



Flooding In Oklahoma, 2019



NASA/NOAA GOES Project

Hurricane Harvey in Texas, 2019



Smoke in New Mexico from wildfires, 2021



Grand Isle, Louisiana one month prior to Hurricane Ida, 2021

EPA Region 6 Climate Adaptation Implementation Plan

October 2022



EPA Region 6 serves
Arkansas, Louisiana, New
Mexico, Oklahoma, Texas
and 66 Tribal Nations

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

SEP 12 2022



DEPUTY ADMINISTRATOR

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.

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.

A handwritten signature in blue ink, appearing to read "J.G. McCabe".

Janet G. McCabe

Executive Summary

The October 2021 EPA Climate Adaptation Action Plan contains five agency-wide priority actions and measures for evaluating performance. The five EPA priorities are:

1. Integrate climate adaptation planning 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 resilience of the nation, with a particular focus on advancing environmental justice.
3. Implement measures to protect the Agency's workforce, facilities, critical infrastructure, supply chains, and procurement processes from the risks posed by climate change.
4. Measure and evaluate performance; and,
5. Identify and address climate adaptation science needs.

This plan updates the Region 6 Climate Change Adaptation Implementation Plan dated May 30, 2014 and serves to proactively incorporate climate adaptation planning into Region 6 programs and policies. For each state within the region, Region 6 has reassessed and updated the vulnerabilities associated with a changing climate. These geographic vulnerabilities include:

Arkansas: Extreme heat and extreme precipitation events, unprecedented warming, droughts

Louisiana: Sea level rise/coastal inundation, frequency/intensity of storms

New Mexico: Unprecedented warming, droughts, wildfires

Oklahoma: Droughts, wildfires, unprecedented warming, flooding

Texas: Sea level rise/coastal inundation, frequency/intensity of storms, droughts, increased wildfire frequency and severity.

Region 6 has also identified vulnerabilities for the regional programs and potential vulnerabilities for the Tribal partners, and other stakeholders. In so doing, Region 6 identified priority actions and sub-actions to address the vulnerabilities and support EPA's five Climate Adaptation Priorities. The Region 6 priority actions for FY 2022 and FY 2023 are:

Priority Action 1: Expand strategic networks to raise awareness of climate adaptation and resilience and understand what matters most to our Tribal and state partners and stakeholders.

Priority Action 2: Collaborate to strengthen the adaptive capacity and resilience of Region 6 communities with a focus on advancing environmental justice

Priority Action 3: Incorporate climate change adaptation into EPA Region 6 activities

Priority Action 4: Address risks to EPA Region 6 day-to-day activities and facilities from climate change.

Priority Action 5: Establish an EPA Region 6 Climate Adaptation Resource/Coordination Center to coordinate Region 6 climate adaptation activities and serve as a portal for climate adaptation tools and resources, outreach, and training.

The priority actions and sub actions are identified in this plan and the associated metrics are included. Plans for training and program needs are also addressed. This plan will be reviewed annually and updated as needed.

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Abbreviations/Definitions

Adapt, Adaptation: Adjustment in natural or human systems to a new or changing environment that exploits beneficial opportunities or moderates negative effects.

Adaptive Capacity: 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.

American Indian Environmental Office (AIEO): The American Indian Environmental Office leads EPA's efforts to protect human health and the environment of federally recognized Tribes by supporting implementation of federal environmental laws consistent with the federal trust responsibility, the government-to-government relationship, and EPA's 1984 Indian Policy.

Bipartisan Infrastructure Law (BIL): Infrastructure Investment and Jobs Act (IIJA) (Public Law 117-58) infusing more than \$1 trillion dollars over five years in federal funding for U.S. public works across various industries and in the nation's infrastructure.

Climate Change: Changes in global or regional climate patterns attributed largely to human-caused increased levels of atmospheric greenhouse gases.

Climate Change Adaptation or Climate Adaptation: Taking action to prepare for and adjust to both the current and projected impacts of climate change.

Climate Change Mitigation: Actions limiting the magnitude and rate of future climate change by reducing greenhouse gas emissions and/or advancing nature-based solutions.

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

Nature-based Infrastructure: Naturally occurring landscape features and/or nature-based solutions that promote, use, restore or emulate natural ecological processes.

NCA4: The Fourth National Climate Assessment (NCA4), completed in November 2018, is a comprehensive and authoritative report on climate change and its impacts in the United States.

National Environmental Policy Act (NEPA): a United States environmental law that promotes the enhancement of the environment and established the President's Council on Environmental Quality (CEQ).

Regional Tribal Operations Committee (RTOC): The Region 6 Tribal Operations Committee (RTOC) is comprised of EPA and Tribal Caucus leadership. The Tribal Caucus is comprised of seventeen tribal partners. The RTOC meets three times a year and holds monthly conference calls. The RTOC's mission is to:

- Develop regional environmental strategies on issues of importance to the Tribes
- Review and make recommendations to EPA on the development of regional tribal strategies
- Identify processes for assessing the environmental problems and needs of the Tribes
- Maintain open dialogue among National Tribal Operations Committee members, RTOC members, and all Tribes on relevant Region 6 environmental issues
- Assist EPA Region 6 in meeting its trust responsibility to Tribes
- Enhance EPA Region 6's responsiveness to tribal needs
- Increase tribal access to EPA programs, funding, technical assistance, training, and information.

U.S. Global Change Research Program (USGCRP): A federal program mandated by Congress to coordinate federal research and investments in understanding the forces shaping the global environment, both human and natural, and their impacts on society.

This document was produced by the EPA Region 6 Climate Adaptation Implementation Plan Workgroup Members. These points of contact represented their divisions, providing input in very compressed timeframes, in addition to their assigned responsibilities. Their contributions and dedication to producing this plan are greatly appreciated.

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Region 6 Climate Adaptation Plan

1. Introduction

EPA published its first Climate Change Adaptation Plan in 2014. Additionally, seventeen Program and Regional Office Implementation Plans were also developed and published in 2014. EPA Region 6's Climate Change Adaptation Implementation Plan was published on May 30, 2014.

Executive Order (EO) 14008, Tackling the Climate Crisis at Home and Abroad, issued January 27, 2021, requires all federal agencies to develop or update Climate Adaptation Action Plans. On May 26, 2021, EPA Administrator Michael Regan signed a Policy Statement on Climate Change Adaptation. In the Policy Statement, the Administrator directed all EPA offices to work with the Office of Policy to update their existing Implementation Plans. In the Oct 2021 Climate Adaptation Action Plan, the EPA accelerates and focuses attention on five priority actions the Agency will take over the next four years to increase human and ecosystem resilience as the climate changes and disruptive impacts increase.

The EPA Climate Adaptation Action Plan identifies five agency-wide priority actions:

- (1) Integrate climate adaptation planning 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 resilience of the nation, with a particular focus on advancing environmental justice.
- (3) Implement measures to protect the Agency's workforce, facilities, critical infrastructure, supply chains, and procurement processes from the risks posed by climate change.
- (4) Measure and evaluate performance; and,
- (5) Identify and address climate adaptation science needs.

EPA Region 6 has reviewed, updated, and revised the 2014 Region 6 Climate Change Adaptation Implementation Plan and developed a Region 6 Climate Adaptation Implementation Plan for 2022 to 2026 based on the EPA priorities (as applicable) listed above. The purpose of this plan is to identify Region 6 priority actions and associated metrics to monitor progress. Helena Wooden-Aguilar, Acting Deputy Regional Administrator Region 6, serves as the Region 6 career senior official and champion for this initiative.

This plan contains:

- (1) An updated vulnerability assessment.
- (2) Actions Region 6 will take to address the five agency-wide priorities.
- (3) Detailed information about how the actions will be successfully implemented.
- (4) An engagement and training plan for staff and external stakeholders.
- (5) Scientific and research needs that align with ORD's process.
- (6) Established process for review and update.

EPA Region 6 will review this plan annually and update as needed.

2. EPA Region 6 2022 Vulnerability Assessment

Region 6 conducted a regionwide vulnerability assessment after reviewing the 2014 Region 6 Plan assessment and the EPA Climate Adaptation Priorities (CAPs) from the Agency’s Climate Change Adaptation Action Plan dated Oct 7, 2021.

Region 6 Overview

EPA Region 6 consists of five states (Arkansas, Louisiana, New Mexico, Oklahoma, and Texas).



Figure 1 – Region 6 Five States

The Region also serves 66 federally recognized Tribes. The Region 6 offices are in Downtown Dallas, Texas, with additional satellite offices in Addison, Texas; New Orleans, Louisiana; El Paso, Texas; Albuquerque, New Mexico; Tulsa, Oklahoma; and a laboratory in Houston, Texas. The Houston lab is scheduled to move to Ada, Oklahoma in the next five years to collocate with the EPA Office of Research and Development (ORD) facilities already present. Region 6 is divided into eight Divisions and Offices (Figure 2).



Figure 2 – Region 6 Eight Divisions and Offices

Geographic Setting

The U.S. Global Change Research Program (USGCRP) is mandated to “assist the Nation and the world to understand, assess, predict, and respond to human-induced and natural processes of global change.” Region 6 straddles three of the ten different climate regions identified by the USGCRP: the Southern Great Plains, the Southeast, and the Southwest (Figure 3). Most of Region 6 (by land mass) lies in the Southern Great Plains Climate Region. The Fourth National Climate Assessment (NCA4) released in November 2018, is a congressionally mandated report of the assessment conducted every four years to fulfill the requirements of the Global Change Research Act. The NCA report is the official US Government’s “state of the Union” about climate change and is vetted by 13 Federal Agencies. While the NCA4 delineates the climate regions by state boundaries, adjacent areas in two climate regions may bear more similar climate characteristics than that described in the climate region. For example, in EPA Region 6 part of coastal Texas has climate characteristics related more to the Southeast climate region as opposed to the Southern Great Plains.

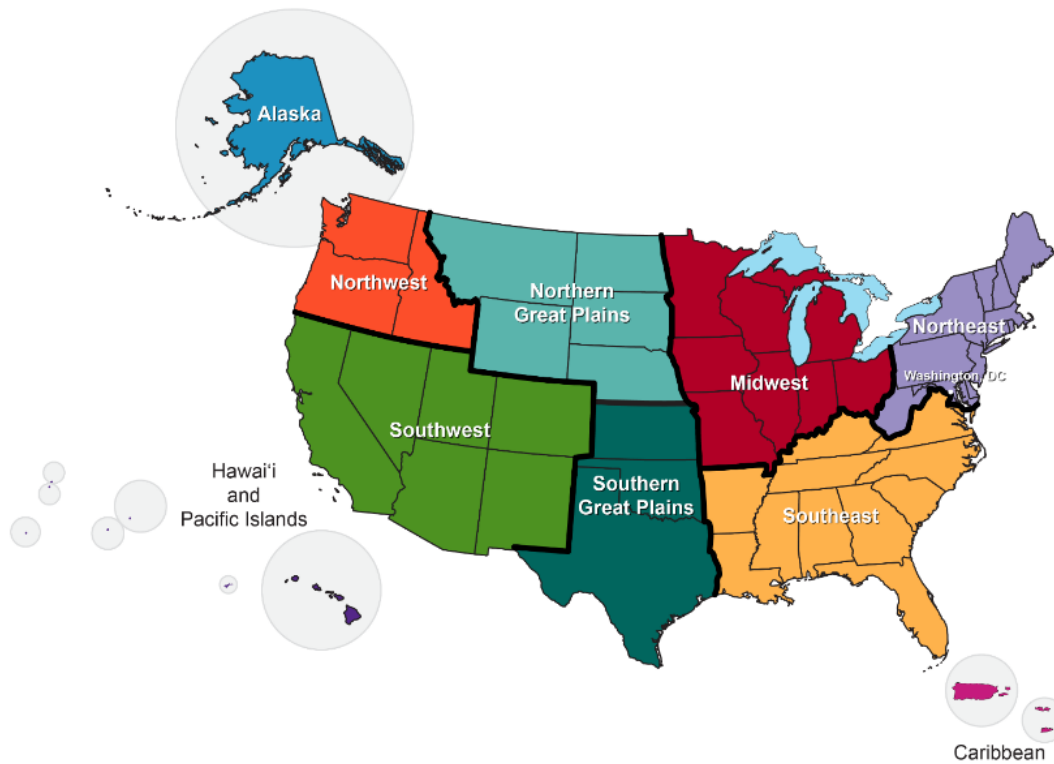


Figure 3 – Map of the ten regions used throughout NCA4.

Climate Regions

According to the NCA4 report, annual average temperatures in the United States are projected to continue to increase in the coming decades and recent record-setting hot years are expected to become common in the near future.

High temperature extremes, heavy precipitation events, high tide flooding events along the U.S. coastline, ocean acidification and warming, and forest fires in the western United States and Alaska are all projected to continue to increase. Land and sea ice cover, snowpack, and surface soil moisture are expected to continue to decline in the coming decades. These and other changes are expected to increasingly impact water resources, air quality, human health, agriculture, natural ecosystems, energy and transportation infrastructure, and many other natural and human systems that support communities across the country. (Jay 2018)

The global average temperature is much higher, and is rising more rapidly, than anything modern civilization has experienced. (NCA4 2018). Annual average temperatures in the United States are projected to continue to increase in the coming decades. (NCA4 2018). Key climate change projections and related issues and impacts for the Region 6 states are presented in the Geographic Vulnerabilities discussion.

Region 6 Geographic Vulnerabilities

State of Arkansas

Arkansas has exhibited little overall warming since the early 20th century, but temperatures in the 21st Century have been about as warm as the previous record levels of the 1930s and 1950s. Arkansas has not seen a significant overall increase in temperature since the early 20th century—similar to the rest of the southeastern United States. Under a higher emissions pathway, historically unprecedented warming is projected by the end of the 21st century. The intensity of future naturally occurring droughts is projected to increase because higher temperatures will increase the rate of loss of soil moisture during dry spells. The number and intensity of extreme heat and extreme precipitation events are projected to increase in the future while the intensity of extreme cold events is projected to decrease. (Runkle 2017)

State of Louisiana

A direct hurricane strike on the coast occurs about once every three years and the Louisiana coast is particularly vulnerable to severe flooding from these storms. Along the southeastern coast, variability is much higher due to the orientation of the coast relative to the general path of tropical cyclones through the central Gulf of Mexico. The geography causes a funneling effect of water, leading to higher observed surge heights. Louisiana is at extreme risk for sea level rise due to its low elevation, which averages only three feet above sea level in the southeastern part of the state. Additionally, the coastline is rapidly sinking due to subsidence (settling of the soil over time). The state has lost almost 2,000 square miles of land since the 1930s. Due to subsidence, sea level rise at some locations is more than four times the global rate. New Orleans is the most populous metropolitan area and is at particular risk for sea level rise impacts. Sea level rise will present major challenges to Louisiana's existing coastal water management system and could cause extensive economic damage through ecosystem damage and losses in property, tourism, and agriculture. (Frankson 2017)

State of New Mexico

New Mexico has not experienced an upward trend in the frequency of extreme precipitation events. The precipitation values for 2015 to 2018 were the highest on record however it is considered too short a period to constitute a trend. Average annual temperature has increased by almost 2°F since the 1970s, and the number of hot days and warm nights has increased. Historically unprecedented future warming is likely. The summer monsoon rainfall provides much needed water for agricultural and ecological systems, and it varies greatly from year to year. Future trends in such precipitation are highly uncertain and droughts are a serious threat in this water-scarce state. Drought intensity is projected to increase, and snowpack accumulation is projected to decrease. Both pose major challenges to New Mexico's environmental, agricultural, and human systems. Wildfire frequency and severity are projected to increase in New Mexico. (Frankson 2017).

State of Oklahoma

In Oklahoma, the frequency of extreme precipitation events of more than 2 inches has increased. The past three decades have the highest number of extreme precipitation events in the historical record. Due to the state geography, severe thunderstorms are common as cold, dry air from the north and west clash frequently with warm, moist air from the Gulf of Mexico. Droughts are a frequent and severe hazard. In addition to devastating impacts on the agricultural economy, severe droughts also increase the risk of wildfires. The average annual temperature has increased by less than 1°F since the early 20th century. Winter warming has been characterized by the much below average occurrence of extremely cold days since 1990. Under a higher emissions pathway, historically unprecedented warming is projected by the end of the 21st century. Precipitation can vary greatly from year to year in this region of transition from humid to semi-arid conditions. Heavy precipitation events are projected to increase, which may increase the risk of flooding and associated increases in soil erosion and non-

point source runoff into streams and lakes. The agricultural economy may capitalize on longer growing seasons however the state is particularly vulnerable to droughts, several of which have occurred in recent years. Higher temperatures will increase the rate of soil moisture depletion, leading to an increase in the intensity of naturally occurring future droughts. (Frankson 2017).

State of Texas

The state of Texas exhibits large east-west variations in precipitation and is subject to frequent occurrences of a variety of extreme events, including hurricanes, tornadoes, droughts, heat waves, cold waves, and intense precipitation. Texas may be more vulnerable to naturally occurring droughts due to the increased demand for limited water supplies due to rapid population growth, especially in urban areas. Mean annual temperature has increased by approximately 1°F since the first half of the 20th century. Under a higher emissions pathway, historically unprecedented warming is projected by the end of the 21st century, with associated increases in extreme heat events. Although projected changes in annual precipitation are uncertain, increases in extreme precipitation events are projected. Higher temperatures will increase soil moisture loss during dry spells, increasing the intensity of naturally occurring droughts. The number of hurricanes making landfall in Texas is highly variable from year to year. As the climate warms, increases in hurricane rainfall rates, storm surge height due to sea level rise, and the intensity of the strongest hurricanes are projected. (Runkle 2017)

<p>Arkansas: Extreme heat and extreme precipitation events, Unprecedented warming, Droughts</p> <p>Louisiana: Sea Level Rise/Coastal Inundation, Frequency/Intensity of storms</p> <p>New Mexico: Unprecedented warming, Droughts, Wildfires</p> <p>Oklahoma: Droughts, Wildfires, Unprecedented warming, Flooding</p> <p>Texas: Sea Level Rise/Coastal Inundation, Frequency/Intensity of Storms, Drought</p> <p>Tribal Lands: Wildfires, Unprecedented Warming, Flooding, Sea Level Rise/Coastal Inundation, Frequency/Intensity of Storms, Drought</p>

Tribal Lands

EPA is committed to strengthening its partnerships with tribes on their priorities related to climate change adaptation. A unique government-to-government relationship exists between the U.S. Government and the 565 federally recognized tribes. EPA gives special consideration to tribes in developing policies that may affect their interests. EPA recognizes that tribes will likely be disproportionately vulnerable to climate change. This disproportionate vulnerability is partly due 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). Natural resources on Tribal lands within Region 6 may be particularly affected by heat waves, drought conditions, flooding, sea level rise/coastal inundation, wildfires, and frequency/intensity of storms.

Sea Level Rise and increased rates of erosion may threaten important cultural resources and create social justice concerns such as the managed retreat and relocation of disadvantaged and native populations out of traditional coastal lands. Isle de Jean Charles is a narrow strip of land about 90 miles southwest of New Orleans in Terrebonne Parish, Louisiana, that has lost 98 percent of its landmass to rising waters of the Gulf of Mexico since 1955, when tracking began. An island that once encompassed more than 22,000 acres, now is only 320 acres. In 2016, Louisiana's Office of Community Development received \$48 million from the Department of Housing and Urban Development to resettle current and former residents of Isle de Jean Charles, designating them the first federally funded climate migrants in the continental United States.

Summary of Region 6 Geographic Vulnerabilities

As a result of this geographic and climate diversity, Region 6 could face many different types of climate change impacts, including increases in air and water temperatures, drought, increased flooding, increased frequency and intensity of extreme precipitation events, coastal inundation, loss of habitat and reduced ecosystem functions, and a general deterioration of water quality. The southeastern part of Region 6 will face continuing problems of sea level rise and coastal land loss, while the western section of Region 6 will likely experience reduced snowpack and associated impacts to natural water storage and discharge in the mountains of New Mexico. These impacts are expected to be compounded by continued drought, population growth and competing demands for fresh water among the industrial, agricultural, energy and municipal sectors throughout Region 6.

Region 6 Division Overviews and Program Vulnerabilities

Air and Radiation Division (ARD)

Currently there are four metropolitan areas that fail to meet the National Ambient Air Quality Standard (NAAQS) and are designated nonattainment for ozone in Region 6. Exacerbating the health impacts from ozone pollution on urban populations will likely be higher nighttime temperatures expected in urban areas, both because of climate change and also because of enhanced effects from urban heat islands. This is apparently particularly evident in sprawling urban centers, which are common in Region 6 (Stone et al., 2010).

A related complication for ozone pollution is an anticipated increase in electricity demand due to higher temperatures in the summer. A further, related complication is the availability of water for power plant cooling purposes. Without sufficient quantities of water that is cool enough, interruptions in service or even shutdowns could occur at these power plants, as happened during the summer of 2011 in Texas (ERCOT, 2011).

Other air pollutants, such as particulate matter and sulfur dioxide, may become problematic in Region 6, particularly if many additional fossil-fueled power plants are built to meet an accelerating electricity demand. These may also negatively impact progress in attaining the goals of the Regional Haze Program in Class I National Park and Wilderness Areas. Increased frequency and spatial extent of wildfires due to enhanced droughts may significantly increase particulate matter loadings in the atmosphere (U.S. EPA, 2009).

Greenhouse gas (GHG) emissions from power plants and industrial sources in Region 6 contribute to elevated atmospheric concentrations of GHG pollutants, which endanger both public health and welfare. New major stationary sources and major modifications at existing stationary sources are required by the Clean Air Act to obtain a GHG air quality permit before commencing operations. All Region 6 states are implementing their own

Air and Radiation Division

Exacerbating health impacts from ozone pollution on urban populations due to higher nighttime temperatures

Anticipated increase in electricity demand due to higher temperatures

Availability of cooling water for power plants

Other air pollutants (PM, SO₂) may become problematic with additional fossil-fueled power plants built to meet an accelerating electricity demand

Negative impacts to progress in attaining the goals of the Regional Haze Program in Class I National Park and Wilderness Areas

Increased frequency and spatial extent of wildfires due to enhanced droughts may significantly increase particulate matter loadings in the atmosphere

Emissions from additional power plants and industrial sources may contribute to elevated atmospheric concentrations of GHG pollutants, which endanger both public health and welfare

Increased industrial activity in Region 6 states, BACT determinations may become more detailed and comprehensive

GHG PSD permitting programs through their EPA-approved regulations. With an expectation of increased industrial activity in Region 6 states, EPA Region 6 will continue to perform direct or permit oversight in those states.

Best Available Control Technology (BACT) determinations for GHGs currently consider options that improve the overall energy efficiency of new stationary sources or existing sources undergoing a major modification. As the climate changes, these BACT determinations may become more detailed and comprehensive, requiring an increased level of Region 6 involvement to ensure that sources are constructed and operated in a manner consistent with achieving the energy efficiency goals established as BACT.

Enforcement and Compliance Assurance Division (ECAD)

As a result of shifting priorities influenced by the effects of climate change, regional compliance and enforcement activities will have to consider a myriad of constantly changing variables such as environmental and urban stressors as the region continues to grow and develop. Excessive precipitation events, floods, and declining source water quality may result in a surge in violations of water related regulations. Air-related regulations could be more frequently violated because of stresses brought on by urbanization including increased demand on regional electricity grids, and increased pollution from industrial activity. With the demands of urbanization increasing, problematic financing for new electricity generating units, and long-term fuel trends complicating decision-making, construction of new power plants may not keep pace. Ensuring grid integrity may portend increasing difficulty meeting air emissions limits. These same factors can also influence success in meeting water quality effluent limits. Regular assessment of such trends will be necessary to ensure regional compliance and enforcement resources are appropriately tailored to meet future challenges.

Laboratory Services and Applied Science Division (LSASD)

Personnel in the Laboratory Services and Applied Science Division are located in the Dallas Regional Office and the Houston Regional Laboratory. Rapid population growth, higher temperatures and longer summers are expected in both areas and may result in decreased reliability of electrical power. While the Houston Laboratory is equipped with an uninterrupted power supply (UPS) and diesel backup generator for short power outages, these systems are not designed to supply power for extended periods. Without reliable power, the Houston Lab cannot run samples and may face challenges ensuring samples and temperature dependent equipment are kept at appropriate temperatures.

Enforcement and Compliance Assurance Division

Excessive precipitation events, floods, and declining source water quality may result in a surge in violations of water related regulations

Air-related regulations could be more frequently violated from urbanization stresses, increased demand on regional electricity grids, and increased pollution from industrial activity.

Increasing urbanization, problematic financing for new electricity generating units, and long-term fuel trends complicate decision-making, construction of new power plants may not keep pace.

Ensuring grid integrity may portend increasing difficulty meeting air emissions limits and meeting water quality effluent limits.

Laboratory Services and Applied Science Division

Power outages and decreased reliability present challenges to lab equipment, processing samples and sample integrity

Flooding from more intense and/or frequent extreme precipitation events and tropical cyclones may inhibit the laboratory's ability to receive and process samples

Per FEMA flood map number 48201C0840L, the Houston Laboratory is currently located in a 1% (100-year) floodplain. Flooding from more intense and/or frequent extreme precipitation events and tropical cyclones may inhibit the laboratory's ability to receive time sensitive samples and prevent staff from commuting safely. Power outages and flooding may compromise potable water availability, quality, and safety which would impact the laboratory's ability to operate.

Land, Chemicals and Redevelopment Division (LCRD)

Pesticides

Local, regional, and global climate changes that result in an increase and duration of mean and extreme temperature, and a reduced average rain fall in combination with extreme precipitation events and floods, are predicted to result in the increased use of pesticides by volume, target site, and type.

The region is likely to experience increased incidence of existing pests, exotic invasive species, and the rise of new endemic pests. The reduced availability of land for agricultural use, decrease in quality and quantity of water for irrigation, decrease in favorable growing seasons, and increased demand on commodities will have a significant impact on crops. The risk of vector-borne diseases that affect public health and agriculture will likely increase dramatically. This is not only due to a predicted increase in abundance of endemic and invasive pest species, but also due to predicted changes to migration patterns of vertebrate hosts, human introduction, and temperature conditions that promote decreased development time for pests and increased pathogen amplification.

As a consequence of the impacts that pests and pest-borne diseases will have on crops and humans, it is expected that the quantity, formulation, or classification of pesticides will change in order to combat these pests. It is reasonable to expect that this increase in pesticide use will generate additional risk to workers, specifically those in agriculture. The use of new and/or unfamiliar pesticides for new or invasive species will pose challenges in communicating risks and implications to workers. Issues will include exposure, reentry requirements, health, and personal protective equipment requirements. With an increase in extreme rainfall events and floods, increased pesticide run-off and contamination of both surface and ground water may occur. Such events could reasonably be expected to have significant implications for surface and groundwater quality throughout the Region. Any increased use of pesticides in quantity, formulation or classification may also increase exposure risks to pollinators. New endemic and exotic pests may require the use of pesticides on new target sites and time periods that increase the risk of pesticide exposure to honeybees, native bees, and other beneficial pollinators (i.e., spraying of pesticides for daytime biting mosquitoes that transmit human disease). Introduction of novel pesticides and application techniques must consider their impact on pollinators in a changing climate.

Waste Site Management

Flooding from more intense and/or frequent storms may lead to contaminant releases from Corrective Action waste management sites. Inundation and flooding may lead to transport of contaminants through surface soils, ground water, surface waters and/or coastal waters.

Land, Chemicals and Redevelopment Division

Increased use of pesticides, more pests, invasive species, and vector borne diseases

Less land available for agricultural use, decreased quality and less water for irrigation, less favorable growing seasons, and increased demand on commodities will significantly impact crops

New pesticides may increase risks to workers and pollinators

Flooding and saltwater intrusion may lead to contaminant releases from sites

Major storm events and wildfires may increase quantities of hazardous wastes,

Saltwater intrusion and increased ground water salinity in coastal aquifers may also increase the permeability of clay liners installed at waste sites, such as landfills, allowing contaminants to spread to nearby properties. These contaminant releases may pose an increased risk of adverse health and environmental impacts.

Additionally, increased incidents of flooding may disrupt existing hazardous waste management networks. Inundation from relative sea level rise or severe storms may disrupt the transportation system in place to handle hazardous waste or may damage treatment, storage, or disposal facility infrastructure. A major storm event may increase the amount of hazardous waste generated and may lead to the release of hazardous materials. Smaller entities that use and store hazardous materials may lack resources for emergency planning, which may increase the risk of abandoned hazardous materials during a flooding or storm event.

Changes in precipitation patterns and temperature may adversely affect the performance and efficacy of remedies, and cleanup timing and duration. To the extent that climate change leads to more prolonged droughts, water intensive remedies may become limited and the risk of wildfires spreading to contaminated sites and chemical storage areas may increase (e.g., Los Alamos National Lab). Changes in precipitation may affect the rate at which vegetation grows, impacting landfill covers, phytoremediation, ecological revitalization efforts, and remedies relying on biological processes (e.g., land farming and enhanced monitored natural attenuation). The impacts may be positive or negative, depending on conditions at each site.

Groundwater characteristics (i.e., depth, flow, chemistry) may also be altered, resulting in potential adverse impacts on the performance and cost of remediation. To the extent that temperatures increase with climate change, contaminants at cleanup sites may become more volatile, increasing risks for local populations.

Brownfields Sites

Brownfield sites in Region 6 exist in many different forms. Brownfield sites can vary from an old, abandoned gas station or movie theater to an illegal dump site or old airport. Some of these sites are relatively small while others may cover many acres. It is the goal of the Brownfields program in Region 6 to encourage state, Tribal, or local entities that are redeveloping old Brownfield sites to consider green technologies and sustainable practices that reduce energy use. In urban areas, the Region encourages development that reduces GHG effects and minimizes the urban footprint. Some of the Region 6 Brownfield sites have been returned to parks and to new construction that utilizes practices resulting in Leadership in Energy and Environmental Design (LEED) certification.

Mission Support Division (MSD)

Region 6 has its main facilities located throughout Texas and Oklahoma. The main regional office is located in downtown Dallas. The Regional laboratories are located in Houston, TX, and Ada, OK, and the U.S.-Mexico Border Office is in El Paso. Additionally, a Training and Conference Center is in Addison, a suburb of Dallas.

In addition to fulfilling Executive Order commitments to reduce energy use, conserve water, reduce waste, and expand recycling, the Region will likely face acute power and water challenges in these locations. This is a

MISSION SUPPORT DIVISION

EPA facilities could suffer from decreasing reliability of electrical power and water availability with significant warming and less precipitation

consequence of being in an area of rapid population growth that is expected to experience significant warming and less reliable precipitation.

Therefore, all these facilities could suffer from decreasing reliability of electrical power and water availability. For example, the power outages which occurred in the Texas electrical grid, ERCOT, in February 2021. As Texas, faced record-low temperatures from February 13 – 17, 2021, snow and ice made roads impassable, the state’s electric grid operator lost control of the power supply, leaving millions without access to electricity. The cascading effect of extreme temperatures and freezing pipes impacted employees’ personal safety due to the absence of reliable power and water. Information technology equipment was also compromised. Employees working remotely due to the ongoing pandemic proved an effective response for poor road conditions, but losses of power, water, and food were more critical needs.

Office of EPA Region 6 Administrator

Office of Communities, Tribes and Environmental Assessment (OCTEA)

OCTEA provides guidance and direction to Region 6 programs in interaction with our local, state, Tribal and international communities that we serve, to benefit communities, promoting equal public health, environmental protection, and environmental justice. OCTEA is a diverse, multidisciplinary organization and home to the Region’s community programs including Environmental Education, Environmental Justice, Tribal Affairs, Border Affairs, as well as the National Environmental Policy Act (NEPA) program. OCTEA incorporates principles of transparency and interdisciplinary engagement as we work collaboratively with our EPA colleagues and external partners in assessment of vulnerable populations, the natural environment, and comprehensively consider our diverse stakeholders in our everyday work and decision-making process to protect the environment and public health.

Tribal Program

The Region 6 Tribal Program is committed to helping tribes strengthen their abilities to manage environmental programs in Indian country, and to ensure that tribes have a voice in decisions that affect their land, air, and water. Under the Constitution, treaties with tribal nations are part of the supreme law of the land, establishing unique sets of rights, benefits and conditions for the treaty-making tribes who were forced to cede millions of acres of their homelands to the United States, in return for recognition of property rights in land and resources as well as federal protections. Tribal treaty rights have the same legal force and effect as federal statutes, and they should be integrated into and given the fullest consideration throughout EPA’s collective work. Reserved rights are the rights tribes retain that were not expressly granted to the United States by tribes in treaties. Treaty and reserved rights, including but not limited to the rights to hunt, fish and gather, may be found both on and off-reservation lands. Agencies should consider treaty and reserved rights in developing and implementing climate adaption plans in order to protect these rights and ensure the Agencies meet their legal and statutory obligations and other mission priorities as we work to combat the climate crisis.

Office of Region 6 Administrator

Areas with substandard infrastructure may be first to fail during times of high temperatures, drought, or extreme precipitation events

Sensitive populations may be more susceptible to heat, poorer air quality, diseases, and not have access to care

Tribes may be particularly affected by heat waves and drought conditions, as many are dependent upon natural resources on their Tribal lands

In September 2021, EPA joined 16 other federal agencies in signing a Memorandum of Understanding (MOU) that committed those parties to identifying and protecting tribal treaty rights early in the decision-making and regulatory processes. Accordingly, EPA will consider and protect treaty and reserved rights in developing and implementing climate adaptation plans through strengthened consultation, additional staff training and annual reporting requirements.

Environmental Justice

The Region 6 Environmental Justice Program has a stated vision that all persons, regardless of race, ethnicity, culture, or income, are protected from unacceptable levels of environmental pollution and hazards and are given the opportunity to meaningfully participate in environmental decisions and processes that may affect their health or community. Environmental Justice is a principle that permeates all that we do in Region 6.

Environmental Education

The Region 6 Environmental Education Program promotes the process that allows individuals to explore environmental issues, engage in problem solving, and take action to improve the environment. As a result, individuals develop a deeper understanding of environmental issues and have the skills to make informed and responsible decisions.

NEPA and 309 Review

Under the NEPA and 309 Review Program, Region 6 ensures that other Federal agencies and EPA consider the significant environmental consequences of their proposed actions and inform the public about their decision making. Section 309 of the Clean Air Act provides authorities to EPA to review other Federal actions and provide comments to ensure the requirements of NEPA are fulfilled and in compliance with the Council on Environmental Quality NEPA implementing regulations.

U.S./Mexico Border

The U.S./Mexico Border Program assures the partnership among U.S. Border Tribes and federal, state, and local governments with the United States and Mexico. The mission of the Border 2025 Program is to: Protect the environment and public health in the U.S.-Mexico border region, consistent with the principles of sustainable development.

OCTEA Vulnerabilities - Environmental Justice and Tribal Programs

The Region 6 Environmental Justice and Tribal Programs oversees affirmative federal environmental protection programs for vulnerable communities and 66 Tribal lands in Region 6. These represent populations that may be at greatest risk as climate change occurs in the future. Many lower-income minority areas are ones characterized by substandard infrastructure which may be the first to fail during times of high temperatures, drought, or extreme precipitation events. For example, older residents of urban areas may be particularly vulnerable to synergistic health impacts due to elevated nighttime temperatures which are expected as the climate changes. Tribes may be particularly affected by heat waves and drought conditions, as many are dependent upon natural resources on their Tribal lands. The Environmental Justice and Tribal programs will be challenged to understand fully the differential impacts on these various communities, to educate themselves about how EPA may be able to assist these populations to protect human and environmental health, and to conduct effective outreach to these vulnerable populations. As more of the Region's Tribal partners begin to develop their own climate change adaptation plans, OCTEA will need assistance from regional staff to help with these efforts. Demands for funding to address climate change can be expected to increase and, therefore, there will be a greater need for grant funding from the Region 6 Management Division and the Environmental Justice Small Grant program.

OCTEA Vulnerabilities Summary

EPA Region 6 and the OCTEA face many serious vulnerabilities in successfully fulfilling its mission as the climate changes. As an area of rapid population growth but one subject to major future temperature and precipitation changes, increasing numbers of people will be impacted by increased environmental pressures due to climate change. It is a Region 6 goal to anticipate fully and understand the nature of such pressures in to achieve EPA’s mission to protect human health and the environment in the Region. This vulnerability assessment should reveal the current state of knowledge but will necessarily change as additional information is received and new scientific and technical knowledge is gained.

Superfund and Emergency Management Division

Emergency Response

Region 6 Emergency Response personnel are very familiar with the challenges of responding to emergencies and natural disasters, having worked for months on several different hurricane responses, including Hurricane Katrina in 2005. With hurricanes continuing to affect the Gulf of Mexico coast and perhaps being more powerful, coupled with an expected increase in extreme precipitation events, Emergency Response in Region 6 will be further challenged. Although the Region maintains a volunteer, basically trained “Response Support Corps” to assist with extreme short-term needs during emergency responses, it is likely there will be a shortage of specialized Emergency Response personnel to respond to these types of events in the future. This is particularly true of geographically wide-spread major events that would require many weeks or months of cleanup activities. Further, if the strength of future hurricanes and extreme precipitation events is as predicted, Emergency Response personnel may be confronted with a whole new set of challenges such as massive storm surges, larger and more widespread flash floods, and long-term breakdown of transportation routes, electricity grids, water and sewer systems, contractor resources, and supply chains.

Superfund Sites

A number of Superfund sites are located in vulnerable areas of Region 6, particularly the Gulf Coast regions of Texas and Louisiana. Rising coastal waters and massive storm surges could potentially flood sites where waste has been capped and left in place. Although most caps and barriers at Superfund sites are engineered to contain waste for many years, the possibility of long term and extensive flooding, even permanent submersion, could affect the integrity of engineered remedies at some sites where waste has been consolidated and remains in place. Additionally, there are active Superfund cleanups expected to be ongoing for many years to come in the vulnerable Gulf Coast areas that will likely be impacted by energy shortages, flooding, storm surges, water shortages and other expected climate change impacts. For example, domestic or public water supplies could be affected in areas where Gulf Coast Superfund sites are utilizing energy intensive pump and treat methods to remedy groundwater contamination in aquifers used to supply drinking water. Or, as discussed above, EPA’s

SUPERFUND AND EMERGENCY MANAGEMENT DIVISION

Expected increase in extreme storm events may result in a shortage of specialized personnel to respond

Stronger and longer duration storm events may add different challenges

Region 6 Superfund sites are located in vulnerable areas including Gulf coast, flood prone areas and storm pathways

Site cleanups may be impacted by energy shortages, flooding, storm surges, water shortages and other expected climate change impacts

Remedies may no longer be protective due to changing site conditions from flooding and rise in sea level

common practice of consolidating waste and leaving it in place in landfills or under engineered caps may no longer be protective of human health and the environment if climate changes result in frequent, massive flooding in the Gulf Coast areas.

Water Division

Numerous environmental complications from projected climate change in Region 6 center around the complex and interrelated issues of increased ambient air temperature, storm frequencies and intensities, drought, and wildfires. General population growth and shifts in population from the Region's rural areas to urban centers will continue to create demands for water storage to maintain sustainable water supplies and increase competition among water users (e.g., energy, industrial, agricultural, and municipal uses). Decreased water availability due to increased temperature, increased evaporation, and longer periods of time between rainfall events, coupled with an increase in societal demand, is very likely to affect many sectors of the Region's economy, including underserved communities. More frequent and more intense droughts could adversely impact agriculture, silviculture, energy production and a myriad of other industries and economic sectors.

Decreases in water supply for fire protection could also hamper the capacity of local, state, and federal fire-fighting efforts, which could lead to fire loss increases including human life, property, infrastructure, and ecosystem flora, fauna, habitat, and function. Declines in soil moisture are expected to increase the magnitude and frequency of wildfires, which have increased over the last 30 years, and to impact water quality in streams, creeks, rivers, lakes.

Reduced groundwater supply due to increased water usage during heat waves, and a lack of recharge will also be a concern. Declining surface and groundwater quantity and quality, coupled with more frequent and severe droughts, will continue to exacerbate water shortages in the Region unless climate adaptation and drought resiliency efforts are prioritized. Population growth projections for the Region will only intensify water shortages and competition among users.

Loss of snowpack in the western portion of the Region will further impact water use, storage, and irrigation practices.

Warmer temperatures will reduce mountain snowpack and peak spring runoff from snow melt will shift to earlier in the season, increasing the shortage of water during the summer. A longer and hotter warm season will likely result in longer periods of extremely low flow and lower minimum flows in late summer. Water supply systems that have no storage or limited storage (e.g., small municipal reservoirs) may suffer seasonal shortages in summer and ecosystems and wildlife may be stressed. The resulting temporal changes in water distribution, storage and availability could have significant consequences for water reservoir and storage system design,

WATER DIVISION

Increased demands for water storage to maintain sustainable water supplies.

Increased temperature and evaporation, and longer periods of time between rainfall events may increase competition among water users.

Decreased water availability may affect many sectors of the Region's industries and economy, impact underserved communities, and hamper fire-fighting efforts.

Reduced groundwater supplies due to increased usage and less recharge.

Population growth expected to increase water demands and shortages

Increased storm intensities lead to flooding and inundation.

Altered stream flows impacts water quality, increasing salinities in estuaries.

Coastal areas may be subjected to more frequent and stronger storms, inundation, and flooding.

operation, and management to ensure municipal (e.g., drinking water and fire protection), agricultural and irrigation, industrial, energy production, and other critical needs are met. Moreover, the temporal changes in water distribution, storage and availability could impact downstream water quality and aquatic life. These changes must be taken into consideration as the adequacy of current water infrastructure is evaluated and as new infrastructure is designed and brought into service.

Concurrently, projected increases in storm intensity and possible increases in the frequency and altered timing of flooding could increase risks to people, ecosystems, and infrastructure. Occurrences of 100-year and 500-year flood events are happening at an increased annual rate, well outside of their modeled predictions. Increased flooding could occur as a result of an increased percentage of winter precipitation falling as rain. Water quality impacts will be amplified both by increases in precipitation intensity and by longer periods of low flow in streams. Increased nonpoint source pollution (e.g., sediments, phosphorus, and nitrogen) is to be expected as a result of increased periods of intense rainfall. This could result in changes to natural stream morphology and could negatively impact the functioning of aquatic ecosystems.

The Region can also expect increases in wildfire extent (burned acreage), intensity and severity due to changes in the climate. The wildfire season is expected to be longer as well. Impacts are expected in forested areas and grasslands alike, and firefighting efforts will likely be complicated by drought and water shortages. Ongoing changes in temperature, drought, and snowmelt likely contribute to warmer, drier conditions that can fuel wildfire outbreaks.

As relative sea levels rise and rainfall patterns change, the physical and chemical structure of estuaries, coastal wetlands, and tidal rivers are likely to become more variable and potentially less sustainable. Some of the fastest rates of relative sea level rise in the U.S. are occurring in areas where the land is subsiding, including parts of the Gulf coast. For example, in coastal Louisiana, relative sea level rise was about eight inches or more during the last 50 years, which is slightly faster than twice the global rate. Estimated flood depths for 100-year flood 50 years from now with a degraded landscape and no additional flood protection is over 15 feet on the outer barrier islands and deltaic estuary systems. Much of New Orleans sits below the mean local sea level and the State's only inhabited barrier island, Grand Isle, is reporting one of the highest sea level rise rates in the world. Projections are that an additional 2250 square miles of Louisiana's coastal zone will be inundated in the next 50 years (CPRA, 2017).

Relative sea levels will vary along the Gulf coast and will contribute to changing barrier island configurations and coastal shorelines. Wetlands will be drowned or eroded and low-lying areas, including some populated areas, will be inundated more frequently or permanently. Salinities will increase in the estuaries and aquifers. Nutrient and pollutant runoff from land can lead to higher incidences of eutrophication in wetlands and estuaries, damaging fresh water sources. Hurricanes often have their greatest impact at the coastal margin where they make landfall, intensifying beach erosion, inland flooding, and wind-related damage to both cultural and natural resources. Increasing relative sea level rise, combined with the damaging effects of more intense storm surges and hurricanes, are expected to pose severe and growing risks to people, personal property, and public infrastructure along the coast. Infrastructure at risk includes energy, transportation, and communications facilities, as well as wastewater treatment facilities and drinking water systems.



Grand Isle, Louisiana, July 2021, EPA Region 6 photo

3. EPA Region 6 Priority Actions and Sub Actions

After conducting the vulnerability assessment, the Region 6 workgroup developed a high-level list of priority actions. A priority action may be an interim step towards a multi-year goal. Sub actions for the priority actions were generated. The Region 6 Priority Actions and Sub Actions identified for FY 2022 and FY 2023 are:

Priority Action 1: Expand strategic networks to raise awareness of climate adaptation and resilience and understand what matters most to our Tribal and state partners and stakeholders.

Sub Action 1.1 (R6 ORA)

Initiate dialogue with States and Tribes on climate adaptation priorities. Meet with Region 6 State, Tribal and other key stakeholders to learn about their current adaptation work and identify gaps where Region 6 can assist.

<i>Fiscal Year Start-Complete</i>	2022
<i>Performance metric</i>	Number of engagements with states, Tribes, and other stakeholders.
<i>Associated Vulnerability</i>	Extreme heat, extreme precipitation events, unprecedented warming, sea level rise, droughts, wildfires, coastal inundation, frequency and intensity of storms
<i>Co-benefits</i>	Public Health; Environmental Justice; National Security; Economic Growth/Job Creation

<i>Resource requirements</i>	Existing
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Sub Action 1.2 (R6 OCTEA)
Coordinate with AIEO on Tribal consultations at a national / regional level in accordance with our established policies. Engage with R6 Tribes in a meaningful dialogue on Climate Change Adaptation and Resilience. Use the Regional Tribal Operations Committee (RTOC) as a forum for climate change adaptation information sharing, training, and capacity building. Exchange information with the National Tribal Science Council on national tribal climate change adaptation needs and directions, as appropriate.

<i>Fiscal Year Start-Complete</i>	2022-2023
<i>Performance metric</i>	Number of engagements with R6 Tribes through/with RTOC and National Tribal Science Council
<i>Associated Vulnerability</i>	Extreme heat, extreme precipitation events, unprecedented warming, sea level rise, droughts, wildfires, coastal inundation, frequency, and intensity of storms
<i>Co-benefits</i>	Public Health; Environmental Justice; National Security
<i>Resource requirements</i>	Existing

Sub Action 1.3 (R6 ORA and others)
Strengthen partnerships with other Regional federal agencies to foster collaboration and align efforts addressing climate adaptation and resilience.

<i>Fiscal Year Start-Complete</i>	2022 – 2023
<i>Performance metric</i>	Number of distinct partnerships/workgroups with Federal Partners addressing Climate Adaptation
<i>Associated Vulnerability</i>	Extreme heat, extreme precipitation events, unprecedented warming, sea level rise, droughts, wildfires, coastal inundation, frequency, and intensity of storms
<i>Co-benefits</i>	Public Health; Environmental Justice; National Security; Economic Growth/Job Creation
<i>Resource requirements</i>	Additional resources needed

Sub Action 1.4 (R6 ORA-XO)
Promote awareness of climate change adaptation via a workshop for non-English (Vietnamese and Spanish) speaking communities along the Gulf Coast.

<i>Fiscal Year Start-Complete</i>	2022
<i>Performance metric</i>	Number of Workshops
<i>Associated Vulnerability</i>	Extreme heat, extreme precipitation events, unprecedented warming, sea level rise, droughts, wildfires, coastal inundation, frequency and intensity of storms
<i>Co-benefits</i>	Public Health; Environmental Justice
<i>Resource requirements</i>	Existing

Sub Action 1.5 (R6 OCTEA)***Serve as liaison with communities concerned about climate change impacts who may have limited resources to plan for or implement adaptation strategies. Consider environmental justice issues into the design and evaluation of adaptation strategies***

<i>Fiscal Year Start-Complete</i>	2022
<i>Performance metric</i>	Identify the number of communities with limited resources to assist in planning for implementation of adaptation strategies
<i>Associated Vulnerability</i>	Extreme heat, extreme precipitation events, unprecedented warming, sea level rise, droughts, wildfires, coastal inundation, frequency, and intensity of storms
<i>Co-benefits</i>	Public Health; Environmental Justice; National Security
<i>Resource requirements</i>	Existing

Sub Action 1.6 (R6 OCTEA)***Support and encourage the use of General Assistance Program (GAP) grants, and other available funds for climate change adaptation, as particular funds allow (e.g., education of staff and members, assessing their community and environment, developing climate change adaptation plans).***

<i>Fiscal Year Start-Complete</i>	2022 – 2023
<i>Performance metric</i>	Number of GAP grants with climate activities
<i>Associated Vulnerability</i>	Extreme heat, extreme precipitation events, unprecedented warming, sea level rise, droughts, wildfires, coastal inundation, frequency, and intensity of storms
<i>Co-benefits</i>	Public Health; Environmental Justice; National Security; Economic Growth/Job Creation
<i>Resource requirements</i>	Existing

Sub Action 1.7 – (R6 LCRD)***Work with states, tribes, and local governments to identify technical support needs for climate adaptation in communities relating to solid waste infrastructure, recycling, food waste and plastic pollution reduction.***

<i>Fiscal Year Start-Complete</i>	2023 – 2024
<i>Performance metric</i>	Number of engagements with R6 partners
<i>Associated Vulnerability</i>	Extreme heat, extreme precipitation events, unprecedented warming, sea level rise, droughts, wildfires, coastal inundation, frequency, and intensity of storms
<i>Co-benefits</i>	Public Health; Environmental Justice; National Security
<i>Resource requirements</i>	Travel resources required

Priority Action 2: Collaborate to strengthen the adaptive capacity and resilience of Region 6 communities with a focus on advancing environmental justice**Sub Action 2.1 (R6 LCRD)*****Conduct tribal recycling workshop to strengthen capacity and implement resilient community programs.***

<i>Fiscal Year Start-Complete</i>	2023
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<i>Performance metric</i>	Tribal workshop held
<i>Associated Vulnerability</i>	Extreme heat, extreme precipitation events, unprecedented warming, sea level rise, droughts, wildfires, coastal inundation, frequency, and intensity of storms
<i>Co-benefits</i>	Public Health; Environmental Justice; Economic Growth/Job Creation
<i>Resource requirements</i>	Existing

Sub Action 2.2 (R6 LCRD)

Provide information to stakeholders building resilience on preparing underground storage tanks for natural disasters, share Flood and Wildfire guidance in FY 2023-2024.

<i>Fiscal Year Start-Complete</i>	2023 – 2024
<i>Performance metric</i>	State/Tribal partners reached with HQ informational products
<i>Associated Vulnerability</i>	Extreme heat, extreme precipitation events, unprecedented warming, sea level rise, droughts, wildfires, coastal inundation, frequency, and intensity of storms
<i>Co-benefits</i>	Public Health; Environmental Justice; National Security
<i>Resource requirements</i>	Travel resources required

Sub Action 2.3 (R6 OCTEA)

The Border Program will support, update and/or complete climate action plans in each of the four (4) northern Mexican Border States (as appropriate) and build the necessary capacity to guarantee sustained implementation.

<i>Fiscal Year Start-Complete</i>	2025
<i>Performance metric</i>	Number of plans updated or completed
<i>Associated Vulnerability</i>	Extreme heat, extreme precipitation events, unprecedented warming, sea level rise, droughts, wildfires, coastal inundation, frequency, and intensity of storms
<i>Co-benefits</i>	Public Health; Environmental Justice; National Security
<i>Resource requirements</i>	Additional resources required

Sub Action 2.4 (R6 WDP)

Conduct workshops on harmful algal blooms.

<i>Fiscal Year Start-Complete</i>	2023
<i>Performance metric</i>	Number of workshops
<i>Associated Vulnerability</i>	Extreme heat, extreme precipitation events, unprecedented warming, sea level rise, frequency and intensity of storms
<i>Co-benefits</i>	Public Health
<i>Resource requirements</i>	Existing

Sub Action 2.5 (6WDA)
Deploy Sustainability Advisors and/or subject matter experts after federally declared disasters to help communities adapt to climate impacts and become more resilient.

<i>Fiscal Year Start-Complete</i>	2022 – 2026
<i>Performance metric</i>	Number of hours supporting effort as SA or SME
<i>Associated Vulnerability</i>	Extreme heat, extreme precipitation events, unprecedented warming, sea level rise, droughts, wildfires, coastal inundation, frequency, and intensity of storms
<i>Co-benefits</i>	Public Health; Environmental Justice; National Security; Economic Growth/Job Creation
<i>Resource requirements</i>	Pending FEMA issuance of Recovery Mission Assignments after disasters

Sub Action 2.6 (R6 ARD)
Provide support and guidance to New Mexico as it develops volatile organic compound (VOC) rules for the oil and gas sector to reduce ozone levels and additionally achieve methane benefits.

<i>Fiscal Year Start-Complete</i>	2022 - 2023
<i>Performance metric</i>	Cumulative number of engagements offers to NMED to support oil and natural gas sector rulemaking
<i>Associated Vulnerability</i>	Extreme heat, extreme precipitation events, unprecedented warming, sea level rise, droughts, wildfires, coastal inundation, frequency, and intensity of storms
<i>Co-benefits</i>	Mitigation of Green House Gases and Other Pollutants; Public Health
<i>Resource requirements</i>	Existing

Sub Action 2.7 (R6 LCRD)
Work with DOE National Renewable Energy Lab (NREL) to conduct renewable energy feasibility studies in 2022-2023.

<i>Fiscal Year Start-Complete</i>	2022 – 2023
<i>Performance metric</i>	Number of Completed Studies
<i>Associated Vulnerability</i>	Extreme heat, unprecedented warming
<i>Co-benefits</i>	Public Health; Environmental Justice; National Security; Economic Growth/Job Creation
<i>Resource requirements</i>	Existing

Priority Action 3: Incorporate climate change adaptation into EPA Region 6 activities

Sub Action 3.1 (R6 LCRD)
Incorporate climate change considerations when conducting Brownfield’s outreach efforts (webinars, discussion with partners and potential grantees) and work with OBLR to include climate change outreach support and messaging capabilities for Brownfields technical assistance.

<i>Fiscal Year Start-Complete</i>	2022 – 2024
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<i>Performance metric</i>	Supporting HQ outreach efforts
<i>Associated Vulnerability</i>	Extreme heat, extreme precipitation events, unprecedented warming, sea level rise, droughts, wildfires, coastal inundation, frequency, and intensity of storms
<i>Co-benefits</i>	Public Health; Environmental Justice; National Security; Economic Growth/Job Creation
<i>Resource requirements</i>	Travel resources required

Sub Action 3.2 (R6 WD)

Initiate efforts to provide outreach on changing agriculture production practices in response to changing water resource availability and changing pest pressures.

<i>Fiscal Year Start-Complete</i>	2023 – 2024
<i>Performance metric</i>	Outreach to State/Tribal/local and non-governmental partners with HQs and Regional Webinar and Informational Products
<i>Associated Vulnerability</i>	Extreme heat, extreme precipitation events, unprecedented warming, droughts, wildfires, frequency and intensity of storms
<i>Co-benefits</i>	Mitigation of Green House Gases and Other Pollutants; Public Health; Environmental Justice; National Security; Economic Growth/Job Creation
<i>Resource requirements</i>	Travel resources required

Sub Action 3.3 (R6 OCTEA)

Incorporate climate change-related environmental effects, and climate change adaptation measures appropriately disclosed and considered in reviewing Environmental Impact Statements (EIS) documents.

<i>Fiscal Year Start-Complete</i>	2022
<i>Performance metric</i>	Number of climate change measures within the review of EIS documents
<i>Associated Vulnerability</i>	Extreme heat, extreme precipitation events, unprecedented warming, sea level rise, droughts, wildfires, coastal inundation, frequency, and intensity of storms
<i>Co-benefits</i>	Public Health; Environmental Justice; National Security
<i>Resource requirements</i>	Additional resources required

Sub Action 3.4 (R6 WDA)

Partner with City of Denton, TX, USACE Silver Jackets, and others to incorporate Green Asset Management practices in Denton County.

<i>Fiscal Year Start-Complete</i>	2022 – 2023
<i>Performance metric</i>	Completion of GI site assessments and identification of corrective actions
<i>Associated Vulnerability</i>	Extreme heat, extreme precipitation events, unprecedented warming, droughts, frequency and intensity of storms
<i>Co-benefits</i>	Mitigation of Green House Gases and Other Pollutants; National Security; Economic Growth/Job Creation

<i>Resource requirements</i>	Existing
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Sub Action 3.5 (R6 WDA)
Revise the US Mexico Border Infrastructure Program (BWIP) project prioritization process to add climate change adaptation to the project ranking factors and provide Technical Assistance to communities when resources are available.

<i>Fiscal Year Start-Complete</i>	2023
<i>Performance metric</i>	Procedure Revision
<i>Associated Vulnerability</i>	Extreme heat, extreme precipitation events, unprecedented warming, droughts, frequency, and intensity of storms
<i>Co-benefits</i>	Public Health; Environmental Justice; National Security
<i>Resource requirements</i>	Existing

Sub Action 3.6 (R6 WDD)
Adapt at least two Area Wide Optimization Program (Region 6 and 7)) meetings and or trainings to address impacts of climate change or options for climate adaptation.

<i>Fiscal Year Start-Complete</i>	2022 – 2023
<i>Performance metric</i>	Meeting/training
<i>Associated Vulnerability</i>	Extreme heat, extreme precipitation events, unprecedented warming, sea level rise, droughts, frequency and intensity of storms
<i>Co-benefits</i>	Public Health, National Security
<i>Resource requirements</i>	Access to subject matter experts and additional resources required

Sub Action 3.7 (6 WDD)
Initiate efforts to review Class VI permit applications and issue permits for CO2 injection in 2023. Class VI injection wells are for the injection of CO2 into underground subsurface rock formations for long term storage, or geologic sequestration.

<i>Fiscal Year Start-Complete</i>	2022 – ongoing
<i>Performance metric</i>	Permit to construct
<i>Associated Vulnerability</i>	Extreme heat, extreme precipitation events, unprecedented warming, frequency and intensity of storms
<i>Co-benefits</i>	Mitigation of Green House Gases and Other Pollutants; Public Health; Environmental Justice; National Security; Economic Growth/Job Creation
<i>Resource requirements</i>	Additional time for permit review and additional resources required

Sub Action 3.8 (R6 LASBE)
Maintain the Houston Laboratory Mobile Laboratory (ML) that responds to hurricane events with flooding and related Drinking Water issues. The Houston Lab works to maintain the ML's ISO accreditation status and its employees trained and ready for a response.

<i>Fiscal Year Start-Complete</i>	2022 – 2023
<i>Performance metric</i>	Permit to construct
<i>Associated Vulnerability</i>	Extreme precipitation events, droughts, frequency, and intensity of storms
<i>Co-benefits</i>	Public Health, National Security
<i>Resource requirements</i>	Existing

Sub Action 3.9 (R6 SED)
Conduct Five-year Reviews for Superfund sites with the goals of decreasing energy consumption.

<i>Fiscal Year Start-Complete</i>	2022
<i>Performance metric</i>	Number of Five-Year reviews
<i>Associated Vulnerability</i>	Extreme heat, extreme precipitation events, unprecedented warming, frequency and intensity of storms
<i>Co-benefits</i>	Environmental Justice, National Security
<i>Resource requirements</i>	Additional contractor resources required

Sub Action 3.10 (R6 ARD)
Promote purchase of automated ambient air monitoring equipment to reduce mobile miles traveled to operate older, manual ambient air monitoring equipment to collect data quality objectives or to repair older equipment during failure events.

<i>Fiscal Year Start-Complete</i>	2022 – 2023
<i>Performance metric</i>	Coordinate with State, Local and Tribal Air Agencies in R6 to replace 95% of the manual PM2.5 equipment (specifically federal equivalent method or FEM monitors)
<i>Associated Vulnerability</i>	Extreme heat, extreme precipitation events, unprecedented warming
<i>Co-benefits</i>	Mitigation of Green House Gases and Other Pollutants; Public Health; Economic Growth/Job Creation
<i>Resource requirements</i>	American Rescue Plan funds required

Sub Action 3.11 (R6 ARD)
Promote operational change in national performance appraisal program (NPAP) procedures to allow ozone-only audit to be conducted using the air monitoring van instead of the diesel truck pulling the trailer equipped for ozone, carbon dioxide, nitrogen oxide, and sulfur dioxide audits; reduce miles traveled with diesel-powered engine.

<i>Fiscal Year Start-Complete</i>	2023 – 2024
<i>Performance metric</i>	Conduct 20% of NPAP audits using the mobile van instead of the diesel truck/trailer assembly
<i>Associated Vulnerability</i>	Extreme heat, extreme precipitation events, unprecedented warming
<i>Co-benefits</i>	Mitigation of Green House Gases and Other Pollutants; Public Health; Environmental Justice; National Security
<i>Resource requirements</i>	Existing

Sub Action 3.12 (WDD)

To address the impacts of drought and other water scarcity issues, promote direct potable reuse projects in Region 6 by providing the latest EPA Water Reuse Guidance and technical assistance to Federal and State Agencies, tribes, and project teams interested in constructing and permitting these projects.

<i>Fiscal Year Start-Complete</i>	2022 – 2023
<i>Performance metric</i>	Meetings
<i>Associated Vulnerability</i>	Extreme heat, unprecedented warming, droughts
<i>Co-benefits</i>	Mitigation of Green House Gases and Other Pollutants; Environmental Justice; Economic Growth/Job Creation
<i>Resource requirements</i>	Additional funding for water and wastewater system updates, requires a number of operators with high enough level of certification to run DPR plant, and additional resources required

Sub Action 3.13 (R6 SED)

Conduct preparedness discussions and planning for hurricane and flooding in pre-hurricane season and pre-storm/post-storm events in coastal and EJ communities

<i>Fiscal Year Start-Complete</i>	2022
<i>Performance metric</i>	Number of preparedness communication messages/meetings
<i>Associated Vulnerability</i>	Extreme precipitation events, unprecedented warming, sea level rise, coastal inundation, frequency and intensity of storms
<i>Co-benefits</i>	Mitigation of Green House Gases and Other Pollutants; Public Health; Environmental Justice; National Security; Economic Growth/Job Creation
<i>Resource requirements</i>	Resources for outreach and printing support required

Sub Action 3.14 (R6 SED)

Reduce exposure to toxic substances associated with Superfund Removal actions and Superfund Remedial activities.

<i>Fiscal Year Start-Complete</i>	2022
<i>Performance metric</i>	Number of Removal and Remedial Actions
<i>Associated Vulnerability</i>	Extreme heat, extreme precipitation events, sea level rise, wildfires, coastal inundation, frequency and intensity of storms
<i>Co-benefits</i>	Mitigation of Green House Gases and Other Pollutants; Public Health; Environmental Justice; National Security; Economic Growth/Job Creation
<i>Resource requirements</i>	Contracting resources required

Sub Action 3.15 (R6 ECAD)

Increase in Risk Management Plan inspections at facilities in EJ areas along the Gulf Coast that are susceptible to the impacts from storms.

<i>Fiscal Year Start-Complete</i>	2022 – 2024
<i>Performance metric</i>	Number of inspections
<i>Associated Vulnerability</i>	Extreme heat, extreme precipitation events, sea level rise, coastal inundation, frequency and intensity of storms
<i>Co-benefits</i>	Environmental Justice
<i>Resource requirements</i>	Additional resources required

Sub Action 3.16 (R6 ECAD)

Target facilities noncompliant with the America’s Water Infrastructure Act (AWIA) of 2018, which requires Risk and Resilience Assessments and Emergency Response Plans to address risks such as Natural Disasters caused by climate change.

<i>Fiscal Year Start-Complete</i>	2023
<i>Performance metric</i>	Number of Drinking Water Systems in compliance with AWIA provisions (e.g. RRA and ERP)
<i>Associated Vulnerability</i>	Extreme precipitation events, wildfires, frequency and intensity of storms
<i>Co-benefits</i>	Public Health
<i>Resource requirements</i>	Existing

Sub Action 3.17 (R6 ECAD)

Focus compliance assistance efforts for Public Water Systems in drought-stricken areas, such as New Mexico.

<i>Fiscal Year Start-Complete</i>	2023
<i>Performance metric</i>	Number of Inspections, number off-site compliance monitoring at PWS facilities, Assistance to systems under an Administrative Order

<i>Associated Vulnerability</i>	Extreme heat, unprecedented warming, droughts, wildfires
<i>Co-benefits</i>	Public Health, Environmental Justice
<i>Resource requirements</i>	Travel required

Sub Action 3.18 – (R6 ECAD)
Continue surveillance activities and issue enforcement actions targeted at VOC reductions at oil and gas facilities that will also result in reductions of methane emissions.

<i>Fiscal Year Start-Complete</i>	2022 – 2024
<i>Performance metric</i>	Methane emissions reductions achieved through settlements
<i>Associated Vulnerability</i>	Extreme heat, unprecedented warming
<i>Co-benefits</i>	Mitigation of Green House Gases and Other Pollutants
<i>Resource requirements</i>	Additional Resources Required

Priority Action 4: Address risks to EPA Region 6 day-to-day activities and facilities from climate change.

Sub Action 4.1 (R6 MSD) Continue implementation of Environmental Management System Goals of Vehicle Emissions and Fuel Use.	
<i>Fiscal Year Start-Complete</i>	2022 – 2023
<i>Performance metric</i>	Follow existing procedures for implementation
<i>Associated Vulnerability</i>	Extreme heat, unprecedented warming
<i>Co-benefits</i>	Mitigation of Green House Gases and Other Pollutants
<i>Resource requirements</i>	Existing

Priority Action 5: Establish an EPA Region 6 Climate Adaptation Resource/Coordination Center to coordinate Region 6 Climate Adaptation activities and serve as portal for climate adaptation tools, outreach, and training

Sub Action 5.1 (R6 ORA) Establish a designated Team of Region 6 climate adaptation experts to promote climate adaptation within their divisions, track implementation plan activities and reach out to our States, Tribes, local partners, and other stakeholders.	
<i>Fiscal Year Start-Complete</i>	2023
<i>Performance metric</i>	Monthly team meetings
<i>Associated Vulnerability</i>	Extreme heat, extreme precipitation events, unprecedented warming, sea level rise, droughts, wildfires, coastal inundation, frequency and intensity of storms
<i>Co-benefits</i>	Public Health; Environmental Justice; National Security
<i>Resource requirements</i>	Additional resources required

Sub Action 5.2 (R6 ORA and others) Conduct Climate Adaptation Awareness Workshops to inform and engage staff regarding the Region 6 Climate Change Adaptation Implementation Plan and incorporation into our everyday work.	
<i>Fiscal Year Start-Complete</i>	2022 - 2023
<i>Performance metric</i>	Number of workshops
<i>Associated Vulnerability</i>	Extreme heat, extreme precipitation events, unprecedented warming, sea level rise, droughts, wildfires, coastal inundation, frequency and intensity of storms
<i>Co-benefits</i>	National Security
<i>Resource requirements</i>	Additional resources required

Sub Action 5.3 (R6 ORA and others)

Compile Climate Adaptation Training Resources and share training opportunities with staff and networks. Conduct Region 6 Climate Change Adaptation Speaker Series/Panels for staff to engage with local experts. Coordinate Climate Adaptation Tool demonstrations for the regional staff and our partners.

<i>Fiscal Year Start-Complete</i>	2022 – 2023
<i>Performance metric</i>	Number of sessions
<i>Associated Vulnerability</i>	Extreme heat, extreme precipitation events, unprecedented warming, sea level rise, droughts, wildfires, coastal inundation, frequency and intensity of storms
<i>Co-benefits</i>	Environmental Justice; National Security
<i>Resource requirements</i>	Additional resources needed

Sub Action 5.4 (R6 ORA)

Publish an internal Region 6 quarterly climate adaptation report to showcase projects, provide progress on Region 6 plan implementation, and share successes.

<i>Fiscal Year Start-Complete</i>	2023 – ongoing
<i>Performance metric</i>	Number of reports
<i>Associated Vulnerability</i>	Extreme heat, extreme precipitation events, unprecedented warming, sea level rise, droughts, wildfires, coastal inundation, frequency and intensity of storms
<i>Co-benefits</i>	Environmental Justice
<i>Resource requirements</i>	Additional resources required

Potential Funding Source for Actions/Sub Actions

A new funding stream entitled the Infrastructure Investment and Jobs Act (IIJA) (Public Law 117-58, also known as the “Bipartisan Infrastructure Law”) is infusing more than \$1 trillion dollars of federal funding for U.S. public works over five years. This funding can be used to support actions to build resilience to climate impacts and is expected to facilitate applying climate resilience criteria to other existing funding resources and to enable and implement climate-smart practices.

It is anticipated recipients will use their Bipartisan Infrastructure Law (BIL) appropriations to accelerate implementation of climate resilient actions described in management plans and strategies. Specifically, the State Revolving Fund (SRF) program plans to engage in discussions with the state SRF programs to encourage the use of BIL appropriations, to prioritize resiliency infrastructure projects on Drinking Water and Clean Water SRF Intended Use Plans (IUPs) during the annual SRF reviews. Funds from the Bipartisan Infrastructure Law may enable more opportunities for the Brownfields program to assist with resilient remedial design and site reuse. Region 6 plans to partner with the Tribes, state and federal agencies to include climate resiliency and climate justice considerations in BIL related projects such as water infrastructure, National Solid Waste for Recycling Infrastructure Grants, Brownfields, Pollution Prevention and Source Reduction Assistance Grants.

4. EPA Region 6 Training and Outreach

EPA’s Climate Action Plan includes as goals “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.” Under this Region 6 Implementation Plan, EPA Region 6 commits to ensure EPA employees receive the basic online climate adaptation training to be developed by EPA’s Office of Policy. The Region will ensure 50% of employees complete the Climate Adaptation 101 Training within one year after it is updated. In addition, EPA Offices will be developing and/or updating program specific climate adaptation training in the coming years (FY 2022/FY 2023).

Climate Adaptation Training Module by Lead Office	Tentative Availability of Modules
Office of Policy (OP) Climate Adaptation 101	Summer 2022
Regulation Writers	End of 2022
Office of Water (OW)	End of 2022
Office of Land and Emergency Management (OLEM)	End of 2022
Office of Air and Radiation (OAR)	End of 2023
Office of Chemical Safety and Pollution Prevention (OCSPP)	End of 2023
Office of Enforcement and Compliance Assurance (OECA)	End of 2023
Office of Mission Support (OMS)	End of 2023
Office of Homeland Security (OHS)	End of 2023
Office of International and Tribal Affairs (OITA)	End of 2023
Office of Research and Development (ORD)	End of 2023

Each Division will ensure employees receive the program specific training developed by the Program offices within one year from training module availability. Priority Action 5 listed in Section 3 of this document prioritizes training and outreach and identifies an effective approach to coordinate these efforts in the Region. As additional resources become available, a Region 6 Climate Adaptation Training Plan will be developed, updated, and expanded. The written plan, when available, will be incorporated into this plan.

Region 6 will also use existing and new training resources provided by USEPA, Office of Research and Development (ORD), other EPA Regions, academia, and others as needed to educate and inform Region 6 employees, states, Tribes, and other stakeholders. Region 6 will inform stakeholders of EPA’s Adaptation Resource Center (ARC-X) (<https://www.epa.gov/arc-x>). This interactive resource can be used to help local governments effectively deliver services to their communities even as the climate changes.

Region 6 has an active Regional Science Council (RSC), a group of Region 6 scientists, engineers and technical staff who meet monthly to discuss issues, work on specific projects of regionwide interest, and make recommendations to management concerning science matters. The primary goal of the R6 RSC is to strengthen science, enhance the use of science in the Region and more effectively communicate scientific work. The RSC plans to host a Seminar Series with a climate adaptation focus in FY 2022 and FY 2023. This series will shift the focus of the existing RSC hour long monthly/bimonthly webinars to climate adaptation, climate change issues, and environmental justice. Seminars will be recorded with the consent of guest speakers and attendance will be tracked to measure progress and participation. Dr. Michael Morton, R6 Regional Science Liaison for ORD is the point of contact for this training initiative.

Region 6 programs will continue to identify training needs. One training need already identified by R6 LCRD is including climate adaptation and mitigation information into university food waste webinar series. Additional R6 division specific training needs will be captured in the annual updates to this plan.

In October 2021, the EPA Region 6 Water Division initiated climate adaptation awareness by hosting workshops throughout the Division to examine climate adaptation related programmatic efforts and assist in the development of Region 6 priority actions and sub actions. Future Region 6 Water Division efforts may include training staff, states, Tribal partners, and water systems on climate change impacts to the water sector. These sessions are dependent upon available resources both Region 6 FTEs and appropriate training materials.

As noted in Priority 2 of EPA's 2021 Plan, "EPA's Regional and Program Offices will work with their partners, engage local stakeholders, and use a diversity of approaches to build adaptive capacity and encourage locally if relevant climate action". Other potential actions Region 6 will consider to advance climate adaptation in the region include:

- Develop a communications "toolkit" with materials providing consistent messaging on climate change, such as fact sheets, website language, social media updates, and talking points. The Region 6 External Affairs office is a valuable resource for communicating via social media platforms. Working with the Region 6 programs, relevant social media messaging in FY 2023 and FY 2024 will be climate adaptation related.
- Strengthen education and outreach on Region 6 climate adaptation efforts with other federal agencies through interagency groups, conferences, and in regular communications so they have greater awareness of the resources available for addressing climate change.
- Work collaboratively with The Department of Interior's South Central Climate Adaptation Science Center (CASC). Established in 2012, the South Central CASC is part of a federal network of nine Climate Adaptation Science Centers managed by the U.S. Geological Survey National Climate Adaptation Science Center (NCASC). The work of the South Central CASC is accomplished through a collaborative partnership among USGS scientists, resource management agencies, and a consortium of academic institutions from across the region. The South Central CASC is hosted by, and physically housed at, the University of Oklahoma (Norman, Oklahoma), where space is provided for university, tribal, and federal employees. The consortium has broad expertise in the physical, biological, natural, and social sciences to address impacts of climate change on land, water, fish and wildlife, ocean, coastal, and cultural resources. The academic consortium also includes six additional member institutions. The South Central CASC is considered a valuable source of training courses and materials.
- Promote awareness of climate change via engagements with linguistically isolated (Vietnamese and Spanish-speaking) communities along the Gulf Coast and US/Mexico border region.
- Identify agricultural practices that reduce vulnerability to agricultural systems and work collaboratively with the U.S. Department of Agriculture on education and outreach. Fostering partnerships with other federal agencies can result in supporting and funding larger scale projects with synergistic results.

Aspirational Region 6 training sessions with climate adaptation experts, academia, and guest speakers, and workshops will be hosted by Region 6, as resources permit, to further enhance the Region 6 knowledge base. These activities are dependent upon available resources.

5. EPA Region 6 Climate Metrics

EPA Region 6 will track, evaluate, and report its progress toward the metrics included in EPA’s FY22-26 Strategic Plan. Goal 1, “Tackle the Climate Crisis,” includes three objectives that reflect the priorities of Executive Order 14008 (Tackling the Climate Crisis at Home and Abroad, January 27, 2021). The three objectives are:

- Objective 1.1 Reduce Emissions that Cause Climate Change;
- Objective 1.2 Accelerate Resilience and Adaptation to Climate Change Impacts; and,
- Objective 3.0 Advance International and Subnational Climate Efforts.

This plan addresses components of Goal 1, Objective 1.2, “Tackle the Climate Crisis”. The Objective 1.2 is listed below along with its three long term performance goals and six annual performance goals. The six annual performance goals will each have an associated performance measure when finalized.

Objective 1.2: Accelerate Resilience and Adaptation to Climate Change Impacts—Deliver targeted assistance to increase the resilience of Tribes, states, territories, and communities to the impacts of climate change.

Three Long Term Performance Goals:

1. By September 30, 2026, implement all priority actions in EPA’s Climate Adaptation Action Plan and the 19 National Program and Regional Climate Adaptation Implementation Plans to account for the impacts of the changing climate on human health and the environment.
2. By September 30, 2026, assist XXX federally recognized Tribes to take action to anticipate, prepare for, adapt to, or recover from the impacts of climate change,
3. By September 30, 2026, assist XXX states, territories, local governments, and communities, especially communities which are underserved and disproportionately at risk from climate change

Six Annual Performance Goals

1. Number of priority actions completed in EPA’s Climate Adaptation Action Plan and Program and Regional Implementation Plans. 100 (FY22) 200 (FY23)
2. Number of EPA national program offices that have developed climate adaptation training for programs and staff. 4(FY22) 10(FY23)
3. Number of federally recognized Tribes supported by EPA to take action to anticipate, prepare for, adapt to, or recover from the impacts of climate change. TBD
4. Number of states, territories, local governments, and communities, especially communities which are underserved and disproportionately at risk from climate change, take action to anticipate, prepare for, adapt to, or recover from the impacts of climate change. TBD
5. Number of state, regional, Tribal, and/or territorial versions of the Climate Change Adaptation Resource Center (ARC-X), or similar, systems developed by universities with EPA support. 3 (FY22) 6 (FY23)
6. Hours of appropriate subject-matter experts deployed by EPA to help communities adapt to climate impacts, build long-term resilience, and support the most underserved and vulnerable communities after federally declared disasters. TBD

Note: The above measures are currently in draft form and final measures will be incorporated in this section of the plan. Specific actions or activities addressing the goals are included in section 3.0 of this plan.

EPA’s 2021 Climate Adaptation Action Plan includes Priority Action 4, “Using Measurement, Data and Evidence to Evaluate Performance”. EPA Region 6 has included metrics for the priority actions included in this plan.

Region 6 will evaluate its climate change adaptation actions on an ongoing basis to assess its progress towards meeting our targets and the Agency objectives and goals.

In recent years Region 6 has engaged in a number of activities related to climate adaptation and resilience that have achieved positive impacts. Appendix A includes examples of recent Region 6 projects.

6. EPA Region 6 Research and Program Needs

Strategic climate adaptation related research and program needs were solicited from and identified by the Region 6 program offices. Some of the R6 research needs identified to date include:

- evaluating solar power requirements to reduce reliance on power grids for operation of ambient air monitoring locations (ARD)
- social science research on behavior changes for the public around plastics and climate change (community based social marketing) (LCRD)
- map and climate predictive models for emerging and migrating public health pests and pest-borne diseases (LCRD)
- map and climate predictive models for emerging and migrating agricultural and food commodity pests (LCRD)
- reuse of produced water from oil production (WDD)
- evaluation of green infrastructure, low impact development processes and components to determine the efficiency of such systems as part of Hazard Mitigation and to support funding proposals that incorporate such systems into funding programs such as FEMA's Building Resilient Infrastructure and Communities (BRIC) (WDA)
- assessment and mapping tools (including EJ) to better identify areas/communities vulnerable to the potential impacts of climate change (e.g., storms, wildfires, drought, etc.) to better target resources (WDA)
- assessment and mapping tools to analyze potential areas to employ nature-based systems to mitigate flooding (WDA)
- analyze impacts and develop tools to incorporate climate adaptation and mitigation measures in coastal restoration projects (WDA)

In addition to research, other needs identified by the R6 programs include science, guidance, and tools are listed in Appendix B. The list includes a variety of media and program specific topics.

Region 6 Divisions will continue to identify climate adaptation related needs and will add to and update the list in the annual plan revision. Region 6 scientific and research needs are anticipated to evolve as climate adaptation becomes inherent in the programs. The Region 6 ORD liaison and the Region 6 RSC are two potential sources for input and other research ideas. The R6 Regional Science Liaison, in conjunction with Senior Regional Management, will participate in discussions with ORD's Deputy Associate Administrator for Science and National Research Program Directors, to identify and give input on Agency-wide climate adaptation research priorities.

7. Summary of Stakeholder Engagement

Note: This section will also include a summary of any stakeholder engagement that occurs between February 18, 2022, and when the plan becomes final (end of summer 2022).

As included in EPA's Climate Adaptation Action Plan, "EPA's Regional and Program Offices will work with their partners, engage local stakeholders, and use a diversity of approaches to build adaptive capacity and encourage locally relevant climate action." To leverage resources, foster involvement, and cultivate a synergistic response from vested stakeholders, Region 6 will continue to expand partnerships with citizens groups, public, non-governmental organizations, and private organizations and across municipal, industrial, energy and agricultural sectors. Climate change adaptation will not be inclusive, integrated, or effective unless these key relationships are developed, fostered, and mobilized into action through active EPA leadership.

Each Program and Regional Office Implementation Plan will support the development of adaptive capacity in the tribes and identify clear steps for ongoing collaboration with tribal governments where appropriate. These efforts will include increasing tribal capacity to identify vulnerabilities to adapt to a changing climate. EPA will work with tribes to support the effectiveness of national climate adaptation programs in Indian country. The Agency will support the development of climate science to meet priority research needs and decision-support tools useful to the tribes. EPA will also work with the tribes to identify and support the use of climate change relevant traditional ecological knowledge (TEK) in decision making. EPA recognizes that TEK, as an expression of key information that links historical, cultural, and local ecological conditions, may help tribes choose how they adapt to climate change while also protecting resources and resource uses important to their culture and livelihood. These efforts will leverage existing EPA partnerships with the tribes and tribal networks.

On a national level, EPA will work with other Federal agencies to collectively support tribes as they assess their vulnerabilities to climate change and plan and implement adaptation actions. Regional Offices will seek opportunities to work together with other Federal agencies' regional offices to provide strong support to tribes on their particular climate change challenges.

Region 6 remains committed to continue collaborating with our Tribal partners. Discussions with Tribes and regular updates on climate change adaptation actions are scheduled to occur at the Regional Tribal Operations Committee (RTOC) meetings. On December 2, 2021, EPA Region 6 initiated climate adaptation discussions at the Region 6 RTOC, where EPA shared overall climate adaptation plan priorities and process. Region 6 OCTEA plans to reach out to the Tribal Caucus to see if there is interest in forming a workgroup to assist with engagement and other activities to finalize this plan. The RTOC monthly calls and meetings will continue to be used for outreach. The May 2022 Region 6 Tribal Summit had a 1.5 hour breakout session block to discuss climate. Summit topics included a discussion on tribal needs, the draft 2022 Region 6 plan, an overview of EPA's Arc-X tool, and a presentation from the South Central Climate Adaptation Science Center. Region 6 also plans engage and work collaboratively with the Bureau of Indian Affairs Climate Center in 2022. USEPA began conducting National Tribal Consultations on May 16, 2022, and Region 6 is coordinating with EPA's American Indian Environmental Office (AIEO) as needed. OCTEA plans to conduct regional sessions with Tribal entities between February 2022 and before this plan is finalized.

A Region 6 Engagement Plan is under development and will be incorporated into the plan when finalized.

SPACE RESERVED FOR OTHER POTENTIAL STAKEHOLDER ENGAGEMENT

8. Conclusion

This Implementation Plan is a first step to ensure that climate adaptation becomes a routine part of the Region's activities and operations. This initial version of the plan will evolve as the Agency develops more tools and resources and further incorporates climate adaptation into program regulations, policies and actions.

EPA Region 6 and its states, Tribes, partners, and stakeholders continue to face many issues and vulnerabilities in adapting to the changing climate. There continues to be significant planning and implementation challenges. By recognizing the vulnerabilities; developing priority actions; assessing training, outreach, science, and research needs; and working together, EPA Region 6 is in a better position to effectively fulfill our mission of protecting human health and the environment and implementing climate adaptation actions.

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Appendices:

- A. Examples of Region 6 Work in Recent Years
- B. Region 6 Science, Research, Guidance and Tools Needed

Appendix A - Examples of Region 6 Work in Recent Years

Division	Title	Climate Risk	Description	On the ground impacts	EJ/Tr
WD	Incorporating Green Infrastructure into Hazard Mitigation Plans, Development of Flood Risk Prioritization tool Denton County, Texas	Flood	Region 6 staff conducted a stakeholder meeting with 26 communities in Denton County, Texas, to incorporate green infrastructure, open space, and nature-based systems into the Denton County Hazard Mitigation Plan. The project's purpose is to identify areas where these nature-based systems can align with areas identified a prone to flooding and utilize a GIS based tool to ease the County's Flood Administrator for opportunities to incorporate these systems as part of their flood management tool. Texas A&M AgriLife presented its Flood Risk Prioritization Tool to show possible locations of these practices to mitigate localized flooding. Contact: David Reazin	Flood Risk Prioritization tool will facilitate and can be used to determine appropriate use of GI and low-impact development practices as part of the county's flood management activities. It will facilitate the county pursue additional technical assistance for pilot demonstration projects.	N
WD	Natural Disaster Resilience in Wharton, El Campo, Liberty and Dayton, Texas	Flood	Assisted the communities of Wharton, El Campo, Liberty and Dayton, Texas, become more resilient to natural disasters. Utilized Region 6 FEMA Hurricane Harvey Disaster Relief funding for contract support to conduct workshops using EPA's Building Blocks – Building Flood Resilience for Riverine and Coastal Communities. These communities developed Action Plans that could be incorporated into their Hazard Mitigation Plan. Contact: David Reazin	Communities were provided with an action plan and roadmap to follow to implement and address community deficiencies identified in the Flood Resilience Checklist (part of the Smart Growth Building Blocks tool).	
WD	Natural Disaster Resilience in Logansport, Louisiana	Flood	Assisted the community of Logansport, Louisiana, become more resilient to natural disasters. Utilized contract support to conduct workshops using EPA's Building Blocks – Building Flood Resilience for Riverine and Coastal Communities. This community developed an Action Plan that could be incorporated into their Hazard Mitigation Plan. Contact: David Reazin	Logansport, Louisiana was provided with an action plan and roadmap to follow to implement and address community deficiencies identified in the Flood Resilience Checklist (part of the Smart Growth Building Blocks tool).	
WD	Building Flood Resilience for Water and WW Utilities - Houston, Beaumont, Austin, and San Antonio, Texas, and their surrounding communities	Flood	Assisted the communities of Houston, Beaumont, Austin, and San Antonio, Texas, and their surrounding communities, build resilience by conducting workshops utilizing EPA's Building Flood Resilience for Water and Wastewater Utilities. Contact: David Reazin		

WD	Natural Disaster Resilience in Wharton, El Campo, Liberty and Dayton, Texas	Flood	Assisted the communities of Wharton, El Campo, Liberty and Dayton, Texas, become more resilient to natural disasters. Utilized Region 6 FEMA Hurricane Harvey Disaster Relief funding for contract support to conduct workshops using EPA's Building Blocks – Building Flood Resilience for Riverine and Coastal Communities. These communities developed Action Plans that could be incorporated into their Hazard Mitigation Plan. Contact: David Reazin	Communities were provided with an action plan and roadmap to follow to implement and address community deficiencies identified in the Flood Resilience Checklist (part of the Smart Growth Building Blocks tool).	N
WD	CREAT at the Lafayette Water Utility in Louisiana	Various	Region 6 is currently conducting exercise using the Climate Resilience Evaluation and Awareness Tool (CREAT) with the Lafayette Water Utility in Louisiana. The exercise is part of EPA's Creating Resilient Water Utilities (CRWU) to better understand the climate risks impacting the utility and expands on Lafayette's America's Water Infrastructure Act of 2018 (AWIA) Risk and Resilience Assessment (RRA) as well as any adaptation projects that are focused on addressing climate risks. Contact: Suzanna Perea, Salvador Gandara	Utility that services 150,000 population with an additional 60,000 wholesale customers is able to reduce its risks and is able to prevent extensive damage to its assets.	
WD	Flood Resilience training for water and wastewater utilities in Louisiana	Flood	Provided Flood Resilience training for water and wastewater utilities in Louisiana to increase climate/flood resilience. Region 6 worked closely with EPA Headquarters and the state of Louisiana to provide two 2 ½ hour introductory sessions on the implementation of the 4-step process and the use of the guidance document. The effort resulted in over 100 attendees from Louisiana utilities. Contact: Salvador Gandara	Implementation of the self-assessment and 4-step tool can prepare water and wastewater utilities to address their vulnerabilities and mitigate their potential vulnerable assets/risks.	Y
WD	Building Flood Resilience in Houston, Beaumont, Austin, and San Antonio, Texas and their surrounding communities	Flood	Assisted the communities of Houston, Beaumont, Austin, and San Antonio, Texas, and their surrounding communities, build resilience by conducting workshops utilizing EPA's Building Flood Resilience for Water and Wastewater Utilities. Contact: David Reazin	Resilient water and wastewater utilities able to achieve quick recovery and/or mitigate their vulnerable assets to minimize future disaster impacts.	Y
WD	Caminada Headland Back Barrier Marsh Creation under the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) project	Extreme Weather	As the federal sponsor for the Caminada Headland Back Barrier Marsh Creation CWPPRA project, EPA Region 6 works with the State of Louisiana Coastal Protection and Restoration Authority (CPRA) to restore coastal Louisiana wetlands. In addition to providing valuable habitat, the Caminada project provides a measure of resiliency and storm protection to nearby critical infrastructure and coastal residents. Contact: Patty Taylor	Approximately 1,000 acres of coastal wetlands will be restored and serve as the first line of defense against storm surge.	

OLEM, ORCR	Training with states on EPA's Disaster Debris Removal Tool (DDRT)	Disaster Debris	Region 6 is conducting training with our states to build awareness of EPA's Disaster Debris Removal Tool (DDRT) and to demonstrate how it might be used after a natural disaster. The Disaster Debris Management Tool (DDRT) is an interactive mapping tool that provides information and locations for over 2,500 facilities capable of managing different types of disaster debris. The tool can be used by emergency planners at the federal, state, and local levels to effectively coordinate the proper recovery, recycling, and disposal of disaster debris in a way that complies with regulations, conserves disposal capacity, and minimizes long-term environmental impacts. The scope of the DDRT can also reach beyond disasters to include green site remediation and materials management technical assistance. Contact: Erik Christianson, Golam Mustafa		
LCRD	Training with states on EPA's Disaster Debris Removal Tool (DDRT)	Disaster Debris	Region 6 is conducting training with our states to build awareness of EPA's Disaster Debris Removal Tool (DDRT) and to demonstrate how it might be used after a natural disaster. The Disaster Debris Management Tool (DDRT) is an interactive mapping tool that provides information and locations for over 2,500 facilities capable of managing different types of disaster debris. The tool can be used by emergency planners at the federal, state, and local levels to effectively coordinate the proper recovery, recycling, and disposal of disaster debris in a way that complies with regulations, conserves disposal capacity, and minimizes long-term environmental impacts. The scope of the DDRT can also reach beyond disasters to include green site remediation and materials management technical assistance. Contact: Erik Christianson, Golam Mustafa	To date, the tool has not been used in Region 6 in the aftermath of a natural disaster, however the tool is readily available to all stakeholders with support from Region 6 staff.	

WD	National Estuary Program (NEPs) develop Climate Adaptation Strategies for their Comprehensive Conservation and Management Plans	Various	The three NEPs in Region 6 have or will soon complete Climate Adaptation Strategies for their Comprehensive Conservation and Management Plans to ensure their actions will be resilient to climate stressors, including Sea Level Rise. The NEPs have incorporated green infrastructure techniques into their actions to increase resiliency and reduce damages from storms. For instance, in the City of Clear Lake, Texas a golf course was being converted to a series of large, landscaped detention ponds when Hurricane Harvey struck. Despite not being completed, they functioned as designed and helped to keep floodwaters out of the homes in the neighborhoods they serve. Contact: Lisa Rickards	Many green infrastructure projects have been completed by the Region 6 NEPs. One to highlight is Exploration Green in Houston, TX. Exploration Green is a 178-acre park located at the former Clear Lake Golf Course that was turned into a stormwater wetland. The park now provides stormwater detention for 500 million gallons of water, protecting over 2,000 nearby homes and businesses. This area is an integrated, natural solution for catastrophic seasonal flooding, while also serving as a nature preserve and recreation area with six-miles of trails and two athletic fields for community use. The park saved over 150 homes from flooding during Hurricane Harvey and completely mitigated flooding during 2019 Tropical Storm Imelda.	
LCRD	Ouachita Parish, LA resiliency planning	Flood	EPA Region 6 and ORD partnered with the Ouachita Parish Police Jury in Louisiana to explore ways to enhance community resiliency in the face of historic flooding along the Ouachita River. Contact: Joyce Stubblefield	The report is being used by local parish, and state partners as a guide for understanding how their communities connect to ecosystems and how their decisions may impact ecosystem services and human well-being values.	Y
LCRD	Bernalillo County, NM Community Resilience and Heat Island Assistance	Heat	Provided technical assistance to Bernalillo County, NM through the Greening America's Communities program, partnered with the Heat Island Reduction Program, to create concept designs for two sites (Sunport Business Park and Prince Street Nexus). The design priorities focused on community amenities, mitigating stormwater, and mitigating heat island effect. Contact: Mike Kennedy		
ORA	Disaster Recovery Workshop on Pediatric Health, both in Louisiana and Houston, TX	Extreme Weather	Funded/facilitated a Disaster Recovery Workshop Series focused on pediatric health, both in Louisiana and Houston, TX. Contact: Ginny Vietti		
LCRD	Bernalillo County, NM Community Resilience and Heat Island Assistance	Heat	Provided technical assistance to Bernalillo County, NM through the Greening America's Communities program, partnered with the Heat Island Reduction Program, to create concept designs for two sites (Sunport Business Park and Prince Street Nexus). The design priorities focused on community amenities, mitigating stormwater, and mitigating heat island effect. Contact: Mike Kennedy		
ORA	Disaster Recovery Workshop on Pediatric Health, both in Louisiana and Houston, TX	Extreme Weather	Funded/facilitated a Disaster Recovery Workshop Series focused on pediatric health, both in Louisiana and Houston, TX. Contact: Ginny Vietti		Y
WD	Collaborating On REstoration (CORE): Youth and Community-Driven Environmental Stewardship in New Orleans East (LA)	Various	Train students and teachers in New Orleans East to design, implement and monitor small-scale restoration projects in their underserved communities with a focus on sustainability, accessibility, and community input. Contact: Randy Rush	Implementation of small-scale restoration projects with the potential to serve as model for other projects/communities.	Y

WD	Trinity River Conservation Corps	Heat	Cultivate community stewardship of riparian and wetland habitats in Dallas, Texas. Through sustained and increased outreach in historically marginalized neighborhoods, the scaling of existing environmental leadership programs for youth, will reduce threats to key habitats and improve environmental health along the Trinity River and its adjacent wetlands. Contact: Randy Rush	Long-term sustainability, health of riparian and wetland habitats along the Trinity River corridor and its adjacent wetlands.	Y
WD	Reforestation Pontchartrain Park New Orleans Project: Engaging Community in Restoration, Education and Stewardship	Various	Engage 600 community volunteers to plant 700 large, native trees in order to restore 457 acres of urban forest, mitigate stormwater runoff into Lake Pontchartrain, enhance habitat for urban bird species, and increase the Pontchartrain Park community's access to nature. Contact Randy Rush	Long-term improvements to Lake Pontchartrain water quality and stormwater runoff management. Improvement and community access to nature and green spaces.	

Appendix B – Region 6 Needs: Science, Research, Guidance and Tools

Division/Program	Region 6 Needs (not inclusive): Science, Research, Guidance, Tools	POC
ARD/APMGB	Evaluate solar power requirements to reduce reliance on power grids for operation of ambient air monitoring locations.	Fran Verhalen
ARD/SPIB	Evaluate impacts of climate change on current and future attainment and maintenance of the NAAQS (ozone, PM).	Guy Donaldson
LCRD	Map and climate predictive models for emerging and migrating public health pests and pest-borne diseases	Ken McPherson
LCRD	Map and climate predictive models for emerging and migrating agricultural and food commodity pests	Ken McPherson
LCRD	Social science research on behavior changes for the public around plastics and climate change (community based social marketing)	Renee Bellew
LCRD	Climate change map layers needed: storm surge, floodplains, sea level rise, current wildfires, predicted future burn zones, drought, extreme temperature events, precipitation changes	Melissa Smith
LCRD	Nationally available and consistent climate vulnerability and resiliency tools and information	Melissa Smith
LCRD	Guidance on incorporating climate change impacts into RCRA permitting and Corrective Action decisions	Melissa Smith
LCRD	Guidance on incorporating climate change impacts into PCB approvals	Melissa Smith
LCRD	Support for and training on Greener Cleanups	Melissa Smith
WDPQ	Establish regional stream monitoring network for long term climate change signature tracking/WQ criteria refinement	WDPQ monitoring staff
WDPQ	Establish biological assessment tools for intermittent streams/rivers. Such tools would allow state and tribal partners to better assess, protect and restore such systems. (Assumption is that climate change will result in currently perennial flowing systems becoming more intermittent)	WDPQ monitoring staff
WDAM/CWPPRA	Barrier islands are first line of defense against storm surge, the % wave reduction needs to be quantified	Patty Taylor
WDAM/CWPPRA	Marsh creation using dredged sediments offset rise in sea level however the projects are expensive. Placing fill unconfined (without containment) would save time and money. Research to develop a method to estimate sediments lost from unconfined placement.	Patty Taylor
WDAM/Nonpoint Source	Units related to heat such as joules per square meter per second (as in our temperature TMDLs) could be added to GRTS database.	WDAM NPS Staff
WDDD	Determine Environmental Justice and Climate Change considerations for addressing water scarcity issues	Danielle O'Neil, Lia Bobay (Tribal)
WDDG	Research to prevent/minimize flares, capture and reuse methane from oilfield production	Mathew Liu
WDDG	Research problems associated with reuse of produced water from oil production	Forrest Frederick
WDDG	Long term containment issues of salt beds/salt caverns for storage of CO2, hydrogen, ammonia, or other fluids associated with the "green" economy	Ken Johnson
WDPQ	Compendium of how states incorporate storm conditions, flow, and sampling into monitoring, assessment and water quality standards programs. A compendium could allow EPA to point states to the programs that are accomplishing inclusion of storm conditions into overall health of waterways.	WDPQ monitoring staff
WDA	Mapping tools to easily identify areas vulnerable to the potential impacts of climate change (e.g. storms, wildfires, drought, etc.) to better target resources	Claudia Hosch
WDA	Mapping tools to analyze potential areas to employ nature-based systems to mitigate flooding	Claudia Hosch
WDA	Develop tools to assess and incorporate climate adaptation and mitigation measures in coastal restoration projects	Claudia Hosch