormwater permits, combined sewer overflows, and Total Maximum Daily Loads can be found on EPA's [website](#).⁸³

⁷⁹ *Healthy Watershed Consortium Grants*, ENV'T PROT. AGENCY, <https://www.epa.gov/hwp/healthy-watersheds-consortium-grants> (last visited Apr. 5, 2024).

⁸⁰ *Protecting Aquatic Systems via Landscape Approaches*, ENV'T PROT. AGENCY, <https://www.epa.gov/hwp> (last visited Apr. 5, 2024).

⁸¹ *2019 Healthy Watersheds Consortium Grant Awards*, ENV'T PROT. AGENCY, <https://www.epa.gov/hwp/2019-healthy-watersheds-consortium-grant-awards-0> (last visited Jan. 31, 2023).

⁸² WHITE HOUSE COUNCIL ON ENV'T QUALITY ET AL., *NATURE-BASED SOLUTIONS RESOURCE GUIDE 12* (2022), <https://www.whitehouse.gov/wp-content/uploads/2022/11/Nature-Based-Solutions-Resource-Guide-2022.pdf>

⁸³ *Integrating Green Infrastructure into Federal Regulatory Programs*, ENV'T PROT. AGENCY, <https://www.epa.gov/green-infrastructure/integrating-green-infrastructure-federal-regulatory-programs> (last visited Apr. 4, 2024).

Green infrastructure practices, a category of nature-based solutions, are commonly included in municipal stormwater permits. The San Diego municipal stormwater permit is a regional permit that requires Water Quality Improvement Plans for the receiving waters of each of ten Watershed Management Areas. This permit also requires intergovernmental coordination among the numerous municipal copermittees. The permit requires the incorporation of any applicable TMDL requirements as well. The watershed approach embedded in the permit ensures that all pollutant sources are considered and held responsible through individual and collective requirements.⁸⁴

1. Watershed Management Areas

The Copermittees must develop a Water Quality Improvement Plan for each of the Watershed Management Areas in Table B-1. A total of ten Water Quality Improvement Plans must be developed for the San Diego Region.

Table B-1. Watershed Management Areas

Hydrologic Unit(s)	Watershed Management Area	Major Surface Water Bodies	Responsible Copermittees
San Juan (901.00)	South Orange County	- Aliso Creek - San Juan Creek - San Mateo Creek - Pacific Ocean - Heislser Park ASBS	- City of Aliso Viejo - City of Dana Point - City of Laguna Beach - City of Laguna Hills ¹ - City of Laguna Niguel - City of Laguna Woods ² - City of Lake Forest ² - City of Mission Viejo - City of Rancho Santa Margarita - City of San Clemente - City of San Juan Capistrano - County of Orange - Orange County Flood Control District
Santa Margarita (902.00)	Santa Margarita River	- Murrieta Creek - Temecula Creek - Santa Margarita River - Santa Margarita Lagoon - Pacific Ocean	- City of Menifee ³ - City of Murrieta ⁴ - City of Temecula - City of Wildomar ⁴ - County of Riverside - County of San Diego - Riverside County Flood Control and Water Conservation District
San Luis Rey (903.00)	San Luis Rey River	- San Luis Rey River - San Luis Rey Estuary - Pacific Ocean	- City of Oceanside - City of Vista - County of San Diego

Source: California Regional Water Quality Control Board, Technical Report for Order No. R9-2013-0001

VOLUNTARY PROGRAMS

Voluntary programs that promote nature-based solutions do so for a broad set of goals that may include mitigating effects of climate change, promoting source water protection, improving agricultural best management practices, and encouraging disaster preparedness. Examples below offer a few ways that nature-based solutions are or could be applied at the watershed scale.

Kentucky’s Energy and Environment Cabinet promotes nature-based solutions through an interactive story map, webinars, videos, publications, and partnerships that include The Nature Conservancy (TNC), the Kentucky Association of Mitigation Managers,⁸⁵ and the Federal Emergency Management Agency (FEMA).⁸⁶ One highlighted project in the [Nature-Based Watershed Solutions in Kentucky Story Map](#)⁸⁷ is funded by NRCS, managed by TNC, and titled [Mississippi River Tributary Wetland Restoration](#).⁸⁸ TNC has purchased easements on 9500 acres

⁸⁴ CAL. REGIONAL WATER QUALITY CONTROL BOARD SAN DIEGO REGION, ORDER NO. R9-2013-0001, NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT AND WASTE DISCHARGE REQUIREMENTS FOR DISCHARGES FROM THE MUNICIPAL SEPARATE STORM SEWER SYSTEMS (MS4s) DRAINING THE WATERSHEDS WITHIN THE SAN DIEGO REGION (Nov. 18, 2015), https://www.waterboards.ca.gov/sandiego/water_issues/programs/stormwater/docs/2015-1118_AmendedOrder_R9-2013-0001_AttF.pdf.

⁸⁵ KENTUCKY ASS’N OF MITIGATION MANAGERS, NATURE BASED SOLUTIONS FOR HAZARD MITIGATION IN KENTUCKY (2022), <https://www.kymitigation.org/wp-content/uploads/2022/04/Nature-Based-Solutions-for-Hazard-Mitigation-in-Kentucky-Final-April-2022.pdf>.

⁸⁶ FED. EMERGENCY MGMT. AGENCY, FEMA ECONOMIC BENEFIT VALUES FOR GREEN INFRASTRUCTURE (2022), https://www.fema.gov/sites/default/files/documents/fema_economic-benefit-values-green-infrastructure.pdf.

⁸⁷ *Nature-Based Watershed Solutions in Kentucky*, KY. ASS’N OF MITIGATION MANAGERS, <https://www.arcgis.com/apps/Shortlist/index.html?appid=bd78c93f73964c5298ff0dc9af28e008> (last visited Apr. 4, 2024).

⁸⁸ *Id.* (Mississippi River Tributary Wetland Restoration).

of frequently flooded farm land and worked to restore native vegetation and hydrology on those lands to reduce nutrients, increase flood water storage, and create habitat for wildlife.

EPA developed a program called Greening America’s Capitols, now called [Greening America’s Communities](#).⁸⁹ This program helps local governments incorporate green infrastructure into their master planning processes by providing a team of designers to work on a pilot neighborhood.

In 2009, following the dramatic 2008 flooding on the Iowa River, Rebuild Iowa tapped into resources and expertise from EPA and FEMA to add green infrastructure and open space to the Riverfront Crossings District in Iowa City. These changes were intended to protect against future flooding, polluted runoff, and erosion by creating a resilient riverfront community park and relocating vulnerable properties and infrastructure.⁹⁰

The Vermont Department of Environmental Conservation has developed a [Functioning Floodplains Initiative](#)⁹¹ that identifies nature-based projects to achieve complementary goals of flood resiliency, ecological integrity, and improved water quality. Assessment of stream and floodplain connectivity and human-related hydrologic disconnections is intended to occur at the basin scale to support regional planning. The [User’s Guide](#)⁹² to the tools of the Initiative apply down to the site level.

5. Breaking Down Silos in Water Resources Management

Across the country, concern about problems in watersheds that cross or define political boundaries can motivate increased communication and coordination among local, state, federal, and Tribal entities. Reaching across jurisdictions to share data, coordinate outreach to impacted communities and generators of pollution, and collaborate on development and implementation of solutions translates into a greater chance for success.

GRANT PROGRAMS

Grant programs frequently encourage applicants to develop partnerships among stakeholders, agencies, Tribes, businesses, and NGOs to facilitate (a) understanding of multiple perspectives and (b) coordination of project implementation among interested parties. Examples follow of grant programs requiring coordination at a watershed scale.

⁸⁹ *Reports from Greening America’s Communities Projects*, ENV’T PROT. AGENCY, <https://www.epa.gov/smartgrowth/reports-greening-americas-communities-projects> (last visited Apr. 5, 2024).

⁹⁰ *Smart Growth Along the Riverfront Helps Manage Stormwater in Iowa City, Iowa*, ENV’T PROT. AGENCY, <https://www.epa.gov/arc-x/smart-growth-along-riverfront-helps-manage-stormwater-iowa-city-iowa> (last visited Apr. 4, 2024); *Community Stories: How EPA Helps Communities Achieve Their Goals*, ENV’T PROT. AGENCY, <https://epa.maps.arcgis.com/apps/Cascade/index.html?appid=23a2be73da6d48f699655195f62d3158> (last visited Apr. 4, 2024).

⁹¹ *Functioning Floodplain Initiative*, VERMONT DEP’T OF ENV’T CONSERVATION, <https://dec.vermont.gov/rivers/ffi> (last visited May 5, 2024).

⁹² VERMONT DEP’T OF ENV’T CONSERVATION, *THE VERMONT FUNCTIONING FLOODPLAIN INITIATIVE TO RECONNECT RIVERS USER’S GUIDE (VERSION 2.1) (2023)*, https://dec.vermont.gov/sites/dec/files/documents/FunctioningFloodplainInitiative_UserGuide.pdf

The [Louisiana Watershed Initiative](#) (LWI) was established in response to historic flooding in 2016 throughout the state.⁹³ An executive order established LWI to coordinate five state and federal agencies and application of federal funding from the Community Development Block Grant Disaster Recovery funds to reduce the state’s flood risk through a watershed-based approach. The guiding principles of this initiative are: using scientific tools and data; enabling transparent, objective decision-making; maximizing the natural function of floodplains; and establishing regional, watershed-based management of flood risk.⁹⁴

The [Mississippi River Basin Healthy Watersheds Initiative](#) (MRBI) was established to coordinate Farm Bill programs in small watersheds such as the Cache River, Fork Point, and St. Francis River in Arkansas.⁹⁵ The MRBI identifies high-priority areas for nutrient reduction on agricultural lands, and assists landowners with voluntary conservation practices funded by several Farm Bill programs. The program has built strong partnerships and trust through investment and technical support. The watershed focus has enabled measurement of success at both the subwatershed and Mississippi River Basin scales.

REGULATORY PROGRAMS

Regulatory programs are established in silos of statute, regulations, and federal, Tribal, state, or local agencies. The examples below demonstrate how the requirements within these programs can be turned into opportunities for coordinated implementation at a watershed scale.

The North Carolina Division of Mitigation Services (NCDMS), previously the North Carolina Ecosystem Enhancement Program, is designed to “restore wetlands functions and values across the State” and to “foster a comprehensive approach to environmental protection.”⁹⁶ Such work is focused on mitigating environmental damage from transportation projects and other development activities.⁹⁷ NCDMS is responsible for developing the first North Carolina Flood Resiliency Blueprint, which is a statewide watershed planning effort designed to support community planning for flooding in the state’s river basins.⁹⁸ Program goals include developing “community and basin-specific risk management processes.”⁹⁹

EPA’s [Chesapeake Bay Program](#) guides restoration and protection of the Chesapeake Bay through agreements among six states, the District of Columbia, and the Chesapeake Bay Commission.¹⁰⁰ Partners in the work include more than 20 federal agencies, state agencies, local

⁹³ LOUISIANA WATERSHED INITIATIVE, <https://watershed.la.gov/> (last visited Apr. 4, 2024).

⁹⁴ *Id.*

⁹⁵ *Mississippi River Basin Healthy Watersheds Initiative*, NAT. RES. CONSERVATION SERV., <https://www.nrcs.usda.gov/programs-initiatives/mississippi-river-basin-healthy-watersheds-initiative> (last visited Apr. 4, 2024).

⁹⁶ NORTH CAROLINA GEN. STAT. § 143-214.9.

⁹⁷ *DMS Programs*, N.C. ENV’T QUALITY, <https://www.deq.nc.gov/about/divisions/mitigation-services/about-dms/dms-programs> (last visited June 6, 2024).

⁹⁸ *Id.*

⁹⁹ *Flood Resiliency Blueprint*, N.C. ENV’T QUALITY, <https://www.deq.nc.gov/about/divisions/mitigation-services/flood-resiliency-blueprint> (last visited June 6, 2024).

¹⁰⁰ CHESAPEAKE BAY PROGRAM, <https://www.chesapeakebay.net/> (last visited Apr. 5, 2024).

governments and entities, academic partners, and non-governmental organizations. This unprecedented watershed-based coordination is now guided by the [Chesapeake Bay Total Maximum Daily Load](#) (TMDL)¹⁰¹ and the Watershed Implementation Plans developed by each of the seven Bay jurisdictions that articulate specific commitments to meet pollution reductions by 2025.

Problems identified in the Rogue River Basin in southwestern Oregon were addressed in a [basin-wide water quality restoration plan](#) (TMDL) in 2008. TMDLs are required by the Clean Water Act when a pollutant is causing a water body to be impaired or threatened.¹⁰² These restoration plans are typically developed for one pollutant in one reach or segment of the water body. This TMDL addresses both bacteria for human health concerns and temperature to protect all life stages of salmon and trout, and it applies to all perennial and intermittent streams, rivers, and lakes within the Rogue River Basin, unless another TMDL applies. All designated management agencies - close to 30 local, state, and federal agencies with responsibility for implementing pollution limits - had 18 months to develop and implement a plan for the TMDL.¹⁰³

In Massachusetts, the Cape Cod Commission was tasked with the update for the region's [Areawide Water Quality Management Plan](#) to address nitrogen problems on the coast.¹⁰⁴ Coordination across Cape Cod involved representation from towns, hundreds of stakeholders, and state and federal agencies, and resulted in nutrient-reduction strategies and regulatory reforms couched in a watershed approach.

VOLUNTARY PROGRAMS

Voluntary programs can offer unique opportunities to work across agencies, media, and beyond usual partnerships, and to promote creative approaches to common problems. The examples below present versions of these unique and creative opportunities with an attention to watersheds.

Louisiana's [Terrebonne Parish](#) suffered devastating human health, property, and economic damage following hurricanes in 2020 and 2021.¹⁰⁵ After the American Rescue Plan was passed in 2021, EPA's Office of Community Revitalization provided Equitable Resilience technical assistance to the community to plan for their response to future events. This support helped them develop a harbor of refuge and a resilience hub for the fishing industry and nearby residents. The partners working together to protect cultural traditions and the local industry included the Pointe-

¹⁰¹ *Chesapeake Bay Total Maximum Daily Load (TMDL)*, ENV'T PROT. AGENCY, <https://www.epa.gov/chesapeake-bay-tmdl> (last visited Apr. 5, 2024).

¹⁰² *Clean Water Act Section 303(d): Impaired Waters and Total Maximum Daily Loads (TMDLs)*, ENV'T PROT. AGENCY, <https://www.epa.gov/tmdl> (last visited Apr. 4, 2024).

¹⁰³ *TMDL Program: Rogue Basin*, OREGON DEP'T OF ENV'T QUALITY, <https://www.oregon.gov/deq/wq/tmdls/pages/tmdls-rogue-basin.aspx> (last visited Apr. 9, 2024).

¹⁰⁴ These plans are required by CWA Section 208. *Section 208 Area Wide Water Quality Management Plan*, CAPE CODE COMMISSION, <https://www.capecodcommission.org/our-work/208> (last visited Apr. 4, 2024).

¹⁰⁵ *Equitable Resilience Technical Assistance Projects with States and Tribes*, ENV'T PROT. AGENCY, <https://www.epa.gov/arp/equitable-resilience-technical-assistance-projects-states-and-tribes> (last visited Apr. 4, 2024) (Terrebonne Parish, Louisiana).

au-Chien Indian Tribe, the Terrebonne Parish Consolidated Government, the Louisiana Office of Community Development, and the Louisiana Chief Resilience Officer, as well as other public, private, and academic partners.¹⁰⁶

Resilience work must respect hydrologic boundaries even if it is implemented by political jurisdictions. EPA and FEMA work in partnership on disaster recovery, long-term resilience, and engagement with underserved and vulnerable communities under their [Memorandum of Agreement](#), recently updated in 2023.¹⁰⁷ The two agencies employ the [Regional Resilience Toolkit](#) they developed in 2019 to help multiple entities collaborate at a regional scale.¹⁰⁸

In 1994, before EPA released its Watershed Framework, the Jamestown S’Klallam Tribe in Washington State led a pilot planning project that resulted in a [Water Resources Management Plan](#) for the Dungeness and Quilcene Rivers.¹⁰⁹ The pilot project was a product of the work of eight caucuses (agricultural, business, environmental, fisheries, and recreation interests, and Tribal, local, and state governments) to plan for protection of water quality and quantity of both surface and ground waters of the region for the following 20 years. Theirs was one of the first groups to test a framework for regional water management plans created through the “Chelan Agreement” during a 1990 retreat that addressed regional fisheries protection.¹¹⁰

The Puget Sound watershed has been the focus of decades of research, advocacy, and collaboration across jurisdictions and disciplines to protect the unique ecosystem of the Salish Sea. Washington’s Watershed Planning Act in 1997 established 62 Water Resource Inventory Areas (WRIAs) and 44 watershed-based planning groups developed plans.¹¹¹

¹⁰⁶ *Id.*

¹⁰⁷ Memorandum of Agreement Between the Department of Homeland Security/Federal Emergency Management Agency and the U.S. Environmental Protection Agency (Aug. 8, 2023), https://www.epa.gov/system/files/documents/2023-08/DHS_FEMA-EPA%20MOA%202023%20Update_FINAL_08.01.2023.pdf.

¹⁰⁸ *Regional Resilience Toolkit*, ENV’T PROT. AGENCY, <https://www.epa.gov/smartgrowth/regional-resilience-toolkit> (last visited Apr. 4, 2024).

¹⁰⁹ JAMESTOWN S’KLALLAM TRIBE, THE DUNGENESS-QUILCENE WATER RESOURCES MANAGEMENT PLAN (1994), <https://apps.ecology.wa.gov/publications/documents/94wrmp1718.pdf>.

¹¹⁰ *Id.* at 1.6.

¹¹¹ *Id.* § 90.82 (Washington Watershed Planning Act of 1997); *Watershed Plan Archive*, WA. DEP’T OF ECOLOGY, <https://ecology.wa.gov/water-shorelines/water-supply/improving-streamflows/watershed-plan-archive> (last visited Apr. 4, 2024).

Washington Watershed Planning Act of 1997

The legislature finds that the local development of watershed plans for managing water resources and for protecting existing water rights is vital to both state and local interests. The local development of these plans serves vital local interest by placing it in the hands of people:

Who have the greatest knowledge of both the resources and the aspirations of those who live and work in the watershed; and who have the greatest stake in the proper, long-term management of the resources.¹¹²

The [Puget Sound Watershed Characterization Project](#) includes 19 WRIAs and the entire drainage area from the Olympic Mountains to the Cascade Mountains.¹¹³ The project is a regional GIS-based tool developed by state, regional, and federal entities (Washington Departments of Ecology and Fish and Wildlife, EPA, and Puget Sound Partnership) that helps identify the most important areas to protect and restore within the watershed. The tool is intended to support planners and resource managers in their efforts to determine areas most suitable for development.

The [Chicago Metropolitan Agency for Planning](#) (CMAP) leads watershed planning processes in northeastern Illinois as part of its role under the Clean Water Act Section 208, Areawide Water Quality Planning.¹¹⁴ The agency facilitates the development of local watershed plans, employing the [Guidance for Developing Watershed Action Plans in Illinois](#) developed with the Illinois Environmental Protection Agency.¹¹⁵ Although watershed planning is voluntary, it is required when applying for some funding programs such as the Clean Water Act Nonpoint Source Program (Section 319) grants mentioned above. The process itself is also beneficial to communities by creating a forum to share information, discuss common water quality challenges, and collaborate on solving the challenges.

¹¹² WASH. REV. CODE § 90.82.010.

¹¹³ *Puget Sound Watershed Characterization Project*, WA. DEP'T OF ECOLOGY, <https://ecology.wa.gov/water-shorelines/puget-sound/watershed-characterization-project> (last visited Feb. 1, 2024).

¹¹⁴ *Watershed Planning*, CHICAGO METROPOLITAN AGENCY FOR PLANNING, <https://www.cmap.illinois.gov/programs/water/water-quality-management/watershed-planning> (last visited Apr. 4, 2024).

¹¹⁵ CHICAGO METROPOLITAN AGENCY FOR PLANNING & ILL. ENV'T PROT. AGENCY, GUIDANCE FOR DEVELOPING WATERSHED ACTION PLANS IN ILLINOIS (2007), <https://www.cmap.illinois.gov/documents/10180/12157/Developing+Watershed+Action+plans.pdf/3173d107-74a4-4d98-8c36-b327bb43018b>.

TOOLS TO ASSIST WATERSHED APPROACHES

To organize or apply funding, regulatory programs, and voluntary programs by watershed requires a certain level of understanding about watersheds. When approaching problems and solutions at a watershed scale, it is necessary to plan and coordinate local input, stakeholders, and scientific expertise. Numerous tools can help jurisdictions, organizations, and individuals better understand their watersheds, learn how to plan at a watershed scale, and organize local input and necessary expertise to create the conditions for success. Though not exhaustive, the following annotated list offers a suite of helpful tools.

Publications, Training, and Guidance

Federal agencies, especially EPA, have developed publications and online resources to encourage and assist in watershed planning, assessment, and restoration, and the application of a watershed perspective to water management.

Examples of these resources from EPA include [A Quick Guide to Developing Watershed Plans](#),¹¹⁶ [Land Use and Green Infrastructure Scorecard](#), [Low Impact Development Strategies to Protect Water Resources](#),¹¹⁷ the Watershed Academy with a breadth of online training in watershed management, and a [Recovery Potential Screening Tool](#)¹¹⁸ for rapid watershed assessment and comparison of watersheds to prioritize restoration efforts and funds.

In addition, and mentioned above, is the [Regional Resilience Toolkit](#)¹¹⁹ that EPA and the Federal Emergency Management Agency developed in 2019 to support regional disaster recovery collaboration that can take the form of watershed collaboration.

Materials have been developed at the national, state, and watershed scales to support communication of the economic values of nature-based solutions such as green infrastructure and riparian buffers. Examples include [FEMA's Economic Benefit Values for Green Infrastructure](#),¹²⁰ the Land Policy Institute's [Comprehensive Study on Economic Valuation](#), [Economic Impact Assessment](#), and [State Conservation Funding of Green Infrastructure Assets](#) in

¹¹⁶ ENV'T PROT. AGENCY, EPA 841-R-13-003, A QUICK GUIDE TO DEVELOPING WATERSHED PLANS TO RESTORE AND PROTECT OUR WATERS (2013), https://www.epa.gov/sites/default/files/2015-12/documents/watershed_mgmnt_quick_guide.pdf.

¹¹⁷ ENV'T PROT. AGENCY, EPA 833R23002, LAND USE AND GREEN INFRASTRUCTURE SCORECARD: LOW IMPACT DEVELOPMENT STRATEGIES TO PROTECT WATER RESOURCES (2023), https://www.epa.gov/system/files/documents/2023-09/wpd-land-use-and-green-infrastructure-scorecard_508_0.pdf.

¹¹⁸ *Recovery Potential Screening (RPS) – Comparing Watershed Condition and Restorability*, ENV'T PROT. AGENCY, <https://www.epa.gov/rps> (last visited Apr. 5, 2024).

¹¹⁹ *Regional Resilience Toolkit*, ENV'T PROT. AGENCY, <https://www.epa.gov/smartgrowth/regional-resilience-toolkit> (last visited Apr. 4, 2024).

¹²⁰ FED. EMERGENCY MGMT. AGENCY, FEMA ECONOMIC BENEFIT VALUES FOR GREEN INFRASTRUCTURE (2022), https://www.fema.gov/sites/default/files/documents/fema_economic-benefit-values-green-infrastructure.pdf.

Michigan,¹²¹ and Delaware Riverkeeper Network's The Economic Value of Riparian Buffers in the Delaware River Basin.¹²²

Interactive Mapping

An increasing amount of data and information is available through interactive maps. These resources allow desktop analysis of a watershed. Examples from EPA include [How's My Waterway](#),¹²³ which provides an overview of water quality data; [Drinking Water Mapping Application to Protect Source Waters](#),¹²⁴ which compiles drinking water providers, potential sources of contamination, and information on polluted waterways; and [Cleanups in my Community](#),¹²⁵ which identifies hazardous waste cleanup locations and grants that are available to address them.

Searchable Databases

Large amounts of useful information about watersheds are available through numerous searchable databases as well. EPA and partner agencies at the federal, state, Tribal, and local levels have collaborated on [the Water Quality Portal \(WQP\)](#), which integrates publicly available water-quality data.¹²⁶ EPA provides one-stop shopping for data from multiple EPA databases covering water pollution, waste, cleanup, air pollution, toxic contamination, and more at [Envirofacts](#).¹²⁷ When examining compliance with regulatory programs within a watershed, EPA's [Enforcement and Compliance History Online](#) website (ECHO) allows searches for the compliance history of specific facilities.¹²⁸

Collection of Visual Data

Compiling visual data and information improves the characterization of problems, communication with impacted communities, and advocacy for urgent solutions. Visual data

¹²¹ See LAND POLICY INSTITUTE, REPORT #CS-2008-01, COMPREHENSIVE STUDY ON ECONOMIC VALUATION, ECONOMIC IMPACT ASSESSMENT, AND STATE CONSERVATION FUNDING OF GREEN INFRASTRUCTURE ASSETS IN MICHIGAN (2008), <https://www.mml.org/pdf/information/msulandpolicyreport.pdf>.

¹²² See DELAWARE RIVERKEEPER NETWORK, THE ECONOMIC VALUE OF RIPARIAN BUFFERS IN THE DELAWARE RIVER BASIN (2018),

<https://www.delawareriverkeeper.org/sites/default/files/Riparian%20Benefits%20ECONW%200818.pdf>.

¹²³ *How's My Waterway: A Tool for Exploring Your Water Quality*, ENV'T PROT. AGENCY, <https://www.epa.gov/green-infrastructure/hows-my-waterway-tool-exploring-your-water-quality> (last visited Feb. 1, 2024).

¹²⁴ *Drinking Water Mapping Application to Protect Source Waters (DWMAPS)*, ENV'T PROT. AGENCY, <https://www.epa.gov/sourcewaterprotection/drinking-water-mapping-application-protect-source-waters-dwmaps> (last visited Feb. 1, 2024).

¹²⁵ CLEANUPS IN MY COMMUNITY, <https://map22.epa.gov/cimc> (last visited Feb. 1, 2024).

¹²⁶ *Water Quality Portal*, NAT'L WATER QUALITY MONITORING COUNCIL, <https://www.waterqualitydata.us/> (last visited Feb. 5, 2024).

¹²⁷ *Envirofacts*, ENV'T PROT. AGENCY, <https://enviro.epa.gov/> (last visited Feb. 1, 2024).

¹²⁸ *Enforcement and Compliance History Online*, ENV'T PROT. AGENCY, <https://echo.epa.gov/> (last visited Feb. 1, 2024).

range from historical photos that depict historical hydrology, to aerial images and LIDAR¹²⁹ collected by plane or drone, to satellite imagery.¹³⁰

Organizations have partnered with [Southwings](#)¹³¹ pilots in the Southeast and [LightHawk](#)¹³² pilots across the country to obtain aerial imaging of pressing environmental concerns. These images help communicate the extent of problems to decision makers and can motivate more timely response for the communities at risk. Aerial imaging and remote sensing technology offer advantages over traditional field-based watershed monitoring methods including cost, time, and ability to access hard-to-reach locations, among others.

Support for Community Leadership

Building capacity and leadership within communities-at-risk or communities already impacted by watershed problems has always been the most valuable investment. Trainings, tools, adaptable materials, and guidance exist and continue to be developed every day in support of this goal. Examples include “Community-based Research and Involvement,”¹³³ which prioritizes listening to and engaging the community from beginning to end in data collection, identification of problems, crafting of solutions, and implementation of solutions. This area is developing rapidly and is ripe for use in watershed-based programs, projects, and analysis.

Social media applications have been developed to engage the public in collection of data and real-time analysis of conditions in their local waters.¹³⁴ Examples of what the applications collect and display include bacteria levels at swimming locations, presence of road salt in waters, and visible signs of ongoing or past water pollution.

Enhanced communications skills, in particular story-telling, are often called out as a component needed to build local trust and support for watershed protection and restoration efforts. The Water Hub, a project of Climate Nexus, has embarked on a campaign called [Just Infrastructure](#) that makes the case for and demonstrates the power of improved communication.¹³⁵

¹²⁹ *What is Lidar?*, NAT'L OCEAN SERV., <https://oceanservice.noaa.gov/facts/lidar.html> (last visited Jan. 29, 2024); *Case Study: LiDAR for Stream Restoration*, AXIS GEOSPATIAL, <https://www.axisgeospatial.com/case-study-lidar-for-stream-restoration/> (last visited Jan. 29, 2024).

¹³⁰ Gabriela Vidad & Suzanne Ozment, *3 Cutting-Edge Satellite Technologies Showcase Nature's Impact on Water*, WORLD RES. INST. (Dec. 13, 2023), <https://www.wri.org/insights/satellites-nature-based-solutions-water-monitoring>; *Case Study: How Satellite Imagery Is Used for Conservation*, GEOCENTO, https://geocento.com/satellite_imagery_for_conservation (last visited Feb. 1, 2024).

¹³¹ SOUTHWINGS CONSERVATION, <https://www.southwings.org/> (last visited Feb. 1, 2024).

¹³² LIGHTHAWK, <https://www.lighthawk.org/> (last visited Feb. 1, 2024).

¹³³ RIVER NETWORK, TOOLS FOR EQUITABLE CLIMATE RESILIENCE: FOSTERING COMMUNITY-LED RESEARCH AND KNOWLEDGE (2021), <https://www.rivernetwork.org/wp-content/uploads/2021/02/rivernetworkcommunityledresearchtoolkit.pdf>; POLICYLINK, COMMUNITY-BASED PARTICIPATORY RESEARCH: A STRATEGY FOR BUILDING HEALTHY COMMUNITIES AND PROMOTING HEALTH THROUGH POLICY CHANGE (2012), <https://www.policylink.org/sites/default/files/CBPR.pdf>.

¹³⁴ SWIM GUIDE: A SWIM DRINK FISH INITIATIVE, <https://www.theswimguide.org/> (last visited Feb. 1, 2024); *Salt Watch*, IZAAK WALTON LEAGUE OF AMERICA, <https://www.iwla.org/water/stream-monitoring/salt-watch> (last visited Feb. 1, 2024); WATER REPORTER, <https://www.waterreporter.org/> (last visited Feb. 1, 2024).

¹³⁵ *Celebrating Water Progress: New Just Infrastructure Campaign*, WATER HUB BLOG (Feb. 21, 2024), <https://waterhub.org/blog/just-infrastructure-campaign/>.

Years of investment in watershed-based planning and strategy-development has led to a body of work that establishes a foundation for all who embark on a watershed-based journey. In particular, EPA and the National Estuary Partnerships around the country have compiled the [Community-Based Watershed Management Handbook](#) addressing (a) methods of communication for outreach and engagement, (b) establishment of workgroups to focus on different problem areas with respective expertise, (c) identification of agency and academic staff who can support the process, and (d) hiring of staff to coordinate across boundaries and subject matter.¹³⁶ It stands the test of time as a must-have resource.

MEASURING SUCCESS

What does a successful watershed approach look like? Success depends on the goals and objectives of the particular application of the watershed approach. If the program, plan, monitoring, strategies, and local organizing are focused on reducing nutrients in a water body, then success would require that we assess whether benchmarks and milestones that the community or experts have set, such as no summer algae outbreaks or nitrogen samples below the standard, have been met.

It is important, however, to include the watershed “process” in the evaluation. Measures of success must also consider who was involved in identifying problems, collecting baseline data, setting benchmarks and milestones, and implementing strategies. Preliminary goals, indicators, metrics, benchmarks, and milestones should all be set up-front with community input, revisited through the process with community input, assessed with community input, and conclusions drawn from them should be with community input. Establishing the timing of and the process for evaluation early is as important as the development of the goals, milestones, and indicators themselves.

Many resources from EPA as well as from state and local watershed planning handbooks include instructions about setting goals and evaluating progress. A few EPA examples are worth mentioning.

- [Handbook for Developing Watershed Plans to Restore and Protect Our Waters](#)¹³⁷
- [Quick Guide 2013](#)¹³⁸
- [Watershed Index Online \(WSIO\)](#)¹³⁹

¹³⁶ ENV’T PROT. AGENCY, EPA 842-B-05-003, COMMUNITY-BASED WATERSHED MANAGEMENT HANDBOOK (2005), <https://www.epa.gov/nep/community-based-watershed-management-handbook>.

¹³⁷ ENV’T PROT. AGENCY, EPA 841-B-08-002, HANDBOOK FOR DEVELOPING WATERSHED PLANS TO RESTORE AND PROTECT OUR WATERS (2008), https://www.epa.gov/sites/default/files/2015-09/documents/2008_04_18_nps_watershed_handbook_handbook-2.pdf (Ch. 13: Implement Watershed Plan and Measure Progress).

¹³⁸ ENV’T PROT. AGENCY, EPA 841-R-13-003, A QUICK GUIDE TO DEVELOPING WATERSHED PLANS TO RESTORE AND PROTECT OUR WATERS (2013), https://www.epa.gov/sites/default/files/2015-12/documents/watershed_mgmnt_quick_guide.pdf.

¹³⁹ *Watershed Index Online (WSIO): A National Watershed Data Library and Tool*, ENV’T PROT. AGENCY, <https://www.epa.gov/wsio/watershed-index-online-wsio-national-watershed-data-library-and-tool> (last visited Feb. 1, 2024).

- [Recovery Potential Screening](#)¹⁴⁰
- [Indicator and metric reference sheets](#)¹⁴¹

Two examples of measuring success at a watershed scale within the Mississippi River Basin are from the [Healthy Mississippi River Basin Healthy Watersheds 2022 Progress Report](#),¹⁴² reporting on soil loss and reduction of phosphorus and nitrogen; and the [Project by County Outcomes Calculator Tool](#)¹⁴³ developed by the American Farmland Trust to analyze cover crops and no-till/strip-till practices in Illinois. The latter is based on outcomes from the Upper Macoupin Creek Watershed Regional Conservation Partnership Project.

TAKEAWAY MESSAGES

This report articulates the value of applying the watershed approach to river, lake, and wetland protection and restoration efforts throughout the Mississippi River Basin. The following key points distill important messages that are illustrated through the numerous and varied examples from within the Basin and around the country:

- **Watershed Approach Proves Valuable in Addressing Contemporary Challenges**
Outcomes of work focused on climate change impacts, environmental justice, drinking water, nature-based solutions, breaking down silos in water resource management, and many additional areas will improve if the watershed approach is applied.
- **Necessary to Increase Understanding of Watershed Context**
Tools at our disposal make it possible to capture the watershed context of almost any water-related concern. By using GIS, aerial photos, or interactive mapping to better understand the watershed and to reach out to the people living within the watershed, engagement is likely to be broader and the messaging to decision-makers is likely to be more powerful. Take the time to compile watershed information and frame your work and communication by watershed.
- **Important to Frame Problems in Watershed Context**
When water-related problems are framed in a watershed context, the cumulative impact on communities and the ecosystem becomes more apparent. The watershed perspective also creates a collective identity for those impacted by the problems that transcends community boundaries. Take the time to understand the cumulative impacts across the watershed and to build the relationships among those impacted.

¹⁴⁰ *Recovery Potential Screening (RPS) – Comparing Watershed Condition and Restorability*, ENV'T PROT. AGENCY, <https://www.epa.gov/rps> (last visited Feb. 5, 2024).

¹⁴¹ *Indicator Reference Sheets*, ENV'T PROT. AGENCY, <https://www.epa.gov/wsio/indicator-reference-sheets> (last visited Feb. 1, 2024).

¹⁴² NAT. RES. CONSERVATION SERV., *MISSISSIPPI RIVER BASIN HEALTHY WATERSHEDS 2022 PROGRESS REPORT (2022)*, https://www.nrcs.usda.gov/sites/default/files/2023-07/NRCS-Scorecard_MRBI_2022.pdf.

¹⁴³ *Project by County Outcomes Calculator (PCOC) Tool*, FARMLAND INFORMATION CENTER, <https://farmlandinfo.org/publications/project-by-county-outcomes-calculator-tool/> (last visited Apr. 4, 2024).

- **Better to Develop Ideas, Innovations, and Solutions in Watershed Context**
Bringing expertise, knowledge, and real-life experience to the development of solutions across a watershed can lead to innovation and creative ideas driven by those who are most vulnerable and most invested in the success of the actions. Take time to build partnerships with those who bring resources to the table and to include impacted communities in developing solutions.
- **More Powerful to Track Outcomes and Evaluate Success in Watershed Context**
Performing effectiveness monitoring and compiling anecdotal results using a watershed approach can facilitate powerful storytelling about the impact of a particular program or investment. Commit early to a plan for monitoring and communicating program outcomes and revisions at a watershed scale.
- **The Watershed Context Must be Central from the Ask**
Framing funding requests for monitoring of problems, outreach to impacted communities, identification of solutions, and tracking of outcomes at watershed scale will likely result in a more powerful investment in strategic partnerships, community commitment, tangible results, and a replicable story.

APPENDIX A: PROGRAM SUMMARY

Many of the descriptions below are taken directly from program websites to best capture the nature and applicability of the programs.

TABLE 1 – FUNDING PROGRAMS

Program	Description	Watershed Context
Healthy Watersheds Consortium Grants ¹⁴⁴	Limited duration grants (2016-2019) intended to bring more emphasis to protecting high-quality waters under the Clean Water Act.	Grants were all watershed-based; one in Minnesota for Mississippi River Headwaters 2019. (p.23)
Mississippi River Basin Healthy Watersheds Initiative ¹⁴⁵	Small watershed approach to support nutrient reduction strategies; uses several Farm Bill programs, including EQIP, to help landowners with voluntary conservation.	Small watershed approach; Cache River, Fork Point, and St. Francis River in Arkansas. (p.26)
Environmental and Climate Justice Program: Community Change Grants, Thriving Communities Grantmaking, Collaborative Problem-Solving Cooperative Agreement, Government-to-Government ¹⁴⁶	Funded by the Inflation Reduction Act, these four grant opportunities provide financial and technical assistance to benefit underserved and overburdened communities.	No watershed framing in the programs, but grantees can and have focused on watersheds; Upper Narragansett Bay Watershed, RI. (p.16)
EPA - Nonpoint Source Management Grants (CWA Section 319) ¹⁴⁷	States, territories, and Tribes receive grant money that supports a wide variety of activities including technical assistance, financial assistance, education, training, technology transfer,	Must develop nine-element watershed plan to apply; Wisconsin’s Citizens Guide to

¹⁴⁴ 2019 Healthy Watersheds Consortium Grant Awards, ENV’T PROT. AGENCY, <https://www.epa.gov/hwp/2019-healthy-watersheds-consortium-grant-awards-0> (last visited Jan. 31, 2023).

¹⁴⁵ Mississippi River Basin Healthy Watersheds Initiative, NAT. RES. CONSERVATION SERV., <https://www.nrcs.usda.gov/programs-initiatives/mississippi-river-basin-healthy-watersheds-initiative> (last visited Jan. 31, 2024).

¹⁴⁶ Inflation Reduction Act Environmental and Climate Justice Program, ENV’T PROT. AGENCY, <https://www.epa.gov/inflation-reduction-act/inflation-reduction-act-environmental-and-climate-justice-program> (last visited May 20, 2024).

¹⁴⁷ 319 Grant Program for States and Territories, ENV’T PROT. AGENCY, <https://www.epa.gov/nps/319-grant-program-states-and-territories> (last visited Feb. 1, 2024).

	demonstration projects and monitoring to assess the success of specific nonpoint source implementation projects.	Watershed Planning. (p.17)
EPA - Urban Waters Program Small Grants ¹⁴⁸	Restore urban waters while benefiting community and economic revitalization; small grants (last in 2015-16).	Focused on urban water bodies; requires government and local stakeholder involvement.
Five Star and Urban Waters Restoration Grant Program ¹⁴⁹	Develop community capacity to sustain local natural resources for future generations through financial assistance to local partnerships focused on improving water quality, watersheds and the species and habitats they support.	Focused on aquatic and terrestrial habitat, but not necessarily at watershed scale.
EPA - Drinking Water State Revolving Fund ¹⁵⁰	Financial assistance program to help water systems and states achieve the objectives of the Safe Drinking Water Act.	Set-asides for Source water Protection Programs and Plans; Skagit Public Utility District (WA) set-aside funds. (p.20)
EPA - Large Basin-specific Programs and Grants	Chesapeake Bay Program grants (p.27), Great Lakes Restoration Initiative, Columbia River Basin Restoration Funding Assistance, etc.	Funding awarded by watershed.
EPA - National Estuary Program Watersheds Grant Program ¹⁵¹	Non-regulatory program that improves the waters, habitats, and living resources of 28 estuaries across the country; grants to support individual programs and	Funding awarded by watershed; Barataria-Terrebonne NEP at

¹⁴⁸ *Urban Waters Small Grants*, ENV'T PROT. AGENCY, <https://www.epa.gov/urbanwaterspartners/urban-waters-small-grants> (last visited Feb. 1, 2024).

¹⁴⁹ *Five Star and Urban Waters Restoration Grant Program*, NFWF, <https://www.nfwf.org/programs/five-star-and-urban-waters-restoration-grant-program> (last visited Feb. 1, 2024).

¹⁵⁰ *Drinking Water State Revolving Fund (DWSRF)*, ENV'T PROT. AGENCY, <https://www.epa.gov/dwsrf> (last visited Feb. 1, 2024).

¹⁵¹ *EPA Awards \$3.5 Million to Protect Coastal Habitats through a National Estuary Grant Program*, ENV'T PROT. AGENCY (Sept. 1, 2022), <https://www.epa.gov/newsreleases/epa-awards-35-million-protect-coastal-habitats-through-national-estuary-grant-program>.

	competitive grants for innovative projects and building local capacity.	mouth of Mississippi River. (p.22)
EPA - Clean Water State Revolving Fund ¹⁵²	Federal-state partnership that provides low-cost financing to communities for a wide range of water quality infrastructure projects, including Bipartisan Infrastructure Law and Inflation Reduction Act funding opportunities.	Projects are developed to improve water quality; could be grouped by watershed.
EPA - CWA Pollution Control grants (CWA Section 106) ¹⁵³	Pollution control grants fund states, interstate agencies, and Tribes to implement water quality standards, water quality monitoring, impaired waters listing and total maximum daily loads development, National Pollutant Discharge Elimination System permitting, enforcement and compliance, and Safe Drinking Water Act source water protection.	Programmatic funds; watershed based with impaired waters, TMDLs, and source water protection.
EPA - Water Quality Management Plan Grants (CWA Section 604(b)) ¹⁵⁴	Available to “Areawide Planning Agencies” and other entities to carry out water quality management planning activities.	May or may not be basinwide planning; Cape Cod (p.27), Chicago (p.29).
USDA/NRCS - Environmental Quality Incentives Program (EQIP) ¹⁵⁵	Financial and technical assistance for developing conservation plan with practices and activities to help solve on-farm resource issues.	Could have watershed component; Cache River, Fork Point, and St. Francis River in Arkansas. (p.26)

¹⁵² *Clean Water State Revolving Fund (CWSRF)*, ENV’T PROT. AGENCY, <https://www.epa.gov/cwsrf> (last visited Feb. 1, 2024).

¹⁵³ *Water Pollution Control (Section 106) Grants*, ENV’T PROT. AGENCY, <https://www.epa.gov/water-pollution-control-section-106-grants> (last visited Feb. 1, 2024).

¹⁵⁴ *Water Quality Management Planning Grants*, ENV’T PROT. AGENCY, <https://www.epa.gov/nps/water-quality-management-planning-grants> (last visited Feb. 1, 2024).

¹⁵⁵ *Environmental Quality Incentives Program*, NAT. RES. CONSERVATION SERV., <https://www.nrcs.usda.gov/programs-initiatives/eqip-environmental-quality-incentives> (last visited Feb. 1, 2024).

<p>USDA/NRCS – Source Water protection¹⁵⁶</p>	<p>2018 Farm Bill supported source water protection with 10% set-asides in 4 programs (RCPP, EQIP, ACEP, CSP).</p>	<p>Cedar River Source Water Partnership in Iowa.¹⁵⁷ (p.20)</p>
<p>USDA/NRCS - Regional Conservation Partnership¹⁵⁸</p>	<p>Public/private partner-driven approach to conservation that funds solutions to natural resource challenges on agricultural land.</p>	<p>Could have watershed component; Tribal Stream and Michigan Fruitbelt Collaborative. (p.17)</p>
<p>USDA/NRCS - Emergency Watershed Program¹⁵⁹</p>	<p>Financial assistance to help local communities relieve imminent threats to life and property caused by floods, fires, windstorms, and other natural disasters that impair a watershed.</p>	<p>Could have watershed component.</p>
<p>USDA/NRCS – Watershed and Flood Prevention Operations¹⁶⁰</p>	<p>Provides technical and financial assistance to States, local governments, and Tribal organizations to help plan and implement authorized watershed projects for the purpose of: flood prevention, watershed protection, public recreation, public fish and wildlife, agricultural water management, municipal and industrial water supply, water quality management.</p>	<p>Local sponsor required, watershed plan required.</p>
<p>USDA/NRCS - Agricultural Conservation Easement Program (ACEP)¹⁶¹</p>	<p>Limits non-agricultural uses that negatively affect agricultural uses and conservation values; protects grazing uses and related conservation values by restoring or conserving eligible grazing</p>	<p>Could have watershed component.</p>

¹⁵⁶ *Source Water Protection*, NAT. RES. CONSERVATION SERV., <https://www.nrcs.usda.gov/programs-initiatives/source-water-protection> (last visited Feb. 5, 2024).

¹⁵⁷ CEDAR RAPIDS & NAT. RES. CONSERVATION SERV., CEDAR RIVER SOURCE WATER PARTNERSHIP, https://cms8.revize.com/revize/cedarrapids/document_center/Utilities/8.5x11%20CRSWP%20Handout.pdf (last visited Apr. 4, 2024).

¹⁵⁸ *Regional Conservation Partnership Program*, NAT. RES. CONSERVATION SERV., <https://www.nrcs.usda.gov/programs-initiatives/rcpp-regional-conservation-partnership-program> (last visited Feb. 1, 2024).

¹⁵⁹ *Emergency Watershed Protection*, NAT. RES. CONSERVATION SERV., <https://www.nrcs.usda.gov/programs-initiatives/ewp-emergency-watershed-protection> (last visited Feb. 1, 2024).

¹⁶⁰ *Watershed and Flood Prevention Operations (WFPO) Program*, NAT. RES. CONSERVATION SERV., <https://www.nrcs.usda.gov/programs-initiatives/watershed-and-flood-prevention-operations-wfpo-program> (last visited Apr. 5, 2024).

¹⁶¹ *Agricultural Conservation Easement Program*, NAT. RES. CONSERVATION SERV., <https://www.nrcs.usda.gov/programs-initiatives/acep-agricultural-conservation-easement-program> (last visited Feb. 1, 2024).

	land, and protecting and restoring and enhancing wetlands on eligible land.	
USDA/NRCS - Conservation Stewardship Program (CSP) ¹⁶²	Financial and technical assistance for developing a conservation plan that enhances existing efforts using new conservation practices or activities.	Could have watershed component.
HUD - National Disaster Resilience Competition ¹⁶³	Two-phased competitive grants awarded to 13 states and communities in 2014 which included capacity building assistance and project funds.	Watershed approach taken by Iowa (p.12), Tennessee, Virginia, and Springfield, MA.

TABLE 2 – REGULATORY PROGRAMS

Program	Description	Watershed Context
CWA Antidegradation Policy ¹⁶⁴	Outstanding National Resource Waters are designated for ecologically and recreationally significant waters.	Entire watersheds have been designated.
EPA - Dredge and Fill Program ¹⁶⁵ (CWA Section 404), compensatory mitigation ¹⁶⁶	Requires restoration, establishment, enhancement, or preservation of aquatic resources to offset unavoidable adverse impacts.	Watershed approach must be used to the extent appropriate and practicable. ¹⁶⁷

¹⁶² *Conservation Stewardship Program*, NAT. RES. CONSERVATION SERV. (Feb. 1, 2024), <https://www.nrcs.usda.gov/programs-initiatives/csp-conservation-stewardship-program>.

¹⁶³ *National Disaster Resilience Competition*, DEP’T OF HOUSING AND URBAN DEV., https://www.hud.gov/program_offices/economic_development/resilience/competition (last visited Apr. 9, 2024).

¹⁶⁴ *Water Quality Standards: Regulations and Resources*, ENV’T PROT. AGENCY, <https://www.epa.gov/wqs-tech/what-are-water-quality-standards#antideg> (last visited May 20, 2024); ENV’T PROT. AGENCY, WATER QUALITY STANDARDS HANDBOOK CHAPTER 4: ANTIDEGRADATION 12 (2012), <https://www.epa.gov/sites/default/files/2014-10/documents/handbook-chapter4.pdf>.

¹⁶⁵ *Section 404 of the Clean Water Act: Permitting Discharges of Dredge or Fill Material*, ENV’T PROT. AGENCY, <https://www.epa.gov/cwa-404> (last visited May 20, 2024).

¹⁶⁶ ENV’T PROT. AGENCY, EPA-843-F-08-00, WETLANDS COMPENSATORY MITIGATION (2015), https://www.epa.gov/sites/default/files/2015-08/documents/compensatory_mitigation_factsheet.pdf.

¹⁶⁷ *Watershed Approach to Compensatory Mitigation Projects*, U.S. ARMY CORPS OF ENG’RS (Feb. 21, 2017), <https://www.usace.army.mil/Media/Fact-Sheets/Fact-Sheets-View/Article/1088740/watershed-approach-to-compensatory-mitigation-projects/>.

<p>EPA - Pollution Discharge Permit Program (CWA Section 402)¹⁶⁸</p>	<p>Permit program that addresses water pollution by controlling point sources that discharge pollutants.</p>	<p>Guidance on watershed-based permitting;¹⁶⁹ Program Policy Addressing Environmental Justice and Equity in NPDES Permitting;¹⁷⁰ San Diego municipal stormwater permit. (p.24)</p>
<p>EPA - Water Quality Assessment Program/Integrated Report (CWA Section 305(b))¹⁷¹</p>	<p>Biennial report to EPA on status of every water body to EPA compiled into Integrated Report. Data often available online.</p>	<p>Reported by waterbody.</p>
<p>EPA - Impaired Waters /TMDL Program (CWA Section 303(d))¹⁷²</p>	<p>Biennial report to EPA on impaired water bodies; development of Water Quality Restoration Plans (TMDLs) required.</p>	<p>Reported by waterbody; could compile information by watershed; some basinwide TMDLs.</p>
<p>EPA - Water Quality Trading¹⁷³</p>	<p>Market-based approach to controlling pollutants from multiple regulated sources.</p>	<p>Trades commonly restricted within basin or hydrologic unit.</p>
<p>EPA - Clean Watersheds Needs Survey¹⁷⁴</p>	<p>Comprehensive assessment of the capital costs (or needs) to meet the</p>	<p>May be compiled by watershed.</p>

¹⁶⁸ National Pollutant Discharge Elimination System (NPDES), ENV'T PROT. AGENCY, <https://www.epa.gov/npdes> (last visited Jan. 31, 2024).

¹⁶⁹ ENV'T PROT. AGENCY, EPA 833-B-03-004, WATERSHED-BASED NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMITTING IMPLEMENTATION GUIDANCE (2003), https://www.epa.gov/sites/default/files/2015-09/documents/watershedpermitting_finalguidance.pdf; ENV'T PROT. AGENCY, EPA 833-B-07-004, WATERSHED-BASED NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMITTING TECHNICAL GUIDANCE 3 (2007), https://www.epa.gov/sites/default/files/2015-09/documents/watershed_techguidance_entire.pdf.

¹⁷⁰ ENV'T PROT. AGENCY, NPDES PROGRAM POLICY: ADDRESSING ENVIRONMENTAL JUSTICE AND EQUITY IN NPDES PERMITTING (2024), <https://www.epa.gov/system/files/documents/2024-01/npdes-ej-program-guidance-principles-recommended-practices-january-2024.pdf>.

¹⁷¹ National Water Quality Inventory Report to Congress, ENV'T PROT. AGENCY, <https://www.epa.gov/waterdata/national-water-quality-inventory-report-congress> (last visited May 21, 2024).

¹⁷² Identifying and Listing Impaired Waters under the Clean Water Act, ENV'T PROT. AGENCY, <https://www.epa.gov/tmdl/identifying-and-listing-impaired-waters-under-clean-water-act> (last visited May 20, 2024).

¹⁷³ Water Quality Trading, ENV'T PROT. AGENCY, <https://www.epa.gov/npdes/water-quality-trading> (Feb. 1, 2024).

¹⁷⁴ Clean Watersheds Needs Survey, ENV'T PROT. AGENCY, <https://www.epa.gov/cwns> (last visited Feb. 1, 2024).

	water quality goals of the CWA and address water quality and water quality-related public health concerns.	
EPA – Nonpoint Source Pollution management Program (CWA Section_319) ¹⁷⁵	States and Tribes must develop a nonpoint source pollution program that includes assessments and grants.	Grants require a watershed plan. Agency program may focus on watersheds.
Saco River?	Prohibitions for building structures in flood way and floodplain.	Must consider watershed, but only may be portions.
USFWS ¹⁷⁶ / NMFS ¹⁷⁷ - Habitat Conservation Plans	If developed, HCPs allow for Incidental Take Permits for species listed under Endangered Species Act.	May have watershed components for aquatic species.

TABLE 3 – VOLUNTARY PROGRAMS

Program	Description	Watershed Context
EPA - National Estuary Program (CWA Section 320) ¹⁷⁸	Established framework, funding, and processes for watershed-focused, science-based evaluation of problems and development of solutions by stakeholders.	All programs are focused on watersheds; Barataria-Terrebonne National Estuary Program is only one in Mississippi River Basin. (p.22)
Unified Federal Policy Watershed Approach ¹⁷⁹	2000 Policy published in federal register; articulates commitment by 7 federal agencies.	Entire purpose of policy is to bring watershed

¹⁷⁵ *Polluted Runoff: Nonpoint Source (NPS) Pollution*, ENV’T PROT. AGENCY, <https://www.epa.gov/nps> (last visited Feb. 1, 2024).

¹⁷⁶ *Habitat Conservation Plans*, U.S. FISH & WILDLIFE SERV., <https://www.fws.gov/service/habitat-conservation-plans> (last visited Feb. 5, 2024).

¹⁷⁷ *Habitat Conservation Plans on the West Coast*, NAT’L OCEANIC & ATMOSPHERIC ADMIN., <https://www.fisheries.noaa.gov/west-coast/habitat-conservation/habitat-conservation-plans-west-coast> (last visited Feb. 5, 2024).

¹⁷⁸ *Estuaries and the National Estuary Program*, ENV’T PROT. AGENCY, <https://www.epa.gov/nep> (last visited Feb. 5, 2024); 33 U.S.C. § 1330 (National Estuary Program of the Clean Water Act).

¹⁷⁹ Unified Federal Policy for a Watershed Approach to Federal Land and Resource Management, 65 Fed. Reg. 62566 (Oct. 18, 2000), <https://www.federalregister.gov/documents/2000/10/18/00-26566/unified-federal-policy-for-a-watershed-approach-to-federal-land-and-resource-management>.

	(USDA, NOAA, DOE, DOI, EPA, TVA, USACE)	perspective into the work of all the agencies.
EPA – Source Water Protection Planning and Protection ¹⁸⁰	1996 Safe Drinking Water Act amendments required development of Source Water Protection Plans by every water supplier; updates and implementation was voluntary, yet widespread commitment to it at national, state, and local levels for surface and groundwater sources.	Source Water planning is focused on watersheds.
EPA - Healthy Watersheds Protection ¹⁸¹	Bring more emphasis to protecting high-quality waters under the Clean Water Act; National Framework and Action Plan; developed Preliminary Healthy Watersheds Integrated Assessments for lower 48 states; statewide assessments for 4 states and targeted assessments for 4 water bodies.	All work is focused on watersheds; Tennessee example. (p.15)
EPA – Greening America’s Communities ¹⁸²	EPA funds a team of designers to help cities and towns develop a vision that incorporates innovative green infrastructure and other sustainable design to protect the environment, economy, and public health.	Nine MRB corridor state locations; watershed improvements in Madison (Lake Monona), Jefferson City, MO (Wears Creek, Missouri River), and Frankfort, KY (Kentucky River). (p.25)
EPA – Smart Growth and Water ¹⁸³	EPA has compiled resources and examples that highlight how Smart Growth strategies can help communities accommodate development and integrate green infrastructure into streets and neighborhoods to reduce stormwater runoff and use water more efficiently. Office of Community Revitalization offers technical assistance.	Could have watershed focus.
EPA - Areawide Management Plans	Planning requirements established in CWA to address pollution and waste management	Some may be focused on watersheds;

¹⁸⁰ *Source Water Protection*, ENV’T PROT. AGENCY, <https://www.epa.gov/sourcewaterprotection> (last visited Feb. 5, 2024).

¹⁸¹ *Healthy Watersheds Protection*, ENV’T PROT. AGENCY, <https://www.epa.gov/hwp> (last visited Feb. 1, 2024).

¹⁸² *Greening America’s Communities*, ENV’T PROT. AGENCY, <https://www.epa.gov/smartgrowth/greening-americas-communities> (last visited May 20, 2024).

¹⁸³ *Smart Growth and Water*, ENV’T PROT. AGENCY, <https://www.epa.gov/smartgrowth/smart-growth-and-water> (last visited May 20, 2024).

(CWA Section 208) ¹⁸⁴	problems; originally called for “area-wide” plans, many are not regularly updated, often now organized by watershed approach.	Massachusetts Cape Cod Commission (p.27); Chicago Metropolitan Planning (p.29).
USDA/NRCS - Environmental Quality Incentives Program (EQIP) ¹⁸⁵	Technical assistance and planning guidance to develop a conservation plan that outlines conservation practices and activities to help solve on-farm resource issues.	Could include watershed perspective intentionally.
USDA/NRCS - Regional Conservation Partnership ¹⁸⁶	Public/private partner-driven approach to conservation that funds solutions to natural resource challenges on agricultural land; technical assistance offered for conservation planning.	Some RCPPs are watershed-focused; could include watershed perspective in all.
USDA/NRCS - Emergency Watershed Program ¹⁸⁷	Technical assistance and planning guidance to help local communities relieve imminent threats to life and property caused by floods, fires, windstorms, and other natural disasters that impair a watershed.	Focused on watersheds.
EPA - Brownfields Program ; ¹⁸⁸ Technical Assistance to Brownfields Communities Program ¹⁸⁹	Provides grants and technical assistance to communities, states, Tribes, and others to assess, safely clean up and sustainably reuse contaminated properties.	Impact on water bodies is likely discussed in many instances; Piscataquis River, Maine. (p.19)
EPA - Water Quality Trading ¹⁹⁰	A market-based approach to control pollutants from multiple sources that collectively impact water quality conditions.	Trades commonly must occur within a watershed; examples in Minnesota, Illinois, and Mississippi.

¹⁸⁴ ENV’T PROT. AGENCY, EPA 520K75001, MANAGEMENT AGENCIES HANDBOOK FOR SECTION 208 AREA WIDE WASTE TREATMENT MANAGEMENT (1975), <https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=910062N0.TXT>.

¹⁸⁵ *Environmental Quality Incentives Program*, NAT. RES. CONSERVATION SERV., <https://www.nrcs.usda.gov/programs-initiatives/eqip-environmental-quality-incentives> (last visited Feb. 5, 2024).

¹⁸⁶ *Regional Conservation Partnership Program*, NAT. RES. CONSERVATION SERV., <https://www.nrcs.usda.gov/programs-initiatives/rcpp-regional-conservation-partnership-program> (last visited Feb. 5, 2024).

¹⁸⁷ *Emergency Watershed Protection*, NAT. RES. CONSERVATION SERV., <https://www.nrcs.usda.gov/programs-initiatives/ewp-emergency-watershed-protection> (last visited Feb. 5, 2024).

¹⁸⁸ *Brownfields*, ENV’T PROT. AGENCY, <https://www.epa.gov/brownfields> (last visited Feb. 5, 2024).

¹⁸⁹ *Technical Assistance*, ENV’T PROT. AGENCY, <https://www.epa.gov/brownfields/technical-assistance> (last visited Apr. 4, 2024) (Brownfields).

¹⁹⁰ *Water Quality Trading*, ENV’T PROT. AGENCY, <https://www.epa.gov/npdes/water-quality-trading> (Feb. 1, 2024).

APPENDIX B: EXAMPLES

Many of the program goals and descriptions below are taken directly from the website literature.

EXAMPLES WITHIN MISSISSIPPI RIVER BASIN

Table 4 shares examples of programs from the Mississippi River Basin that are structured around watersheds or that use the watershed approach in their implementation.

TABLE 4

Jurisdiction	Program	Goal/Objective	Description
Basin	America’s Watershed Initiative ¹⁹¹	Educate and promote investment and collaboration across the Mississippi River Watershed to ensure the Mississippi River Watershed remains productive and healthy for future generations.	Collaborative organization working with hundreds of business, government, academic, and civic organizations to find solutions for the challenges of managing the Mississippi River and the more than 250 rivers that flow into it; focus on Mississippi River Watershed Report Card , brings together data from multiple sectors and basins, allowing an examination of the status and trends in the watershed to build a shared vision for collaborative action.
Basin	USDA/NRCS – MRB Healthy Watersheds Initiative ¹⁹²	Improve water quality, restore wetlands, and enhance wildlife habitat while ensuring economic viability of agricultural lands.	Small watershed approach to support nutrient reduction strategies; uses several Farm Bill programs, including EQIP, to help landowners with voluntary conservation; Cache River, Fork Point, and St. Francis River in Arkansas. (p.26)
Basin	Upper Mississippi River Basin Association (UMBRA) ¹⁹³	Construction of a second lock; establishment of an ecosystem restoration	Working with Congress and federal agencies to implement key recommendations from the Upper Mississippi River Basin

¹⁹¹ AMERICA’S WATERSHED INITIATIVE, <https://americaswatershed.org/> (last visited May 20, 2024).

¹⁹² *Mississippi River Basin Healthy Watersheds Initiative*, NAT. RES. CONSERVATION SERV., <https://www.nrcs.usda.gov/programs-initiatives/mississippi-river-basin-healthy-watersheds-initiative> (last visited Feb. 5, 2024).

¹⁹³ UPPER MISSISSIPPI RIVER BASIN ASSOCIATION, <https://umrba.org/> (last visited Feb. 5, 2024).

		and monitoring program.	Commission’s 1981 Master Plan for the Upper Mississippi River System.
Basin	Mississippi River Cities and Towns Initiative ¹⁹⁴	Helps protect and restore the Mississippi River to a natural system that can sustainably support human culture and economies as well as wildlife.	Builds the capacity of member mayors of 124 Mississippi River main stem cities and towns; effective local initiatives; bicameral Mississippi River Caucus; funding for natural infrastructure and sustainable development.
Basin	Barataria-Terrebonne National Estuary Program ¹⁹⁵	Protect and preserve the culture and land located between the Mississippi and Atchafalaya Rivers in Southeast Louisiana.	One of 28 National Estuary Programs which are watershed-based programs established to protect and restore the water quality and ecological integrity of estuaries of national significance through collaboration of local stakeholders.
Minnesota	Board of Water and Soil Resources One Watershed, One Plan ¹⁹⁶	Align local water planning on watershed boundaries to create a watershed-wide, science-based approach to watershed management.	Voluntary program; local governments form planning team to create Comprehensive Watershed Management Plans; some planning grants available.
Minnesota	Watershed Health Assessment Framework ¹⁹⁷	Approach for understanding natural resource conditions and challenges, and for identifying opportunities to improve the health and resilience of Minnesota’s watersheds.	State agency compiles water quality data by watershed into Watershed Restoration and Protection Strategies.

¹⁹⁴ MISSISSIPPI RIVER CITIES & TOWNS INITIATIVE, <https://www.mrcti.org/> (last visited Feb. 5, 2024).

¹⁹⁵ *Estuary Issues*, BARATARIA-TERREBONNE NATIONAL ESTUARY PROGRAM, <https://btnep.org/estuary-issues/> (last visited Feb. 5, 2024).

¹⁹⁶ *One Watershed, One Plan*, MINN. BOARD OF WATER & SOIL RES., <https://bwsr.state.mn.us/one-watershed-one-plan> (last visited Feb. 5, 2024).

¹⁹⁷ *Watershed Health Assessment Framework*, MINN. DEP’T OF NAT. RES., <https://www.dnr.state.mn.us/whaf/index.html> (last visited Feb. 5, 2024).

Minnesota	Mississippi Watershed Management Organization ¹⁹⁸	Protect and improve water quality, habitat, and natural resources in an urban watershed that drains directly into the Mississippi River; promote active environmental stewardship among residents.	A joint-powers local government unit that partners with member communities to invest in green infrastructure, monitor and track water quality, and conduct education and outreach.
Wisconsin	Citizens Guide to Watershed Planning ¹⁹⁹	Provide guidance for anyone embarking on restoration and protection of local waters.	UWM Extension offers processes, tips, lists, resources, and other information to assist in writing and implementing a watershed plan; features EPA’s Nine Elements of a Comprehensive Watershed Plan.
Wisconsin	Water Resources Planning and Monitoring Programs - Targeted Watershed Assessments ²⁰⁰	Fulfill federal and state requirements to develop Area Water Quality Management Plans.	Rotating program of water quality monitoring, assessment, and planning by watershed.
Wisconsin	Yahara watershed based permitting ²⁰¹	Phosphorus reduction through collaboration of point and nonpoint sources.	Adaptive management pilot project in Yahara watershed within the Rock River Basin through intergovernmental agreement.
Wisconsin	Menomonee River watershed based municipal stormwater NPDES permit ²⁰²	Require pollution control collaboration among sources of stormwater pollution.	Joint stormwater permit among 14 local, regional, and state jurisdictions within the Menomonee River watershed. (p.14)

¹⁹⁸ MISSISSIPPI WATERSHED MANAGEMENT ORGANIZATION, <https://www.mwmo.org/> (last visited Feb. 5, 2024).

¹⁹⁹ DANIEL ZERR, UNIVERSITY OF WISCONSIN-MADISON, A CITIZEN’S GUIDE TO WATERSHED PLANNING IN WISCONSIN, <https://fyi.extension.wisc.edu/watershedplanning/> (last visited Apr. 4, 2024).

²⁰⁰ *Clean Water Act Water Quality Plans and Reports*, WIS. DEP’T OF NAT. RES., <https://dnr.wisconsin.gov/topic/SurfaceWater/wqmplan> (last visited Feb. 5, 2024).

²⁰¹ ENV’T PROT. AGENCY, EPA-833-F-22-003, WATERSHED-BASED PERMITTING CASE STUDY – YAHARA WATERSHED, WISCONSIN (2023), <https://www.epa.gov/system/files/documents/2022-12/yahara-watershed.pdf>.

²⁰² ENV’T PROT. AGENCY, EPA 833-F-22-004, WATERSHED-BASED PERMITTING CASE STUDY – MENOMONEE RIVER WATERSHED, WISCONSIN (2023), <https://www.epa.gov/system/files/documents/2023-03/menomonee.pdf>.

Wisconsin	Healthy Watersheds Integrated Assessment ²⁰³	Identify healthy watersheds and characterize relative watershed health across the state to guide future protection initiatives.	Integrated assessment of relative watershed health throughout Wisconsin.
Wisconsin	2013 cumulative impacts law ²⁰⁴	Permits written with all pollution sources in watershed in mind.	Allows Wisconsin to consider the cumulative effect of all polluting sources on an entire watershed.
Iowa	Iowa Watershed Approach ²⁰⁵	Reduce floods and improve water quality.	Dept. of Housing and Urban Development investment in collaborative strategy to reduce floods and improve water quality.
Iowa	EPA/FEMA resources in Iowa City River Crossings District ²⁰⁶	Reduce future flooding, runoff, and erosion.	Agencies helped Rebuild Iowa create a resilient riverfront community park and relocate vulnerable properties and infrastructure. (p.25)
Illinois	Watershed Management Program ²⁰⁷	Develop an integrated holistic process that will effectively and efficiently protect, enhance, and restore the physical, chemical and biological integrity of water resources within a defined watershed.	Utilizing a watershed approach, the Planning Unit conducts activities and implements programs for the protection and restoration of Illinois' water resources: *Targeted Watershed Approach *Unified Watershed Assessment *Watershed Restoration Priorities

²⁰³ ENV'T PROT. AGENCY, EPA 841-R-14-001, A REPORT ON THE STATUS AND VULNERABILITY OF WATERSHED HEALTH IN WISCONSIN (2014), https://www.epa.gov/sites/default/files/2015-11/documents/wihwreport_0.pdf.

²⁰⁴ *Protecting Our Waters with a Watershed Approach (SB 190)*, WIS. CONSERVATION VOTERS, <https://conservationvoters.org/victories/protected-our-waters-with-a-watershed-approach> (last visited Feb. 5, 2024).

²⁰⁵ IOWA WATERSHED APPROACH, <https://iowawatershedapproach.org/> (last visited Feb. 5, 2024).

²⁰⁶ *Smart Growth Along the Riverfront Helps Manage Stormwater in Iowa City, Iowa*, ENV'T PROT. AGENCY, <https://www.epa.gov/arc-x/smart-growth-along-riverfront-helps-manage-stormwater-iowa-city-iowa> (last visited Apr. 4, 2024); *Community Stories: How EPA Helps Communities Achieve Their Goals*, ENV'T PROT. AGENCY, <https://epa.maps.arcgis.com/apps/Cascade/index.html?appid=23a2be73da6d48f699655195f62d3158> (last visited Apr. 4, 2024).

²⁰⁷ *Planning*, Ill. ENV'T PROT. AGENCY, <https://epa.illinois.gov/topics/water-quality/watershed-management/planning.html> (last visited Feb. 5, 2024).

Chicago Metropolitan Agency for Planning	Areawide Water Quality Planning; Water Quality Management Plan development ²⁰⁸	Acknowledge the value of water and other natural resources and seek to improve quality-of-life in the watershed for both current residents and future generations.	Leads one or more watershed planning processes at any given time in the northeastern Illinois region; voluntary but necessary for funding. (p.29)
Kentucky	Watershed Planning ²⁰⁹	Help Kentuckians work together to improve the waterways they appreciate and use.	The program depends on basin coordinators, promotes nature-based solutions, and is guided by the Watershed Planning Guidebook.
Kentucky	Mississippi River Tributary Wetland Restoration ²¹⁰	Reduce nutrients, increase flood water storage, and create habitat for wildlife.	Project funded by NRCS; TNC has purchased easements on 9500 acres of frequently flooded farmland and restored native vegetation and hydrology. (p.24)
Missouri	Watershed Planning ²¹¹	A statewide watershed planning effort to strategically address local water resource issues.	Watershed Planning for nonpoint source funding and source water protection; Guidelines for Protecting Forests and Streams; Upper Little Sac River Watershed Management Plan. (p.21)
Tennessee	Watershed Management Approach ²¹²	Watershed approach to water quality protection and restoration.	Synchronizes public involvement, identification of challenges, planning, monitoring, assessment, and permitting activities by watershed.
Tennessee	Tennessee Healthy	Improve the state’s collective approach to	Forum for communication, collaboration, and thoughtful planning among a broad

²⁰⁸ *Watershed Planning*, CHICAGO METROPOLITAN AGENCY FOR PLANNING, <https://www.cmap.illinois.gov/programs/water/water-quality-management/watershed-planning> (last visited Feb. 5, 2024).

²⁰⁹ *Watershed Planning*, KENTUCKY ENERGY & ENV’T CABINET, <https://eec.ky.gov/Environmental-Protection/Water/Protection/Pages/WatershedPlanning.aspx> (last visited Feb. 5, 2024).

²¹⁰ *Id.* (Mississippi River Tributary Wetland Restoration).

²¹¹ *Watershed Planning*, MO. DEP’T OF NAT. RES., <https://dnr.mo.gov/water/what-were-doing/watershed-planning> (last visited Feb. 5, 2024).

²¹² *Watershed Management Approach*, TENN. DEP’T OF ENV’T & CONSERVATION, <https://www.tn.gov/environment/program-areas/wr-water-resources/watershed-stewardship/watershed-management-approach.html> (last visited Feb. 5, 2024).

	Watershed Initiative ²¹³	managing water resources.	partnership of agencies and interests.
Tennessee	Federal Healthy Watersheds Integrated Assessment ²¹⁴	Bring more emphasis to protecting high-quality waters under the Clean Water Act.	Identified relative health of watersheds across the entire state of Tennessee; Watershed Health and Vulnerability Indices. (p.15)
Arkansas	University of Arkansas Extension Watershed Approach ²¹⁵	Promote local watershed management plans.	Gives decision-making power to those who are interested in maintaining and improving water quality at the watershed level.
Arkansas	Source Water Assessment and Protection Programs ²¹⁶	Provide background and access to Arkansas and EPA source water protection documents.	Guidance released for source water assessment and protection program (SWAP), connection to Watershed Approach, emphasize public involvement for the SWAP.
Arkansas	Watershed Resources website ²¹⁷ ; Organized Arkansas Watershed Community Efforts	Provide access to watershed information and resources.	Website with watershed-specific resources of interest to Arkansas residents, including connection to 16 Arkansas-specific watershed community efforts.
Arkansas	Septic Tank Remediation Program ²¹⁸	Protect private wells that are vulnerable to the karst geology.	Run by the Illinois River Watershed Partnership; provides grants and zero-interest loans

²¹³ *New Initiative Designed to Maintain and Improve Tennessee Rivers and Streams*, TENN. STATE GOV'T (July 18, 2012), <https://www.tn.gov/news/2012/7/18/new-initiative-designed-to-maintain-and-improve-tennessee-rivers-and-stream.html>; *Tennessee's Healthy Watershed Initiative*, ENV'T COUNCIL OF THE STATES (Jan. 30, 2015), <https://www.ecos.org/news-and-updates/tennessees-healthy-watershed-initiative/>.

²¹⁴ ENV'T PROT. AGENCY, HEALTHY WATERSHEDS PROGRAM, TENNESSEE INTEGRATED ASSESSMENT OF WATERSHED HEALTH: A REPORT ON THE STATUS AND VULNERABILITY OF WATERSHED HEALTH IN TENNESSEE (2015), https://www.epa.gov/sites/default/files/2015-10/documents/tn_hwp_report_final_october2015.pdf.

²¹⁵ UNIV. OF ARK., DIV. OF AGRIC., FSA9526R, USING THE WATERSHED APPROACH TO MAINTAIN AND ENHANCE WATER QUALITY, <https://www.uaex.uada.edu/publications/pdf/FSA-9526.pdf> (last visited Feb. 5, 2024).

²¹⁶ *Source Water Protection: Source Water Assessment and Protection Programs*, ARK. DEP'T OF HEALTH, <https://www.healthy.arkansas.gov/drinking-water-source-water-protection> (last visited Feb. 5, 2024).

²¹⁷ *Watershed Resources*, ARK. DEP'T OF ENERGY & ENV'T, <https://www.adeq.state.ar.us/poa/watershed/> (last visited Feb. 5, 2024).

²¹⁸ *Septic Tank Remediation Program (STRP)*, ILL. RIVER WATERSHED PARTNERSHIP, <https://www.irwp.org/septic> (last visited Apr. 5, 2024).

			with funds from the Natural Resources Division of the Arkansas Department of Agriculture. (p.20)
Arkansas	Smart Growth for Source Water Protection ²¹⁹	Protect high quality source water and resilience of Beaver Lake, the drinking water source for 20 percent of Arkansans.	Relies on voluntary adoption of tools and practices such as native plants, rain gardens, low impact development, and model codes and ordinances.
Louisiana	Louisiana Watershed Initiative ²²⁰	Reduce flood risk through a watershed-based approach that respects the natural functions of our watersheds.	Coordinates funding, data, and resources among five state agencies. (p.26)
Louisiana	Water Quality Trading regulations	Fulfill regulatory requirements at a watershed scale.	Allow establishment of watershed trading frameworks for one or more watersheds in any TMDL, TMDL implementation plan, or state water quality management plan.
Louisiana	EPA Office of Community Revitalization; Equitable Resilience technical assistance	Plan response to future events while protecting cultural traditions and local industry.	Developed a harbor of refuge and resilience hub for fishing industry and residents. (p.28)

²¹⁹ *Id.*; *Smart Growth for Source Water Protection*, BEAVER WATERSHED ALLIANCE, <https://www.beaverwatershedalliance.org/smart-growth-for-source-water-protection/> (last visited Apr. 4, 2024).

²²⁰ LOUISIANA WATERSHED INITIATIVE, <https://watershed.la.gov/> (last visited Feb. 5, 2024).

EXAMPLES OUTSIDE MISSISSIPPI RIVER BASIN

Examples from outside the Mississippi River Basin are plentiful. The list in Table 5 is a small sample. Depending on interest in different regions of the country, particular watersheds, particular jurisdictions, or particular types of programs or projects, a significant amount of additional research and collection of examples is possible.

TABLE 5

Jurisdiction	Program	Goal/Objective	Description
Columbia River Basin	Northwest Power and Conservation Council Subbasin Planning ²²¹	Help direct Bonneville Power Administration funding of projects to mitigate the fish and wildlife impacts of the Columbia River hydropower system.	Established collaborative process in 1980 to distribute Bonneville Power Administration funding for subbasin planning process for 62 subbasins.
Chesapeake states	Chesapeake Bay Program ²²²	Work in partnership to address the Bay’s pollution problems.	Chesapeake Bay TMDL sets limits on the amount of nutrients and sediment that can enter the Bay and its tidal rivers; each of the seven Bay jurisdictions has created a Watershed Implementation Plan (WIP) . ²²³
Great Lakes states	Great Lakes Program	Restore and maintain the chemical, physical and biological integrity of the Great Lakes Basin Ecosystem.	Coordinates U.S. efforts with Canada under the Great Lakes Water Quality Agreement (GLWQA) , which required Lakewide Action and Management Plans to coordinate assessment and action across states, local authorities, Tribes, First Nations, and Canada. ²²⁴

²²¹ *Overview of Subbasin Planning*, NORTHWEST POWER & CONSERVATION COUNCIL, <https://www.nwcouncil.org/subbasin-plans/overview-of-subbasin-planning/> (last visited Feb. 5, 2024).

²²² CHESAPEAKE BAY PROGRAM, <https://www.chesapeakebay.net/> (last visited Feb. 5, 2024).

²²³ *2015 Watershed Implementation Plans (WIPs)*, CHESAPEAKEPROGRESS, <https://www.chesapeakeprogress.com/clean-water/watershed-implementation-plans> (last visited Feb. 5, 2024).

²²⁴ *Great Lakes Water Quality Agreement (GLWQA)*, ENV’T PROT. AGENCY, <https://www.epa.gov/glwqa> (last visited Feb. 5, 2024).

North Carolina	North Carolina Ecosystem Enhancement Program ²²⁵	Restore, enhance, and protect key watershed functions in the 17 river basins across the state.	Provides compensatory mitigation projects for road projects and development activities before permitted impacts occur. (p.26)
Vermont	Functioning Floodplain Initiative ²²⁶	Improve flood resiliency, ecological integrity, and water quality.	Identifies nature-based projects that restore and protect rivers, wetlands, and floodplains.
Nevada	Carson River Watershed Regional Floodplain Management Plan ²²⁷	Develop strategies for floodplain management that can be applied regionally as well as locally.	Promotes power of the watershed approach for floodplain management.
Ohio	Guide to Developing Local Watershed Action Plans ²²⁸	Accurately identify pollutants and pollution sources to enable development solutions.	Guide to Developing Local Watershed Action Plans.
Oregon	Oregon Plan for Salmon and Watersheds ²²⁹	Restoring native fish populations and the aquatic systems that support them to productive and sustainable levels that will provide substantial environmental, cultural, and economic benefits.	Plan that articulates specific actions address the factors that affect fish populations and watershed health. Most of these actions focus on water quality, stream flows, and habitat restoration. Oregon Watershed Enhancement Board provides grants and coordinates watershed protection and restoration strategy setting.
Oregon	Rogue River Basin Total	Water quality restoration plan for	Applies to all perennial and intermittent streams, rivers,

²²⁵ NORTH CAROLINA ECOSYSTEM ENHANCEMENT PROGRAM (NCEEP) (2008), <https://www.deq.nc.gov/water-quality/planning/bpu/broad/broad-basin-plans/2008-plan/eep/download>.

²²⁶ *Functioning Floodplain Initiative*, VERMONT DEP’T OF ENV’T CONSERVATION, <https://dec.vermont.gov/rivers/ffi> (last visited May 20, 2024).

²²⁷ *Regional Floodplain Management*, CARSON CITY, NEVADA, <https://www.carson.org/government/departments-g-z/public-works/storm-water-flood-plain-management/regional-floodplain-management> (last visited June 3, 2024).

²²⁸ OHIO ENV’T PROT. AGENCY, DIV. OF SURFACE WATER, A GUIDE TO DEVELOPING LOCAL WATERSHED ACTION PLANS IN OHIO (1997), <https://epa.ohio.gov/static/Portals/35/nps/WSGuide.pdf>.

²²⁹ *Oregon Plan for Salmon and Watersheds*, OREGON WATERSHED ENHANCEMENT BOARD, <https://www.oregon.gov/oweb/resources/pages/opsw.aspx> (last visited Feb. 1, 2024).

	Maximum Daily Load ²³⁰	bacteria and temperature.	and lakes within the Rogue River Basin. (p.27)
Jamestown S’Klallam Tribe	Dungeness-Quilcene Watershed Management Plan ²³¹	Protecting water quality and quantity of the surface and ground waters of the region for the next twenty years.	Plan for demonstration projects in collaborative water resource planning; Dungeness River Management Team; came out of Chelan Agreement. (p.28)
Washington	Watershed Planning Act 1997 ²³²	Establish framework for developing local solutions to watershed issues.	Created Watershed Resource Inventory Areas for planning and management. (p.28)
Washington	Puget Sound Watershed Characterization Project ²³³	Identifies the most important areas to protect and restore and identifies those areas more suitable for development.	WDOE, EPA, WDFW, PSP; developed a tool that allows planners and resource managers to identify such areas. (p.29)
Washington	RCPP- Upper Yakima River Water Supply and Fish Habitat Improvements	Protect and enhance natural resources, improve water availability and reliability, establish efficient water markets, manage water supply variability, and prepare for climate change.	Kittitas County Conservation District will assist producers with on-farm and delivery irrigation practices and habitat practices; replace irrigation diversion structures with fish friendly structures; install riparian habitat; realize water savings.
Massachusetts	Cape Cod Commission 2015 208 Plan ²³⁴	Resolving nitrogen impacts on coastal water quality.	Plan provides for a watershed-based approach. (p.27)

²³⁰ TMDL Program: Rogue Basin, OREGON DEP’T OF ENV’T QUALITY,

<https://www.oregon.gov/deq/wq/tmdls/pages/tmdls-rogue-basin.aspx> (last visited Apr. 9, 2024).

²³¹ Amanda Cronin & David M. Ostergren, *Tribal Watershed Management: Culture, Science, Capacity, and Collaboration*, 31 AM. INDIAN QUARTERLY 87 (2007).

²³² *Watershed Plan Archive*, WA. DEP’T OF ECOLOGY, <https://ecology.wa.gov/water-shorelines/water-supply/improving-streamflows/watershed-plan-archive> (last visited Jan. 31, 2024).

²³³ *Puget Sound Watershed Characterization Project*, WA. DEP’T OF ECOLOGY, <https://ecology.wa.gov/water-shorelines/puget-sound/watershed-characterization-project> (last visited Feb. 1, 2024).

²³⁴ CAPE CODE COMMISSION, CAPE COD AREA WIDE WATER QUALITY MANAGEMENT PLAN UPDATE (2015), https://www.capecodcommission.org/resource-library/file/?url=/dept/commission/team/208/208%20Final/Cape_Cod_Area_Wide_Water_Quality_Management_Plan_Update_June_15_2015.pdf.



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