United States Environmental Protection Agency

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OFFICE OF WATER 2022–2026

CLIMATE ADAPTATION IMPLEMENTATION PLAN

Advancing Climate Change Adaptation and Resilience Through EPA's Water Programs

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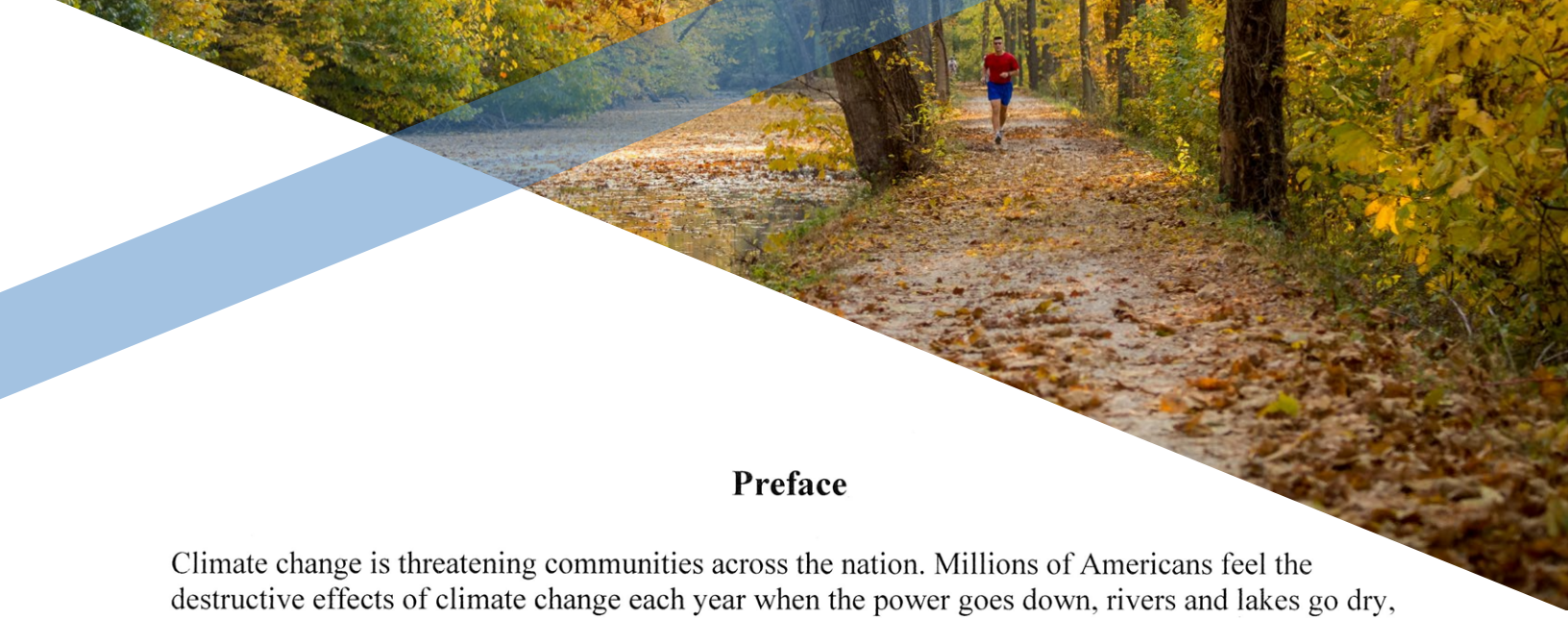

Preface

Climate change is threatening communities across the nation. Millions of Americans feel the destructive effects of climate change each year when the power goes down, rivers and lakes go dry, homes are destroyed by wildfires and communities are flooded by hurricanes. Underserved communities are especially vulnerable to the climate crisis and are more likely to experience the negative health and environmental effects of extreme weather events.

The Biden-Harris Administration is actively confronting the climate crisis while also advancing environmental justice. As part of a whole-of-government approach, the U.S. Environmental Protection Agency is strongly committed to taking the actions necessary to protect human health and the environment and to increase the resilience of the entire nation, even as the climate changes.

The EPA's commitment to action is reflected in its FY 2022-2024 Strategic Plan and in the 2021 Climate Adaptation Action Plan. Both documents present priority actions the agency will take to ensure that its programs, policies and operations remain effective under future climate conditions while we work to support states, territories, tribes and communities in increasing their own adaptive capacity and resilience to climate change impacts.

From flooding at Superfund sites, to wildfires causing air pollution, to sea-level rise affecting water quality and infrastructure, the EPA will boldly address climate impacts in both its programs and the communities it serves. We recognize the importance of tribal, state and local government partnerships in efficient, effective and equitable implementation of climate change adaptation strategies. Our plans were informed and improved by input we received in listening sessions we held to engage these and other partners as we developed these plans.

To ensure we are addressing the climate crisis in a comprehensive way, each of our national program and regional offices has developed individual Climate Adaptation Implementation Plans that outline how the EPA will attain the agencywide goals described in the broader Climate Adaptation Action Plan. These plans describe how programs and regions will integrate climate adaptation into their programs, partnerships and operations. They also describe how they will help partners build their resilience and capacity to adapt, while delivering co-benefits, including curbing greenhouse-gas emissions and other pollution, and promoting public health, economic growth and climate justice. Of course, the EPA has a major role to play on emissions reductions as well, though that is not the focus of these plans. Indeed, we must focus on both climate adaptation and mitigation to ensure our nation and communities thrive in an era of climate change.

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As part of this effort, we will empower our staff and partners by increasing awareness of how climate change may affect our collective ability to implement effective and resilient programs. We will also provide them with the necessary training, tools, data, information and technical support to make informed decisions and integrate climate adaptation into our work.

The EPA will work to modernize its financial assistance programs to encourage climate-resilient investments across the nation. We will also focus on ensuring that investments funded by the Bipartisan Infrastructure Law, the Inflation Reduction Act and other government programs are resilient to the impacts of climate change. Finally, as our knowledge advances and as impacts continue to develop, our response will likewise evolve. We will work to share these developments to enhance the collective resilience of our nation.

The actions outlined in these implementation plans reflect the EPA's commitment to build every community's capacity to anticipate, prepare for, adapt to and recover from the increasingly destructive impacts of climate change. Together with our partners, we will work to create a healthy and prosperous nation that is resilient to the ever-increasing impacts of climate change – which is vital to the EPA's goal of protecting human health and the environment and to ensuring the long-term success of our nation.

Janet G. McCabe

Message from Radhika Fox, Assistant Administrator for the Office of Water

This year, as we mark the 50th anniversary of the Clean Water Act (CWA), I am reflecting on the progress we have made in cleaning up our nation's waterways and making our water and communities safer. As I look to the next 50 years, how we respond to climate change will be a defining factor in our efforts to meet our CWA goals and deliver on our mission to protect public health and the environment.

Climate change is one of the most urgent and universal challenges facing U.S. communities and the environment. So many of us experience climate change through water, including flooding in coastal and inland communities, drought across the South and the West, and unpredictability that impacts everyone from water utilities to farmers to ecosystems.

That is why I am proud to release this plan and to share the priorities that will guide the Office of Water's (OW's) work over the next several years to support states, communities, and the water sector in their efforts to adapt to a changing climate. These efforts include incorporating flood resilience across the nearly $50 billion EPA will invest in water through the Bipartisan Infrastructure Deal, prioritizing nature-based solutions, and considering future climate conditions across CWA permitting and water quality programs.

This plan includes a range of priority actions that the Office of Water commits to taking in the near-term to advance its climate adaptation agenda. These are important, high-impact steps we can take now to embed climate considerations across OW's infrastructure, regulatory, and research programs. However, these are not the only steps OW is taking to address the impacts of climate change. As we implement the actions in this plan, we will learn more. And, as we learn more, we will do more.

Importantly, while the actions in this plan are ones that OW is taking, we look to the broader water community—public water systems, local governments, community organizations, water-reliant businesses, the engineering and construction sector, the scientific community, and many more—to join us in implementing these actions and amplifying their impact. Only through partnership will we be able to adapt to the new conditions and challenges posed by our changing climate. This is not just a plan. It is a promise to work together, across all levels of government, to build a resilient water future.

Key Terms and Definitions

The definitions below are a guide to reading this Implementation Plan. These descriptions are derived from several sources, including *Executive Order (EO) 14008 on Tackling the Climate Crisis at Home and Abroad*, EPA's *2021 Climate Adaptation Action Plan (CAAP)*, EPA's Environmental Justice 2020 Glossary, the *National Water Program 2012 Strategy: Response to Climate Change*, and the Intergovernmental Panel on Climate Change.

Climate change refers to alterations in global or regional climate patterns attributed largely to human-caused increased levels of atmospheric greenhouse gases.

Climate change adaptation or climate adaptation means taking action to prepare for and adjust to both the current and projected impacts of climate change.

Climate change mitigation refers to actions limiting the magnitude and rate of future climate change by reducing greenhouse gas emissions and/or advancing nature-based solutions.

Adaptive capacity is the ability of a human or natural system to adjust to climate change (including climate variability and extremes) by moderating potential damages, taking advantage of opportunities, or coping with the consequences.

Climate resilience is the capacity of a system to maintain function in the face of stresses imposed by climate change and to adapt to be better prepared for future climate impacts.

Climate risk is a combination of the magnitude of the potential consequences of climate change impacts (e.g., financial, environmental, health) and the likelihood that the consequences will occur.

Climate vulnerability is the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity.

Natural hazards are natural events that present near-term risks or threats to the normal operations of a community or specific asset. Climate change may introduce new hazards within a community or increase the intensity or frequency of hazards. Natural hazards include earthquakes, floods, hurricanes, wildfires, and hydrologic changes.

Environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, culture, national origin, income, and educational levels with respect to developing, implementing, and enforcing protective environmental laws, regulations, and policies.

Overburdened communities include minority, low-income, tribal, or indigenous populations or geographic locations in the United States that potentially experience disproportionate environmental harms and risks. This disproportionality can be a result of greater vulnerability to environmental hazards, lack of opportunity for public participation, or other factors. Increased vulnerability may be attributable to an accumulation of negative or a lack of positive environmental, health, economic, or social conditions within these populations or places. The

term describes situations where multiple factors, including both environmental and socioeconomic stressors, may act cumulatively to affect health and the environment and contribute to persistent environmental health disparities.

Climate justice applies the same understanding and principles of environmental justice within a context of considering the impacts of climate change on overburdened and vulnerable communities. This includes considering not only the reality that communities with environmental justice concerns will typically be impacted by climate change worst and first, but also considering priorities, such as just transition, that allow communities to move toward a clean, sustainable economy.

Indian Country is defined at 18 U.S. Code § 1151, as 1) all land within the limits of any Indian reservation under the jurisdiction of the U.S. government, notwithstanding the issuance of any patent, and including rights-of-way running through the reservation; 2) all dependent Indian communities within the borders of the United States, whether within the original or subsequently acquired territory thereof, and whether within or without the limits of a state; and 3) all Indian allotments, and the Indian titles to which have not been extinguished, including rights-of-way running through the same.

Indigenous peoples include state-recognized tribes; indigenous and tribal community-based organizations; individual members of federally recognized tribes, including those living on a different reservation or living outside Indian Country; individual members of state-recognized tribes; Native Hawaiians; Native Pacific Islanders; and individual Native Americans.

Tribes when used in this document, refers to federally recognized tribes. Federally recognized tribes include any Indian or Alaska Native tribe, band, nation, pueblo, village, or community that the Secretary of the Interior acknowledges to exist as an Indian tribe pursuant to the Federally Recognized Indian Tribe List Act of 1944, 25 U.S. Code § 479a.

Meaningful involvement means that potentially affected community residents have an appropriate opportunity to participate in decisions about a proposed activity that will affect their environment and/or health; the public's contribution can influence the regulatory agency's decision; the concerns of all participants involved will be considered in the decision-making process; and that decision-makers seek out and facilitate the involvement of those potentially affected.

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Introduction

Climate change is here. Communities across the nation are already experiencing its real and significant impacts on the social, economic, and environmental systems we depend on. As communities experience changes to historical climatic norms, communities frequently feel the effects of those changes through regular interactions with their water resources, which bring the consequences of a changing climate into our everyday lives. Aside from an increase in extreme weather events, the changing climate is creating more frequent and longer droughts, water supply shortages, regular nuisance flooding, and sea-level rise. These events and accompanying impairments in water quality threaten the health of communities and diminish or deprive them of economic and recreational opportunities.

The impacts of climate change are not equally distributed across locations, communities, and populations. Those experiencing environmental injustices and vulnerable populations already at a disadvantage for coping with climate-related risks are disproportionally vulnerable to the impacts of climate change. Likewise, climate change has direct and cascading effects on water resources that vary across regions and watersheds, presenting a wide range of risks to natural and human systems. Climate change acts as a threat multiplier, exacerbating existing stressors that impact public health, degrade the quality of our waterways, and destabilize the critical water infrastructure we rely upon.

The U.S. Environmental Protection Agency's (EPA's) Office of Water (OW) has an important responsibility in the Biden-Harris Administration's efforts to tackle the climate crisis. The Clean Water Act (CWA) and Safe Drinking Water Act (SDWA) charge the Office of Water to restore and protect the integrity of our nation's waters, and to protect public health by ensuring safe drinking water for the public. However, achieving water management goals has become more challenging and complex as climate change shifts hydrological patterns outside of historical norms. Our programs and the water community are already confronting a variety of climate impacts, including the increased frequency of extreme weather events on water infrastructure operations, saltwater intrusion that places greater demands on drinking water treatment facilities, and changing weather patterns that increase pollutant loading to water bodies, which hinders the attainment of water quality goals. The quantity and diversity of these impacts underscore the importance of climate adaptation to the success of OW's mission.

Adapting to the impacts of climate change is vital to maintaining the future success of OW's programs, as well as the long-term effectiveness of state, tribal, and local water management programs nationwide. OW will strategically take actions to embed climate change adaptation across its financial assistance, regulatory, and non-regulatory programs. OW will place

particular focus on the historic opportunity presented by the Bipartisan Infrastructure Law (BIL). As OW implements nearly $50 billion in investments in clean water, drinking water, and natural infrastructure, it can help ensure the largest investment in water in the nation's history creates long-term resilience in communities and ecosystems across the United States. OW will also embed climate considerations in its implementation of Justice40[1] to ensure that federal investments and benefits that accrue to disadvantaged communities and nature-deprived communities are climate resilient and support climate adaptation.

OW's programs include supporting drinking water, wastewater, and stormwater infrastructure; setting standards for protecting water quality; regulating municipal and industrial discharges of pollutants to waters; working to control nonpoint sources of pollution; monitoring the condition of surface waters, including rivers, lakes, and coastal and ocean waters; preserving healthy watersheds; restoring waters impaired by point and nonpoint sources of pollution; and protecting wetlands, rivers, streams, and coastal waters when dredge or fill permits are issued. OW also supports several place-based partnership programs that bring together diverse stakeholders within communities and watersheds. These partnership programs can help decision-makers at various scales take the necessary actions to protect and restore their water resources, while considering other key social and economic needs.

[1] Federal agencies are required to consider how certain investments might be made toward a goal that 40 percent of the overall benefits of such investments flow to disadvantaged communities. www.whitehouse.gov/wp-content/uploads/2021/07/M-21-28.pdf. For more information on Justice40, visit: www.whitehouse.gov/omb/briefing-room/2021/07/20/the-path-to-achieving-justice40/.

Climate Adaptation at EPA Under the Biden-Harris Administration

On January 27, 2021, *Executive Order (EO) 14008: Tackling the Climate Crisis at Home and Abroad* set the stage for the Biden-Harris Administration's whole-of-government charge to address climate mitigation, adaptation, and resilience. The EO directs each federal agency to develop climate action plans that describe their agency's climate vulnerabilities and the steps they will take to increase both their and the nation's resilience to the impacts of climate change.

Released in October 2021, EPA's Climate Adaptation Action Plan (CAAP) focuses the Agency's work on five cross-agency priority actions to implement EO 14008. These actions will help ensure that EPA continues to fulfill its mission of protecting human health and the environment—even as the climate changes and disruptive impacts increase. EPA's priority actions are as follows:

1. Integrate climate adaptation into EPA programs, policies, rulemaking processes, and enforcement activities.
2. Consult and partner with tribes, states, territories, local governments, environmental justice organizations, community groups, businesses, and other federal agencies to strengthen adaptive capacity and increase the nation's climate resilience, with a particular focus on advancing environmental justice.
3. Implement measures to protect EPA's workforce, facilities, critical infrastructure, supply chains, and procurement processes from the risks posed by climate change.
4. Measure and evaluate performance.
5. Identify and address climate adaptation science needs.

In the plan, EPA Administrator Michael S. Regan directed all EPA headquarters offices and regional offices to update their 2014 Climate Adaptation Implementation Plans to proactively incorporate climate adaptation throughout all programs, policies, and rulemaking processes. Following this directive, OW, under guidance from the Office of Policy, worked across its programs and with the Water Divisions in every EPA region to develop this Climate Adaptation Implementation Plan. Key elements of this Implementation Plan include:

- An assessment of the climate vulnerabilities of water resources, communities, and EPA's water programs.
- OW's priority actions for fiscal year (FY) 2022–2026 to address those vulnerabilities, and measures of progress for those actions.
- Science needs to advance current and future work on climate adaptation of communities, water infrastructure, and water resources.
- Training and outreach priorities to engage and support OW's stakeholders.

> "From fires in the West, to widespread drought, and the wide path of destruction left by Hurricane Ida from Louisiana to New York, recent and current events show the impact our changing climate is having on our lives and livelihoods."
>
> – EPA Administrator Michael S. Regan

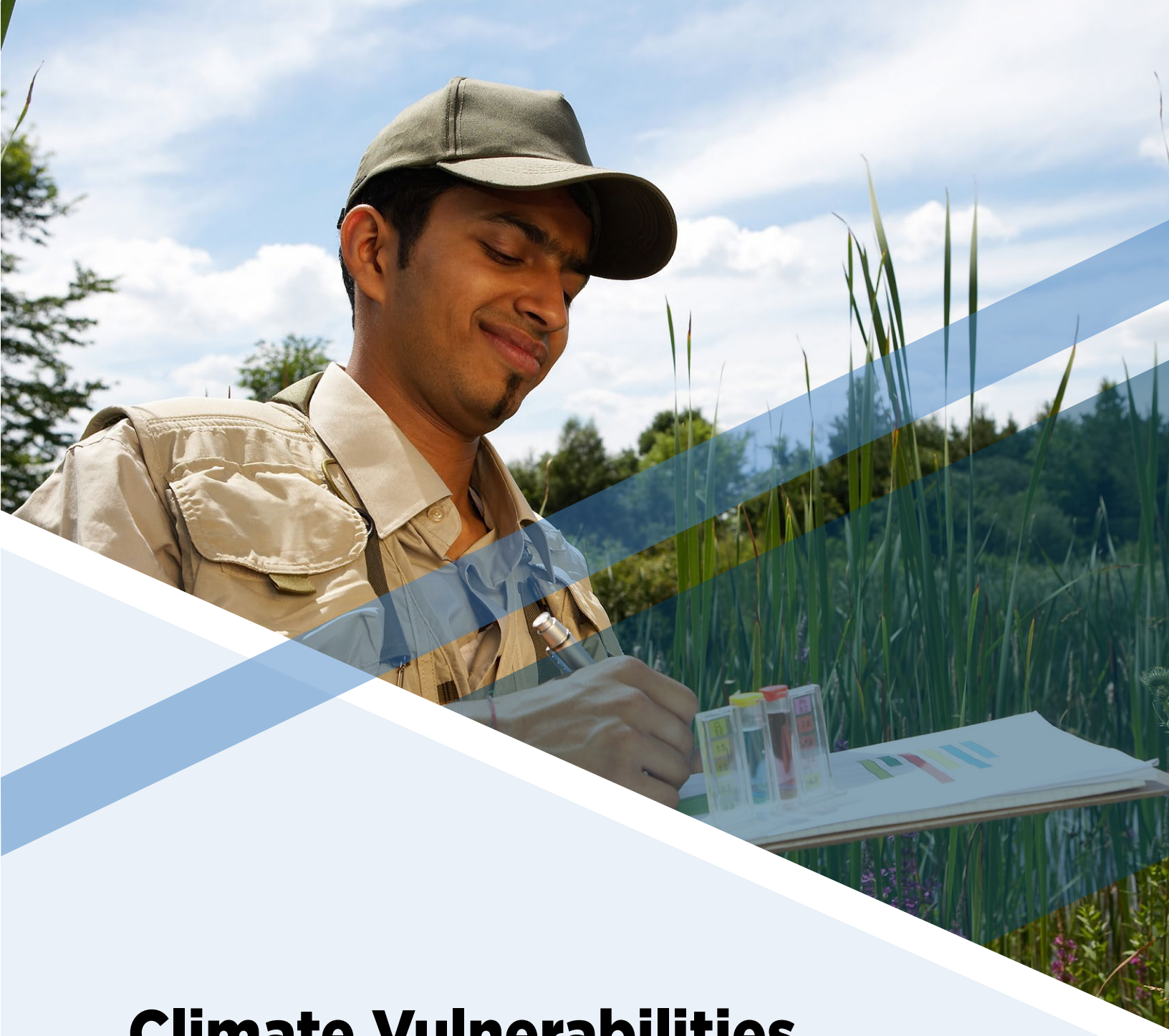
Purpose and Intent of this Implementation Plan

This Implementation Plan outlines priority actions that will help OW further integrate climate change considerations into the daily fabric of its work and build resilience to a wide range of water-related climate vulnerabilities. In addition, each EPA regional office has developed a Climate Adaptation Implementation Plan that complements the plans of OW and the other national program offices. The EPA regional offices' plans incorporate climate resilience into their core programmatic work, recognizing the unique geographic climate challenges facing each region.

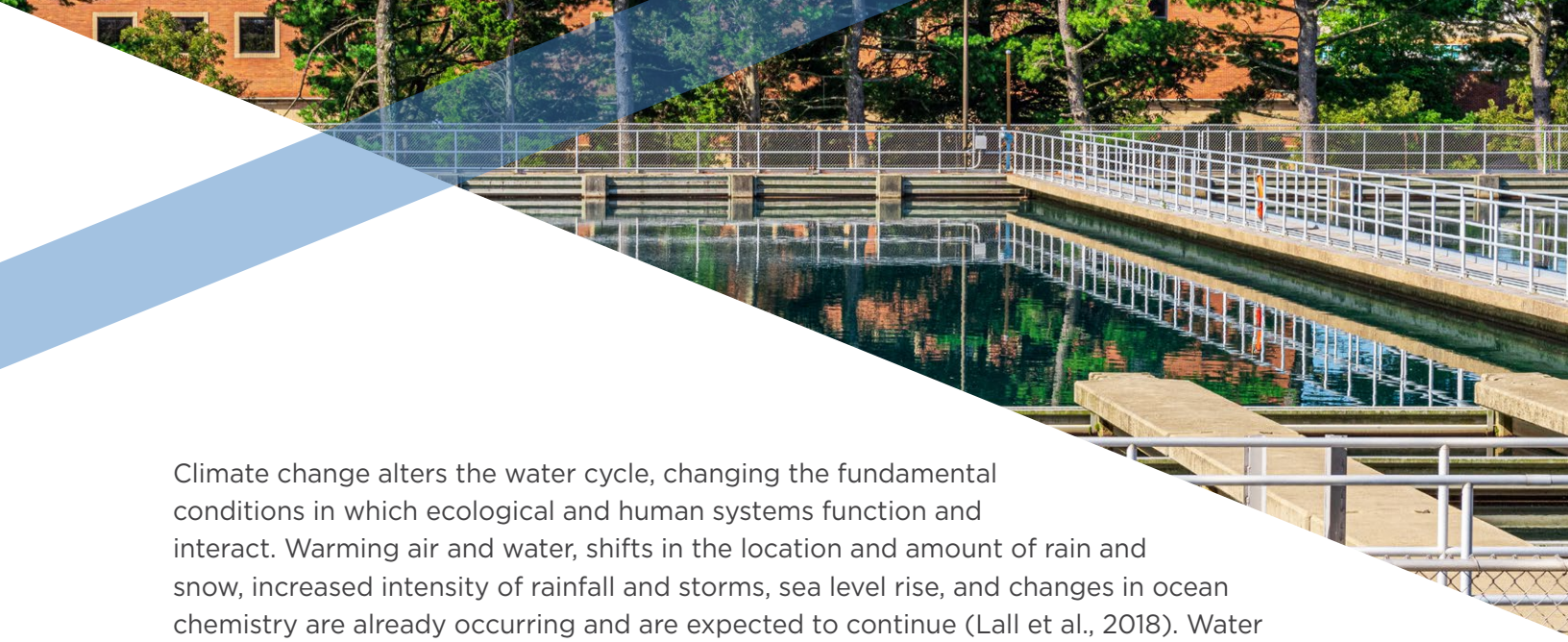
OW's plan seeks to leverage its regulatory and non-regulatory, financial assistance, and scientific programs to meet the climate challenge. OW will adaptively manage its implementation to track progress toward achieving our goals and identify future actions that meet the adaptation needs of our water community. This plan is both a roadmap for OW's programs and staff and a communication to partners about OW's goals. Many of the priority actions focus on better incorporating climate resilience into the programs that are jointly administered by EPA and the states, such as water infrastructure programs and the National Pollutant Discharge Elimination System (NPDES) program, and into programs and projects that can help states, tribes, communities, utilities, and others build climate resilience on the ground (e.g., Creating Resilient Water Utilities and Urban Waters Federal Partnership). Partnerships across the water community are critical for efficient, effective, and equitable implementation of climate adaptation strategies.

OW commits to working closely with its co-regulators and stakeholders across the water community to implement the priority actions and amplify the impact of these actions.

In that spirit, OW will engage affected and interested partners and stakeholders—including states, tribes, territories, environmental justice organizations, community groups, businesses, and other federal agencies—to successfully implement the actions in this Implementation Plan. OW will coordinate across its programs, as well as with EPA's regions, to more effectively align its work with plans and initiatives developed by offices across EPA. Additionally, under the whole-of-government approach embodied by the Biden-Harris Administration, OW will work with other federal agencies on adaptation efforts that cut across organizations to improve the efficiency and effectiveness of this combined federal endeavor. As part of that effort, OW will actively support the America the Beautiful initiative to conserve, protect, connect, and restore our lands and waters across the country. Together, we can help address the climate crisis, protect water quality, and provide equitable environmental outcomes in communities across the country.



Climate Vulnerabilities of Water Resources, Communities, and Office of Water Programs



Climate change alters the water cycle, changing the fundamental conditions in which ecological and human systems function and interact. Warming air and water, shifts in the location and amount of rain and snow, increased intensity of rainfall and storms, sea level rise, and changes in ocean chemistry are already occurring and are expected to continue (Lall et al., 2018). Water quality changes were already complex and challenging to decipher without the additional complications caused by climate change. Not only is there significant variability across even small geographies and water bodies over time, but water quality is also influenced by interacting climate, watershed, and human factors (Paul et al., 2018). Localized data, conditions, and priorities are therefore essential factors for identifying the programs and water bodies most vulnerable to climate change.

The following section describes the main water-related climate vulnerabilities that impact communities and water resources and the relationship of those vulnerabilities to OW's programs. A figure is provided for each core vulnerability to highlight the programs most associated with these challenges. Detailed lists outlining these core vulnerabilities, distilled from the U.S. Global Change Research Program's (USGCRP) Fourth National Climate Assessment (NCA4), are available in the Appendix.

OW acknowledges that the changing climate may affect its workforce and their ability to complete their work. For example, climate change may affect those staff engaged in field monitoring of water quality. More frequent and intense weather events such as excessive heat, wildfires, and hurricanes will impact crews' ability to safely collect data. Climate change can also result in conditions that increase pollution in water and air, as well as other infectious disease vectors that may put field crew health at increased risk. As a result of these impacts, crews may not be able to complete all planned sampling or may need to take additional precautions, which can negatively affect OW's ability to meet our goal of assessing the nation's waters.

The changing climate may also generate more high intensity and damaging extreme weather events. Already, the number of presidentially-declared disasters has risen significantly in the last 70 years. (In 1950 through the 1980s, the number of declarations averaged about 30, but beginning in the 1990s, the average number of major disaster declarations per year was 45.8, the average number from 2000 to 2009 was 57.1, and the average number from 2010 to 2016 was 58.7[2]). Emergency response staff in both OW and the EPA regions will be tasked more often to assist states to manage the larger universe of impacted utilities that require longer

[2] Congressional Research Service (Aug 28, 2017). Stafford Act Declarations 1953–2016: Trends, Analyses, and Implications for Congress. sgp.fas.org/crs/homesec/R42702.pdf

times to recover. OW staff in EPA Headquarters and Regional Emergency Operations Center and the Federal Emergency Management Agency's (FEMA's) National Response Coordination Center will be required to work longer and be activated more often to handle this situation. Already, limited staff are working on multiple efforts on response or long-term recovery which often lasts months to years.

Core Climate Vulnerabilities

Critical Water Infrastructure. Throughout the United States, communities rely on clean and safe water from an extensive network of drinking water, wastewater, and stormwater infrastructure. The impacts of climate change are stressing the operation of our country's already aging infrastructure. For example, alterations in precipitation patterns and flooding due to intense storms are overwhelming or damaging existing water infrastructure. Increased stormwater runoff and flooding is also washing pollutants and other chemical contaminants into drinking water sources, requiring additional or alternative methods of treatment and placing greater pressure on already constrained systems to meet water quality standards. Extreme events also accelerate erosion and sedimentation of streams and rivers, reservoirs, and port facilities, adversely affecting aquatic organisms and requiring more frequent dredging and the disposition of potentially contaminated sediment. These infrastructure challenges have real implications for public health and communities, especially those that are underserved or already have heightened exposures to pollutants. The frequency and magnitude of heavy precipitation and runoff events is expected to increase in all parts of the country (Coffey et al., 2018). However, today's infrastructure designs, operations, financing principles, and regulatory standards typically do not account for the impacts of a changing climate. With a historic influx of federal funding to build and modernize our nation's water infrastructure, it will be more important than ever for OW to help ensure investments are made in projects that will withstand the impacts of climate change and reliably provide clean and safe water to all Americans.

Most Impacted Water Programs in Blue:

Drinking Water Standards	Surface Water Standards	**Technology Based Standards**	**Emergency Planning**
Drinking Water Planning	Clean Water Planning	**Water Monitoring**	Water Restoration/Total Maximum Daily Loads (TMDLs)
Underground Injection Control Permits	**Wastewater Permits**	**Stormwater Permits**	Wetlands Protection and Restoration
Source Water Protection	Nonpoint Pollution Control	**Estuarine and Coastal Management**	Partnership Programs
Infrastructure Funding and Financing Programs	**Combined Sewer Overflow Plans**	Ocean Protection	

Impacts to the Availability of Water for Human Use. Climate change is impacting both the quality and volume of the supplies we rely on for clean, safe water. One of EPA's primary roles is protecting drinking water sources from contamination. Climate change makes those sources more vulnerable to contamination in two ways: more intense storms result in larger pulses of pollution and drought dwindles water supplies, both of which result in concentrated pollutant loads. EPA does not have a direct role in ensuring adequate water supplies. Nonetheless, changes in water quantity can affect water quality and its availability for human use. Water quantity is already a significant issue for many communities, and these trends will continue, as most regions of the United States are projected to experience a higher frequency of severe droughts and longer dry periods (Vose et al., 2019). Warming air temperatures will cause precipitation in some areas to fall more as rain rather than snow, along with shifts to earlier springtime snowmelt. Shrinking snowpack, higher evaporation, and reduced precipitation can all reduce water supplies and lead to more drying that intensifies the risk of wildfires (Lall et al., 2018). Wildfires and erosion following fires create significant impacts on surface drinking water sources (Bladon et al., 2014). A growing number of communities are expected to grapple with challenges to their water supplies year-round. These communities will need to manage competition between municipal supplies, energy production, industrial use, agricultural use, and ecological needs. OW's programs may be called on to support local and regional decision-making around water quality issues related to water supply availability (e.g., implementing water reuse actions to enhance water supply availability).

Most Impacted Water Programs in Blue:

Drinking Water Standards	**Surface Water Standards**	**Technology Based Standards**	**Emergency Planning**
Drinking Water Planning	**Clean Water Planning**	**Water Monitoring**	**Water Restoration/ Total Maximum Daily Loads (TMDLs)**
Underground Injection Control Permits	**Wastewater Permits**	**Stormwater Permits**	Wetlands Protection and Restoration
Source Water Protection	**Nonpoint Pollution Control**	**Estuarine and Coastal Management**	**Partnership Programs**
Infrastructure Funding and Financing Programs	Ocean Protection	Combined Sewer Overflow Plans	

Waterborne Illness and Water Treatment Needs. Increasing air and water temperatures, combined with greater pollutant loads reaching sources of drinking water and other water bodies, will continue to threaten the health of people and ecosystems. In the coming decades, climate change is expected to increase risks from harmful algal blooms (HABs) related to drinking water sources and recreational activities (Ebi et al., 2018). Increased air and water temperatures will also affect the survival of waterborne pathogens that present water safety concerns to people, pets, and aquatic organisms (Coffey et al., 2018). Rising waters, storm surge, higher tides, and altered runoff amplify the risk of salinity intrusion in aquifers, leading to additional drinking water infrastructure and treatment needs. Industrial facilities and contaminated sites located near waterways experiencing flooding and extreme weather may become more prone to release toxic materials that further threaten the quality of waterways and sources of drinking water. The increased mobilization of various pollutants and prevalence of waterborne illnesses can affect other services valued by the public, including economic and recreational opportunities. OW's programs are designed to help ensure that water systems are sustainable and secure by developing and revising water quality standards, ensuring compliance with these standards, and protecting sources of drinking water from contamination. OW also helps to build the technical, managerial, and financial capacity of systems. Demand on OW programs is likely to increase as climate change requires local systems to expand treatment in response to rising risks from waterborne illness and contamination.

Most Impacted Water Programs in Blue:

Drinking Water Standards	**Surface Water Standards**	**Technology Based Standards**	**Emergency Planning**
Drinking Water Planning	**Clean Water Planning**	**Water Monitoring**	**Water Restoration/ Total Maximum Daily Loads (TMDLs)**
Underground Injection Control Permits	Wastewater Permits	**Stormwater Permits**	Wetlands Protection and Restoration
Source Water Protection	**Nonpoint Source Management**	**Estuarine and Coastal Management**	**Partnership Programs**
Infrastructure Funding and Financing Programs	Ocean Protection	**Combined Sewer Overflow Plans**	

Aquatic Ecosystem Health. Variations in temperature, precipitation, and acidity (pH) will likely have wide-ranging effects on water chemistry, ecosystem health, habitat, and suitability for human use (see inset). Increasing air and water temperatures will alter the condition of waterways, potentially resulting in additional water bodies not meeting water quality standards. More intense rainfall, storms, wildfires, and other extreme weather and events will also amplify the amount of runoff carrying greater pollutant loads to water bodies (Lall et al., 2018). Water temperatures are expected to continue to increase throughout the United States, with the greatest changes occurring in locations where high summer air temperatures coincide with low streamflow volumes (Coffey et al., 2018). Warming waters and other ecological shifts will threaten the functions of aquatic habitats and the survival of aquatic species (e.g., cold water fisheries, coral reefs), particularly affecting communities that depend on the availability of these resources as part of their economy, subsistence, and social or cultural traditions. Warming water also increases the potential for HABs and hypoxia. Nutrient enrichment of coastal waters exacerbates the acidification of nearshore waters, while increased atmospheric carbon dioxide and warmer temperatures lead to acidification in open ocean waters. Protecting and restoring water quality is fundamental to OW's mission, but existing approaches to water quality management are being tested by changes in climate across the nation. In developing better climate adaptation strategies to support local decision-making, OW and its partners may need to adjust and expand implementation of water quality management programs under the CWA.

In the United States, historically wetter regions (i.e., northern and eastern regions) are likely to receive increased annual precipitation with corresponding increases in runoff, whereas historically drier regions (i.e., the arid Southwest, southern Great Plains, and parts of the Southeast) will likely receive less precipitation, resulting in decreased runoff. In addition, more frequent heavy precipitation events—even in areas that receive substantial annual precipitation—and longer dry periods between precipitation events are projected (Coffey et al., 2018).

Most Impacted Water Programs in Blue:

Drinking Water Standards	**Surface Water Standards**	**Technology Based Standards**	Emergency Planning
Drinking Water Planning	**Clean Water Planning**	**Water Monitoring**	**Water Restoration/ Total Maximum Daily Loads (TMDLs)**
Underground Injection Control Permits	**Discharge Permits**	**Storm Water Permits**	**Wetlands Protection and Restoration**
Source Water Protection	**Nonpoint Pollution Control**	**Coastal Zone**	**Partnership Programs**
Infrastructure Funding and Financing Programs	**Ocean Protection**	**Combined Sewer Overflow Plans**	

Transportation and Energy Infrastructure Interfacing with Water. Climate change poses additional vulnerabilities for the development, maintenance, and longevity of transportation infrastructure (e.g., bridges, culverts, dams, port facilities, navigation channels). Damage to and hardening of transportation infrastructure can impact the quality and quantity of hydrologic flows. Increased precipitation and extreme weather events have already had a significant impact on transportation and energy infrastructure where roads, railroads, dams, bridges, causeways, stream crossings, and other important transportation structures intersect with waterways. These structures are often not built or repaired to be resilient against the effects of climate change. As a result, they may impair water quality, be unable to withstand floods or pass flows, create barriers to aquatic life, hinder critical ecological functions, and impact public safety. Elevating and adapting transportation and energy infrastructure to withstand more intense storms, particularly in places where it intersects waterways, can increase its impacts on wetlands and other sensitive areas. Extreme rainfall and storm events can also damage groins, jetties, and breakwaters and cause shoaling of navigation features in ports that are essential to shipping of goods and services. These structural vulnerabilities have the potential to exacerbate existing stressors from hydrologic alteration, which further reduces the overall resilience of water resources to climate change while eliminating other economic and social functions communities depend on. These stressors are likely to increase demand on OW programs intended to protect water quality and mitigate the hydrologic impacts of constructed facilities.

Most Impacted Water Programs in Blue:

Drinking Water Standards	**Surface Water Standards**	Technology Based Standards	**Emergency Planning**
Drinking Water Planning	**Clean Water Planning**	**Water Monitoring**	Water Restoration/ Total Maximum Daily Loads (TMDLs)
Underground Injection Control Permits	Wastewater Permits	**Stormwater Permits**	**Wetlands Protection and Restoration**
Source Water Protection	**Nonpoint Pollution Control**	**Estuarine and Coastal Management**	Partnership Programs
Infrastructure Funding and Financing Programs	**Ocean Protection**	Combined Sewer Overflow Plans	

Impacts of Climate Change on Vulnerable Communities and Populations

Climate change poses risks to our nation's water resources that, in turn, create significant vulnerabilities for public health and the economic and social wellbeing of communities. Certain communities and populations are uniquely and disproportionally vulnerable to climate change impacts due to a variety of factors, including higher pollution burdens, greater exposure to environmental contaminants, lack of financial resources, limited access to quality health care, and other issues. While communities of color, low-income communities, children, persons with disabilities, the elderly, tribes, and indigenous people may experience the same water-focused climate threats described in the previous sections, these groups face unequal and often greater risks from climate change. In addition, these populations generally have fewer resources to prepare for or cope with climate-related events—including those that impact the quality and quantity of their water resources—and are expected to experience greater hardships from climate change in the future (Lall et al., 2018; Gillespie-Marthaler et al., 2019). The whole-of-government emphasis on addressing environmental justice and equity through the Justice40 Initiative is a critical element to providing adaptation opportunities to these communities. OW plans to identify and prioritize program actions that help support populations most vulnerable to the impacts of climate change, including programs covered by Justice40 such as the State Revolving Funds (SRF) program, geographic programs, and the National Estuary Program (NEP).

> "Development of effective, equitable adaptation plans and strategies will require EPA to identify how pre-existing social inequities limit a community's adaptive capacity and respond accordingly."
>
> – EPA's 2021 Climate Adaptation Action Plan

Overburdened, Underserved, and Disadvantaged Communities. Communities of color, low-income communities, and rural populations face disproportionately high pollutant exposures, including exposure to drinking water contamination and impaired water quality (Schaider et al., 2019). Because of existing impairments, these communities will face greater challenges in meeting water quality goals for drinking water and surface waters as the climate changes. Increasing costs for water treatment and water infrastructure upgrades and repairs will create a significant barrier for protecting and improving water quality. For example, rate hikes to cover increased costs can decrease water service affordability and jeopardize access to clean, safe water for low-income customers or those already facing economic hardships. Low-income, underserved, or rural communities with decentralized water infrastructure may face greater risks from sea level rise, saltwater intrusion, and flooding that can impair drinking water quality from individual wells and the functioning of detached septic systems. Furthermore, communities of color and low-income communities often experience capacity barriers in securing financing for water management projects that offer climate resilience. Decision-makers in these communities often lack the staff and access to the information needed to secure resources for climate risk assessment, planning, and project implementation. Rural water systems frequently have fewer ratepayers to share the cost of system improvements. Furthermore, rural, agriculturally-focused communities may face additional economic hardship as climate variability makes crop production—and associated water quality management challenges—more uncertain and difficult. The Appendix includes examples that further illustrate how the existing constraints and water quality challenges experienced by these communities or populations will be amplified by a changing climate.

Tribal Nations and Indigenous Peoples. The wellbeing of tribal and indigenous communities is at risk from climate change. Climate change is affecting water resources that are often critical to their cultures, traditional lifeways, spiritual practices, and economies. The ecological effects of climate change, such as shifts in aquatic species and their habitat ranges, as well as the quality and amount of snowpack, are already affecting the economic and social welfare of tribal and indigenous communities across the country (Lall et al., 2018). These impacts threaten the protection of tribal treaty rights to fish, hunt, and gather at usual and accustomed grounds and stations. Indigenous communities represent diverse cultures, histories, governments, and environments, so their individual experiences with climate change will differ. Indigenous peoples and their partners have undertaken a wide range of adaptation projects over the last decade (see inset), but the inequitable burden of adaptation costs and sociopolitical barriers are leaving tribal nations at a disadvantage for implementing climate adaptation efforts.

Case studies of tribal adaptation activities are included in the Institute for Tribal Environmental Professionals' Tribal Profiles and tribal case studies within the U.S. Climate Resilience Toolkit.

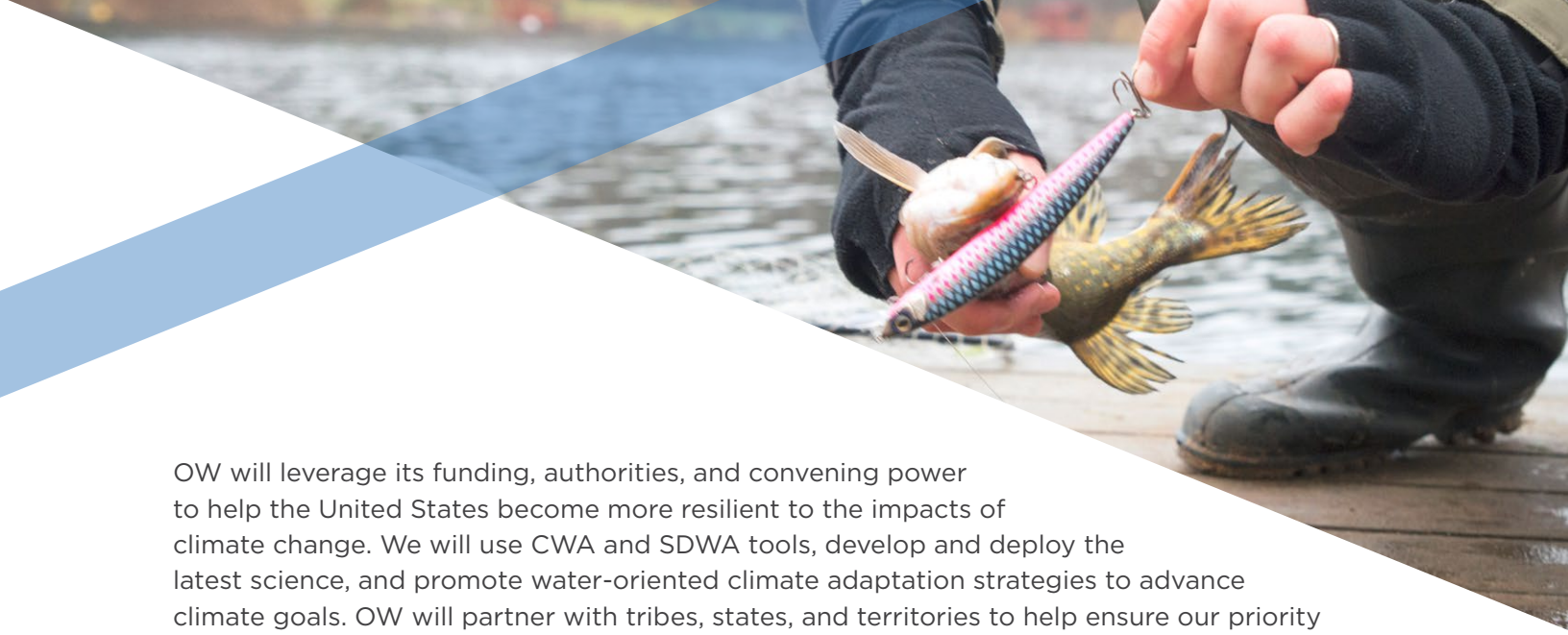
"EPA recognizes that tribes are disproportionately vulnerable to the impacts of climate change, due in part to their dependence on specific geographic areas for their livelihood; unique cultural, economic and political characteristics; and limited resources to prepare for, respond to, and recover from climate-related hazards (i.e., limited adaptive capacity)."

– EPA's 2021 Climate Adaptation Action Plan

Territories and Island States. Territories and island states have unique characteristics that make them especially vulnerable to climate change impacts, such as their dependence on limited local sources of freshwater, concentration of infrastructure along coastlines, and general isolation (Gould et al., 2018). Sea level rise threatens low-lying critical assets, including drinking water supplies, coastal ecosystems, cultural sites, businesses, and infrastructure. Coastal island areas can also be subject to more frequent and intense extreme weather events that threaten life and property (Lall et al., 2018). For these areas, climate change will exacerbate existing challenges to water infrastructure, including protecting and maintaining drinking water supplies and unique aquatic resources.

The Tribal Water Action Plan outlines the steps OW is taking to deliver on the Biden-Harris Administration's commitment to upholding the United States' tribal trust responsibility by strengthening the nation-to-nation relationship between the United States and tribes, and empowering tribal nations to govern their communities. The plan is organized around four priority focus areas: 1) promoting robust coordination and meaningful consultation with tribal nations; 2) strengthening and expanding water governance in Indian Country; 3) increasing infrastructure funding and capacity development; and 4) honoring the federal trust responsibility and protecting tribal reserved rights related to water resources.

Priority Actions



OW will leverage its funding, authorities, and convening power to help the United States become more resilient to the impacts of climate change. We will use CWA and SDWA tools, develop and deploy the latest science, and promote water-oriented climate adaptation strategies to advance climate goals. OW will partner with tribes, states, and territories to help ensure our priority actions support the climate adaptation needs of vulnerable and underserved people in communities across the country.

As it works to adapt to the impacts of climate change, OW will advance the following goals and objectives:

GOAL 1

IMPROVE CLIMATE RESILIENCE OF AMERICA'S WATER INFRASTRUCTURE

OBJECTIVES

- **A** Deploy Grant and Loan Programs to Advance Climate Objectives
- **B** Incorporate Climate Planning Resources into Technical Assistance Programs
- **C** Promote Resilient Infrastructure Solutions

GOAL 2

PROTECT NATION'S WATERS FROM THE IMPACTS OF A CHANGING CLIMATE

OBJECTIVES

- **A** Integrate Climate Considerations in CWA and SDWA Actions and Programs
- **B** Invest in Ecosystem Protection and Restoration
- **C** Leverage Strategic Research

GOAL 3

ADVANCE ADAPTIVE CAPACITY OF WATER SECTOR AND CLIMATE KNOWLEDGE OF ALL COMMUNITIES AND DECISIONMAKERS

OBJECTIVES

- **A** Support Assessment of Climate Risks and Climate-Informed Decision Making
- **B** Improve Availability of Data and Information to Support Climate-Informed Decisions

To pursue the objectives outlined above, OW has identified priority actions in the following section as specific steps OW will take to help prepare water programs, partners, and stakeholders for the current and future impacts of climate change. Each action has a concrete timeline and measures for tracking progress toward completion, recognizing that there may be additional work that cannot be easily measured or ongoing work beyond the identified timeline (e.g., managing a new grant program.) Taken together, many of these actions reinforce each other, deliver significant co-benefits, and represent an expansion and acceleration of the OW's long-term climate response.

OW will take steps to ensure the outcomes of infrastructure investments using Infrastructure Investment and Jobs Act (IIJA, or Bipartisan Infrastructure Law [BIL]) funds are resilient to the impacts of climate change. OW will provide technical assistance to recipients of BIL funds to help them make climate smart infrastructure investments. OW will also explore additional opportunities to integrate climate change considerations into our financial assistance programs in order to expand support for projects that increase climate resilience while delivering co-benefits for public health, the mitigation of greenhouse gases, and the reduction of other pollution.

OW's climate change efforts are not limited to the priority actions listed here. OW develops regulations, provides training, and administers a broad range of programs that directly and indirectly address climate impacts, including climate mitigation and disaster response. OW will continue to support climate adaptation opportunities across all programs and engage with partners and stakeholders on additional areas for focus. As new needs are identified, more resources become available, and science and tools advance, OW will update this plan to include additional actions.

Goal 1: Improve Climate Resilience of America's Water Infrastructure

Climate change threatens essential drinking water, wastewater, and stormwater systems. Disadvantaged communities suffer disproportionately from both inadequate water infrastructure and the impacts of climate change. OW will work to accelerate efforts to enhance the resilience of critical water infrastructure, including the use of green and nature-based infrastructure. Through the BIL, EPA and its state and tribal partners have a transformational opportunity to modernize and build new infrastructure that can withstand a broad range of climate risks. By working to ensure equitable implementation of the BIL and other OW funding and financing programs, OW aims to help make significant progress toward combatting climate inequality and advancing Justice40 goals through covered programs. Across its infrastructure programs, OW will deploy grant and loan programs to advance climate objectives, incorporate climate planning resources to technical assistance programs, and promote resilient infrastructure solutions that also advance the use of natural infrastructure.

Objective 1.A. Deploy Grant and Loan Programs to Advance Climate Objectives

Priority Action 1.A.1. Fund climate adaptation projects in small and disadvantaged communities through the Water Infrastructure Improvements for the Nation (WIIN) Grant Drinking Water System Infrastructure Resilience and Sustainability Program.

In fall 2022, OW will issue a Request for Applications for grant projects in underserved and disadvantaged communities with populations of less than 10,000 individuals to increase drinking water system resilience to natural hazards. Eligible grant recipients include public water systems and states on behalf of underserved communities. Recipients can use funding for water conservation and efficiency, modification or relocation of infrastructure, or other measures that increase resilience. increase resilience.

Timeframe: FY22–23

Lead: Office of Ground Water and Drinking Water
Partners: EPA regions, states, tribes, territories

Benefits: Infrastructure resilience; Community resilience; Equity; Environmental justice; Human health

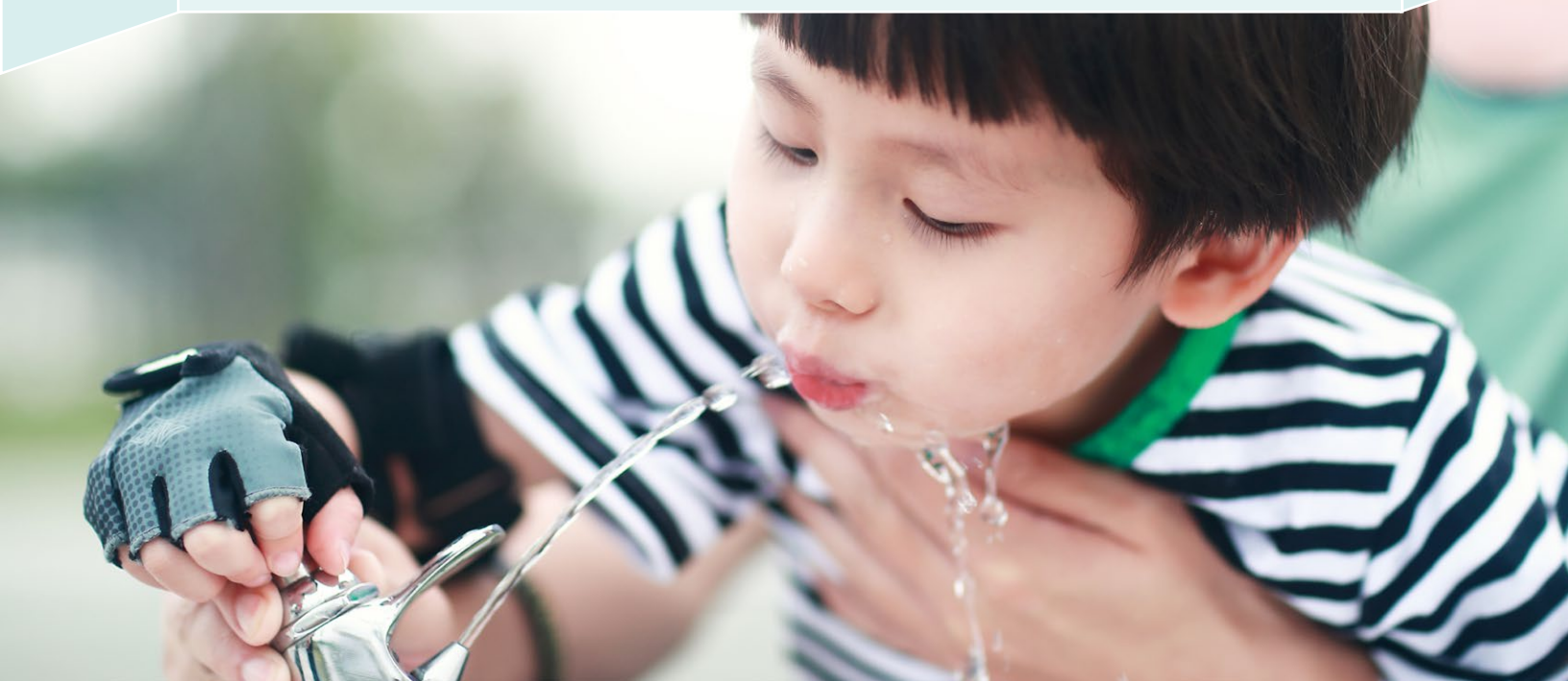
Resource Need: Existing

Measures:

- FY23: Release Request for Applications for grants totaling $6.7 million.
- FY23: Track issuance of grants ($6.7 million) and support recipients.

EPA CAAP Goals Supported: 1, 2

Vulnerabilities Addressed: Waterborne illness and water treatment needs; Critical water infrastructure; Availability of water for human use; Overburdened, underserved, and disadvantaged communities; Tribal nations and indigenous peoples



Priority Action 1.A.2. Incorporate climate change considerations into infrastructure grant and loan guidance and programs.

OW will identify opportunities to further incorporate climate risks and adaptation priorities, including the Federal Flood Risk Management Standard, throughout Bipartisan Infrastructure Law and core infrastructure funding and financing programs, including the Drinking Water and Clean Water SRF programs and the Water Infrastructure Finance and Innovation Act (WIFIA). OW will also work with its state partners to evaluate how SRF programs can effectively promote climate-smart pre- and post-disaster resilience and recovery actions.

Timeframe: FY22–24

Lead: Office of Wastewater Management, Office of Ground Water and Drinking Water
Partners: EPA regions, states, tribes, territories

Benefits: Infrastructure resilience; Equity; Environmental justice; Community resilience; Climate mitigation

Resource Need: Existing

Measures:

- FY22: Complete examination of updates needed for nearly $50 billion in core grant and loan processes, criteria, or guidance over FY22–26.
- FY 22: Issue memorandum to SRF programs regarding reinstatement of the Federal Flood Risk Management Standard, which includes a list of EPA climate adaptation tools and resources.
- FY22: Incorporate information on the Federal Flood Risk Management Standard into the WIFIA program handbook.
- FY22: Establish and hold monthly meetings of a resilience subgroup of the State-EPA SRF Workgroup to share experiences and case studies related to climate risk and adaptation.
- FY22: Release fact sheets on SRF funding for drought, flood, and wildfire resilience.
- FY23: Incorporate climate resilience into SRF BIL guidance for more than $40 billion in grant and loan programs from FY23–26.
- FY23: Develop case studies demonstrating WIFIA-financed projects for climate resiliency.

EPA CAAP Goals Supported:
1, 2

Vulnerabilities Addressed: Critical water infrastructure; Availability of water for human use; Overburdened, underserved, and disadvantaged communities; Tribal nations and indigenous peoples; Territories and island states

Priority Action 1.A.3. Collaborate with other federal agencies to demonstrate how federal funding can support small system resilience and improve the capacity of rural communities to respond more quickly from natural disasters.

Interagency partnerships and collaboration provide important synergies to support adaptation actions in rural and small communities. For example, OW will leverage its 2019 EPA-FEMA Memorandum of Understanding on the SRFs and Disaster Assistance Grants, under which EPA will work with FEMA to clarify frameworks and educate stakeholders on program funding eligibilities enabling states to quickly deploy SRF funds after natural disasters, to be later reimbursed through FEMA's disaster assistance programs. In another area, OW will seek opportunities with the U.S. Department of Agriculture (USDA) to advance key work under an EPA-USDA Memorandum of Agreement to work with the USDA Rural Utilities Service to highlight how small and rural water systems can successfully incorporate climate resilience into their infrastructure and utility management.

Timeframe: FY22–24

Lead: Office of Wastewater Management, Office of Ground Water and Drinking Water
Partners: EPA regions, USDA, FEMA, states, tribes, territories, technical assistance providers

Benefits: Infrastructure resilience; Community resilience; Interagency coordination

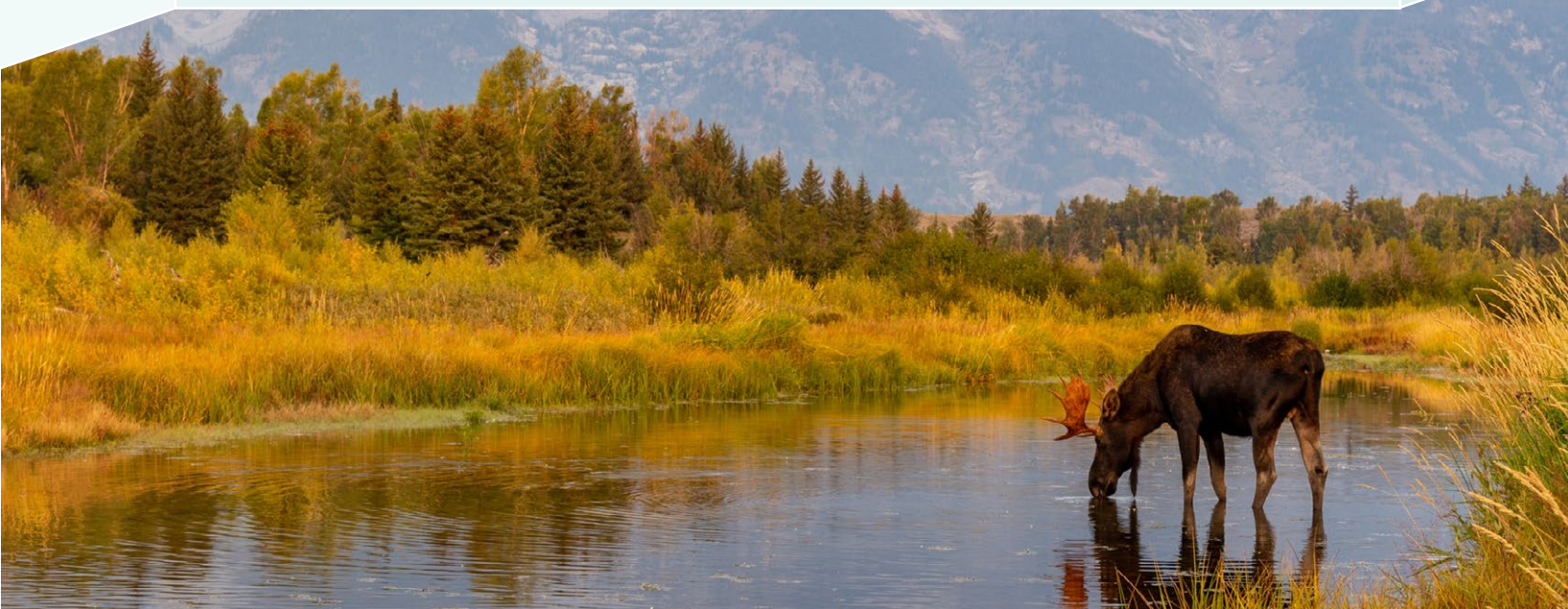
Resource Need: Existing

Measures:

- FY22: Initiate two separate webinar series with FEMA to clarify program funding eligibilities that enable states to quickly deploy funds after disasters.

EPA CAAP Goals Supported: 1, 2

Vulnerabilities Addressed: Critical water infrastructure; Availability of water for human use; Overburdened, underserved, and disadvantaged communities



Objective 1.B. Incorporate Climate Planning Resources into Technical Assistance Programs

Priority Action 1.B.1. Highlight climate resilience tools and resources in EPA's water infrastructure technical assistance programs.

As it establishes an unprecedented technical assistance program to support underserved communities in applying for more than $43 billion in BIL SRF funds, OW will work with technical assistance providers to provide communities information and tools to assess climate risks, identify solutions, and explore SRF and other funding options.

Timeframe: FY22–24

Lead: Office of Wastewater Management, Office of Ground Water and Drinking Water
Partners: EPA regions, states, territories, Environmental Finance Centers, other technical assistance providers

Benefits: Infrastructure resilience, Environmental justice, Equity, Community resilience, Stakeholder engagement

Resource Need: New and existing

Measures:

- FY22: Launch EPA community technical assistance initiative to support implementation of more than $43 billion in SRF grants and loans available through the BIL.
- FY22: Release Request for Applications for Environmental Finance Centers Grant Program, which includes potential climate-related technical assistance.
- FY23: Award grants.

EPA CAAP Goals Supported: 1, 2

Vulnerabilities Addressed: Critical water infrastructure; Availability of water for human use; Overburdened, underserved, and disadvantaged communities; Tribal nations and indigenous peoples

Priority Action 1.B.2. Support holistic integrated planning for climate impacts on existing wastewater and stormwater systems.

OW will deliver technical assistance to states, tribes, territories, and municipalities to support asset owners and planners to develop integrated planning frameworks that incorporate climate adaptation practices into clean water infrastructure.

Timeframe: FY22–23

Lead: Office of Wastewater Management
Partners: OECA, EPA regions, states, territories, Environmental Finance Centers, Green Infrastructure Federal Collaborative

Benefits: Infrastructure resilience; Community resilience; Environmental justice and equity; Stakeholder engagement; Education and training

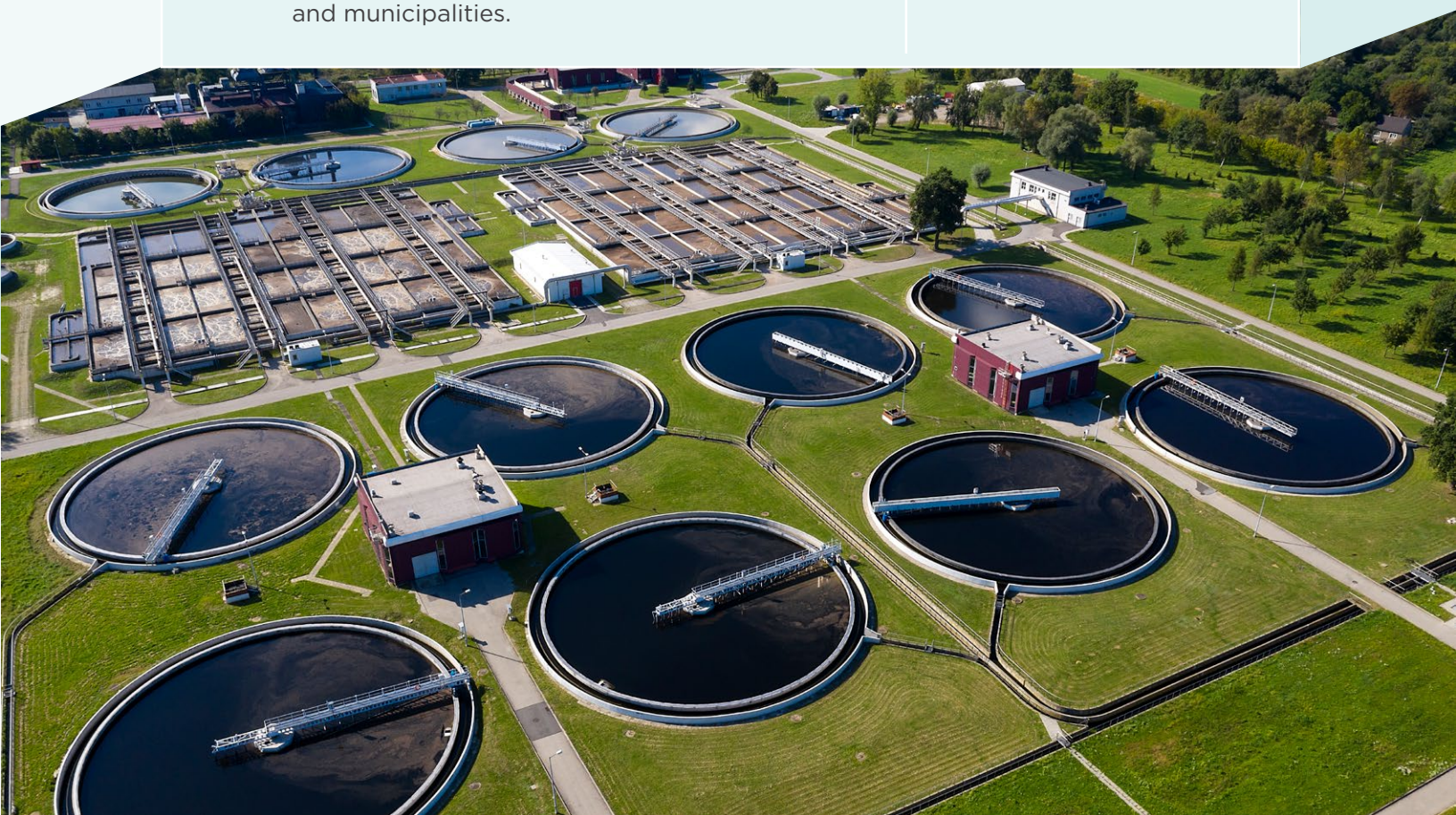
Resource Need: Existing

Measures:

- FY22: Publish state permitting toolkit, case studies, and factsheets.
- FY22–23: Provide technical assistance to states and municipalities.

EPA CAAP Goals Supported: 1, 2

Vulnerabilities Addressed: Critical water infrastructure; Availability of water for human use; Overburdened, underserved, and disadvantaged communities; Tribal nations and indigenous peoples



Priority Action 1.B.3. Expand access to climate risk assessment through the Creating Resilient Water Utilities Program.

OW will increase the capacity of the Creating Resilient Water Utilities (CRWU) initiative to provide outreach, training, and workshops to water systems to evaluate and understand their long-term climate risk and adaptation options, especially with those applying for federal funds. Using a suite of tools, including EPA's Climate Resilience Evaluation and Awareness Tool, CRWU will help more communities and utilities complete climate risk assessments.

Timeframe: FY22–25

Lead: Office of Ground Water and Drinking Water
Partners: Office of Wastewater Management, Office of Enforcement and Compliance Assurance, National Oceanic and Atmospheric Administration (NOAA), non-governmental organizations, water sector associations, territories, states, tribes, local government

Benefits: Infrastructure resilience; Climate mitigation; Environmental justice and equity

Resource Need: New and existing

Measures:

- FY22: Publish state permitting toolkit, case studies, and factsheets.
- FY22–25: Provide outreach, training, and workshops to utilities, with a focus on outreach to systems in small or underserved communities.

EPA CAAP Goals Supported: 1, 2

Vulnerabilities Addressed: Critical water infrastructure; Waterborne illness and water treatment needs; Overburdened, underserved, and disadvantaged communities

Objective 1.C. Promote Resilient Infrastructure Solutions

Priority Action 1.C.1. Advance green infrastructure and nature-based solutions across nearly $2.5 billion in investments to improve climate resilience, water quality, and public access to natural spaces.

OW will leverage a variety of pathways to advance and invest in nature-based infrastructure, including through the Clean Water SRF Green Project Reserve, its geographic programs and the NEP, CWA Section 319 Nonpoint Source Program, and through its interagency participation in the Green Infrastructure Federal Collaborative.

Timeframe: FY22

Lead: Office of Wastewater Management; Office of Wetlands, Oceans and Watersheds
Partners: Other federal agencies, states, tribes, territories, American Association for the Advancement of Science

Benefits: Infrastructure resilience; Community resilience; Environmental justice and equity; Stakeholder engagement; Education and training

Resource Need: New and existing

Measures:

- FY22: Incorporate green infrastructure and nature-based solution priorities into the NEP BIL guidance and Geographic Program Infrastructure Program Implementation Plans for the more than $1.8 billion BIL funds from FY22–26.
- FY22: The CWA Section 319 Nonpoint Source Program will publish training modules promoting green infrastructure and nature-based solutions opportunities across more than $170 million in annual grants.
- FY22: The Green Infrastructure Federal Collaborative will host six forums addressing equity and environmental justice in climate adaptation.

EPA CAAP Goals Supported: 1, 2, 5

Vulnerabilities Addressed: Critical water infrastructure; Aquatic ecosystem health; Waterborne illness and water treatment needs; Overburdened, underserved, and disadvantaged communities

Priority Action 1.C.2. Advance water reuse in agricultural applications.

In the United States, an estimated 20 percent of existing irrigation demand can be met through reused water from municipal wastewater treatment plants, making water reuse a powerful tool to preserve, maintain, and restore declining freshwater supplies from climate related stressors. OW, working with members of the Water Reuse Interagency Work Group (i.e., U.S. Food and Drug Administration, USDA), will develop resources describing potential on-farm water sources, pathways, and reuse opportunities and solutions.

Timeframe: FY22–23

Lead: Office of Science and Technology
Partners: Office of Wastewater Management; Office of Wetlands, Oceans and Watersheds; Office of International and Tribal Affairs; Office of Research and Development; U.S. Food and Drug Administration; USDA

Benefits: Climate adaptation; Energy/water efficiency; Community resilience; Drought resilience; Water conservation; Interagency coordination; Stakeholder engagement

Resource Need: New

Measures:

- FY22: Launch the Water Reuse Interagency Workgroup.
- FY23: Release interagency infographic illustrating potential on-farm municipal water reuse opportunities.

EPA CAAP Goals Supported: 1, 2

Vulnerabilities Addressed: Waterborne illness and water treatment needs; Availability of water for human use; Overburdened, underserved, and disadvantaged communities; Tribal nations and indigenous peoples

Goal 2: Protect America's Waters from Impacts of a Changing Climate

Wetlands, coastlines, inland waterways, and oceans all provide important climate resilience benefits. At the same time, these waters and the communities and ecosystems that rely on them are vulnerable to stressors amplified by a changing climate. OW plans to integrate climate change considerations throughout its national CWA and SDWA programs. To help advance holistic approaches to adaptation, we also will encourage investments in ecosystem protection and restoration that support the goals of Justice40 for covered programs, as well as strategic research.

Objective 2.A. Integrate Climate Considerations in CWA and SDWA Actions and Programs

Priority Action 2.A.1 Advance a "Climate-Ready" NPDES program.

The NPDES program establishes nationwide permit limits, monitoring, and reporting requirements on the point sources that discharge pollutants into U.S. waters. OW will incorporate climate data into multiple tools and models to account for thermal discharges, controls for wet weather programs (e.g., stormwater and combined sewer systems, concentrated animal feeding operations), precipitation, critical flow, and other environmental measures. These data, along with technical assistance, will provide permit writers with the latest information to support climate adaptation when developing pollutant limits and implementing permit-related activities.

Timeframe: FY22–24

Lead: Office of Wastewater Management
Partners: Office of Wetlands, Oceans and Watersheds; Office of Enforcement and Compliance Assurance; EPA regions; states; territories

Benefits: Human health; Ecosystem protection; Education and training; Environmental justice

Resource Need: Existing

Measures:

- FY23: Publish multiple tools to determine thermal discharges, controls for wet weather programs, precipitation, critical flow, and other measures that will provide permit writers with the information to support climate change adaptation.

EPA CAAP Goals Supported: 1, 2

Vulnerabilities Addressed: Waterborne illness and water treatment needs; Aquatic ecosystem health; Overburdened, underserved, and disadvantaged communities

Priority Action 2.A.2. Advance the adoption of nonpoint source water quality actions that provide climate resilience and adaptation co-benefits under the CWA Section 319 Nonpoint Source Grant program.

In FY22 and 23, the CWA Section 319 Nonpoint Source Grant program will improve internal processes for tracking and documenting the climate co-benefits of nonpoint source water quality actions. Working with grantees in the states, tribes, and territories, the program will identify opportunities for promoting greater adoption of these practices through training, outreach, technical assistance, and potential enhancements to the CWA Section 319 Nonpoint Source Grant program guidance.

Timeframe: FY22–25

Lead: Office of Wetlands, Oceans and Watersheds
Partners: EPA regions, states, tribes, territories

Benefits: Conservation; Human health; Economic resilience; Ecosystem protection; Community resilience; Drought resilience; Recreational opportunities; Environmental justice and equity; Stakeholder engagement; Education and training

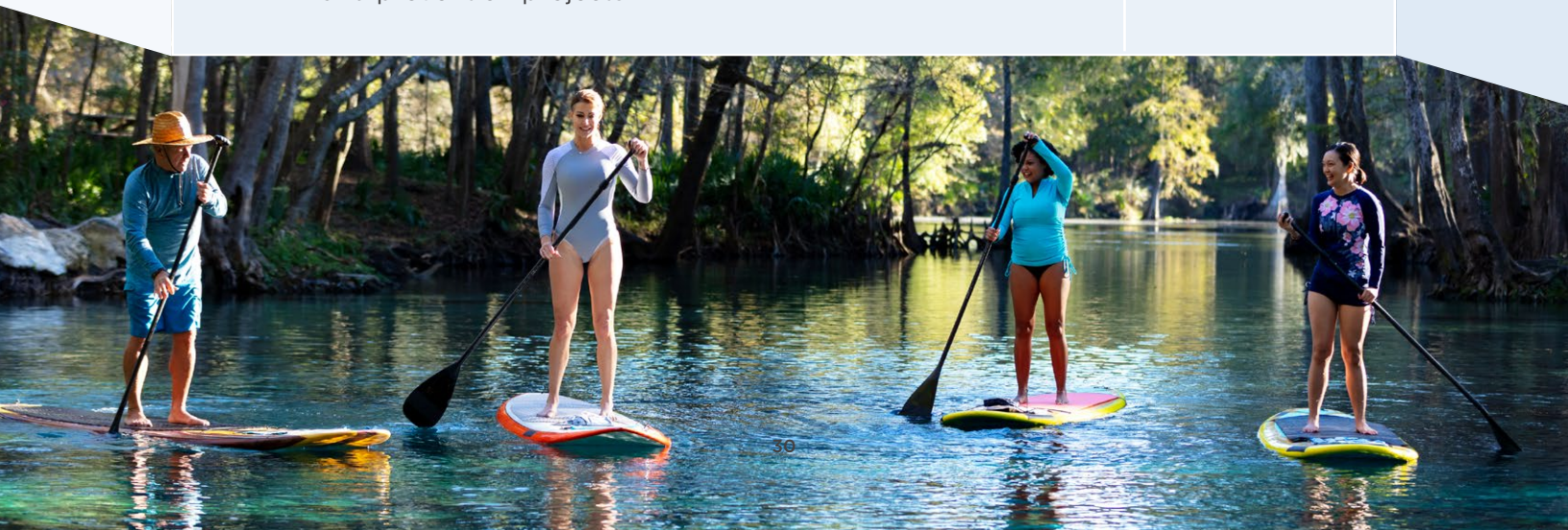
Resource Need: Existing

Measures:

- FY22–25: Support at least 500 on-the-ground projects that provide climate adaptation and resilience co-benefits as reported by CWA Section 319 Nonpoint Source grant recipients in the Grants Reporting and Tracking System.
- Projects may include but are not limited to projects that offset increases in water temperature, enhance ecological flows and groundwater recharge, or improve soil health, as well as green infrastructure that reduces urban runoff and increases groundwater infiltration, and wildfire restoration and prevention projects.

EPA CAAP Goals Supported:
1, 2, 4

Vulnerabilities Addressed:
Availability of water for human use; Aquatic ecosystem health; Overburdened, underserved, and disadvantaged communities; Tribal nations and indigenous peoples



Priority Action 2.A.3. Advance a "Climate-Ready" CWA section 303(d) assessment, listing, and TMDL program.

Under EPA's regulations and CWA section 303(d), states, territories, and authorized tribes identify waters that do not meet CWA water quality standards and develop TMDLs showing pollutant reductions needed to meet those standards. OW will take several steps to further integrate climate change considerations into the CWA Section 303(d) program and will continue to engage states, territories, tribes, and stakeholders in training and information sharing on climate change and the CWA Section 303(d) program. OW also plans to discuss climate change considerations in the 2024 Integrated Reporting Memorandum (which will support EPA regions, states, territories, and authorized tribes in assessing water quality) and distribute a document to support consideration of climate change in developing and implementing TMDLs. By undertaking these activities, OW will promote improved consideration of changing environmental conditions (e.g., precipitation, flow, temperature) to produce water quality assessment and planning actions that are more resilient and adaptive.

Timeframe: FY22–23

Lead: Office of Wetlands, Oceans and Watersheds
Partners: EPA regions, states, tribes, territories

Benefits: Community resilience; Conservation; Energy/water efficiency; Climate mitigation

Resource Need: Existing

Measures:

- FY22: Complete CWA Section 303(d) long-term program vision, including a climate focus area.
- FY22: Develop draft 2024 Integrated Reporting Memorandum.
- FY22: Develop draft document to support the consideration of climate change in developing and implementing TMDLs.
- FY22: Hold national training and stakeholder meeting covering multiple climate-related section 303(d) topics.
- FY23: Issue 2024 Integrated Reporting Memorandum, including discussion of climate change considerations.
- FY23: Issue document to support the consideration of climate change in developing and implementing TMDLs.

EPA CAAP Goals Supported:
1

Vulnerabilities Addressed: Waterborne illness and water treatment needs; Aquatic ecosystem health; Tribal nations and indigenous peoples; Territories and island states

Objective 2.B. Invest in Ecosystem Protection and Restoration

Priority Action 2.B.1. Leverage the BIL's historic funding of OW's Gulf Hypoxia Program, geographic programs, and the NEP to enhance ecosystem and community resilience to climate change.

As EPA place-based programs receive more than $1.8 billion in new funding in the BIL, they will prioritize investments in planning, community capacity-building, ecosystem restoration and nature-based infrastructure, and other climate adaptation activities. EPA will work with grantees to identify and track climate resilience and adaptation projects over the lifetime of the BIL funding.

Timeframe: FY22–26

Lead: Office of Wetlands, Oceans and Watersheds; geographic programs; EPA regions
Partners: States, tribes, territories, local governments, NEPs, nongovernmental organizations, universities, other federal agencies

Benefits: Community resilience; Conservation; Climate mitigation; Interagency coordination

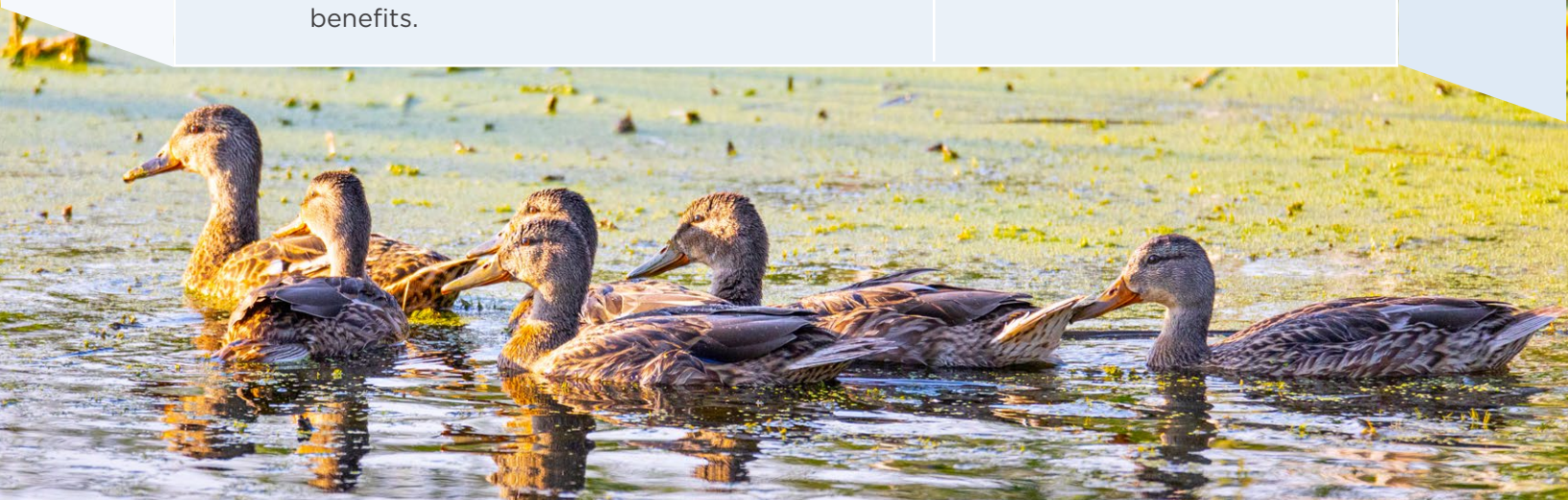
Resource Need: Existing

Measures:

- FY22: Incorporate adaptation priorities into the Infrastructure Program Implementation Plan for the more than $1.7 billion in geographic program BIL funding.
- FY22: Incorporate climate adaptation priorities into guidance for more than $130 million in NEP BIL project funding.
- FY22-26: Gulf Hypoxia Program grantees to identify nutrient reduction actions with climate benefits.

EPA CAAP Goals Supported:
1, 2, 4

Vulnerabilities Addressed:
Waterborne illness and water treatment needs; Aquatic ecosystem health; Overburdened, underserved, and disadvantaged communities; Tribal nations and indigenous peoples; Territories and island states



Priority Action 2.B.2. Release and implement the "Interagency Coastal Wetlands Workgroup Recommendations for Reducing Wetland Loss in Coastal Watersheds of the United States."

Coastal wetlands provide valuable flood storage, buffer storm surge, and help protect coastal infrastructure from storms and rising sea levels. OW will release recommendations to inform cross-federal efforts to address coastal wetland losses. OW will create a regional protocol to identify, assess, and prioritize removing hard infrastructure that restricts tidal flow to restore natural habitats and strengthen ecosystem resilience.

Timeframe: FY22–26

Lead: Office of Wetlands, Oceans and Watersheds
Patners: EPA regions; states; territories

Benefits: Infrastructure resilience; Community resilience; Climate mitigation; Conservation; Interagency coordination

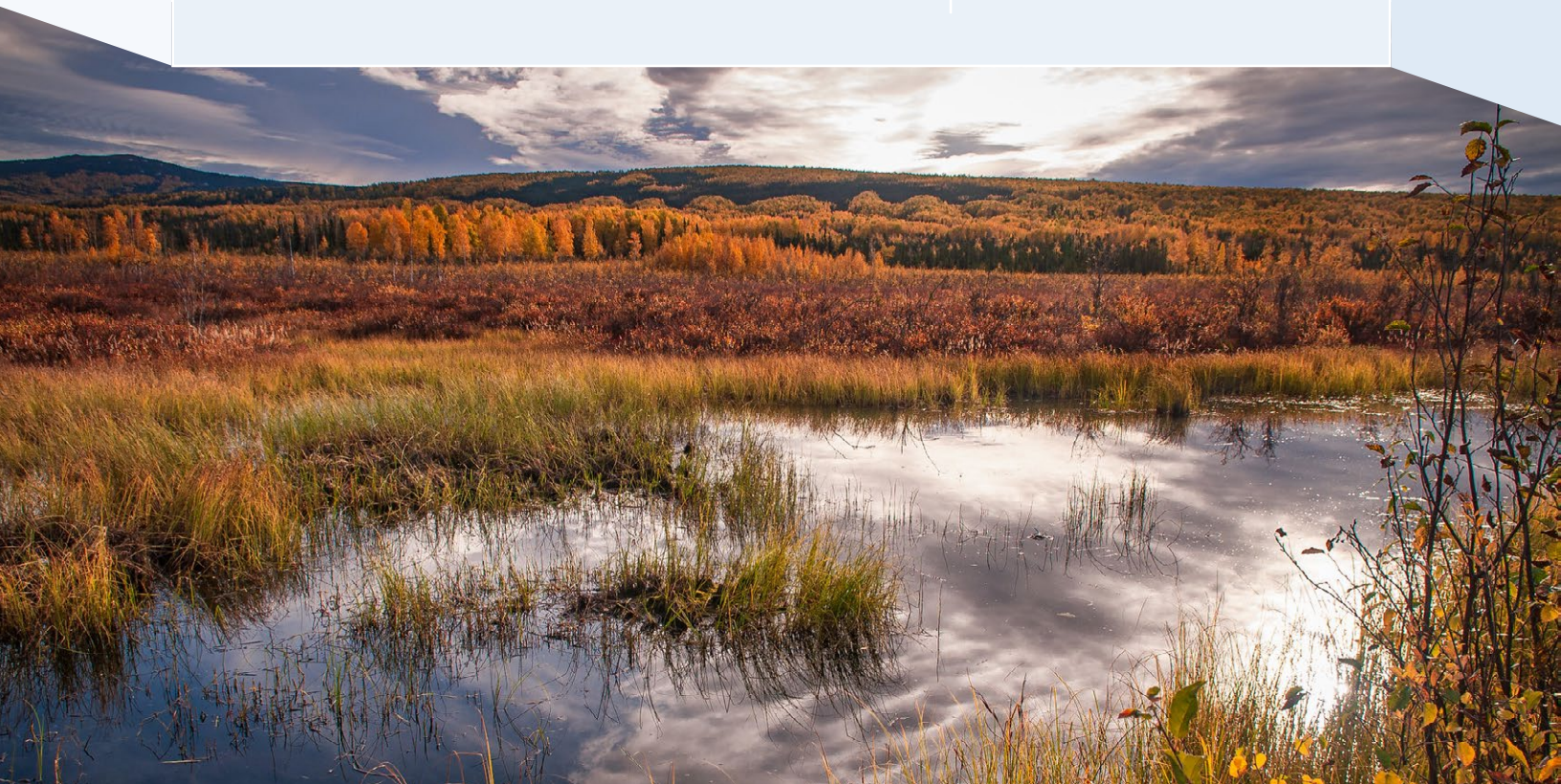
Resource Need: Existing

Measures:

- FY22: Release recommendations report.
- FY24: Produce regional protocol to support removal of tidal restrictions.

EPA CAAP Goals Supported:
1, 2

Vulnerabilities Addressed:
Aquatic ecosystem health; Tribal nations and indigenous peoples; Territories and island states



Objective 2.C. Leverage Strategic Research

Priority Action 2.C.1. Incorporate climate considerations into EPA's Water Quality Standards (WQS) program and handbook.

WQS serve as the foundation for achieving national and state water management goals. OW will conduct analyses and assessments necessary to issue updated WQS Handbook chapters and an updated WQS Priorities Memorandum to EPA regions, states, tribes, and territories. The handbook and memorandum will provide important direction to states and tribes for building climate adaptation into WQS updates and supporting the adoption of robust, climate-sensitive WQS, including criteria for nutrients, HABs, and hydrologic flow.

Timeframe: FY22–23

Lead: Office of Science and Technology
Partners: EPA regions, states, tribes, territories

Benefits: Conservation; Community resilience; Human health; Drought resilience; Education and training

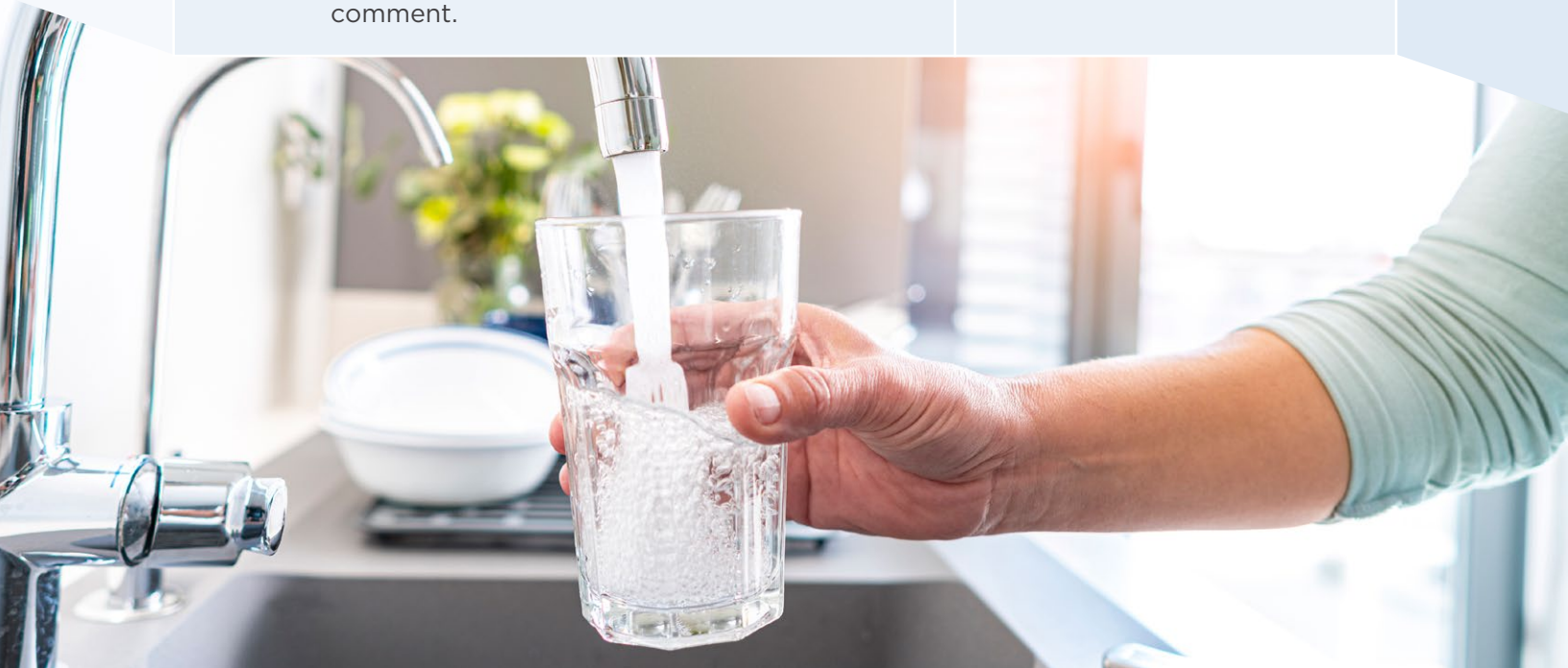
Resource Need: Existing

Measures:

- FY22: Provide draft WQS Handbook for state review and tribal consultation.
- FY23: Issue updated WQS Priorities Memorandum.
- FY23: Publish draft WQS Handbook for public comment.

EPA CAAP Goals Supported:
1, 2

Vulnerabilities Addressed:
Waterborne illness and water treatment needs; Availability of water for human use; Aquatic ecosystem health



Priority Action 2.C.2. Develop an agencywide strategic plan to address HABs in fresh and coastal marine waters that will include an objective to evaluate the impacts of climate change on their occurrence, magnitude, and spatial extent.

As warming water temperatures lead to larger and more frequent occurrences of HABs, OW will identify actions it can take to understand their formation as well as strategies to monitor and mitigate their impacts on drinking water supplies, human and ecological health, and recreational and economic activity.

Timeframe: FY22–23

Lead: Office of Science and Technology, Office of Research and Development, Office of Wetlands, Oceans and Watersheds
Partners: Office of Ground Water and Drinking Water, Office of Wastewater Management, EPA regions, states, tribes, territories, Association of Clean Water Agencies

Benefits: Conservation; Human health; Economic resilience; Ecosystem protection; Community resilience; Recreational opportunities

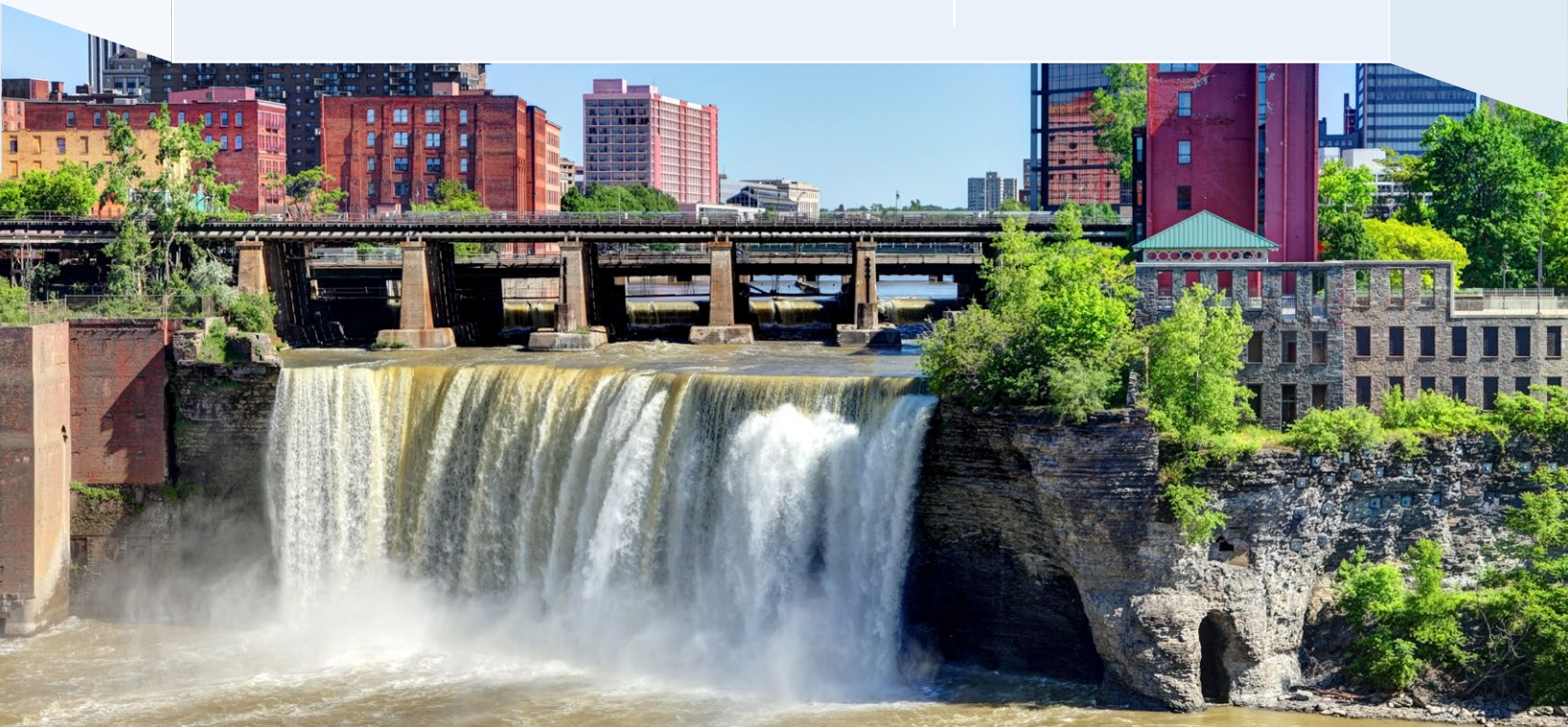
Resource Need: Existing

Measures:

- FY22: Develop draft HAB strategic plan for internal review.
- FY23: Finalize HAB strategic plan.

EPA CAAP Goals Supported:
1, 2, 5

Vulnerabilities Addressed:
Waterborne illness and water treatment needs; Availability of water for human use; Aquatic ecosystem health



Priority Action 2.C.3. Develop CWA Water Quality Criteria recommendations that protect aquatic life from an imbalance of salts in water due to climate change.

Aquatic species depend on specific waterbody conditions and habitats to thrive. Shifting climatic patterns are altering the levels of salts which are then reaching our waterways. OW's recommendations will support states and tribes in establishing water quality protections that account for alterations in precipitation and streamflow and their impacts on salinity levels.

Timeframe: FY22–23

Lead: Office of Science and Technology:
Partners: OW offices, Office of Research and Development, EPA regions, states, tribes, territories

Benefits: Conservation; Ecosystem protection

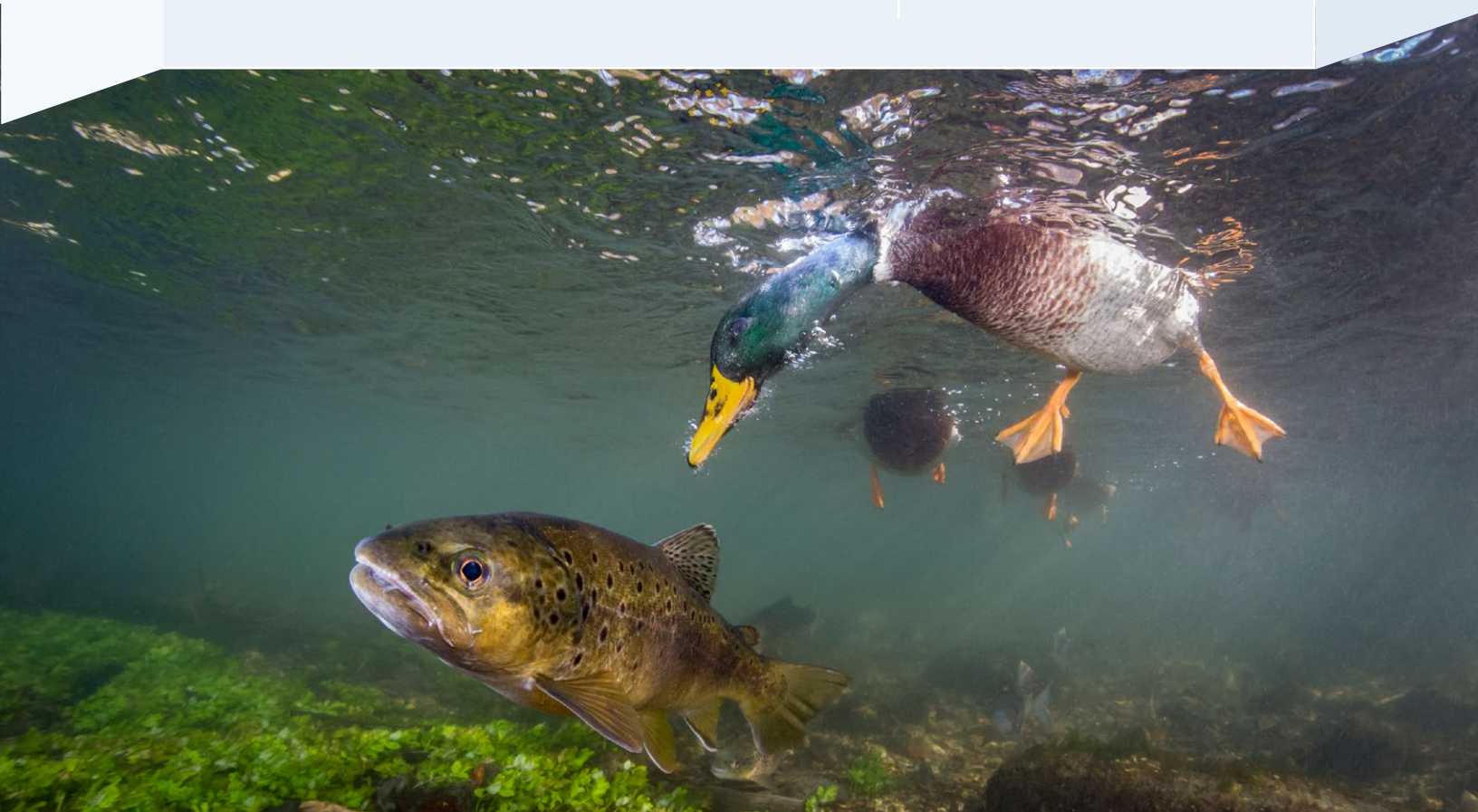
Resource Need: Existing

Measures:

- FY22: Develop draft criteria for internal review.
- FY23: Publish draft CWA Section 304(a) Water Quality Criteria for chloride for scientific input.

EPA CAAP Goals Supported:
1, 2, 5

Vulnerabilities Addressed:
Aquatic ecosystem health; Transportation and energy infrastructure interface with water



Goal 3: Advance Adaptive Capacity of Water Sector and Climate Knowledge of Communities and Decisionmakers

OW must interpret and communicate the latest climate data, science, and information, and make it accessible and usable for all stakeholders—from state and tribal co-regulators to disproportionately impacted communities. OW plans to work internally and with partners to incorporate climate adaptation data, information, and best practices into its outreach programs, decision support tools, and other resources in ways that address barriers to access, such as geography and language. Our goal is to help national and local partners assess climate risks and impacts to make informed choices about the actions they will take.

Objective 3.A. Support Assessment of Climate Risks and Climate-Informed Decision-Making

Priority Action 3.A.1. Support and integrate Traditional Ecological Knowledge (TEK) into decision-making tools.

Honoring and working with our tribal partners requires EPA to incorporate knowledge acquired by tribes and indigenous peoples through direct contact with the environment. This knowledge is important both to understanding how Indian Country and tribal ways of life may be impacted by climate change, and to informing our broader understanding of ecological systems. Consistent with the November 2021 White House Office of Science and Technology Policy and the Council on Environmental Quality memo "Indigenous Traditional Ecological Knowledge and Federal Decision Making," OW will support the application of TEK in grant programs, future water program operations, technical assistance, and decision support tools.

Timeframe: FY22–26

Lead: Office of Water
Partners: OW offices, Office of International and Tribal Affairs, Office of Research and Development, Office of Mission Support, EPA regions, National Tribal Water Council, National Tribal Operations Council, Bureau of Indian Affairs (BIA), tribes

Benefits: Infrastructure resilience; Community resilience; Environmental justice; Ecosystem protection; Stakeholder engagement

Resource Need: Existing

Measures:

- FY24: Convene tribal officials and national water program staff to discuss potential needs and opportunities for supporting TEK in water program decision-making.

EPA CAAP Goals Supported:
1, 2

Vulnerabilities Addressed:
Waterborne illness and water treatment needs; Aquatic ecosystem health; Overburdened, underserved, and disadvantaged communities; Tribal nations and indigenous peoples

Priority Action 3.A.2. Leverage the Urban Waters Federal Partnership (UWFP) to address climate adaptation in urban communities.

The UWFP, co-chaired by EPA, is a landmark partnership of 15 federal agencies working across 20 urban locations to revitalize urban waters and greenspaces and promote their environmental, economic, and social benefits. Through the UWFP and Urban Waters Learning Network, OW will help municipalities and communities across the United States (including those beyond the UWFP) understand climate impacts, share best practices, and learn about successful adaptation techniques to address climate stressors in urban communities.

Timeframe: FY22–23

Lead: Office of Wetlands, Oceans and Watersheds
Partners: Urban Waters federal partners and locations, EPA regions

Benefits: Community resilience; Interagency coordination; Climate justice

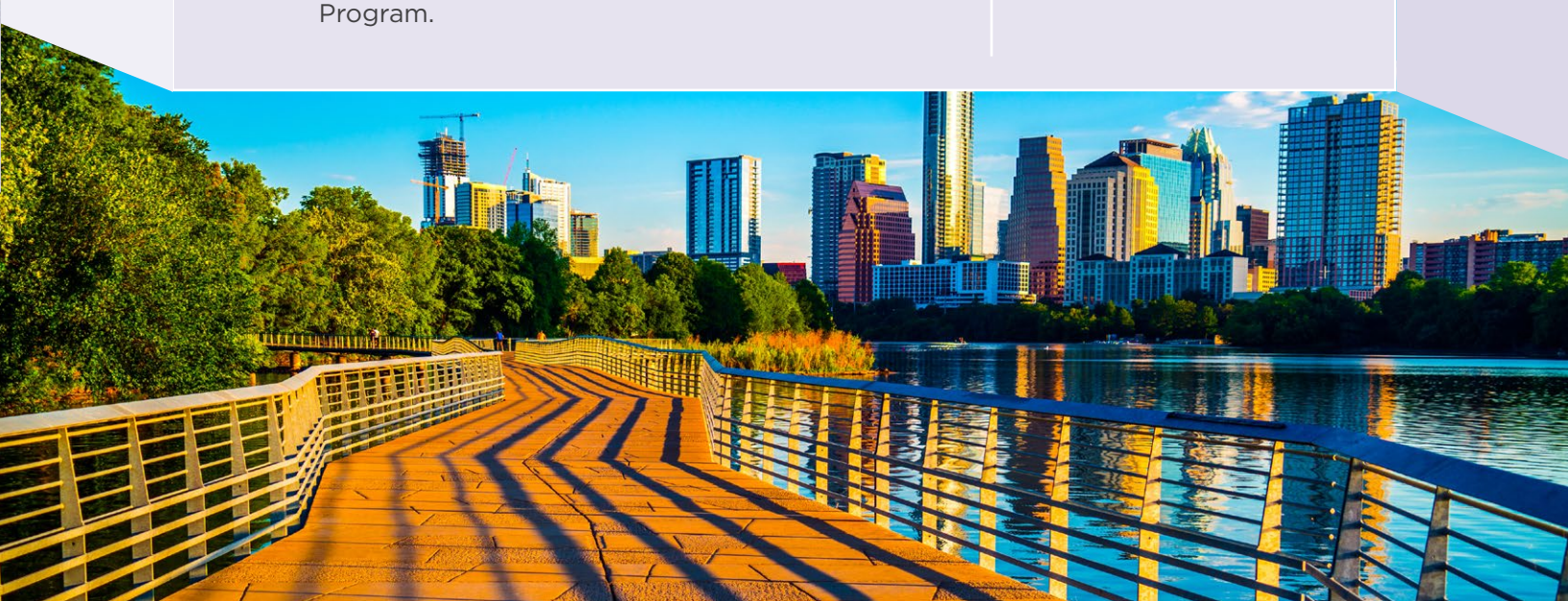
Resource Need: Existing

Measures:

- FY23: Issue white paper study of climate resilience program in UWFP locations.
- FY22: Establish Climate Resilience Community of Practice within Urban Waters Learning Network.
- FY23: Issue Story Map or report on supporting equitable climate resilience planning with Grand Rapids Federal Partnership in collaboration with the Office of Research and Development and the Sustainable and Healthy Communities Research Program.

EPA CAAP Goals Supported: 1, 2, 5

Vulnerabilities Addressed: Waterborne illness and water treatment needs; Aquatic ecosystem; health; Overburdened, underserved, and disadvantaged communities



Priority Action 3.A.3. Advance coastal climate resilience and adaptation through EPA's Climate Ready Estuaries (CRE) Program.

OW's CRE program develops decision support tools that enable EPA staff and partners to integrate climate adaptation into their work. CRE shares climate adaptation knowledge and strategies with EPA's place-based programs and the broader coastal management community. Working with OW's NEP, the UWFP, and other coastal managers and programs, the CRE program will help coastal communities assess climate change vulnerabilities, develop adaptation strategies, and engage and educate coastal community stakeholders. The CRE program will leverage the NEP and UWFP networks to share best practices, technical guidance, and other climate adaptation assistance.

Timeframe: FY22–26

Lead: Office of Wetlands, Oceans and Watersheds
Partners: EPA regions, NEP, geographic programs, UWFP, Office of Research and Development

Benefits: Infrastructure resilience; Energy/water efficiency; Community resilience; Drought resilience; Conservation; Environmental justice and equity; Human health; Interagency coordination; Stakeholder engagement; Education and training

Resource Need: New

Measures:

- FY23: Publish an online estuary temperature climatology tool with NOAA.
- FY24: Publish a sea level rise scenarios guide for agency staff and water community.
- FY26: Publish sector supplements and decision guides for the "Being Prepared for Climate Change" workbook.
- FY26: Partner with place-based programs to provide CRE technical assistance in at least two regions.

EPA CAAP Goals Supported:
1, 2, 5

Vulnerabilities Addressed:
Waterborne illness and water treatment needs; Aquatic ecosystem health; Overburdened, under-served, and disadvantaged communities; Tribal nations and indigenous peoples; Territories and island states

Objective 3.B. Improve Availability of Data and Information to Support Climate-Informed Decisions

Priority Action 3.B.1. Improve the accessibility and transparency of water and climate data through How's My Waterway.

How's My Waterway is a critical data and mapping integration platform used by water managers, educators, students, and the public. OW will engage partners and stakeholders to identify, prioritize, and grow the underlying foundation of climate-specific data and information for the How's My Waterway app. These efforts will improve the accessibility and transparency of water and climate data and the discoverability of data sets for climate change and water resource research, as well as support climate-informed decision-making across SDWA and CWA programs.

Timeframe: FY22–24

Lead: Office of Wetlands, Oceans and Watersheds
Partners: U.S. Geological Survey (USGS) and other federal partners, EPA regions, Office of Research and Development

Benefits: Interagency coordination; Stakeholder engagement; Education and training; Community resilience

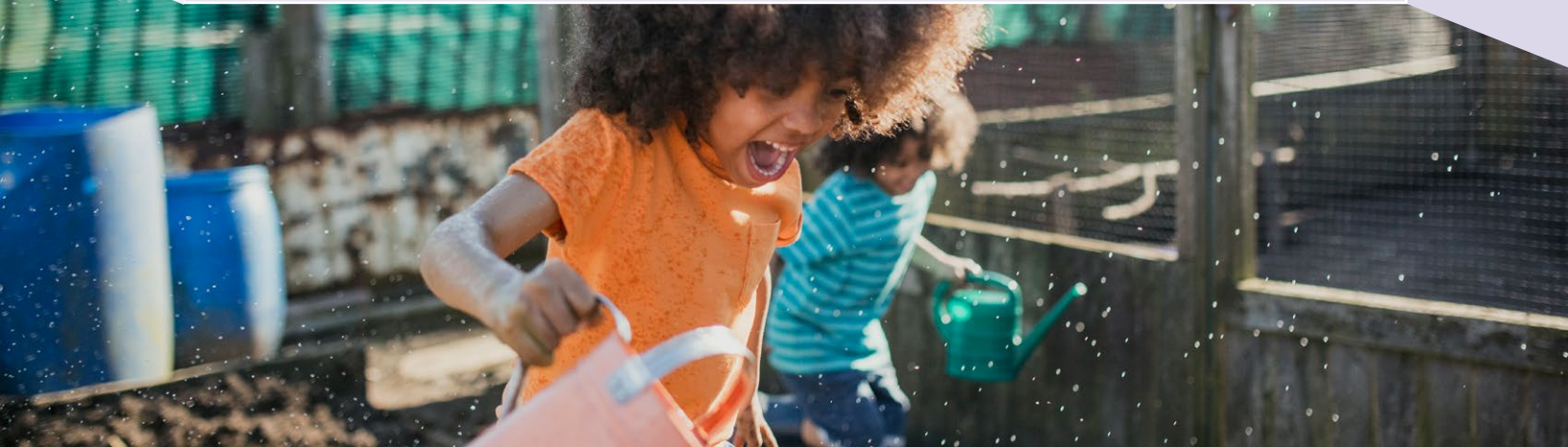
Resource Need: Existing

Measures:

- FY22: Complete addition of cyanobacteria and USGS current weather and water conditions data into How's My Waterway.
- FY24: Complete inventory and incorporate prioritized climate data and information into How's My Waterway.

EPA CAAP Goals Supported: 1, 2, 5

Vulnerabilities Addressed: Waterborne illness and water treatment needs; Availability of water for human use; Aquatic ecosystem health; Tribal nations and indigenous peoples; Territories and island states



Priority Action 3.B.2. Update and maintain the EPA website, "Climate Change in the Water Sector."

This website will be a platform to widely share water program information, tools, trainings, technical assistance opportunities, and other resources to support state, tribal, and local decision-makers in accessing climate adaptation resources.

Timeframe: FY22–23

Lead: Office of Water
Partners: EPA regions, Office of Research and Development, Office of Policy

Benefits: Interagency coordination; Stakeholder engagement; Education and training; Community resilience

Resource Need: Existing

Measures:

- FY23: Update website.

EPA CAAP Goals Supported: 1, 2, 5

Vulnerabilities Addressed: Waterborne illness and water treatment needs; Critical water infra-structure; Availability of water for human use; Aquatic ecosystem health; Overburdened, under-served, and disadvantaged communities; Tribal nations and indigenous peoples; Territories and island states.

OW will continue to adapt and refine this Implementation Plan over time, in collaboration with the Office of Policy Climate Adaptation Program and the Regions, to deliver on cross-agency priorities that seek to incorporate climate change into rulemakings, cross-program projects, and policies, as outlined in the CAAP. Throughout its implementation process, OW will consult and partner with states, tribes, territories, environmental justice organizations, community groups, businesses, and other federal agencies to strengthen the adaptive capacity of the Nation. Outside of the actions expressed in this Plan, OW will continue to implement a broad array of activities to tackle the climate crisis.

Evaluating and Tracking Our Progress

OW will track and evaluate its progress toward achieving the actions identified in this Implementation Plan. As it implements these actions, OW will regularly assess its effectiveness at achieving its climate adaptation goals, areas that can be improved, and remaining information and resource gaps. Since results often come months or years after implementation, in the near term, OW will use interim, action-specific measures to capture progress. OW will also support the long-term performance goals identified in EPA's CAAP and Strategic Plan.

Measuring Progress in EPA's Strategic Plan and Climate Adaptation Action Plan

At the agency-level, EPA has established long-term performance measures to evaluate its progress on climate change activities under the FY2022–2026 EPA Strategic Plan. The Strategic Plan includes important new goals for climate change and environmental justice with an emphasis on embedding these priorities in all of EPA's work. Strategic Plan Goal 1, "Tackle the Climate Crisis," includes as a key objective, *Accelerate Resilience and Adaptation to Climate Change Impacts*. OW's plan outlines our commitments to fulfill this Strategic Plan goal. (For more information on the Strategic Plan goals and long-term performance goal measures related to climate change, visit the EPA Strategic Plan webpage.)

Similarly, EPA recognizes the importance of monitoring and evaluating performance and acting on lessons learned in Priority Action 4 of its 2021 Climate Adaptation Action Plan, "Using Measurement, Data and Evidence to Evaluate Performance." EPA will evaluate its climate change adaptation actions on an ongoing basis to assess its progress toward:

1. Integrating climate adaptation throughout EPA's programs, policies, rules, enforcement and compliance assurance activities, and operations.
2. Modernizing financial assistance programs in ways that encourage climate-resilient investments.
3. Providing the information, tools, training, and technical support communities need to increase resilience and adapt to climate change.
4. Advancing equity and environmental justice to support the needs of the most overburdened and vulnerable communities in responding to climate change.

Identifying Science Needs to Advance Adaptation and Resilience

OW must have and use the best available science on climate change risks, impacts, and vulnerabilities when implementing its programs or formulating strategies to adapt to a changing climate. As that science continues to evolve, OW's programs, and the decision-makers they support, need the latest data, models, and tools. In addition, as efforts to address climate change impacts continue to evolve, the need for regional and localized information is more important than ever. As part of its adaptation planning process, OW and EPA regional staff identified a wide range of research needs, informed by both the climate-related vulnerabilities and programmatic actions identified in this Implementation Plan. The science needs identified will support EPA's Office of Research and Development in prioritizing exploratory and applied climate adaptation research, as well as communicate research needs to other federal agencies and the scientific community. OW's climate science needs include the following:

Advance Modeling Methods to Include and Regionalize Climate Change Information

- Advance existing models and methods used to simulate water quality responses to future climate scenarios, support risk-based modifications, and provide additional confidence in projections (in partnership with the National Center for Atmospheric Research (NCAR), NOAA, BIA, USGS, and others).
- Advance existing downscaled model development (in partnership with NCAR, NOAA, BIA, USGS, and others) to provide forecasting and scenario information on site-specific issues with high spatial resolution, including altered precipitation patterns that drive hydrological alterations and other water quality changes.
- Work with tribes to incorporate TEK data inputs when developing downscaled models specific to tribal lands.
- Develop forecasting methods to assess current and future changes to permafrost, including the impacts to water infrastructure, in Alaska Native Villages.
- Refine monitoring, assessment, and modeling approaches to manage large river systems, versus state by state, to understand long-term alterations from climate change.

Build Resilient Water Infrastructure

- Analyze impacts of changes in precipitation in different regions of the country on pollutant loading from combined sewer overflow (CSO) events and stormwater runoff to provide guidance for CSO controls and stormwater management programs.
- Identify options for designing climate-smart water infrastructure that is both structurally resilient to the impacts of climate change and provides significant opportunities to reduce greenhouse gas emissions in operations.
- Identify risks to wastewater treatment plant outfalls, drinking water treatment plant intakes, and CSO sites from flooding or tidal inundation and drought or low-flow conditions.

Support Climate-Smart Investments with Economic and Finance Data

- Research the effectiveness and co-benefits of green infrastructure or nature-based solutions (e.g., water quantity, water quality, habitat, temperature stabilization, socioeconomic factors) under future climate scenarios.
- Quantify the value of green infrastructure or nature-based solutions in mitigating and adapting to climate change (e.g., economic cost savings, quantification of co-benefits, valuation/return on investment of certain projects).

Safeguard Human Health and Community Wellbeing

- Undertake additional assessments to improve understanding of compounding stressors and their impacts on communities' public health and resources, and to improve EPA's approaches to work effectively with communities to build resilience, especially communities disproportionately vulnerable to climate impacts, including tribal and Pacific Island communities.
- Model and predict population migration patterns due to climate change, including the impacts of the current or potential movement of people on ecosystems and surrounding water bodies.

Support Community and Watershed-Scale Adaptation

- Map and visually overlay various data sets to provide a more complete picture of water quality and quantity, priority climate risks and vulnerabilities, and social and economic co-benefits of adaptation.
- Identify watersheds and communities at greatest risk of impairment due to extreme weather and other stressors by linking social, economic, and environmental or climate models. The goal of this research is to bolster existing indicator work to help explain the connection between these areas of study, allowing for a comprehensive perspective of how changes in each domain interact at various scales (e.g., how affordability, access, and equity can exacerbate water quality conditions within vulnerable communities). These indicators would include water quality and quantity conditions, as well as economic, land use, or social metrics.
- Analyze the interplay between climate change, adaptive urban planning, and pollutant exposure of communities with a focus on environmental justice concerns (e.g., contaminated sites, water infrastructure, ecosystems, fate and transport of pollutants).
- Identify and share successful water management and adaptation practices used by states, tribes, territories, localities, federal agencies, and other entities with an emphasis on nutrient and sediment reduction. This effort could include recommendations to partner with federal agencies or other program partners on collaborative science efforts.

- Study the risks and benefits of reusing dredged or fill material for agriculture uses, beach renourishment, wetland enhancement, marsh restoration, or climate change resilience and adaptation.

Protect Aquatic Ecosystems and Their Services

- Expand continuous, long-term water quality monitoring networks that can reveal climate-driven trends and help water resource managers assess the relationship between water quality and climate over finer scales and longer timeframes. This effort should focus on more vulnerable water resources like lakes, wetlands, and smaller streams, which are not typically included in continuous, long-term monitoring networks. The effort should also include data on water quality and quantity, aquatic life, land use, habitat, and other measures of watershed health.
- Examine how climate-related impacts (e.g., increases in nutrient runoff from extreme precipitation events, warming water body temperatures) are contributing to the rise of benthic HABs, and share effective management interventions.
- Research the impacts of altered hydrologic flows and warming water temperatures on aquatic and terrestrial ecosystems, with a particular focus on critical species (e.g., eel grass, kelp).
- Determine how temperature and hydrologic changes (e.g., increased frequency and intensity of precipitation, increased drought) will impact species ranges, tolerance, and survival due to ecosystem shifts and water quality alterations (e.g., cold-water fish species, kelp).
- Collect information on the type, lifespan, and performance of best management practices for agriculture and concentrated animal feeding operations. This information is necessary to identify successful approaches to meet water management objectives and maintain their effectiveness under future climate conditions.
- Identify wetland restoration strategies that effectively account for climate impacts, such as extreme weather and warming waters, and performance standards to ensure successful restoration.

Mitigate and Reduce Greenhouse Gas Emissions

- Characterize and model the effects of carbon sequestration technologies on the marine environment, such as ocean alkalinity enhancement and carbon removal (e.g., using kelp to sequester carbon on the seafloor), to support permitting responsibilities under the Marine Protection, Research, and Sanctuaries Act.
- Expand data, maps, and inventories of blue carbon habitats (i.e., seagrasses, tidal marshes, and mangroves), including high-resolution maps, deep core data, and characterization of vegetation type.

Evaluate the Nexus of Water Quality and Availability

- Research the interface between surface waters and groundwater to understand both water quality and quantity implications from projected changes in climate.
- Identify impacts on water quality (e.g., drinking water supplies) from wildfires and/or controlled burns.
- Develop effective water reuse approaches (e.g., sustainable aquifer recharge, reuse of produced water from oil production) that consider impacts and opportunities related to tribes, equity, and the economy.

Ongoing Collaboration

These recommendations align with existing planning frameworks that allow for strategic, transparent identification of water research needs between the Office of Research and Development and OW, including those related to climate science. OW will continue to coordinate with the Office of Research and Development to ensure the latest science is translated into actionable information for state, tribal, and local partners seeking to build resilience to climate change. In addition to these efforts, OW will coordinate and collaborate with other federal agencies and the scientific community to access the best available research, technologies, tools, and data. EPA's ongoing partnerships with the U.S. Global Change Research Program and other federal agencies offer additional opportunities to provide feedback on specific climate research needs and to access new scientific information or resources to guide the implementation of water management programs. For more information on the climate-specific research that the Office of Research and Development will perform to help EPA and the nation meet today's complex environmental and human health challenges, see the Office of Research and Development's website for updates on the Strategic Research Action Plans for 2023–2026.

Elevating Employee and Stakeholder Knowledge of Climate Change

OW will expand and develop training and educational resources to elevate staff, management, and program partners' awareness of climate science, impacts, and resilience approaches.[3]

To meet these educational goals for OW programs, OW will complete the following actions in FY22–26:

- Hold an all-hands meeting upon release of the OW Climate Adaptation Implementation Plan to highlight the activities OW will pursue.
- Identify opportunities to highlight and provide training, as applicable, on priority actions as they are completed.
- Update the training module "Understanding Climate Change Impacts on Water Resources" to support ongoing learning by both management and staff of the impacts of climate change on OW's mission. This publicly available, 45-minute training discusses the causes of climate change, its impacts on water resources, and the challenges water resource managers face.
- As OW achieves milestones and completes measures associated with the priority actions in this Implementation Plan, relevant program offices will host office-wide and public trainings on the context, impact, and other key information on each action.
- Promote opportunities for program staff to learn about and participate in climate adaptation efforts as part of the National Water Program Climate Resilience Workgroup. The workgroup, established in 2007, will continue to feature a variety of federal, state, local, non-governmental, and private sector presenters as a monthly event open to all EPA staff. The workgroup can be a source of support for program staff working to institutionalize climate change in their operations.
- Consider including climate change education in staff and management training requirements and track the development of climate-focused trainings..

[3] These trainings and educational materials will support two goals of EPA's 2021 Climate Adaptation Action Plan: "to increase awareness about the importance of climate adaptation and encourage all EPA staff and partners to consider the changing climate in the normal course of business" and "to introduce its staff and partners to specific methods and tools for integrating climate adaptation into decision-making processes."

> "To respond to climate change, EPA needs its personnel and partners to adopt new ways of achieving its mission. EPA will build capacity through ongoing education and training. Equipped with an understanding of projected climate-related changes and adaptation approaches and trained on how to use new decision support tools, EPA and its partners will be better able to incorporate climate adaptation into their plans and decisions."
>
> – EPA's 2021 Climate Adaptation Action Plan

To meet these educational goals for OW internal and external partners, in addition to the priority actions in this Implementation Plan, OW will:

- In FY23, update and maintain the EPA website Climate Change in the Water Sector to widely share water program information that can support state, tribal, and local decision-making.
- In FY22, OW will work with EPA's regional offices to develop a presentation and communications materials for all EPA water programs describing climate change and water issues generally, with a focus on advancing the priorities of EPA's 2021 CAAP and this Implementation Plan. The presentation will provide consistent baseline messaging during national program meetings, stakeholder engagement, and training workshops, as well as other water program events.
- Between FY22–26, OW will develop or revise climate change modules and workshops as part of national program trainings for water sector audiences. For example, OW will update the Water Quality Standards Academy's resilience module to include more focus on climate-related issues like hydrologic flow.
- To provide ongoing educational opportunities for both staff and stakeholders, OW will develop and update additional climate-focused trainings, which may include the following actions:
  - » Offer climate change webinars through OW's Watershed Academy Webcast series, such as modules on the use of green infrastructure for water quality resilience and the Creating Co-Benefits Through Hazard Mitigation Planning and Water Resource Management webcast.
  - » Continue development and distribution of resilience focused fact sheets and case studies that highlight climate focused projects supported by the SRFs programs.
  - » Continue engaging and educating internal and external stakeholders about climate change adaptation through the CRE Program through trainings and an online toolkit of resources that include recorded webinars, video tutorials, and other resources for environmental professionals.

- Conduct outreach and training to support workforce development for local "green" operations and maintenance professionals through the Green Infrastructure Program and webcast series event, Green Infrastructure Jobs for Operations and Maintenance to Help Communities Get Climate Ready.
- Continue public webinars featuring case studies and recommendations for tribes interested in pursuing water reuse projects, such as the 2020 *Implementing Water Reuse Projects in Tribal Communities* webinar. (Additional information can be found on the National Water Reuse Action Plan Online Platform.)
- Develop a new workshop series, Advancing the Integration of Clean Water Act Programs with National Hazard Mitigation Planning and Implementation, to build state and local wetland program capacity on topics related to nature-based hazard mitigation, in partnership with the National Association of Wetland Managers.
- Partner with EPA's Office of Environmental Justice to host a webinar on OW's programs to assist underserved, disadvantaged, and disproportionately at-risk communities to combat current and ongoing climate challenges. The initial audience for these webinars will be Urban Waters program locations around the country.

Through these actions, OW will help support our water community while also advancing an agencywide effort to develop and maintain the Climate Change Adaptation Resource Center (ARC-X) to provide greater access to climate adaptation information.

Engagement and Outreach

During the development of this plan and actions that will follow its release, OW has committed to reaching out to and engaging our water sector stakeholders. These stakeholders span states, tribes, territories, local governments, environmental justice organizations, businesses, and other federal agencies. OW began informally engaging with several water sector partners in winter 2022, with formal engagement events held in May and June 2022. For the first round of informal engagements, OW held dialogues with external partners through existing venues to help prioritize and shape the draft priority actions that would be most important and impactful. These conversations also helped OW identify areas where the federal government would provide the most added value. Details on the formal engagement events that took place during the development of this plan can be found below.

Event Name	External Participant(s)	Key Themes Heard	Date of Event
Water Equity Engagement	Non-governmental organizations, tribal representatives, environmental justice advocates, citizens	• Integrate environmental justice and Justice40. • Take opportunities to overlap climate work with the America the Beautiful initiative. • Address language justice in climate communications. • Integrate climate into National Environmental Policy Act analyses.	May 2, 2022
Water Sector Engagement	Water sector associations, state drinking water and clean water program directors, tribal and state representatives, water utilities	• Promote green infrastructure/ nature-based solutions, including through regulatory flexibility for utilities. • Work with utility groups to improve the use of climate-informed deci-sion-making tools. • To the extent possible, add localized data to existing data and mapping tools.	May 4 and 9, 2022

Event Name	External Participant(s)	Key Themes Heard	Date of Event
(continued) Water Sector Engagement	(continued) Water sector associations, state drinking water and clean water program directors, tribal and state representatives, water utilities	(continued) • Consider climate change throughout the regulatory framework. • Plan additional tribal feedback opportunities. • If funded, integrate the mid-sized and large drinking water system resilience and sustainability program under the BIL. • Incorporate climate considerations into SRFs and permitting. • Ensure equity and environmental justice in implementing the plan's actions. • Provide grant funding opportunities to address climate impacts. • Provide additional opportunities to comment on the plan. • Provide support to underserved communities to apply for grants. • Engage cross-sector partners in ecosystem protection and restoration. • Take opportunities to address climate in failing and aging infra-structure, especially in Justice40 communities. • Integrate actions to address HABs. • Measure success of actions. • Provide training and build institu-tional capacity for climate adaption work.ordinate climate resiliency and adaptation efforts at the interna-tional level.	(continued) May 4 and 9, 2022

Event Name	External Participant(s)	Key Themes Heard	Date of Event
National Tribal Webinar and Listening Session (Cross-EPA)	Tribal representatives	• Consider tribal treaty rights. • Consider TEK.	June 1, 2022
State and Local Government Association Listening Session (Cross-EPA)	National state and local government associations	• There is a general appreciation for EPA providing an overview of the various plans and opportunities for future engagement.	June 9, 2022

Conclusion

Water is essential to our everyday lives. It supports public health, economic opportunity, recreational activity, and the ecosystems upon which we depend. As the impacts of climate change on water resources and the hydrologic cycle increase, OW is committed to working to advance climate adaptation to protect water quality, improve water resource management, and expand resilient water infrastructure investment.

This Implementation Plan represents a course shift toward bold and coordinated action to embed climate adaptation and resilience across OW's financial assistance programs, policies, regulatory actions, training, and outreach. The priority actions within this plan will help ensure our programs continue to deliver services essential to supporting the adaptive capacity of communities. The priority actions are also fundamental to OW's mission and long-term CWA and SDWA goals. Critically, as the Biden-Harris Administration and EPA work to implement the largest investment in water infrastructure in American history, OW will support communities and water systems in modernizing and building new infrastructure prepared for future climate conditions.

Coordination across OW, EPA, and other federal agencies will be key to the success of this endeavor. As OW leads in areas of infrastructure investment, regulatory modernization, and strategic research, we will also leverage its partnerships and convening power to help bolster the climate resilience of its partners. States, tribes, local communities, utilities, businesses, and nonprofit organizations all play important roles in ensuring OW effectively supports resilient outcomes in communities and their environments. OW commits to meaningful and continuous dialogue with its partners as it implements this plan. OW will pursue deeper engagement with those communities most vulnerable to or least able to prepare for the impacts of climate change, including tribes, indigenous peoples, and underserved and disadvantaged communities.

As OW makes progress toward completing the priority actions identified in this Implementation Plan, it will continue to set higher bars and new measures for success. As it does so, OW looks forward to pursuing the goals of Justice40 and supporting, collaborating with, and learning from the communities and partners it serves to help them prepare for a changed climate—now and in the future.

Appendices

Acknowledgements and Responsibility for Overseeing the Implementation of this Plan

OW, under guidance from EPA's Office of Policy, is responsible for developing, managing, and executing this Implementation Plan. Benita Best-Wong, OW's Career Deputy Assistant Administrator, will oversee implementation of the activities described in this plan.

The following OW and EPA regional staff serve as members of the Water Climate Committee (WCC) and were instrumental in developing this Implementation Plan. The WCC will further facilitate implementation of this plan by supporting cross-program coordination, measuring progress, and advancing this plan's (and other) priority actions to address climate change across EPA's water programs.

Office of the Assistant Administrator

- **Benita Best Wong,** Deputy Assistant Administrator
- **Zachary Schafer,** Senior Advisor and WCC Co-Chair

Office of Wetlands, Oceans, and Watersheds

- **Mindy Eisenberg,** Oceans, Wetlands and Communities Associate Director and WCC Co-Chair
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Office of Policy, Management, and Engagement

- **Macara Lousberg,** Office of Policy, Management, and Engagement Director
- **Roger Gorke,** Senior Policy Advisor

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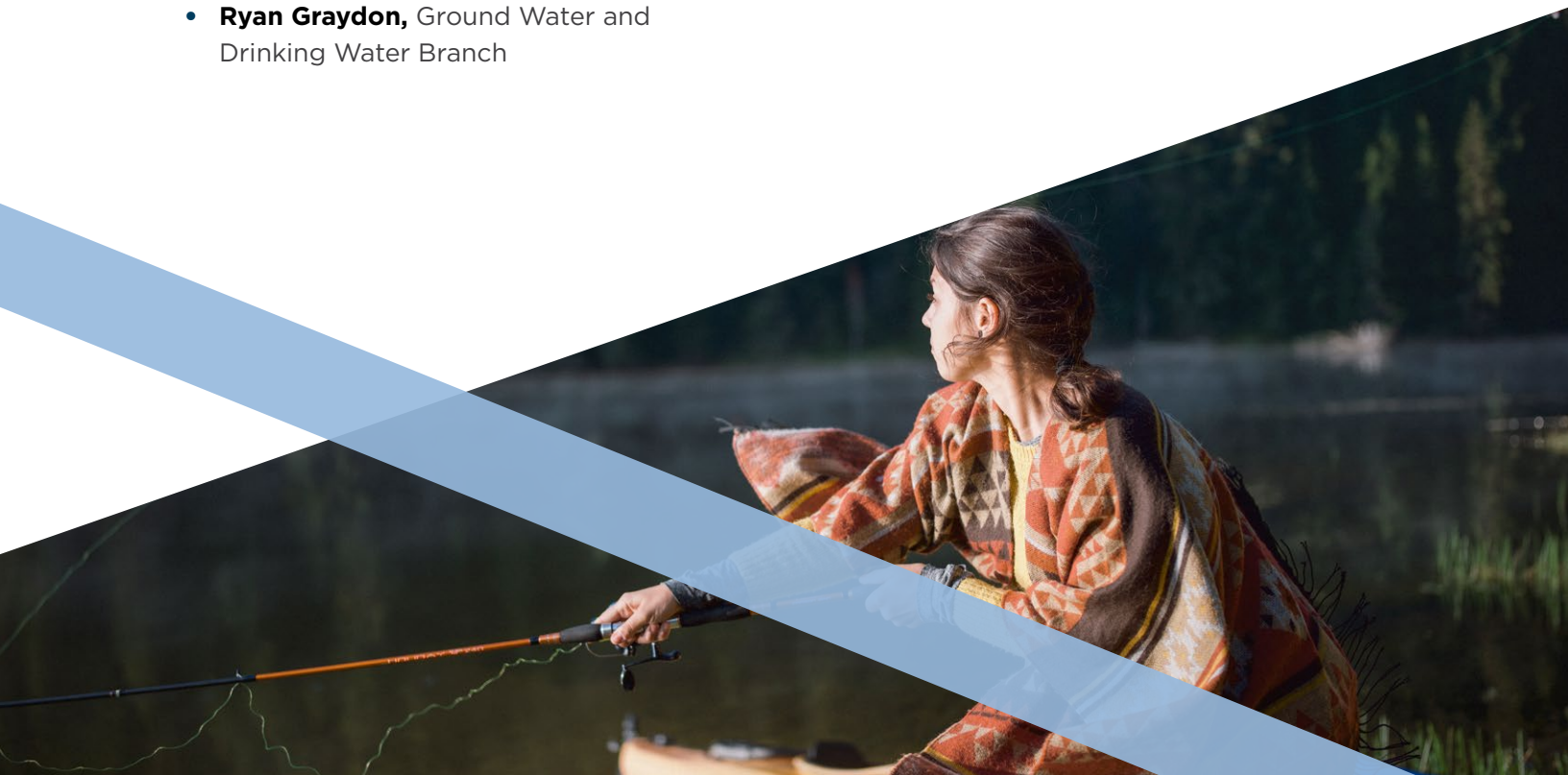
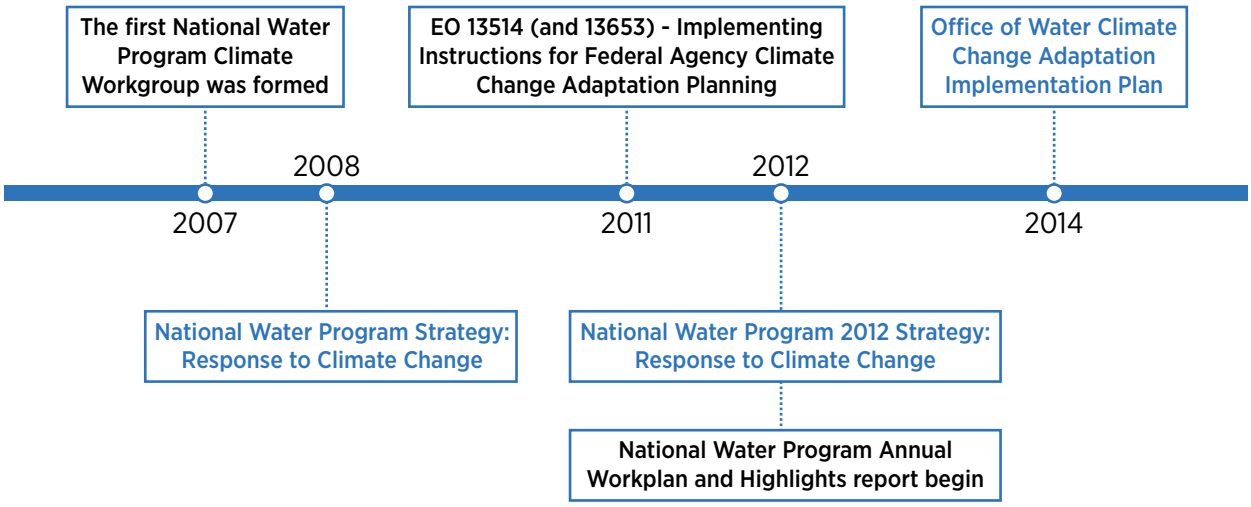


A History of Ongoing Efforts to Address Climate Change Risks and Vulnerabilities

OW and the water programs in EPA's regional offices (along with the National Water Program) have been working to address climate change since 2007, developing and employing both regulatory and non-regulatory programs to assist a variety of partners with building their adaptive capacity. OW initially advanced climate activities under three foundational planning documents (highlighted in blue, below). These strategies integrated climate change considerations into many near-term and long-term water management practices, building the adaptive capacity of both our state, tribal, and local partners, and of our own water programs.



- A 2008 National Water Program Strategy: Response to Climate Change identified 44 key near-term actions to address climate impacts to our national programs and water resources.
- A successive National Water Program 2012 Strategy: Response to Climate Change, which established long-term goals and priority actions under five core vision areas.
- An Office of Water Climate Change Adaptation Implementation Plan (2014), released under agencywide direction per EO 13514, helped implement the 2012 Strategy by outlining activities that would further institutionalize OW's climate change goals and priorities.

Over the past several years, the National Water Program Resilience Workgroup worked to implement many of the recommendations in these planning documents, in addition to developing several Annual Workplans and Highlights reports, which captured progress under the 2012 Strategy. Over the years, OW has facilitated numerous planning efforts and activities to support the long-term operation of our federal programs that protect water resources and drinking water. Our programs have provided technical assistance, funding, training, decision support resources, and communications expertise to co-regulators and stakeholders seeking to bolster their resilience to climate change. While the pace and scale of climate change impacts have accelerated, and much progress remains to be made, these efforts have collectively made EPA's water programs, its partners, and the resources and communities they protect more resilient. These efforts have also built important foundations for future action upon which this Implementation Plan will build.

More information about many of OW's ongoing actions to address the vulnerabilities of its programs and partners is provided in *Resources for Resilience: A Catalogue of EPA's National Water Program*. The Catalogue will be updated periodically to ensure our partners can continue to learn about the work of our programs and the federal resources available to help them plan for or implement water management projects that build climate resilience.

Detailed Assessment of Vulnerabilities to OW Programs, Stakeholders, and National Water Resources

Waterborne Illness and Water Treatment Needs

The following risks and vulnerabilities are referenced in the Fourth National Climate Assessment (NCA4) chapters 3, 7, 8, and 14:

- Warmer water temperatures, expanded seasonal windows, and the frequency and intensity of extreme weather events contribute to greater occurrences of HABs, pathogens, and nuisance plant growth that threaten ecosystem functioning and human health.
- Increased risk of human illness from recreation near, ingestion of, and contact exposure to water-related diseases (e.g., algal toxins, pathogens, pests).
- Increased episodic loading of nutrients, sediment, and pathogens from stormwater and nonpoint sources to surface waters, which can exacerbate favorable conditions for HABs (Coffey et al., 2018).
- Greater spread of disease among aquatic organisms due to warming waters, changing stratification, and seasonal shifts.
- Increased salinity of both surface water and ground water that amplifies impacts from saltwater intrusion and limits coastal drinking water supplies, often in areas where demand is currently increasing or peaking.
- Increased contamination of drinking water supplies and waterways due to sea level rise, flooding, permafrost melt, or storm events that mobilize or release toxic contaminants into nearby surface waters, groundwater, or soil.
- Additional strain on drinking water and wastewater facilities from increased treatment needs due to rising pathogens, contaminants, salinity, and pollutants.

Critical Water Infrastructure

The following risks and vulnerabilities are referenced in NCA4 chapters 3, 8, and 11:

- Additional pressure on drinking water programs and infrastructure operators to meet water quality standards due to increased point and nonpoint pollutant loading to source waters.
- More frequent and prolonged failures of drinking water and wastewater treatment facilities from damage caused by sea level rise, flooding, storm surge, and other natural disaster events.

- Water quality impacts to groundwater supplies from increased withdrawals and to surface sources of drinking water, as well as to drinking, wastewater and stormwater infrastructure from wildfires.
- Decreased overall functioning and performance of stormwater control infrastructure (e.g., sanitary sewers, combined sewers) from intense precipitation and extreme weather, leading to more frequent overflows and wastewater bypasses that fuel runoff, flooding, and water-related illness.
- Increased risk from invasive species, algal mats, and other pests that disrupts drinking water, stormwater, and wastewater system operations.
- Impediments to the functioning of drinking water intakes and wastewater outfalls from greater variation in rising or falling water levels, as well as system blockage due to debris from extreme weather or wildfire events.
- Greater need for advanced and innovative drinking water treatment approaches, monitoring systems, and technologies to address the increased growth of HABs, microbes, and pathogens.
- Rising temperatures that increase local or regional demand for limited water supplies, placing additional pressure on water infrastructure to plan for adequate, safe drinking water supplies.
- Decreased access to and reliability around the provision of safe, clean drinking water from systems that are not currently designed to withstand the current or long-term effects of climate change.

Transportation and Energy Infrastructure Interface with Water

The following risks and vulnerabilities are referenced in NCA4 chapters 3, 8, and 12:

- Pressure on aging or obsolete transportation structures from extreme weather events, variable seasonal temperatures, intense precipitation, sea level rise, and flooding may lead to system failure and pose dangers to downstream communities.
- Rising sea levels and intense storms will inundate and damage the integrity of coastal transportation systems.
- Growing post-wildfire debris flows may inundate transportation infrastructure during severe precipitation events and carry additional nonpoint source pollution to nearby waterways.
- Exacerbated water quality stressors and hydrologic variability from manmade transportation structures can increase aquatic ecosystem decline and the loss of critical ecosystem services.
- More frequent erosion of banks and shorelines due to flooding from intense precipitation or storms decreases vegetative cover and habitat that helps keeps sediment and other water pollutants from entering waterways.
- Increases in repairs to groins, jetties, and breakwaters from climate change impacts adversely affects the integrity of submerged aquatic vegetation and other surrounding habitats.
- Increased sedimentation and shoaling of navigation channels and berthing or mooring areas will require more frequent dredging and dredged material placement, which further degrades coastal ecosystems and water quality.

Impacts to the Availability of Water for Human Use

The following risks and vulnerabilities are referenced in NCA4 chapters 3, 7, and 8:

- Declining or highly variable water supplies and drinking water sources from regional changes in the amount and timing of precipitation and streamflow is leading to water scarcity.
- Increased overall demand for water with rising air temperatures, resulting in more surface water, groundwater, and aquifer withdrawals.
- Shifts in water demand to underground aquifers or underground storage of treated water may raise safety concerns around these drinking water sources.
- Increased need to develop new water supply plans to meet current and projected water use demands in areas that rely on snowpack as a primary water supply.
- Greater sedimentation caused by extreme precipitation that may cause aging water supply reservoirs to reach their service life earlier than anticipated.
- More frequent periods of high streamflow that may increase erosion and the amount of runoff carrying pollutants into waterways, which decreases drinking water quality.
- Declining precipitation and streamflow that enhances drought events, lowers hydrologic flows, and limits ground water recharge, resulting in less water for the dilution of permitted discharges as well as rising water temperatures.
- More frequent and intense wildfires that may release polluted runoff from fire-scorched areas into waterways pose additional water quality threats to water supplies.
- Reduced glaciers, snowfall, and snowpack, as well as earlier spring runoff, lead to drier soils and vegetation that are more susceptible to wildfires, which increase the polluted runoff entering waterways.
- Rising climate sequestration technologies and approaches to store carbon dioxide underground may have unintended or unforeseen impacts on drinking water sources.

Aquatic Ecosystem Health

The following risks and vulnerabilities are referenced in NCA4 chapters 3, 7, 8, and 9:

- Changing water quality conditions (e.g., salinity, pH, dissolved oxygen, turbidity, temperature, water boundaries, nuisance plant/algal growth, species composition) can result in more water quality impairments and the loss of key ecological functions.
- Amplified runoff to waterways due to heavier precipitation, storms, and extreme weather events will alter pollutant loadings and the natural flow regimes on which aquatic life depends.
- Loss of aquatic species due to death, disease, and declining water quality conditions, in addition to other ecological effects of climate change.
- Inability of coastal ecosystems and features to successfully migrate in response to sea level rise and changing shorelines, combined with increases in development and water withdrawal.
- Amplified impacts of saltwater intrusion from sea level rise, impairing freshwater ecosystems and altering species ranges or survival.
- Alterations to the habitat, geographic ranges, and overall survival of fish, vegetation, and other organisms may also allow for a rise in invasive species.
- Amplified water quality impacts from an increase in the intensity, frequency, and duration of droughts and wildfires that concentrate existing nonpoint source pollution and degrade aquatic systems.
- Increased acidification and hypoxia in waterbodies from higher air and water temperatures that reduce dissolved oxygen levels and increase carbon dioxide concentrations.
- Complete loss of water resources (e.g., wetland migration, headwater streams, coastal wetlands) and the associated benefits communities receive for water quality and climate resilience (e.g., ability of wetlands systems to filter pollutants or absorb flooding events).

Overburdened, Underserved, and Disadvantaged Communities

The following risks and vulnerabilities are referenced in NCA4 chapters 3, 8, 10, and 14:

- Communities of color and low-income populations that have been disproportionately impacted by environmental pollution face greater challenges in meeting water quality goals for drinking water and surface waters under climate change.
- Low-income communities are at greater risk from increases in extreme weather and natural disasters due to capacity limitations around responding to emergency events and lack of access to safe water after they occur.
- Already aging or underperforming drinking water, wastewater, and stormwater infrastructure will experience greater strain from droughts, sea level rise, and other climate-related events, heightening public health risks from system failures as drinking water or stormwater are more likely to become contaminated.
- Rate hikes associated with increased water demand and dwindling water supplies can decrease water service affordability and access to clean, safe water for low-income customers or those already facing economic hardships.
- Low-income, underserved, or rural communities with decentralized water infrastructure may face greater risks from sea level rise, saltwater intrusion, and flooding that will lessen drinking water quality from individual wells and the functioning of detached septic systems.
- Communities of color and low-income communities often experience unique financial

capacity barriers when it comes to financing water management projects that afford climate resilience, due to federal application inequities, a lack of financial resources, a lack of financial capacity-building programs, and difficulty navigating the grants application process, among others.

- Communities and regional industries that heavily depend on natural resources and favorable climate conditions (e.g., agriculture, tourism, fisheries) are expected to experience greater disruption to their economic vitality and labor productivity.
- Practitioners and government officials in communities of color and low-income communities often have inadequate environmental and socioeconomic information to make decisions on how to best use limited resources with climate change in mind.
- Non-English-speaking individuals may not effectively receive messages and important information about their water quality and climate-related risks that would otherwise allow them to proactively address climate change, manage their water resources, and prevent illness or socioeconomic harm.
- Certain groups, such as the elderly, children, and persons with disabilities, may be disproportionately vulnerable to climate change. For example, older adults with lower immunity or children playing outside may have greater risk of becoming ill from waterborne diseases.

Tribal Nations and Indigenous Peoples

The following risks and vulnerabilities are referenced in NCA4 chapters 3, 8, 9, 14, and 15:

- Indigenous peoples face institutional barriers to their self-determined management of infrastructure, water, land, and other resources that will be impacted increasingly by changes in climate.
- Tribes and indigenous communities disproportionately lack in-home access to safe drinking water and adequate water supplies, which may be amplified by increases in drought, decreased groundwater recharge, and shifting pollutant loads due to changing precipitation patterns.
- Tribes and indigenous communities are experiencing disproportionate impacts to their water quality from climate-related events that threaten the functionality of their already strained drinking water, wastewater, and septic infrastructure.
- Many indigenous communities lack sufficient water delivery and treatment facilities and the operating capital needed to maintain and/or improve those facilities. Unmet infrastructure and maintenance challenges of tribal communities make them more vulnerable to climate change.

- Tribes and indigenous communities are disproportionately affected by the impact of HABs on their drinking water sources, subsistence food sources, and cultural resources.
- Observed and projected changes of increased wildfire, diminished snowpack, drought, flooding, ocean and coastal acidification, and sea level rise will uniquely affect traditional subsistence and commercial sector activities related to agriculture, hunting and gathering, fishing, forestry, energy, recreation, and tourism enterprises (Taylor et al., 2017; Markon et al., 2018).
- Climate impacts to lands, waters, foods, and other plant and animal species (e.g., risks to salmon, elk, deer, roots, and huckleberry habitat) threaten cultural heritage sites and practices that sustain intra- and intergenerational relationships built on sharing traditional or indigenous knowledges, food, and ceremonial or cultural objects.
- Climate-related disasters are causing tribal and indigenous communities to consider or actively pursue relocation and managed retreat as an adaptation strategy throughout the United States, which is difficult due to high costs, land constraints, and loss of cultural institutions.
- Thawing permafrost, loss of coastal sea ice, sea level rise, and more intense extreme weather events are increasing erosion and flooding along Alaska's northwestern coast, which is causing extensive damage and creating new dangers to Alaskan natives that lead to relocation as a safety approach.
- Indigenous knowledges, such as TEK, are not currently used to help identify climate vulnerabilities and adaptation strategies to protect the water resources critical to tribal culture and livelihood.

Territories and Island States

The following risks and vulnerabilities are referenced in NCA4 chapters 3, 8, 9, 20, 26, and 27:

- Concentration of people and infrastructure along coastlines presents notable vulnerabilities for community safety and critical infrastructure during natural disaster events or other climate driven impacts (e.g., coastal inundation, erosion, and sea level rise).
- Natural disaster impacts may persist longer in territories or on islands due to shortages in supplies, limitations in emergency responders, and dependence on imported resources.
- Fuel, power transmission, and transportation system issues after a major natural disaster place additional strain on the functioning of island water infrastructure and delivery of safe water supplies.
- Out-of-date and poorly maintained water infrastructure on islands is less resilient to climate risks and impacts, due in part to ongoing funding and supply chain constraints. Areas with low-lying land bases have limited options for relocating infrastructure as a way to adapt to climate change.
- Rising temperatures, sea level rise, saltwater contamination, drought, and flooding threaten access to and the quality of already limited freshwater supplies.
- Islands have unique ecosystems high in biodiversity (e.g., coral reefs, mangrove forests) that provide vital economic marine resources and ecosystem services that protect coastal communities; however, these assets are threatened by ocean acidification, warming temperatures, and extreme weather events.
- Islands have unique challenges related to data availability and the capacity to develop data sets compared to those available for the contiguous United States.

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