Climate Preparedness and Resilience

POLICY STATEMENT

The primary and overarching policy document for USACE is the USACE Climate Preparedness and Resilience Policy Statement.

As the federal government's largest and oldest manager of water resources, the U.S. Army Corps of Engineers (USACE) has long been adapting its policies, programs, projects, planning, and operations to external stressors and variabilities. It is USACE's policy to integrate climate change preparedness and resilience planning and actions in all activities to enhance community resilience and ensure the effectiveness of our civil works and military support missions.

USACE recognizes the need to innovate and improve while learning more about how best to address the ever-evolving climate change impacts on our projects and supporting our partners in doing the same. USACE will continue to modernize our programs and policies to better assess risk, support climate-resilient investments, and develop tools that bolster climate preparedness, resilience planning, and engineering design. We will also strive to publish guidance that provides best practices for our teams while also providing others outside USACE valuable information and tools to improve their resilience building efforts.

As these activities are pursued, USACE will maintain a focus on underserved and overburdened communities, which are often the most impacted by climate change and lack adequate resources to address these multiplying challenges. USACE will provide opportunities for communities with environmental justice concerns and Tribal Nations to participate in climate adaptation decisions that impact their communities and actively gather and share knowledge of climate change impacts and resilience planning with these partners. We will also endeavor to incorporate Indigenous Knowledge to improve our project development and solutions. USACE will strive to be a leader in environmental justice across the government, using our resources and authorities to the maximum extent possible as we work with all communities, but especially underserved and overburdened ones, on comprehensive, equitable, and innovative solutions to their climate change challenges.

USACE will continue to work with other agencies and collaborators to develop science and engineering research and leverage the best scientific, economic, environmental, and social knowledge of our partners to develop solutions to better adapt to a changing climate. Furthermore, USACE will continue to use the Climate-Informed Science Approach for all civil works studies related to flood resilience and consider potential climate change impacts when undertaking long-term planning, setting priorities, and making decisions that affect its resources, projects, programs, policies, and operations.

USACE will leverage its research and development capabilities and work with partners to address specific knowledge gaps to reduce uncertainty in future climate conditions, while also embracing that uncertainty where it cannot be reduced. Efforts to modernize the planning process and be better prepared for this uncertainty through the Agency Specific Procedures under the Principles, Requirements and Guidelines will help ensure that USACE projects are as prepared as possible for the conditions of the future as well as those of the present. These policy and process improvements will help provide a better understanding of the risks and opportunities facing the nation's water resources infrastructure.

Among the significant impacts of climate change on USACE Civil Works missions, the onset of extreme drought across the nation has been an increasing trend over the past several decades, affecting temperature, precipitation, hydrology, vegetation, and the overall availability of water. Through the flood and coastal storm risk management missions, USACE will continue to address climate change impacts on the opposite end of the spectrum, working to reduce risk to communities from extreme precipitation events as well as regularly occurring flooding. USACE will work to apply its significant capabilities discussed in this plan to build climate change resilience across the nation and to reduce drought and flood impacts.

While the magnitude and complexity of climate change challenges are significant, USACE will continue to modernize our tools, guidance, and research while working with our partners to address impacts to all communities and adapt water resources infrastructure to future conditions using a watershed approach. Through these efforts, we are committed to support resilient, thriving communities across the nation.

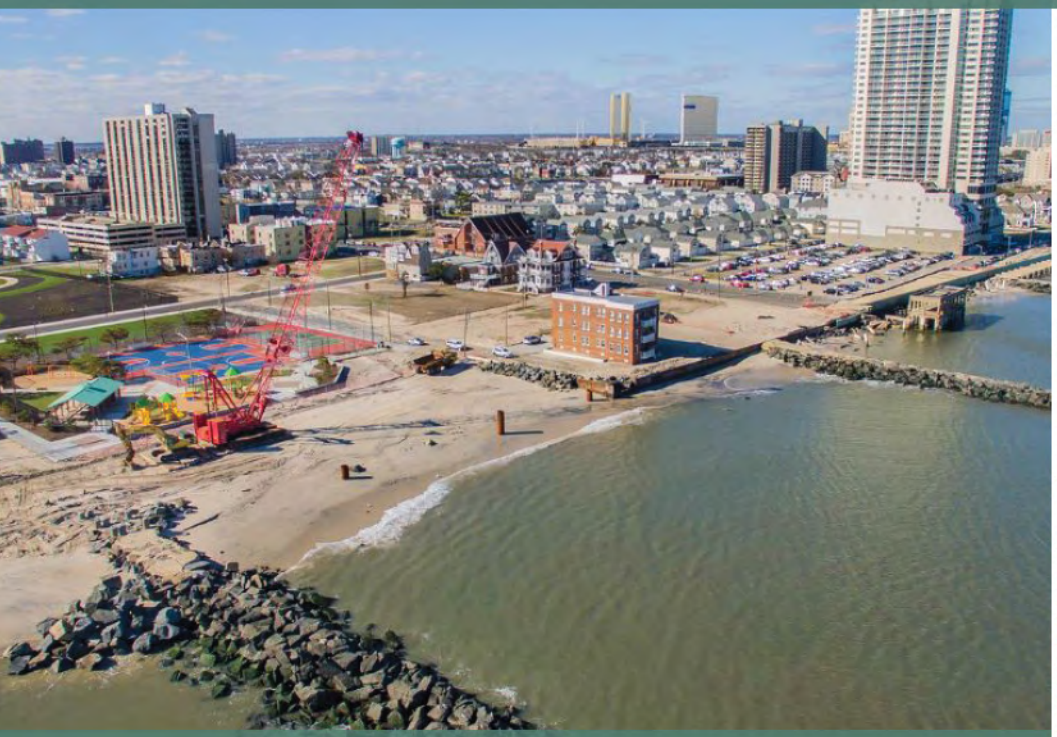
The Assistant Secretary of the Army for Civil Works is the Agency official responsible for ensuring implementation of all aspects of this policy related to USACE Civil Works, including Civil Works actions which support USACE Military Programs. This policy statement reaffirms and supersedes the commitment made by USACE in its 2021 Climate Preparedness and Resilience Policy Statement but does not alter or affect any existing duty or authority. This policy will be effective beginning June 2024, for all USACE missions, operations, programs, and projects and will remain in effect until it is amended, superseded, or revoked.

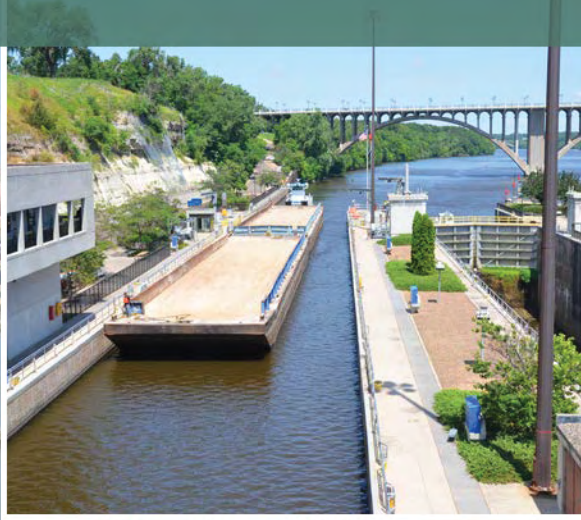
Signed,

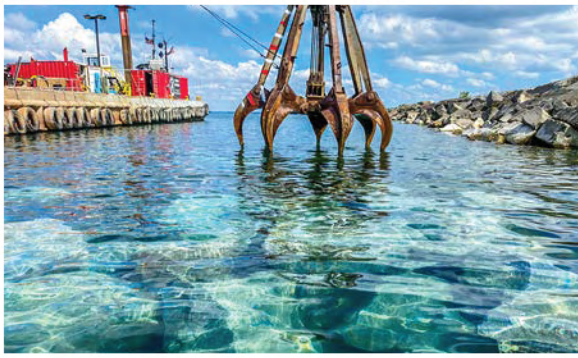
Michael Connor
Assistant Secretary of the Army for Civil Works

"USACE continues to implement adaptable and resilient solutions to changing conditions"

Mr. Edward E. Belk, SES, Director of Civil Works

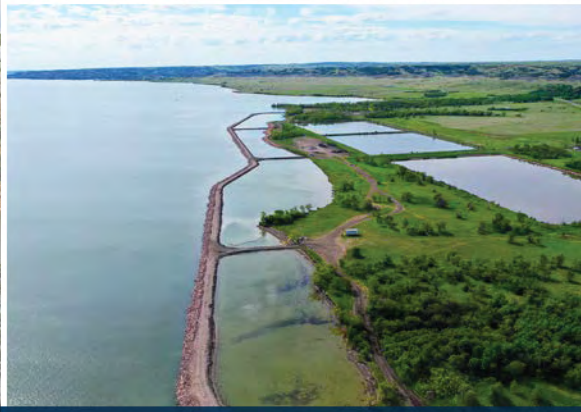






U.S. ARMY CORPS OF ENGINEERS

2024–2027 Climate Adaptation Plan



U.S. ARMY

USACE CLIMATE PREPAREDNESS AND RESILIENCE

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Introduction

This U.S. Army Corps of Engineers (USACE) Climate Adaptation Plan (CAP) for 2024–2027 reflects the numerous advancements in climate science and adaptation methodology since the publication of previous USACE climate action/adaptation plans in 2011, 2014, 2015, and 2021. As science continues to mature and new tools and methods become available, USACE continually updates its technical guidance, tools, and procedures to advance the agency's readiness to execute programs, projects, missions, and operations despite the uncertainties of climate change.

Building on the 2021 Climate Action Plan, USACE's preparation efforts regarding the effects of climate change fall into five categories:

- Modernizing USACE programs and policies to support climate-resilient investments
- Managing USACE lands and waters for climate preparedness and resilience (CPR)
- Enabling state, local, and tribal government preparedness
- Providing actionable climate information, tools, and projections
- Planning for climate change-related risks to USACE missions and operations

As required by the instructions from the White House Council on Environmental Quality (CEQ) regarding plan preparation, this plan differs from prior plans in providing much greater detail on the hazards facing USACE buildings and employees, whereas prior plans were more focused on climate risks to mission success and by extension, public well-being. Other areas of new or particular emphasis in this plan reflect aspects of climate change impact that most urgently threaten USACE missions and projects. The first and most impactful climate change effect on USACE projects is global mean sea level rise (SLR). As described in this plan, USACE will undertake the most significant overhaul of its sea level planning and design guidance since 2012 to coincide with the National Oceanic and Atmospheric Administration (NOAA) National Ocean Service's next National Tidal Datum Epoch publication, anticipated in 2026. This update aligns construction grades with tidal water levels and ensures that USACE's sea level scenarios reflect the latest actionable oceanographic, glaciologic, and climate science.

The other broad category of climate impact that affects most USACE water infrastructure projects involves changes to hydrometeorological processes leading to changes in riverine flow frequency. In 2023, USACE published new guidance on applying climate model outputs in project planning and design. In 2024 and beyond, USACE will build on this document to update all its technical guidance on climate-affected hydrology, providing engineers and planners with actionable information to inform water resources decision-making while avoiding hazardous over-precision. With each of these guidance updates, USACE will deliver associated training, tools, and resources to span the five categories of climate action listed above and ensure effective uptake of the latest actionable climate science and information.

Building on the successes of past plans, USACE will continue to work with nationwide partners and use its research and development (R&D) capabilities to address specific knowledge gaps to reduce uncertainty in future climate conditions, while also embracing that some risks are too uncertain to project with confidence. Simultaneously working to better understand climate change impacts and modernize planning approaches to reflect the deeply uncertain nature of a rapidly changing world ensures that USACE projects are prepared to perform under present and future conditions. This approach also helps senior leadership, stakeholders, and the public understand the risks and opportunities facing the nation's water resources infrastructure.

Section 1: Agency Profile

AGENCY PROFILE	
Mission	Deliver vital engineering solutions, in collaboration with our partners, to secure our nation, energize our economy, and reduce disaster risk.
Agency Climate Adaptation Official	Will Veatch, PhD, PH Lead, Climate Preparedness and Resilience Community of Practice
Agency Risk Officer	Pete G. Perez, PE, SES Chief, Engineering and Construction Division
Point of Public Contact for Environmental Justice	Jerica Richardson Environmental Justice Program Manager
Owned Buildings	22,611 buildings with total area of 63,065,000 square feet[1] (Source: USACE Enterprise Data Warehouse, 2024)
Leased Buildings	181 leased buildings with total area of 2,988,000 square feet[1] (Source: USACE Enterprise Data Warehouse, 2024)
Employees	• 37,933 federal employees as of 31 Mar 2024, of which 26,599 are assigned to Civil Works functions. • Contractor support highly variable by construction season and appropriations (Source: Defense Civilian Personnel Data System, 2024)
Federal Lands and Waters	• Lands and Waters: 12 million acres • Lakes and Reservoirs: 6 million acres • USACE Geospatial Open Data • USACE Reservoirs: Published 07 DEC 2016; Last Updated 18 JAN 2023 • Civil Works Land Data Migration – Sites: Published 29 MAR 2022; Last Updated 27 SEP 2023
Budget	$8.343B FY22 Enacted[2] (P.L. 117-103) $8.310B FY23 Enacted[3] (P.L. 117-328) $8.681B FY24 Enacted[4] (P.L. 118-42) $7.22B FY25 President's Budget (link)
Key Areas of Climate Adaptation Effort	• Flood and Coastal Storm Risk Management • Aquatic Ecosystem Restoration (AER) • Navigation • Water Supply • Hydropower All USACE Civil Works (CW) business lines are water-related and therefore must include climate adaptation considerations. Authorities typically derive from Water Resources Development Acts (WRDAs).

1 The portfolio of USACE owned or leased buildings shown here has been filtered to just those associated with the Civil Works program, which is the focus of this plan.

2 FY22 appropriations also included $22.81B in disaster relief supplemental appropriations and the Bipartisan Infrastructure Law.

3 FY23 appropriations also included $1.48B in disaster relief supplemental appropriations.

4 FY24 appropriation is net of $8.703B in appropriations and $22M in rescissions of unused, previously appropriated funds.

As the Federal Government's largest and oldest manager of water resources, USACE has a long history of delivering programs, projects, planning, and operations that support community resilience and incorporate principles of resilience and adaptability. All USACE Civil Works (CW) mission areas are water related and therefore affected by global climate change through its impacts on the hydrological cycle.[5] As a result, every USACE project faces exposure to climate hazards and supports the nation's preparedness to these hazards.

USACE has long applied resilience principles in project planning, such as allowing room for floodwaters in the Mississippi River and Tributaries project beginning in 1928. The relatively recent reconceptualization of resilience as a more formal design concept led USACE to develop Engineer Pamphlet (EP) 1100-1-2, U.S. Army Corps of Engineers Resilience Initiative Roadmap, in 2016. This roadmap details the USACE "prepare, absorb, recover, and adapt" framework for resilience and actions to align these principles with agency initiatives and programs. Similarly, adaptation has been a part of the agency's policies since at least 1986, when it issued its first guidance on planning for sea level change (SLC) as a CW policy memorandum. In the intervening years, these policies have been updated and expanded over time to reflect the state of science and engineering practices, Administration priorities, and Congressional authorities.

Beyond offering useful information to practitioners, policy and technical guidance documents also provide an enforcement mechanism for agencies to implement preparedness and resilience principles. The USACE CW review policy requires that study reports undergo district quality control review, agency technical review, and policy and legal compliance review to ensure that CPR policies are followed.

USACE's policy is to mainstream CPR into the agency's normal business processes, rather than treat it like a specialty area or a topic for supplementary analysis. Therefore, all USACE employees must have sufficient knowledge of climate preparedness to incorporate these considerations into their normal work activities. The climate preparedness and resilience community of practice (CPR CoP) provides a forum to leverage the diverse skills and expertise across the agency to share best practices, lessons learned, emerging science, and innovative methods with colleagues. CPR CoP subject matter experts (SMEs) develop guidance, deliver training, champion new tools and methods, provide technical review, and advise teams on applying preparedness and resilience analyses.

As an implementor of water resources infrastructure, USACE faces vulnerabilities from climate change impacts that extend beyond its own sites and employees to the preparedness of the nation. By planning adaptable, resilient projects that are prepared to perform despite the uncertainties of climate change, USACE helps ensure the nation's water risks and resources are managed according to the latest actionable climate science, so they continue to deliver value today and in the future.

5 USACE also faces another suite of hazards in its role as a provider of engineering and construction services to the Department of Defense and other partners. As those hazards are the subject of partner agencies' plans, this plan focuses on Civil Works.

Section 2: Risk Assessment

USACE used the Federal Climate Mapping for Resilience and Adaptation Application (Federal Mapping App) — which was developed for federal agencies by CEQ and NOAA to conduct a high-level screening of climate hazard exposure for federal facilities and personnel. In addition, USACE used the underlying data from the Department of Defense Climate Assessment Tool (DCAT) to assess extreme heat and precipitation exposure for Alaska and Hawaii and drought exposure for USACE reservoirs across the continental U.S. (CONUS), Alaska, and Hawaii. As a co-contributor to the development of DCAT, USACE is using much of the same exposure information in DCAT to develop a Civil Works Vulnerability Assessment Tool (CWVAT).

USACE assessed the exposure of its buildings; employees; and lands, waters, and cultural and natural resources to five climate hazards: extreme heat, extreme precipitation, SLR, flooding, and wildfire risk. USACE also assessed exposure to drought using several indicators developed for DCAT.

Climate Data Used in Agency Risk Assessment

HAZARD	DESCRIPTION	SCENARIO	GEOGRAPHIC COVERAGE
Extreme Heat	Measured as whether an asset is projected to be exposed to an increased number of days with temperatures exceeding the 99th percentile of daily maximum temperatures (calculated annually), calculated with reference to 1976-2005. Data are from high-resolution, downscaled climate model projections based on the Localized Constructed Analogs (LOCA) dataset prepared for the 4th National Climate Assessment.	Representative Concentration Pathway (RCP) 4.5	All 50 States
		RCP 8.5	All 50 States
Extreme Precipitation	Measured as whether an asset is projected to be exposed to an increased number of days with precipitation amounts exceeding the 99th percentile of daily maximum precipitation amounts (calculated annually), with reference to 1976-2005. Data are from high-resolution, downscaled climate model projections based on the LOCA dataset prepared for the 4th National Climate Assessment.	RCP 4.5	All 50 States
		RCP 8.5	All 50 States
Sea Level Rise (SLR)	Measured as whether an asset is within the inundation extents from the National Oceanic and Atmospheric Administration (NOAA) Coastal Digital Elevation Models and the 2022 Interagency Sea Level Rise Technical Report. Intermediate and Intermediate-High SLR scenarios used as proxies for RCP 4.5 and 8.5, respectively.	RCP 4.5	Continental U.S. (CONUS) and Puerto Rico (PR)
		RCP 8.5	CONUS and PR
Wildfire Risk	Measured as whether an asset is in a location is rated as high, very high, or extreme risk based on the U.S. Forest Service Wildfire Risk to Potential Structures (a data product of Wildfire Risk to Communities), which estimates the likelihood of structures being lost to wildfire based on the probability of a fire occurring in a location and likely fire intensity. Data reflects wildfires and other major disturbances as of 2014.	Historical	All 50 States

HAZARD	DESCRIPTION	SCENARIO	GEOGRAPHIC COVERAGE
Flooding	Measured as whether an asset is located within a 100-year floodplain (1% annual chance of flooding) or 500-year floodplain (0.2% annual chance of flooding), as mapped by the Federal Emergency Management Agency National Flood Hazard Layer.	Historical	All 50 States and PR
Drought	Measured based on indicators provided through the Federal Mapping App and the Defense Climate Assessment Tool (DCAT): • Consecutive Dry Days – measured as the mean annual maximum number of consecutive dry days with less than 0.01 inches of precipitation. • Mean Annual Streamflow – measured as the mean annual unregulated streamflow. • Aridity – measured as precipitation divided by potential evapotranspiration, also referred to as Aridity Index, represents average dryness. The threshold between humid and arid climates is 0.65, with lower values representing higher aridity. • Drought Year Frequency – measured as the average percentage of years in which the 12-month Standardized Precipitation Evapotranspiration Index (SPEI) is less than -1, which indicates moderate to extreme drought.	RCP 4.5	All 50 States
		RCP 8.5	

Exposure to extreme heat, extreme precipitation, SLR, and drought parameters were evaluated at mid- (2050) and late-century (2080) under two emissions scenarios, Representative Concentration Pathway (RCP) 4.5 and RCP 8.5. Exposure to flooding and wildfire risk were only evaluated for the present day due to data constraints.

Climate Scenarios Considered in Agency Risk Assessment

SCENARIO DESCRIPTOR		SUMMARY DESCRIPTION FROM 5TH NATIONAL CLIMATE ASSESSMENT
RCP 8.5	Very High Scenario	Among the scenarios described in the 5th National Climate Assessment, RCP 8.5 reflects the highest range of carbon dioxide (CO_2) emissions and no mitigation. Total annual global CO_2 emissions in 2100 are quadruple emissions in 2000. Population growth in 2100 doubles from 2000. This scenario includes fossil fuel development.
RCP 4.5	Intermediate Scenario	This scenario reflects reductions in CO_2 emissions from current levels. Total annual CO_2 emissions in 2100 are 46% less than the year 2000. Mitigation efforts include expanded renewable energy compared to 2000.

Additional details about the data used in this assessment are provided in Appendix A.

2A. Climate Hazard Exposures and Impacts Affecting Federal Buildings

INDICATORS OF EXPOSURE OF BUILDINGS TO CLIMATE HAZARDS	RCP 4.5 2050 (MID-CENTURY)	RCP 4.5 2080 (LATE CENTURY)	RCP 8.5 2050 (MID-CENTURY)	RCP 8.5 2080 (LATE CENTURY)
Extreme Heat: Percent of buildings projected to be exposed to more days with temperatures exceeding the 99th percentile of daily maximum temperatures (calculated annually) from 1976-2005.	100%	100%	100%	100%
Extreme Precipitation: Percent of buildings projected to be exposed to more days with precipitation amounts exceeding the 99th percentile of daily maximum precipitation amount (calculated annually) from 1976-2005.	98%	99%	99%	99%
SLR: Percent of buildings projected to be inundated by SLR.	0.1%	0.6%	0.1%	1%
	HIGH RISK	VERY HIGH RISK	EXTREME RISK	
Wildfire: Percent of buildings at highest risk to wildfire.	5%	0.4%	0.4%	
	100- OR 500- YEAR FLOODPLAIN			
Flooding: Percent of buildings located within floodplains.	15%			

USACE owns or leases almost 24,000 buildings at 1,575 sites across CONUS, Alaska, and Hawaii.[6] USACE leases a significant amount of space for its district, division, and headquarters offices from private landowners and other federal agencies, with 171 of these buildings leased from or through the General Services Administration (GSA). USACE intends to formally partner directly with GSA to address the vulnerabilities of these sites and facilities to incremental climate change and variability. A larger portion of the USACE building portfolio consists of buildings supporting USACE missions such as lock and dam projects and regulatory offices. The USACE building portfolio spans across the United States with a higher concentration of buildings east of the Mississippi River and along the West Coast.

Increased exposure of the USACE building portfolio to various climate change hazards is expected for both the RCP emission scenarios, RCP 4.5 and RCP 8.5, during the mid- and late-century time periods. Combining an emission scenario and a future time period is known as an epoch-scenario. Maps in Appendix A illustrate the national trends for various climate change hazards required for agency CAPs: extreme temperature, extreme precipitation, SLR, flooding, and wildfire at USACE buildings.

The risk assessment presented here relies primarily on climate projection information provided by CEQ, supplemented with information calculated and assessed using DCAT for Alaska and Hawaii. Mapping for Alaska and Hawaii is not included in the appendices to improve readability and reduce the length of the overall plan, but the risk assessment for Alaska and Hawaii are included in the summary tables using underlying climate projection data from DCAT. The terms extreme temperature and precipitation, as used throughout the main body of this CAP, should be interpreted as higher values of temperature and precipitation, as compared to present-day values. The effects of extreme low precipitation on drought and related impacts, such as reduced streamflow into and higher potential evapotranspiration on USACE reservoirs, are discussed in Section 2E and maps illustrating a risk assessment of drought are provided in Appendix C.

6 The portfolio of USACE owned or leased buildings shown here has been filtered to just those associated with the Civil Works program, which is the focus of this plan.

- Extreme heat is projected to increase across the U.S. By mid-century, larger increases are anticipated in the southern portion of the U.S., generally below the 37th latitude, for both emission scenarios. More significant increases are projected across most of CONUS during the late-century period, especially for the RCP 8.5 emission scenario.
- Extreme precipitation is projected to increase across the U.S., with higher percent changes expected in the Northwestern and Northeastern U.S. In addition to these areas, more significant increases in extreme precipitation are expected to extend into larger portions of the Western and Eastern U.S. for the RCP 8.5 emission scenario. Smaller increases in extreme precipitation are expected in the Great Plains region.
- While SLR, which includes sunny-day and nuisance flooding, poses a significant risk to government-owned buildings, USACE's exposure to SLR is relatively low nationally with less than one percent of all USACE buildings impacted by SLR for any epoch-scenario.
- Evaluating present-day one percent annual exceedance probability (1% AEP), or 100-year, and 0.2% AEP, or 500-year, floodplain maps indicates that USACE buildings are only moderately impacted by flooding. The 1% AEP and 0.2% AEP events designated by the Federal Emergency Management Agency (FEMA) impact 10.7% and 4.3% of USACE buildings, respectively. Most of the buildings in the USACE portfolio that fall within the FEMA 1% or 0.2% AEP floodplain are along major rivers such as the Ohio and Mississippi Rivers and help support USACE's water resources mission.
- Nationally, USACE buildings have low exposure to the threat of wildfire. Less than 6% of the buildings in USACE's portfolio fall within the high-risk wildfire category, and less than 0.5% of buildings are categorized as having a very high or extreme wildfire risk. The U.S. Forest Service developed the Wildfire Risk to Potential Structures to classify the potential threat of a hypothetical building to wildfire. The data, provided as percentiles of risk, are classified as Low, Moderate, High, Very High, and Extreme. The highest wildfire risk exists in the Western U.S. where the climate is more arid, and the wildland-urban interface creates an advantageous environment for wildfires. Fortunately, USACE does not own or operate in many buildings in the Western U.S. However, additional areas of higher risk exist in the Appalachia region and southern Florida. With climate change, wildfire risk is anticipated to increase across the nation.

USACE buildings represent the locations where USACE missions occur; therefore, maintaining a resilient building portfolio is critical to delivering USACE's water resources mission. Each climate hazard poses a unique risk to the operational capacity of the agency's real property with compounding impacts across multiple hazards, such as prolonged high temperatures increasing the potential for drought conditions that lead to a heightened risk of wildfire.

BUILDING COMPONENTS	IMPACTS
Building Operation	**Extreme Temperature** • High temperatures stress building mechanical systems, affecting performance and longevity of system components and increasing costs through greater energy demand and repair/replacement costs, respectively. • Extended exposure to high temperatures accelerates the deterioration of building materials such as roofing and window seals and the expansion and contraction of structural components, reducing overall structural integrity. • High temperatures also impact the performance and longevity of electrical systems and components such as computers and servers. **Extreme Precipitation, SLR, and Flooding** • SLR, extreme precipitation and increased flooding impact building plumbing systems, damage structures, disrupt utilities, and prohibit access to and evacuation from buildings. Increased frequency and duration of power outages also strain the existing emergency power sources currently designed for USACE buildings. • Heavy precipitation, increased flooding, increased temperatures, and SLR cause land degradation through erosion, permafrost thaw, and landslides. In turn, these impacts cause structural damage, damage to critical infrastructure, and accessibility issues due to disruption of transportation networks. • SLR contributes to saltwater intrusion to freshwater drinking sources, while prolonged extreme heat leads to drought, reducing water supply capacity. Both climate hazards compromise drinking water sources in different ways. • SLR and saltwater intrusion increase exposure of concrete, steel, and other materials critical to building operation to the corrosive effects of saltwater. **Wildfires** • Wildfires directly damage buildings and disrupt critical infrastructure like roads and utilities. • Wildfires also cause large-scale destruction of nearby communities that provide services to USACE buildings and employees.
Building Maintenance	**All Climate Hazards** • Flooding, SLR, heavy precipitation, and wildfires increase the costs for repair, replacement, and rehabilitation of federal buildings. • Extreme heat impacts the performance and lifespan of mechanical systems, electronic equipment, and other critical systems, requiring more frequent repair and maintenance. • Extreme precipitation and SLR impacts lead to water infiltration and deterioration of building components, requiring additional maintenance to buildings. • Flooding, SLR, and storm surge damage utilities and water/wastewater systems, resulting in service outages and increased maintenance costs. • Wildfires cause significant damage to buildings, either directly through partial or complete loss of a building or indirectly through smoke damage.

BUILDING COMPONENTS	IMPACTS
Health and Environment	**All Climate Hazards** • Flooding, SLR, heat and humidity, and extreme precipitation promote mold growth, posing health risks to USACE employees. • Flooding due to SLR and extreme precipitation generates electrical hazards that linger even after floodwater recedes. • Smoke from wildfires affects outdoor air quality and can permeate building HVAC systems, negatively impacting indoor air quality, as well. • Extreme precipitation, flooding, and SLR can contaminate potable water sources, spreading pathogens and increasing the risk of waterborne disease. • High temperatures lead to heat stress, threatening employee health and diminishing productivity.

2B. Climate Hazard Exposures and Impacts Affecting Federal Employees

INDICATORS OF EXPOSURE OF EMPLOYEES TO CLIMATE HAZARDS	RCP 4.5 2050	RCP 4.5 2080	RCP 8.5 2050	RCP 8.5 2080
Extreme Heat: Percent of employees duty-stationed in counties projected to be exposed to more days with temperatures exceeding the 99th percentile of daily maximum temperatures (calculated annually), from 1976-2005.[7]	100%	100%	100%	100%
Extreme Precipitation: Percent of employees duty-stationed in counties projected to be exposed to more days with precipitation amounts exceeding the 99th percentile of daily maximum precipitation amount (calculated annually), from 1976-2005.[8]	98%	99%	99%	99%
SLR: Percent of employees duty-stationed in counties projected to be inundated by SLR.[9]	17%	24%	26%	26%

	HIGH RISK	VERY HIGH RISK	EXTREME RISK
Wildfire: Percent of employees duty-stationed in counties at highest risk to wildfire.	7%	1%	3%

7 *Calculations for Alaska and Hawaii are derived from the DCAT.*
8 *Calculations for Alaska and Hawaii are derived from the DCAT.*
9 *SLR information was not available for Alaska and Hawaii.*

According to the Defense Civilian Personnel Data System (DCPDS), USACE employs 37,933 employees globally. For climate hazard exposure of federal employees, this risk assessment includes only the 26,599 Civil Works employees located in CONUS, Alaska, and Hawaii. Like the assessment of USACE buildings, analysts used DCAT to calculate and assess the projection information for temperature and precipitation impacting employees in Alaska and Hawaii. In addition, this risk assessment is based on the number of USACE employees residing in each county, per employee data stored in DCPDS.

While numerous employees work remotely, the vast majority live and work near the 1,575 buildings described in the building risk assessment. A majority of USACE employees supporting the Civil Works Program work in one of the 62 district, division, headquarters, laboratory, or centers of expertise, while the remainder work in regional or satellite offices. Beyond the USACE employees working in a traditional office space, a significant number work in the field.

The projected climate hazards anticipated for USACE's workforce are similar to those expected at USACE's building locations. The magnitude and characteristics of climate impacts to the USACE workforce vary regionally. All climate hazards have the potential to adversely affect the communities in which USACE employees live and work. USACE's skilled workforce is the agency's greatest asset, thus training and maintaining a resilient workforce is critical, as climate impacts threaten USACE's ability to reliably execute its missions.

Extreme Heat

For extreme heat, an indicator of extreme temperature days (annual days above the 99th percentile of daily maximum temperature) helps define an employee's exposure to high heat. All counties in CONUS, Alaska, and Hawaii are expected to see an increase in the indicator for future epoch-scenarios. The greatest percent increase in extreme temperature days is expected in southern Florida, the downstream reaches of the Mississippi River in Louisiana, and the southeastern portion of the Rio Grande River watershed in Texas; however, the number of extreme heat days are also expected to increase nationally.

Extreme heat will impact USACE employees in the workplace as described in Section 2A. Extreme heat poses an even greater risk to employees working in the field, as they are more likely to experience heat-related illnesses, reduced work productivity, and more extreme weather events. Outside of work activities, USACE employees may also encounter increased energy costs, heat stress, water scarcity, food insecurity, more prevalent spread of disease, and political unrest, which may stress the effectiveness of the USACE workforce and may more directly impact the USACE's remote workforce.

Extreme Precipitation and Flooding

For extreme precipitation, an indicator of extreme precipitation days (annual days above the 99th percentile of daily maximum precipitation) helps define an employee's exposure to extreme precipitation. Almost all counties in CONUS, Alaska, and Hawaii are expected to see an increase in this indicator for all future epoch-scenarios except for areas in the Southwest U.S., southern areas of the Great Plains, and southern Florida. The greatest percent increases in extreme precipitation are expected in the Pacific Northwest, the northern coast of California, and the Northeast, to include the Ohio River Basin and Great Lakes region.

Extreme precipitation will impact USACE employees in the workplace, in the field, and in the locations where they reside. USACE employees will face pluvial and fluvial flooding that can impact their homes and the critical infrastructure and transportation systems on which they rely. Employees may see the spread of waterborne diseases and contamination to public water supply sources. Employees may also experience financial burdens including repairs for and protection against extreme precipitation events and increases in insurance needs and premiums.

Flood risk is closely correlated with extreme precipitation. The most critical impact of flooding on USACE employees is the potential for loss of life and damage to personal assets. Flooding also increases financial burdens through the need and cost of insurance premiums as well as the costs to mitigate against flood risk. Like the other climate hazards, flooding poses threats to public health, emergency services, critical infrastructure, and housing/urban planning. Although this assessment uses historical floodplain information, increases in the intensity and frequency of future extreme storm events, coupled with SLR, will likely cause increases in future flood risk in some parts of the country.

SLR

Data required to evaluate a USACE employee's risk to SLR is found in the 2022 Interagency Sea Level Rise Technical Report. As illustrated in Table 2B of this plan, about 20-25% of the counties where USACE employees reside are impacted by SLR. While the counties along the Gulf and Eastern coastline will be most impacted by SLR, USACE employees may still be vulnerable to coastal hazards and flood risks, which are magnified and intensified by SLR. USACE employees will likely experience nuisance flooding from increased SLR and more extreme coastal storm events.

SLR poses many threats including strains on the emergency response system, zoning challenges, utility service vulnerabilities and disruption, and in extreme cases, population displacement. The analysis of the impact of SLR on USACE personnel for this assessment assumes that all employees within a county are vulnerable to SLR if the data indicates that any portion of the county could be impacted by SLR. Although employees may be indirectly impacted by SLR, the estimated number of impacted employees is most likely overestimated in this assessment.

Wildfire

Wildfire risk, representing risk to U.S. structures, is based on vegetation and wildland fuels data from LANDFIRE 2014 (version 1.4.0), which reflects landscape conditions as of the end of 2014. Wildfire risk is highest in the Western U.S., areas of Appalachia, and southern Florida.

Wildfire poses a catastrophic risk to USACE employees through loss of life and asset destruction (land and property). Wildfires also degrade air quality and pose a quality-of-life risk to employees. In addition to these direct risks, debris generated by wildfires damages water resources infrastructure, increases pollutant loads, and increases rainfall-runoff due to land cover and soil characteristic changes. Watershed hydrology could be permanently impacted by wildfire due to its catastrophic destruction, which could result in dramatic changes for employees in these watersheds.

Maps in Appendix B illustrate the national trends for various climate change hazards including extreme temperature, extreme precipitation, SLR, flooding, and wildfire for USACE personnel. Please note that Alaska and Hawaii are not included in the maps in Appendixes A, B, and C to improve readability, but the risk assessment for Alaska and Hawaii are included in the summary tables using underlying climate projection data from DCAT.

2C. Climate Hazard Exposures and Impacts Affecting Federal Lands, Waters and Associated Cultural Resources

FEDERAL ASSET	CURRENT CLIMATE HAZARD IMPACT OR EXPOSURE	FUTURE CLIMATE HAZARD IMPACT OR EXPOSURE
USACE Lakes and Reservoirs (approximately 6 million acres)	**Extreme Heat** • Although extreme temperatures pose challenges to USACE mission areas, USACE currently manages its waters effectively against the impacts of higher temperatures through application of laws, policy, and guidance. • Shifts in temperature caused by extreme heat change the timing of thermal stratification and lake turnover. Turnover is critical to dissolved oxygen (DO) levels in lakes. In turn, DO impacts the distribution and behavior of aquatic organisms. • USACE effectively manages its lakes and reservoirs based on Congressionally authorized purposes of the lakes, such as hydropower, water supply, and recreation. During drought and high heat periods, increased evaporation rates and higher risk of drought cause declining water levels, presenting challenges to these authorized purposes. • USACE currently manages the impacts of harmful algal blooms, which can be worsened by increased water temperatures. These blooms create public health issues and threaten terrestrial and aquatic ecosystem health. • Increased temperatures release more nutrients from soils via nitrification, mineralization, carbon from organic matter, and phosphorous release. This degrades water quality in lakes and reservoirs.	**Extreme Heat** • Increasing temperature trends can catastrophically impact thermal stratification and lake turnover characteristics. Higher temperatures lengthen the stratification period and make thermal mixing more difficult, both of which are critical characteristics of a healthy lake ecosystem. Stratification changes could lower DO levels at deeper depths, which provide refuge for many lake species during heat waves and cause trophic mismatch between lake species with symbiotic relationships. • Increasing temperatures, especially the magnitude, frequency, and duration of extreme temperatures, pose a major threat to USACE's water management missions due to higher evaporation rates and risk of drought. • Further reduction of DO levels in lakes could irreversibly impact fish and other aquatic organisms. • Higher temperatures increase the risk and magnitude of harmful algal blooms, creating greater public safety risks and placing additional strain on water management missions. • Increased temperature poses an even greater challenge to USACE's water management missions related to maintaining water quality in its lakes and reservoirs. • Increasing temperatures can shift seasonality, necessitate changes in reservoir management rules, and cause greater river forecast uncertainty. These effects may create challenges to water management in terms of maintaining water supply and managing flood response (e.g., time-based reliability of operations, reliance on historic behavior to inform water management). • Shifts in the growing season due to temperature and precipitation changes can result in longer periods of exposed soil, which may increase sediment loads to lakes in agricultural watersheds.

FEDERAL ASSET	CURRENT CLIMATE HAZARD IMPACT OR EXPOSURE	FUTURE CLIMATE HAZARD IMPACT OR EXPOSURE
USACE Lakes and Reservoirs (approximately 6 million acres), cont.	**Extreme Precipitation** • Although extreme precipitation poses challenges to USACE mission areas, USACE currently manages its waters effectively against the impacts of extreme precipitation through application of laws, policy, and guidance. • Extreme precipitation poses challenges to USACE's water management role. Climate change increases uncertainty of future frequency, intensity, and duration of extreme precipitation events, as well as droughts. • Higher precipitation changes lake levels more rapidly, leading to increased shoreline erosion. • Storm events increase sediment loads to lakes from streambank and bed erosion, reducing available lake storage. • Increased inflow of contaminants (e.g., nitrogen and phosphorus loads) and other hazardous materials to lakes impacts public health.	**Extreme Precipitation** • Climate change increases uncertainty of future frequency, intensity, and duration of extreme precipitation events, as well as droughts. • With more extreme storm events, rapid changes in lake levels could lead to even more significant shoreline erosion. • Increased sediment loads to reservoirs are expected due to the erosion from extreme precipitation events. Additional sediment further reduces available lake storage and undermines the Congressionally authorized purposes of the lakes, such as water supply and flood risk management (FRM). • More intense and frequent storm events could further increase the inflow of contaminants (e.g., nitrogen and phosphorus loads) and other hazardous materials to lakes, impacting public health.
	SLR • SLR poses various challenges to USACE's waters and waterways; however, these challenges are effectively mitigated through water management policies, guidance, and approaches. • USACE currently faces challenges with saltwater intrusion impacts to lake water quality, water supply sources, and mechanical components associated with USACE lakes, especially as drought conditions lower water levels along rivers flowing into the ocean.	**SLR** • Increased SLR could impact critical infrastructure, like roads, buildings, and utilities, directly or indirectly associated with USACE lakes. • SLR, coupled with other coastal hazards like coastal storms and flooding, could create effects further inland, posing even greater impacts to infrastructure that historically has not experienced them. • Greater saltwater intrusion impacts are expected due to SLR, especially as other adverse conditions from climate change increase, such as drought. • Increasing SLR could reduce wetlands both along the coast and associated with coastal lakes.

FEDERAL ASSET	CURRENT CLIMATE HAZARD IMPACT OR EXPOSURE	FUTURE CLIMATE HAZARD IMPACT OR EXPOSURE
USACE Lakes and Reservoirs (approximately 6 million acres), cont.	**Flooding** • Flooding is a major threat to USACE missions. While USACE effectively manages flooding through its water management approaches, USACE's FRM business line specifically focuses on managing flood risk and its associated consequences. • Increased inflow of nutrients from increased flooding contributes to the occurrence of harmful algal blooms. • Intense flooding results in higher influxes of sediments to USACE lakes. • Impacts to the thermal stratification of lakes affect water temperatures, nutrients, and oxygen levels. • Impacts of flooding are especially amplified in coastal areas where compound flooding related to pluvial, fluvial, and coastal flooding commonly occurs coincidently.	**Flooding** • Increased flooding poses even greater life safety risks and economic consequences. • A higher frequency of flood events impacting the Congressionally authorized purposes increases stress on water management staff. • Increased impacts to mechanical systems at USACE lakes and reservoirs results in the need for additional maintenance and potentially reduces the lifespan of these systems. • Increased flooding also poses risks to non-federal lands within the flood control (and surcharge) pool of USACE reservoirs, impacting operations at these projects. • An increased inflow of nutrients from increased flooding contributes to the more frequent occurrence of harmful algal blooms. • Intense flooding causes even higher influxes of sediments to USACE lakes, impacting the Congressionally authorized purposes and expanding the USACE dredging program. • Recurrent or prolonged flooding events have long-term effects on the sedimentation and nutrient dynamics of the lake, negatively impacting habitat availability and overall lake ecosystems. • Greater impacts to thermal stratification of lakes can irreversibly damage ecosystems and environmental health. • Impacts of coastal storm events that cause flooding are expected to increase, especially in combination with SLR and extreme precipitation.

FEDERAL ASSET	CURRENT CLIMATE HAZARD IMPACT OR EXPOSURE	FUTURE CLIMATE HAZARD IMPACT OR EXPOSURE
USACE Lakes and Reservoirs (approximately 6 million acres), cont.	**Wildfire** • Wildfire reduces the vegetation cover and alters the soil characteristics in the upland watershed, impacting inflows to USACE lakes. • Loss of vegetation cover from the landscape increases erosion in the watershed, resulting in higher sedimentation and debris flows into USACE lakes. • Greater areas of exposed soil introduce higher concentrations of nutrients to lakes. • Reduced riparian vegetation lowers its benefits: filtering pollutant inflow, shading water, and reducing shoreline erosion. • Wildfire alters downstream flood risk at the decadal scale and affects the performance of downstream FRM infrastructure.	**Wildfire** • Anthropogenic climate change is projected to increase the area, frequency, and severity of fire weather. • Climates could no longer be suitable to re-establish historical vegetation communities. Conifer forests that burn with high intensity in many areas could re-establish as grassland or shrubland, with long-term changes to watershed hydrology. • Rising temperatures contribute to more intense drought and fire weather and increase the portion of the year when wildfires occur. In many parts of the West and boreal North America, fire weather and devastating wildfires are already no longer confined to a single season. • More frequent, larger, and more intense wildfires will further alter downstream flood risk and affect the performance of downstream FRM infrastructure. • Loss of vegetation cover from the landscape increases erosion in the watershed, resulting in higher sedimentation and debris flows into USACE lakes. • Greater areas of exposed soil introduce higher concentrations of nutrients to lakes. • Reduced riparian vegetation lowers its benefits: filtering pollutant inflow, shading water, and reducing shoreline erosion.

FEDERAL ASSET	CURRENT CLIMATE HAZARD IMPACT OR EXPOSURE	FUTURE CLIMATE HAZARD IMPACT OR EXPOSURE
USACE Lands (approximately 12 million acres)	**Extreme Heat** • High heat poses the risk of heat-related illnesses for staff and visitors to USACE-owned lands. • Heat detrimentally impacts staff performing field work, construction (e.g., adverse weather days), and operations and maintenance (O&M) supporting USACE missions. • Increases in the number of visitors to USACE recreation areas typically occur during high-temperature periods, due to the water-related nature of USACE's recreation areas. Increased visitation causes more drownings and swift water rescues. • Extreme heat increases the likelihood of drought.	**Extreme Heat** • High heat increases the risk of heat-related illnesses for staff and visitors to USACE-owned lands. • Heat increases the detrimental impacts to staff performing field work, construction (e.g., adverse weather days), and O&M supporting USACE missions. • Increased temperatures could drive more visitors to USACE recreation areas, resulting in higher life safety risks and the need for additional staff to maintain recreation services. • Extremely high temperatures beyond a certain threshold could reduce the number of visitors experiencing the benefits of USACE recreation areas. • Heat detrimentally impacts ecosystem health and services on USACE lands. • Extreme heat increases the likelihood of drought, which necessitates modifying USACE land management.
	Extreme Precipitation • Current flooding, especially pluvial and coastal compound flooding, damages structures, risks life safety, and stresses sewer/stormwater systems on USACE lands. • Extreme precipitation detrimentally impacts O&M, as well as construction (e.g., increases in adverse weather days) conducted on USACE lands.	**Extreme Precipitation** • Increased flooding, especially pluvial and coastal compound flooding, damages structures, risks life safety, and stresses sewer/stormwater systems on USACE lands. • Increases in extreme precipitation events could detrimentally impact O&M, as well as construction (e.g., increases in adverse weather days) conducted on USACE lands.
	SLR • SLR creates nuisance and event-based flooding issues, which USACE manages through its coastal storm risk management (CSRM) business line. • Shoreline erosion threatens USACE lands. • Saltwater intrusion and increased flooding affect the ecosystem on USACE lands.	**SLR** • SLR could significantly increase nuisance and event-based flooding of USACE lands, impacting mission and recreation opportunities. Land near the coastlines is at risk of being permanently inundated. • SLR, coupled with other coastal hazards like coastal storms and flooding, could create impacts further inland, posing an even greater impact to USACE lands. • SLR reduces the effectiveness of breakwaters and jetties, possibly requiring their modification. • Increased shoreline erosion threatens USACE lands. • Saltwater intrusion and increased flooding could further affect ecosystem services on USACE lands.

FEDERAL ASSET	CURRENT CLIMATE HAZARD IMPACT OR EXPOSURE	FUTURE CLIMATE HAZARD IMPACT OR EXPOSURE
USACE Lands (approximately 12 million acres), cont.	**Flooding** • Damage to USACE assets requires repair, replacement, rehabilitation, and/or modification. • Flooding threatens the performance of USACE assets, such as dikes, flood control structures, and recreation facilities that support USACE missions. • Sedimentation from floods impacts the effectiveness of USACE projects such as locks, dams, and diversion channels.	**Flooding** • Increased flooding poses life safety risks and causes more costly damages to USACE lands, projects, and structures. • Increases in flood magnitude and frequency could pose an even greater threat to USACE assets, resulting in greater needs for repair, replacement, rehabilitation, and/or modification. • Increases in flooding continue to threaten the performance of USACE assets, such as dikes, flood control structures, and recreation facilities that support USACE missions, potentially requiring investment in adaptation to improve the performance of these assets. • Increased flooding also poses risks to non-federal lands within the flood control (and surcharge) pool of USACE reservoirs, impacting operations at these projects. • Increased sedimentation impacts the effectiveness of USACE projects such as locks, dams, and diversion channels.
	Wildfire • Fires unnaturally change vegetation cover and soil characteristics on USACE lands, potentially increasing flooding and erosion. • Wildfires destroy USACE lands and threaten the purposes of those lands, including ecosystems located in recreation, natural, and wildlife areas. • Wildfires threaten the lives of visitors to the vast recreation areas managed by USACE.	**Wildfire** • Anthropogenic climate change is projected to increase the area, frequency, and severity of wildfires. • Increased wildfire risk catastrophically damages USACE lands, potentially significantly enough to limit the recovery of the pre-fire land cover. • Wildfires threaten the lives of visitors to the vast recreation areas managed by USACE. • Climates may no longer be suitable to re-establish historical vegetation communities. Conifer forests that burn with high intensity in many areas could re-establish as grassland or shrubland, with attendant long-term changes to watershed hydrology.

FEDERAL ASSET	CURRENT CLIMATE HAZARD IMPACT OR EXPOSURE	FUTURE CLIMATE HAZARD IMPACT OR EXPOSURE
Navigable Waterways and Harbors (191 lock sites, 25,000 miles of Waterways and 926 coastal, Great Lakes and inland harbors)	**Extreme Heat** • High heat poses the risk of heat-related illnesses for staff. • O&M staff, who are more commonly in the field, are impacted by the effects of extreme heat. • Heat detrimentally impacts ecosystem health and services within USACE harbors and waterways by stressing the current conditions necessary for ecosystem health. • Drought and lower water levels undermine USACE's navigation mission by necessitating load lightening and creating more frequent and longer wait times for barge traffic.	**Extreme Heat** • High heat increases the risk of heat-related illnesses for staff. • Heat increases the detrimental impacts to staff performing O&M, potentially necessitating changes to current standard procedures for field employees. • Heat increases the detrimental impacts to ecosystem health and services within USACE harbors and waterways, potentially resulting in irreversible changes to the current ecosystem. • An increased likelihood of drought and more frequent lower water levels undermine USACE's navigation mission by necessitating load lightening and creating more frequent and longer wait times for barge traffic.
	Extreme Precipitation • Flooding, especially pluvial and coastal compound flooding, damages structures and disrupts navigation. • Extreme precipitation detrimentally impacts O&M by creating more dangerous conditions in the field. • Resulting flooding increases sediment loads and erosion. • High/fast water causes navigation hazards and/or waterway closures and lock stoppages/delays.	**Extreme Precipitation** • Increased risk of flooding, especially pluvial and coastal compound flooding, damages structures and disrupts navigation and lockages. • Extreme precipitation causes more detrimental impacts to O&M. • Sediment loads and erosion significantly increase, placing added stress on USACE dredge operations. • Increases in high/fast water causes navigation hazards and/or waterway closures and lock stoppages/delays.
	SLR • Increased nuisance and event-based flooding disrupts and impacts USACE navigable waterways by creating more dangerous flow conditions and potentially reducing bridge clearances in coastal areas.	**SLR** • Increased nuisance and event-based flooding disrupts and impacts USACE navigable waterways. • SLR, in combination with other coastal hazards like storm surge, extreme precipitation, and flooding, could create adverse navigation conditions further inland.
	Flooding • Damage to USACE navigation infrastructure requires repair, replacement, rehabilitation, or modification. • Increased sedimentation impacts the effectiveness of USACE projects, such as locks and dams, and places additional stress on the USACE dredge fleet.	**Flooding** • More extensive and costly damage to USACE navigation infrastructure requires repair, replacement, rehabilitation, or modification. • Increased flooding threatens the future performance of USACE navigation structures, dredge operations and dredge disposal areas. • More severe sedimentation impacts the effectiveness of USACE projects, such as locks and dams, and places additional stress on the USACE dredge fleet.

FEDERAL ASSET	CURRENT CLIMATE HAZARD IMPACT OR EXPOSURE	FUTURE CLIMATE HAZARD IMPACT OR EXPOSURE
Navigable Waterways and Harbors (191 lock sites, 25,000 miles of Waterways and 926 coastal, Great Lakes and inland harbors), cont.	**Wildfire** • Unnaturally changed vegetation cover and soil characteristics on USACE lands increase flooding, debris flow, and/or erosion.	**Wildfire** • More extensively changed vegetation cover and soil characteristics on USACE lands increase flooding, debris flow, and/or erosion. • Wildfire can alter downstream flood conditions at the decadal scale and affect the performance of downstream navigation infrastructure.
Archaeological Sites	**Extreme Heat** • Temperature impacts site and artifact stability because of increased exposure, shifts in soil characteristics, and changes in biochemical processes and biota. • Heat stress is a threat to archaeological professionals and USACE employees responsible for site maintenance, preservation, and identification. • Drought conditions expose normally flooded sites which could increase rates of decay and exposure to human interference.	**Extreme Heat** • Increased extreme heat impacts site and artifact stability because of increased exposure, shifts in soil characteristics, and changes in biochemical processes and biota. • Increased future temperatures accelerate degradation of exposed artifacts, which become brittle and crumble under increased temperature and drier conditions. • Heat stress poses an elevated threat to archaeological professionals and USACE employees responsible for site maintenance, preservation, and identification. • Increases in the frequency and duration of drought conditions expose sites to more extreme temperature impacts, especially normally flooded sites.
	Extreme Precipitation • Extreme precipitation intensity and frequency results in erosion, which damages sites, moves artifacts, and disrupts context. • Extreme precipitation can expose new sites, increasing the risks of natural exposure and theft or vandalism. • Increased lake pool levels flood terrestrial sites, requiring a deviation from normal operating procedures.	**Extreme Precipitation** • Increases in extreme precipitation intensity and frequency increase erosion, which damages sites, moves artifacts, and disrupts context. • Extreme precipitation can expose even more new sites, increasing the risks of natural exposure, theft, or vandalism. • Increased lake pool levels more frequently flood terrestrial sites, requiring a deviation from normal operating procedures.
	SLR • Coastal storm hazards impact sites through nuisance and event-based flooding and erosion. • Saltwater intrusion, a variable connected to SLR, exposes artifacts to corrosion (of particular concern for metal artifacts). • Sea water impacts shallow-water or land-water interface sites which could increase rates of decay and exposure to human interference.	**SLR** • Increased shoreline erosion puts sites at greater risk of damage. • SLR, in combination with coastal storm hazards, could further impact sites through nuisance and event-based flooding. Some sites near the coastline are at risk of being permanently inundated. • Increased ocean acidification and saltwater intrusion, variables connected to SLR, expose artifacts to higher corrosion rates (of particular concern for metal artifacts). • Shallow-water or land-water interface sites become underwater sites.

FEDERAL ASSET	CURRENT CLIMATE HAZARD IMPACT OR EXPOSURE	FUTURE CLIMATE HAZARD IMPACT OR EXPOSURE
Archaeological Sites, cont.	**Flooding** • Inundation of terrestrial sites cause damage, disruption (loss of context), and destruction of sites and artifacts. Flooding also causes mold growth and uproots artifacts. • Flooding reduces access to sites by archaeological professionals and tribes. Tribal access could be impeded for sacred sites or locations associated with sacred sites. • Floods pose life safety risks to archaeological professionals.	**Flooding** • Increased inundation of terrestrial sites causes greater and more prevalent damage, disruption (loss of context), and destruction of sites and artifacts. Flooding also causes mold growth and uproots artifacts. • Reduced access to sites by archaeological professionals and tribes is more frequent and of longer duration. Tribal access could be impeded for sacred sites or locations associated with sacred sites. • Increased flooding increases life safety risks to archaeological professionals.
	Wildfire • Fire irreparably damages sites and archaeological artifacts. • Fire poses life safety risks to archaeological professionals.	**Wildfire** • Anthropogenic climate change is projected to increase the area, frequency, and severity of wildfires, more significantly impacting archaeological sites. • Fires cause more expansive irreparable damage to sites and archaeological artifacts. • Increased wildfires increase life safety risks to archaeological professionals.
Sacred Sites and Traditional Cultural Places	**Extreme Heat** • Temperature impacts site and artifact stability because of increased exposure, shifts in soil characteristics, and changes in biochemical processes and biota. • Heat stress poses a threat to archaeological professionals and USACE employees responsible for site maintenance, preservation, and identification. • Drought conditions expose normally flooded sites which could increase rates of decay and exposure to human interference.	**Extreme Heat** • Increased extreme heat further impacts site and artifact stability because of increased exposure, shifts in soil characteristics, and changes in biochemical processes and biota. • Increased future temperatures accelerate degradation to exposed artifacts, which become brittle and crumble under increased temperature and drier conditions. • Heat stress poses an elevated threat to archaeological professionals and USACE employees responsible for site maintenance, preservation, and identification. • Increases in the frequency and duration of drought conditions expose sites to more extreme temperature impacts, especially normally flooded sites.

FEDERAL ASSET	CURRENT CLIMATE HAZARD IMPACT OR EXPOSURE	FUTURE CLIMATE HAZARD IMPACT OR EXPOSURE
Sacred Sites and Traditional Cultural Places, cont.	**Extreme Precipitation** • Extreme precipitation intensity and frequency results in erosion, which damages sites, moves artifacts, and disrupts context. • Extreme precipitation exposes new sites, increasing the risk of natural exposure, as well as theft, vandalism, and human interference. • Increased lake pool levels flood terrestrial sites, requiring a deviation from normal operating procedures.	**Extreme Precipitation** • Increases in extreme precipitation intensity and frequency increase erosion, which damages sites, moves artifacts, and disrupts context. • Extreme precipitation exposes more new sites than presently expected, increasing the risk of natural exposure, as well as theft or vandalism. • Increased lake pool levels more frequently flood terrestrial sites, requiring a deviation from normal operating procedures.
	SLR • Coastal storm hazards impact sites through nuisance and event-based flooding and erosion. • Saltwater intrusion, a variable connected to SLR, exposes sites to corrosion. • Shallow-water or land-water interface sites are impacted by sea water.	**SLR** • Increased shoreline erosion puts sites at greater risk of damage. • SLR, in combination with coastal storm hazards, could further impact sites through nuisance and event-based flooding. Some sites near the coastline are at risk of being permanently inundated. • Increased ocean acidification and saltwater intrusion, variables connected to SLR, expose sites to higher corrosion rates. • Shallow-water or land-water interface sites become underwater sites.
	Flooding • Inundation of terrestrial sites causes damage, disruption (loss of context), and destruction of sites and artifacts. Flooding also causes mold growth and uproots artifacts. • Flooding reduces access to sites by archaeological professionals and tribes. Tribal access could be impeded for sacred sites or locations associated with sacred sites. • Flooding poses life safety risks to archaeological professionals and tribes.	**Flooding** • Increased inundation of terrestrial sites causes greater and more prevalent damage, disruption (loss of context), and destruction of sites and artifacts. Flooding also causes mold growth and uproots artifacts. • Reduced access to sites by archaeological professionals and tribes is more frequent and of longer duration. Tribal access could be impeded for sacred sites or locations associated with sacred sites. • Increased flooding increases life safety risks to archaeological professionals and tribes.
	Wildfire • Fire irreparably damages sites and archaeological and tribal artifacts. • Fire poses life safety risks to archaeological professionals and tribes.	**Wildfire** • Anthropogenic climate change is projected to increase the area, frequency, and severity of wildfires, more significantly impacting sacred sites and traditional cultural places. • Fires cause more expansive irreparable damage to sites and artifacts. • Increased wildfires increase life safety risks to archaeological professionals and tribes.

FEDERAL ASSET	CURRENT CLIMATE HAZARD IMPACT OR EXPOSURE	FUTURE CLIMATE HAZARD IMPACT OR EXPOSURE
Historic Buildings and Structures	**Extreme Heat** • Heat degrades building materials. • Heat impacts the cost of historic building climate control, potentially necessitating future O&M costs to upgrade building utilities and retrofit buildings with air conditioning units.	**Extreme Heat** • Heat increases degradation of building materials, potentially irreparably damaging the buildings or requiring more extensive maintenance. • The cost of historic building climate control could significantly increase, necessitating future O&M costs to upgrade building utilities and retrofit buildings with air conditioning units.
	Extreme Precipitation • Extreme precipitation intensity and frequency causes erosion, which damages buildings. • Flooding impacts historic buildings, requiring measures to protect these structures. • Water leaks irreparably damage buildings.	**Extreme Precipitation** • Increases in extreme precipitation intensity and frequency increase erosion, which significantly damages buildings. • Increased magnitude and frequency of flooding significantly damages historic buildings, requiring measures to protect these structures. • Increased likelihood, frequency, and severity of water leaks irreparably damages buildings.
	SLR • Coastal storm hazards impact sites through nuisance and event-based flooding and erosion. • Saltwater intrusion, a variable connected to SLR, exposes buildings to corrosion.	**SLR** • Increased shoreline erosion puts buildings at greater risk of damage. • SLR, in combination with coastal storm hazards, could further impact buildings through nuisance and event-based flooding. Some sites near the coastline are at risk of being permanently inundated. • Increased ocean acidification and saltwater intrusion, variables connected to SLR, expose sites to higher corrosion rates.
	Flooding • Inundation damages and destroys buildings and contents. • Flooding limits access to buildings by professionals. • Floods pose life safety risks to professionals supporting the historic buildings.	**Flooding** • Increased inundation of buildings damages and destroys the buildings and contents. • Frequency, magnitude, and duration of flooding could increase in the future. • Flooding further reduces access to buildings by professionals. • Increased flooding increases life safety risks to professionals supporting the historic buildings.
	Wildfire • Fire irreparably damages buildings and contents. • Fire poses life safety risks to professionals supporting the historic buildings.	**Wildfire** • Anthropogenic climate change is projected to increase the area, frequency, and severity of wildfires, posing a more significant impact to historic buildings and structures. • Fires cause more expansive irreparable damage to buildings and contents. • More extreme wildfires increase life safety risks to professionals supporting the historic buildings.

The impacts of climate change-driven hazards to USACE assets vary by region and depend on how a given asset is managed and used. Climate-driven hazards to USACE assets include those associated with extreme heat/warming temperatures; extreme precipitation; flooding; increasing intensity, frequency, and severity of storms; SLR; and wildfire. In the future, the impacts of climate hazards may be amplified due to potential increases in extreme temperatures and precipitation, increased drought frequency, SLR, flooding, and wildfires. Human-driven climate change impacts introduce a source of additional and significant uncertainty and present a challenge to effective asset management.

USACE is the largest water management organization in the nation; therefore, climate change will have a detrimental impact on many aspects of USACE's water management missions including flood risk management (FRM), ecosystem management, navigation, hydropower, water supply, and recreation. For instance, increasing temperatures degrade aquatic ecosystems by altering thermal lake stratification, lowering dissolved oxygen levels, and causing harmful algal blooms. SLR is expected to increase flooding and saltwater intrusion into USACE reservoirs, degrading equipment, water quality, and ecosystem function. SLR also causes upstream saltwater wedge migration on USACE-maintained waterways and has implications for freshwater intakes (e.g., Mississippi River among other waterways affiliated with USACE dredging and operations activities). Wildfires, which will likely increase in frequency, scale, duration, and severity, alter vegetative cover and soil characteristics and exacerbate flooding. Erosion driven by prolonged drought, extreme storms, and wildfire increases sediment loads to USACE reservoirs and waterways, while sedimentation impacts available reservoir storage volume.

In addition to managing reservoirs, USACE provides safe, reliable, efficient, and sustainable waterborne transportation systems (harbors and waterways). The impacts of SLC and climate change-driven increases in drought and extreme storm frequency and intensity threaten to undermine USACE's navigation mission by interrupting navigation and threating navigation infrastructure.

USACE is the steward of almost 50,000 cultural sites that include archaeological sites, historic buildings/structures, and Tribal-sacred sites/cultural places. USACE works with both Tribal Nations and State Historic Preservation officers (SHPOs) to protect these resources. Extreme storms, flooding, climate change-driven shifts in management practices, wildfire-induced erosion, and drought can all expose a previously protected cultural resource or disrupt its context. Context, where an artifact is found and associated with other findings, is one of the most important pieces of information archeologists gather from a site. After exposure, cultural resources become vulnerable to damage, destruction, and human interference. Wildfires, flooding, and extreme storms also destroy historic structures, buildings, and associated features. Relative water level changes that affect lands along the nation's coastlines (including the Great Lakes) expose sites to damage and destruction from wave action and inundation. Places that are significant to Tribal Nations as sacred sites or traditional cultural places may no longer be accessible for ceremonies or cultural activities due to relative water level changes.

Environmental justice (EJ) is also an important consideration in USACE management of its lands, waters, and cultural resources. Communities with EJ concerns face significant risk from the effects of climate change and have decreased ability to recover from climate-related disasters. USACE strives to manage its natural and cultural resources in a manner that lessens the burdens on these communities. In addition, as a member of the White House Environmental Justice Interagency Council, USACE received recommendations on Climate Planning, Preparedness, Response, Recovery and Impacts from the White House Environmental Justice Advisory Council (WHEJAC). The report includes many recommendations that are relevant to the work of the USACE. USACE is reviewing the recommendations and, as appropriate and to the maximum extent permitted by law, is taking steps to address the WHEJAC's recommendations.

2D. Climate Hazard Exposures and Impacts Affecting Mission, Operations and Services

SUMMARY OF KEY CURRENT AND PROJECTED CLIMATE HAZARD IMPACTS AND EXPOSURES		
Area of Impact or Exposure	**Identified Climate Hazard**	**Description**
Navigation	Extreme Temperature	• Increases in extreme temperature include heat waves and a broader range of extremes in water availability, impeding ability to maintain approved navigation depths on waterways. • Low water events increase mission requirements related to safety and coordination.
	Extreme Precipitation	• Increases in frequency and intensity of large storm events and associated flooding impede navigation in waterways and coastal zones. • Extreme events may also increase water turbidity and come with high winds. • Extreme low precipitation can cause low sailing drafts and reduce navigability.
	SLR	• Increases in SLR impact the functionality of coastal navigation structures, ports, and harbors and waterways. • Increases in SLR impact bridge clearances along coastal zone waterways and contribute to upstream migration of saltwater wedges, affecting river ecosystems, water intakes, and potable water supplies.
	Flooding	• More frequent large flood events reduce the time in service for many navigable waterways and harbors. • Supporting structures and personnel servicing the navigation mission may be impacted by extreme floods and storm damages. • Debris removal and survey mission areas see increased demand.
	Wildfire	• Wildfires lead to soil erosion and sedimentation in waterways, estuaries, and bays, reducing draft depths and requiring alterations to maritime and navigation charts. • Fires generate debris in waterways. • Smoke from wildfires reduces air quality and visibility.

SUMMARY OF KEY CURRENT AND PROJECTED CLIMATE HAZARD IMPACTS AND EXPOSURES		
Area of Impact or Exposure	**Identified Climate Hazard**	**Description**
FRM	Extreme Temperature	• Increasing temperatures change the seasonality and drivers of annual peak floods (rainfall vs. snowmelt driven), shifts in the growing season, and changes in river ice dynamics, all factors that impact the magnitude and timing of floods. • Increasing temperatures also cause higher evapotranspiration rates and reduce soil moisture, which can offset the impacts of extreme precipitation.
	Extreme Precipitation	• In much of the U.S., the frequency and intensity of extreme precipitation events is projected to increase. • Increases in extreme rainfall cause increased runoff and may cause flash floods, especially impactful in urban areas, which typically have higher populations.
	SLR	• Observed sea level is rising and is anticipated to continue to rise. • SLR, coupled with storm surge and high tides, poses many impacts to USACE's FRM mission and coastal communities. • Increases in nuisance or sunny-day, tidally driven flooding present a hazard to impacted infrastructure and populations. • Coastal storm risk and compound flooding are amplified by rising sea levels and is currently an issue. • SLR may require constructing coastal barrier structures and/or modifying existing structures.
	Flooding	• Some parts of the country show evidence that annual precipitation, extreme storm events, and peak flows are increasing and are likely to continue increasing. • FRM projects continue to be critical for reducing the impacts of flood risk. • Existing FRM projects may experience increased stress due to increases in the frequency, duration, and magnitude of storms and high-water events.
	Wildfire	• Wildfire increases erosion, resulting in sedimentation changes in streams that may change stream flow conveyance characteristics. • Wildfire destroys vegetation cover, reducing capture of precipitation and reducing a basin's evapotranspiration capacity. • Wildfire impacts soil infiltration characteristics. Reduced channel conveyance and decreased loss rates potentially lead to increased runoff.

SUMMARY OF KEY CURRENT AND PROJECTED CLIMATE HAZARD IMPACTS AND EXPOSURES		
Area of Impact or Exposure	**Identified Climate Hazard**	**Description**
Water Supply	Extreme Temperature	• Increases in extreme temperatures and general warming trends over time, along with increased frequency and magnitude of heat waves, make managing competing water needs a challenge. This is especially true where water supplies rely on snowmelt and where warming trends reduce or eliminate annual snowpacks. • Increased temperatures are projected to increase the frequency, magnitude, and duration of droughts. • Increased water demand, combined with higher evaporative and sedimentation rates, impacts water supply storage, stressing USACE's water supply mission. • Extreme loss of water supply storage also impacts the reliability of water supply infrastructure.
	Extreme Precipitation	• Extreme precipitation causes erosion, leading to increased sediment flow into lakes and reservoirs, thus decreasing their storage volume. • Debris impacts water supply intakes and equipment. • Added stress on infrastructure due to extreme precipitation events (sometimes in short duration) increases risk of flooding/reservoirs reaching capacity.
	SLR	• Sea levels along the coastline are projected to increase and may exacerbate saltwater intrusion into the freshwater water supply. • Reservoir releases, combined with SLR, may increase compound flooding in estuarine environments, particularly during major storm events. • SLR in some locations, such as Hawaii, is also raising the water table and threatening groundwater/water supply.
	Flooding	• Flooding increases bank and bed erosion of sediment loads to reservoirs. Increased sediment loads reduce available storage volume allocated for water supply. • Flood-borne debris impacts water supply intakes and equipment. • The priority of water supply as a Congressionally authorized purpose may be downgraded during flood events for other purposes such as FRM and/or hydropower.
	Wildfire	• Wildfires increase erosion from the landscape, leading to increased sediment flow into lakes and reservoirs, thus decreasing their storage volume. • Debris flowing into reservoirs after wildfires impacts water supply intakes and equipment.

SUMMARY OF KEY CURRENT AND PROJECTED CLIMATE HAZARD IMPACTS AND EXPOSURES		
Area of Impact or Exposure	**Identified Climate Hazard**	**Description**
Aquatic Ecosystem Restoration and Environmental Stewardship	Extreme Temperature	• Increased ambient air temperatures increase water temperatures, change seasonality, alter snow dynamics, and shift lake stratification and turnover. These lead to water quality concerns, particularly in terms of decreased DO levels and increased water temperatures. • Increased air temperature is associated with the growth of harmful algal blooms and the spread of invasive species. • Changes in air temperature both directly and indirectly influence fish and wildlife by altering things like range, life cycle, and food chain dynamics.
	Extreme Precipitation	• Increased extreme storm intensity and frequency and more prolonged and frequent drought conditions, coupled with greater uncertainty about future conditions, make planning for ecosystem needs difficult. • These conditions also stress USACE's ability to manage invasive species.
	SLR	• SLR increases nuisance flooding, coastal storm risk, and permanent inundation along the coast. • Increased flooding alters coastal ecosystems, including wetlands. This may undermine the critical ecosystem services that natural systems provide. • Saltwater intrusion may modify or destroy existing coastal ecosystems.
	Flooding	• Increases in inundation in coastal zones and potential shifts in inland floodplain dynamics, driven by either higher peak flows or lower low flows, may negatively impact ecosystems.
	Wildfire	• While wildfire at a certain frequency is required to maintain ecosystem dynamics, wildfire poses multiple threats to ecosystem function. • Wildfire may directly destroy habitat while also negatively impacting air and water quality, which could be detrimental to adjacent and downstream ecosystem function. • Increased sedimentation from wildfire could alter water chemistry and flood/floodplain dynamics.

SUMMARY OF KEY CURRENT AND PROJECTED CLIMATE HAZARD IMPACTS AND EXPOSURES		
Area of Impact or Exposure	**Identified Climate Hazard**	**Description**
Hydropower	Extreme Temperature	• Extreme temperatures increase energy demand, increasing the strain on the energy grid. • Increased air temperatures increase in drought intensity and frequency and evaporation rates, resulting in lower inflows and water levels. Lower water levels reduce the amount of power that hydropower plants can generate. • Increases in water temperatures may influence the operation and performance of hydropower plants.
	Extreme Precipitation	• While annual precipitation totals may not increase in some regions, the distribution of precipitation may become more variable seasonally. Seasons with higher precipitation totals may require bypassing hydropower units to maintain reservoir pool levels, while seasons with lower precipitation totals may limit hydropower production. • Increased river flows may lead to increased power generation; however, projected increases in variability and the uncertainty associated with future conditions may make hydropower as an energy source more unpredictable.
	SLR	• SLR affects the capacity of reservoirs, reducing their ability to store water and impacting a plant's efficiency. • Rising sea levels contribute to an increased risk of coastal flooding. For hydropower plants in coastal areas, rising sea levels inundate infrastructure, submerge turbines, corrode hydropower components, and disrupt operations.
	Flooding	• Flood events may be beneficial for hydropower plants, as increased river flows may lead to increased water available for power generation; conversely, flood events may inundate hydropower infrastructure, submerge turbines, and disrupt operations. • Shifts in the timing of flows due to changes in seasonality and snow dynamics may impact the amount of storable water available for hydropower generation and how it aligns with periods of significant demand.
	Wildfire	• Wildfires in the vicinity of hydropower facilities pose safety concerns for workers. • Wildfires increase sedimentation, reducing the storage capacity of reservoirs. • Increased water temperatures and sediment and debris loads also influence the operation and performance of hydropower plants.

SUMMARY OF KEY CURRENT AND PROJECTED CLIMATE HAZARD IMPACTS AND EXPOSURES		
Area of Impact or Exposure	**Identified Climate Hazard**	**Description**
Recreation	Extreme Temperature	• USACE has seen increases in visitation during heat waves, causing increased drownings and swift water and downstream rescues; however, as extreme heat increases beyond a certain threshold, this trend may change. • Periods of extreme high heat pose human health concerns. • Higher water temperatures result in harmful algal blooms. • Changes in air and water temperature, seasonality, lake stratification, etc., alter fish and wildlife dynamics. • Periods of low water driven by drought impede access to boat launches and water access points.
	Extreme Precipitation	• Increases in extreme storm events make recreational activity difficult, dangerous, or impossible. • Extreme precipitation leads to flooding and bank/shoreline erosion, which decreases the number of visitors to USACE recreation areas and reduces access to boat launches, piers, and docks, while also posing life safety risks to visitors and recreation staff.
	SLR	• SLR threatens cultural and heritage sites, impacting the cultural and historical experiences that contribute to recreational tourism. • SLR reduces access to shorelines and undermines coastal infrastructure, such as entry points, ports, harbors, and piers. • SLR contributes to loss of shoreline through beach erosion. • Saltwater intrusion into estuaries and coastal wetlands affects aquatic habitats, impacting recreational fishing opportunities.
	Flooding	• Flooding creates hazardous conditions for visitors and employees at USACE-owned/managed recreation sites. • More frequent flooding of sites could deter visitors and reduce access to boat ramps, piers, and dock access points. • Flooding damages recreation areas and their associated infrastructure, making them unusable or out of service for extended periods of time. • Flooding increases shoreline erosion.
	Wildfire	• Wildfire prevents access to, destroys, or damages recreation areas. • Wildfires place visitors and recreation staff at risk. • Wildfire also reduces air and water quality at recreation areas and detrimentally impacts fish and wildlife. • Wildfires undermine the natural beauty that draws visitors to recreation areas.

SUMMARY OF KEY CURRENT AND PROJECTED CLIMATE HAZARD IMPACTS AND EXPOSURES		
Area of Impact or Exposure	**Identified Climate Hazard**	**Description**
Emergency Management	Extreme Temperature	• Extreme temperatures pose a heat stress-driven health concern, especially in areas where another climate-related emergency is being managed. • Warmer water temperatures increase the potential for waterborne diseases and harmful algae blooms. • The increased risk of waterborne pathogens is compounded by increased precipitation, flooding, and SLR, which increase health safety risks, including emergency endemics and pandemics.
	Extreme Precipitation	• Extreme storm events create emergency situations and disrupt critical infrastructure and utilities. • Extreme storms are capable of intense precipitation, winds, and storm surge in coastal areas and may occur more frequently and be of greater intensity, increasing the need for assistance in disaster response and recovery. • Extreme low precipitation can lead to low river flows and saltwater intrusion, requiring measures to protect municipal drinking water supplies.
	SLR	• SLR amplifies the impacts of coastal floods driven by tropical storms, hurricanes, and cyclones, creating emergency conditions. • Coastal flooding is also intensified when coupled with storm surge, wave conditions, extreme tidal conditions, and/or inland flooding.
	Flooding	• Flooding is one of the most common challenges for USACE emergency management operations, as USACE provides assistance to FEMA in response to federally declared flooding emergencies. • In some regions, including coastal areas already impacted by SLR, more frequent and larger magnitude storms result in higher instances of flood events. • Increases in flood frequency strain the federal agencies responding to these emergencies.
	Wildfire	• Wildfires frequently necessitate an emergency response and result in large areas of land and property being destroyed. • After a wildfire, the denuded landscape poses an increased flood risk, affecting critical public infrastructure such as floodways and roadways and water treatment facilities. • Wildfire poses a major life safety and human health risk. • The frequency and intensity of wildfires is projected to increase.

SUMMARY OF KEY CURRENT AND PROJECTED CLIMATE HAZARD IMPACTS AND EXPOSURES		
Area of Impact or Exposure	**Identified Climate Hazard**	**Description**
Regulatory	Extreme Temperature	• USACE's Regulatory Program (permitting) evaluates permit applications for essentially all construction activities in the nation's waters, including wetlands. Extreme temperatures, particularly heat waves, change water availability and quality. Permits for constructing or modifying structures such as water intakes and outfalls may need to account for variations in water levels during periods of extreme heat or drought. • Extreme temperatures and drought result in more frequent wetland drying and soil structure changes. Additionally, warming changes the timing and amount of water that wetlands receive from snowmelt. Changes in wetland dynamics might result in the need to modify existing policies or procedures.
	Extreme Precipitation	• Assessments developed during regulatory review may need to account for impacts from extreme precipitation events, such as changes in hydrological regimes, potential habitat loss, and the impact on vulnerable species. • Permits related to constructing and maintaining infrastructure need to account for the challenges of working in wetter conditions.
	SLR	• SLR changes wetland boundaries and coastal landscapes through inundation, saltwater intrusion, and shoreline erosion. • Over time, shifts in water levels and the extent of tidal influence may change the identified boundaries of jurisdictional Waters of the United States (WOTUS). • Permitting reviews would need to consider the influence from SLR.
	Flooding	• Potential increases in future flooding have similar impacts on USACE's Regulatory Program as those described for extreme precipitation and SLR. • Some wetlands may become wetter, and others may experience prolonged water levels too deep for current plant species to survive. These impacts may at times require further analysis during the National Environmental Policy Act (NEPA) and permitting process. • The USACE Regulatory Program administers the Clean Water Act Section 404 program, which regulates the discharge of dredged or fill material into WOTUS, including wetlands. Flooding may necessitate emergency response measures, so USACE may need to expedite permitting processes while ensuring environmental safeguards are in place (USACE regulations contain emergency permitting procedures for expedited response to these types of situations).
	Wildfire	• Wildfires lead to vegetative loss, increase erosion and sedimentation, change soil structure (including soil moisture), and change hydrologic response. • Wildfires negatively impact wetlands and riparian areas and catalyze shifts in hydrologic regime. • "Emergency situations" after a fire necessitate expediting permits to discharge dredged or fill material into WOTUS to respond to current and imminent threats. Emergency permitting procedures are available to facilitate a timely response. • After the emergency phase passes, permit applications may need to consider post-wildfire conditions.

Climate change poses significant challenges to USACE missions: navigation, FRM, water supply, aquatic ecosystem restoration (AER), hydropower, recreation, emergency management, and regulatory. The impacts of extreme/warming temperatures, extreme precipitation, SLR, flooding, and wildfires are multifaceted, influencing the planning,

execution, and success of USACE missions.

Navigation. Rising temperatures cause more frequent drought and lower water levels, impacting the navigability of U.S. waterways. Extreme rainfall events, SLR, and flood events impede navigation, particularly in coastal zones. Climate-driven flood events and wildfire may damage critical navigation infrastructure, requiring emergency response and recovery efforts. Extreme precipitation, flooding, and wildfires lead to sedimentation and debris in rivers, impacting navigation channels. Increased sedimentation may require adjustments in dredging and survey operations. SLR influences tidal dynamics and saltwater intrusion, particularly in estuarine environments, causing added wear on coastal infrastructure.

Flood Risk Management. Increased precipitation intensity and variability contribute to heightened flood risks and compound hazards. USACE FRM efforts may need to account for changing precipitation patterns and anticipate more frequent and severe flood events. Rising temperatures influence snowpack accumulation and melting patterns, affecting river flows and the timing of peak runoff. This temperature change influences FRM strategies. SLR elevates the risk of coastal hazard impacts and flooding, necessitating enhanced coastal protection measures. USACE must consider SLR coupled with other environmental stressors in designing and maintaining flood control infrastructure. Wildfires lead to increased runoff and flash floods in burned areas, influencing FRM.

Water Supply. Extreme temperatures impact water availability and demand. Warmer temperatures may increase evaporation rates, affecting reservoir storage and water supply reliability. Altered precipitation patterns shift the timing and magnitude of water availability. Extended droughts and changes in snowpack affect water supply planning. SLR contributes to saltwater intrusion into freshwater sources, impacting water availability. USACE must consider these effects in managing water supply infrastructure. Increased wildfire frequency causes higher sediment loads and decreases water quality that sustains lake ecosystems. Additionally, debris and sediment from wildfires damages water supply infrastructure.

Aquatic Ecosystem Restoration and Environmental Stewardship. Temperature changes impact the structure and function of ecosystems and USACE's ability to manage, conserve, and protect natural resources. For instance, warmer temperatures increase harmful algae blooms and the spread of invasive species. More frequent extreme precipitation events, shifts in drought frequency/intensity, changes in wildfire dynamics, SLR, and flood events all significantly impact ecosystems. For example, altered precipitation patterns affect wetland hydrology and impact the success of aquatic ecosystem restoration projects. Drought conditions may hinder the establishment of vegetation. Coastal aquatic ecosystem restoration projects face challenges from SLR, impacting the viability of restored habitats. Creating more resilient and adaptive aquatic ecosystem restoration strategies is essential in the face of changing conditions and increasing climatic uncertainty. Flooding disrupts restoration efforts, while wildfires may destroy restored habitats. USACE must implement resilient restoration designs to withstand these hazards. Trends for all climate variables could result in invasive species proliferation, which is a common challenge to USACE's aquatic ecosystem restoration mission. Future climate scenarios must be considered when planning AER project goals, objectives, and success criteria to avoid setting goals/objective/criteria that are unobtainable and might otherwise require endless chasing of ever-moving targets. As USACE moves to consider the effects of its non-AER missions on ecosystem goods and services, implications of climate hazards on these services should also be considered (i.e., demand for and supply of reliable and predictable service delivery).

Hydropower. As temperatures increase, energy demand is likely to increase. Increases in the frequency and duration of drought conditions may reduce water availability for power production. Higher temperatures also result in earlier snowmelt, resulting in less water being available to meet late-season (summer) hydropower demand. Extreme precipitation events are expected to increase in intensity and frequency. Flooding after heavy rains may threaten the structural integrity of hydropower facilities and/or disrupt operations. SLR poses similar risks to coastal hydropower infrastructure. Wildfires impact power transmission lines and damage or destroy hydropower infrastructure, either directly or via increased sediment and debris loads.

Recreation. USACE is one of the nation's leading federal providers of outdoor recreation with more than 400 lake and river projects. Visitors enjoy activities like hiking, boating, fishing, camping, and hunting. While increases in temperature typically result in increased visitation to USACE recreation areas, extreme increases in temperature could result in a reduction in visitors and increases in heat-related safety risks to both visitors and staff. Warmer water temperatures result in declining ecosystems, negatively impacting fish and wildlife. Low water levels caused

by increases in drought frequency and intensity reduce access to boat ramps, docks, etc. Increased precipitation intensity more frequently disrupts outdoor recreation and reduces access to and damages recreational facilities. As a result of SLR, coastal sites face the risk of permanent or more frequent inundation, changes in fish and wildlife habitat, and shoreline erosion. Wildfires damage recreational infrastructure and present a safety risk to staff and visitors. Adaptation strategies are needed to maintain and effectively operate USACE's recreational facilities. Emergency management and recovery efforts are crucial for restoring recreational amenities after severe weather, flooding, or wildfire.

Emergency Management. Since extreme temperatures influence the intensity and frequency of heat waves, emergency management plans must consider health impacts driven by warming temperatures including increases in waterborne disease and harmful algae blooms. Intense precipitation events contribute to flooding emergencies. SLR increases the risk of coastal storm hazards, infrastructure damages, and flooding emergencies. Emergency management plans must account for the potential displacement of communities and critical infrastructure. Flooding and wildfires are primary drivers of life safety risk and emergency situations. USACE is involved in planning, response, and recovery efforts for these hazards, requiring coordination with other agencies. USACE also plays a key role in emergency response efforts, including water management, flood response technical and direct assistance to tribal and state agencies, infrastructure repair, and assistance to the Department of Homeland Security.

Regulatory. USACE's Regulatory (permitting) Program evaluates permit applications for essentially all construction activities that occur in the jurisdictional waters of the U.S., including wetlands. This includes emergency response permits and facility/infrastructure recovery and repair post-disaster. Increasing temperatures influence soil characteristics, snowmelt dynamics, and water quantity, having substantial impacts on aquatic ecosystems. Altered precipitation patterns affect stormwater runoff. Increases in flood frequency are also driven by more frequent and intense rainfall events. Newly inundated areas produced by SLR and shifts in flood/drought dynamics may affect the boundaries of U.S. jurisdictional waters. Saltwater intrusion driven by SLR impacts aquatic habitats. Increases in wildfire frequency shift hydrologic response and ecosystem dynamics. Flooding and wildfires prompt emergency permitting needs. The USACE Regulatory Program is flexible and adapts to changing circumstances, fulfilling its mission to protect the nation's aquatic resources while allowing reasonable development through fair, flexible, and balanced permit decisions.

Climate change hazards present complex challenges for USACE across its diverse missions. Adaptive strategies, resilience planning, and collaboration with various stakeholders are essential to navigate the evolving impacts of extreme temperature, extreme precipitation, SLR, flooding, and wildfires on water resources and infrastructure. USACE must continue to integrate climate change considerations into its planning and decision-making processes to fulfill its crucial roles in the nation's water resource management and environmental stewardship.

2E. Impacts from and Exposure to Drought

CLIMATE HAZARD EXPOSURE TO DROUGHT		RCP 4.5 2050 (MID-CENTURY)	RCP 4.5 2080 (LATE CENTURY)	RCP 8.5 2050 (MID-CENTURY)	RCP 8.5 2080 (LATE CENTURY)
% of reservoirs located in areas projected to be exposed to an increase in the annual maximum number of consecutive dry days		96.9%	96.9%	95.7%	98.3%
Annual maximum number of consecutive dry days statistics	Range	8.6 to 148.2	8.8 to 147.3	8.8 to 151.4	9.6 to 156.5
	Average	23.9	24.1	24.3	25.6
% of reservoirs located in areas projected to be exposed to decreasing mean annual inflows		40.1%	49.6%	38.4%	40.1%
% of reservoirs located in areas with projected aridity values less than 0.65 (indicative of arid climate)		11%	11.5%	8.6%	17.4%

CLIMATE HAZARD EXPOSURE TO DROUGHT	RCP 4.5 2050 (MID-CENTURY)	RCP 4.5 2080 (LATE CENTURY)	RCP 8.5 2050 (MID-CENTURY)	RCP 8.5 2080 (LATE CENTURY)
% of reservoirs located in areas with projected aridity values decreasing from baseline (indicative of increasingly arid climate)	100%	99.8%	91.2%	100%
% of reservoirs located in areas projected to be exposed to an increase in drought year frequency	99.5%	100%	100%	100%
% of reservoirs located in areas projected to be exposed to an increase in flash drought frequency	99.8%	99.5%	99.5%	97.1%

Extreme drought has been an increasing trend across the U.S. over the past several decades and is recognized as a hazard that contributes to vulnerability for USACE and its large portfolio of water resources infrastructure, including multi-purpose reservoirs. Highlighting the criticality of this hazard, the Assistant Secretary of the Army for Civil Works (ASW(CW)) issued a policy memorandum in July 2022 focused on Army CW programs supporting drought resilience across America's communities. In addition to discussing the impacts of drought on communities and USACE projects, the memorandum also discusses many of the strategies USACE has employed to overcome the challenges of extreme drought and directs USACE to provide a comprehensive brief to the ASA(CW) on the ongoing, planned, and potential additional CW actions to ensure community resilience to drought at local and regional scales.

The drought hazard is evaluated at USACE reservoirs, where vulnerability to drought is critical, using historic and projected consecutive dry days (CDDs), based on Localized Constructed Analogs (LOCA)-downscaled Coupled Model Intercomparison Project Phase 5 (CMIP5) Global Climate Model (GCM) outputs. Gridded geospatial data representing annual maximum number of CDDs over each 30-year epoch (historic baseline [1975–2005], mid-century [2036–2065], and late-century [2070–2099]) was provided by CEQ as supplementary information. The gridded annual maximum CDDs information is developed by the National Climate Organization and provided through the Climate Mapping for Resilience and Adaptation portal. The maps in Appendix C illustrate the exposure of drought risk throughout each epoch-scenario.

The Western U.S., especially the Southwest, experiences the highest number of annual maximum CDDs. Climate model projections project that the highest values will continue to be in the Western U.S., increasing in the northeastern direction from the Southwest. This observation of the climate projections does not imply that the Southwest is the only area of the U.S. that will be impacted by drought. Large percent increases in the annual maximum CDDs are projected in the Great Plains, the Pacific Northwest, and the Ohio River Valley for all epoch-scenarios while some of these same regions may see increases in extreme precipitation during portions of the year.

Annual maximum CDDs is only one indicator of drought hazard risk. For instance, mean annual streamflow (MAF), aridity, drought year frequency (DYF), and flash drought frequency (FDF) are other drought indicators used for screening level risk assessments. For this assessment, USACE utilized the DCAT climate projection database to qualitatively evaluate these other indicators. As depicted in the drought exposure maps in Appendix B, the upper Colorado and Rio Grande River basins and the northern portions of the Mountain West are projected to see the largest decreases in MAF, the greatest contributing indicator to the drought hazard according to DCAT. The lower Mississippi River basin, Gulf Coast, and headwaters of the Ohio River basin, critical areas for USACE missions such as navigation, hydropower, and flood risk management, are also projected to see significant decreases in MAF. For aridity, smaller values indicate greater aridity with arid climate zones represented by values less than 0.65. The Western U.S. and Florida are projected to have the greatest exposure to aridity. DYF is expected to increase across the Southwest with very high increases in the Western and Southern U.S. for the RCP 8.5 late century epoch-scenario. FDF is expected to increase broadly across the U.S. with higher occurrences of FDF in the Great Basin and Great Plains regions. For the RCP 8.5 late century epoch-scenario, higher FDF occurrences are projected for the Great Lakes region and portions of the east coast.

Drought profoundly impacts USACE activities across various areas. Drought disrupts water management efforts by diminishing water availability in reservoirs and rivers managed by USACE, affecting tasks like flood control, navigation, and aquatic ecosystem restoration. Drought impacts hydropower generation as reduced water levels and flows impede the capacity of hydroelectric power plants operated by USACE, potentially leading to power generation reductions or shutdowns. Navigation, which already experiences drought-related impacts, becomes challenging or impossible due to decreased water levels in rivers and channels, prompting USACE to undertake dredging operations or impose restrictions on vessel traffic to ensure safe navigation. AER is a primary USACE mission. Drought could result in adverse ecological impacts like habitat degradation and fish kills, necessitating USACE to implement measures to mitigate these effects, such as releasing water from reservoirs to maintain minimum flows or conducting AER projects to make ecosystems more resilient. Drought also strains water supply infrastructure, including dams, reservoirs, and treatment facilities, leading USACE to implement emergency measures to ensure continued water supply to communities, industries, and agriculture.

While USACE meets the challenges currently posed by drought through its policies, programs, and operations of reservoirs, the location and severity of drought are anticipated to become broader and more extreme, respectively, based on the parameters evaluated through this assessment. USACE will use a comprehensive, coordinated strategy, developed in response to the ASA(CW) drought policy memorandum, to apply its missions and capabilities to address the impacts of drought and to build drought resilience in alignment with the White House Resilience Interagency Working Groups and the USACE Climate Adaptation Plan priorities.

Section 3: Implementation Plan

3A. Addressing Climate Hazard Impacts and Exposures

3A.1 Addressing Climate Hazard Exposures and Impacts Affecting Federal Buildings

PRIORITIZED ACTIONS TO ADDRESS CLIMATE HAZARD IMPACTS ON AND EXPOSURE OF FEDERAL BUILDINGS[10]		
Climate Hazard Impact on and/or Exposure of Federal Buildings	**Priority Action**	**Timeline for implementation (2024–2027)**
All Climate Hazards	Perform enterprise-wide vulnerability assessment of USACE building portfolio.	• Complete assessment – Fiscal Year (FY) 2024 (FY24). • Conduct future assessments on five-year interval.
All Climate Hazards	Integrate climate vulnerability assessments and hazard-specific plans into the Strategic Asset Management Plan.	• Update Strategic Asset Management Plan (FY27 or sooner depending on update to current management plan).
All Climate Hazards	Develop climate-informed design standards or update existing design standards as necessary to include climate-resilient designs.	• Evaluate existing design standards to prioritize needs (FY24). • Develop/Update standards based on prioritization (FY25–27).
All Climate Hazards	Coordinate with the managing federal agencies where USACE leases buildings/ office space.	• Establish dedicated liaisons with federal agencies responsible for USACE office leases. • Include assessing climate impacts to leased USACE building/office space to the USACE POCs who liaise with managing federal agencies.
Flooding and SLR	Develop an overall flood mitigation plan in concert with the overall vulnerability assessment of the USACE building portfolio.	• Develop flood mitigation plan (FY25).
Wildfire	Develop an overall wildfire mitigation plan in concert with the overall vulnerability assessment of the USACE building portfolio.	• Develop wildfire mitigation plan (FY25).
Extreme Temperature and Precipitation	Implement smart building technologies to monitor temperature, precipitation, and other environmental parameters critical to building function.	• Investigate potential technologies for investment (FY25). • Develop an implementation plan for smart building technologies (FY26).

10 Supports the requirements of Office of Management and Budget (OMB) M-24-03, Advancing Climate Resilience through Climate-Smart Infrastructure Investments and Implementation Guidance for the Disaster Resiliency Planning Act.

USACE's building portfolio of almost 23,000 buildings at 1,575 sites in CONUS, Alaska, and Hawaii includes business offices, satellite offices, and field offices. USACE buildings are currently impacted by various natural hazards. Some of the primary natural hazards affecting USACE buildings include: extreme weather events, flooding, extreme heat, drought, wildfire, storm surge, and erosion. The specific impact of natural hazards on USACE buildings depends on factors such as location, building design, and the intensity of the hazard event. The actions provided in the 3A.1 table are summarized below to provide additional context.

Current USACE Climate Resilience Approach

USACE continually engages in efforts to assess vulnerabilities, implement resilience measures, and develop emergency response plans to mitigate the impacts of natural hazards on its buildings and infrastructure. USACE took a proactive approach to understanding vulnerabilities and resilient design by developing CWVAT, the Corps Project Exposure Tool (CorpsPET), and the Comprehensive Evaluation of Coastal Hazard due to Sea Level Change (CESL) approach and by acting as a primary developer of DCAT. These tools are part of a suite of USACE CPR tools and resources that provide climate exposure and vulnerability assessments of USACE assets including projects, studies, and infrastructure.

In March 2015, the Chief of Engineers established USACE's Resilience Initiative. This initiative updates USACE's standards and criteria to reflect the latest actionable risk-informed decision-making practices for improved project resilience and provides greater support to community resilience both locally and through national policies. In August 2022, USACE published the USACE Civil Works Strategic Asset Management Plan, which focuses on six policy goals: Cross-Functional Integration; Asset Information Standards; Maintenance; Investment Criteria; Investment Recommendations; and Investment Planning. The Civil Works Asset Management System framework synthesizes guidance, provides tools, and drives practices to optimize value from CW's portfolio of physical assets.

As an agency responsible for operating and maintaining a portfolio of water resources infrastructure and planning, designing, and constructing public water resources infrastructure, USACE has always focused on resilience to natural hazards. In 2014, USACE established the USACE CPR CoP to specifically focus on developing practical, nationally consistent, and cost-effective approaches and policies to reduce potential vulnerabilities to the nation's water infrastructure resulting from climate change and variability.

Building Resilience Implementation Summary

USACE has a range of options available to improve the resilience of its buildings and structures in the face of climate change and other potential hazards. Resilience involves the ability of infrastructure systems to anticipate, prepare for, respond to, and recover from disruptive events. Generally, to meet the challenges of projected climate impacts on its building portfolio, USACE needs to enhance and extend its current CPR approach.

- **Vulnerability Assessments** – While USACE currently conducts climate change vulnerability assessments for planning studies, projects, budget work package submittals, and on an ad hoc basis, the agency has yet to complete a comprehensive vulnerability assessment of USACE-owned buildings and structures. The results of the proposed portfolio-wide vulnerability assessment, coordinated with federal agencies like GSA where USACE leases space, should be incorporated into the Civil Works Asset Management System to determine where detailed analyses employing more advanced approaches and software are needed. By incorporating Climate Change Vulnerability Assessment results into the Civil Works Asset Management System, results effectively support life-cycle performance through cross-functional integration, asset information standards, maintenance, and resilience-informed investment strategies.
- **Climate-Informed Design Standards** – In 2016, USACE published its most recent Resilience Initiative Roadmap (RIR) per Executive Order (EO) 13653, Preparing the U.S. for the Impacts of Climate Change. The RIR serves as the agency's roadmap to implement several key resilience-related strategies. Strategy 1 of the RIR is to "Evolve USACE Resilience Practices." Although USACE made progress ensuring that each USACE project/system being designed/delivered includes baseline resilience, a similar strategy should be applied to the agency's portfolio of buildings and structures. To accomplish this, USACE will identify ways to incorporate resilient practices into building design standards and include a climate-informed design framework in updated policies. USACE will also conduct a review of existing applicable standards to make updates and/or identify areas where new policy and guidance is required.

- **Sustainability and EO 14057 –** USACE is strategically aligning with EO 14057, Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability, to achieve 100% carbon pollution-free electricity (CFE) by FY30, as outlined in the 2022 USACE Sustainability Plan. The approach involves a dual focus on on-site CFE and purchased CFE, emphasizing renewable sources such as new solar or wind projects and incremental hydropower. Prioritization for on-site CFE considers factors like balancing authority, viability, site suitability, and alignment with EJ initiatives, with attention to life-cycle costs. While these efforts are primarily focused on climate mitigation through reducing GHG emissions, on-site generation of CFE can also increase resilience to power outages including those caused by extreme weather events.

The priority actions identified in this section directly support the requirements of the Office of Management and Budget (OMB) M-24-03, Advancing Climate Resilience through Climate-Smart Infrastructure Investments and Implementation Guidance for the Disaster Resiliency Planning Act. So that USACE buildings and structures are resilient to the natural and climate hazards identified in Section 2, USACE will incorporate vulnerability assessments into an asset management system framework to develop and execute a responsible investment strategy. USACE will also focus on sustainability, including energy and water conservation and moving toward CFE.

3A.2 Addressing Climate Hazard Exposures and Impacts Affecting Federal Employees

PRIORITIZED ACTIONS TO ADDRESS CLIMATE HAZARD IMPACTS ON AND EXPOSURE OF FEDERAL EMPLOYEES		
Climate Hazard Impact on and/or Exposure of Federal Employees	**Priority Actions**	**Timeline for implementation (2024–2027)**
Extreme Temperature	Augment existing training materials on heat safety with regional estimations of projected extreme temperatures.	• Evaluate and update training material (FY24).
Extreme Weather Events **Wildfire** **Flooding**	Incorporate climate considerations into personal employee emergency response planning materials through collaboration with the safety office.	• Develop/Update employee emergency response planning materials (FY25).
All Climate Hazards	Expand Climate 101 training to educate employees across the USACE organization on topics that provide general overviews of climate hazards.	• Expand various components of Climate 101 training (FY25–27).
All Climate Hazards	Improve climate resilience in communities where USACE employees reside by facilitating climate resilience planning through USACE planning authorities (e.g., floodplain management services and Silver Jackets) and upon request of state, local, tribal, or territorial entities.	• Ongoing and continuous.

To effectively address climate impacts, USACE must continue to build a culture that values and supports innovative thinking around climate change. This culture must extend to the agency's greatest asset, its people. The workforce of the future requires knowledge and skills to address the challenge of climate change at work and home to provide the public services enhancing community resilience, while also understanding the hazards to themselves and their families. USACE must transition from viewing knowledge of climate change and related issues as a specialized discipline to recognizing it as a fundamental component of all USACE decision-making and actions.

USACE, like all federal agencies, is subject to Occupational Safety and Health Administration (OSHA) regulations that include provisions for protecting workers from various workplace hazards, including those related to extreme weather conditions. These regulations may cover issues such as heat stress, cold stress, and other weather-related risks. USACE has policies, guidance, and regulations in place to address employee protection from extreme weather events. USACE manages its own Safety and Occupational Health Office that provides policy, programs, technical

services, oversight, and outreach related to safety and occupational health matters to safeguard the well-being of its employees. This program may include specific guidance on working in adverse weather conditions and protective measures. USACE's Engineer Manual (EM) 385-1-1, Safety and Occupational Health Requirements, defines the requirements, processes, and procedures to provide a safe workplace. EM 385-1-1 establishes safety roles and the precautions and actions to take in the event of a severe weather event and strategies to monitor for and combat the effects of extreme heat.

USACE develops emergency response plans to address various scenarios, including those related to extreme weather events. These plans outline procedures for employee safety, evacuation, and emergency response in the event of severe weather conditions. USACE offices and installations typically have local safety policies and guidelines in place that consider the specific weather risks in their regions. These policies may address issues such as hurricanes, tornadoes, floods, or extreme temperatures.

USACE employs various communication and notification systems to disseminate effective and timely information to its personnel. USACE uses the Department of Defense (DoD) Alert Mass Notification System to alert employees of natural disasters like extreme weather events, critical events, and urgent situations based on geographic proximity of personnel to the critical event. DoD Alert provides two-way communication allowing personnel to acknowledge receipt of alerts. USACE also employes the U.S. Army Disaster Personnel Accountability and Assessment System (ADPAAS), which standardizes a method for the Army to account, assess, manage, and monitor the recovery process for personnel and their families affected and/or scattered by a wide-spread catastrophic event. ADPAAS provides valuable information to all levels of the Army chain of command, allowing commanders to make strategic decisions that facilitate a return to stability. ADPAAS allows Army personnel to do the following: report accounting status, update contact information, provide location information, complete a needs assessment, and view reference information. These systems are tested and used as part of training exercises on a regular basis.

Education is the most critical step to enabling a resilient workforce. USACE provides training and awareness programs to educate employees about the risks and hazards associated with heat stress, extreme weather events, flooding, and wildfire and the preventive measures they should take to protect themselves. USACE's safety hazard training program continues to improve by engaging USACE social scientists to develop multi-tiered, innovative communication tools and training plans that support integrating climate change concepts to inform the workforce on the impacts of climate hazards, which in many cases will vary regionally. The expected outcome is an educated workforce that understands current and future climate risks and how these risks may impact their professional roles and personal safety.

USACE focuses on all aspects of employee safety, including the hazards that are and will be associated with climate change; therefore, USACE is already implementing many of the actions that prepare its employees for the impacts of climate change. However, the standard practices already implemented can be enhanced and new practices can be developed to improve employee resilience professionally and personally. More specific details of the actions outlined in the 3A.2 table include:

- **Maintain a robust employee alert system**. The existing systems need to be continuously maintained and tested through exercises.
- **Training**. USACE should continue to train and educate its employees on the impacts of climate-driven hazards like heat stress, extreme weather, high water, and wildfire so that employees perform their jobs safely. In addition to USACE's traditional safety and occupational health training program, USACE should provide comprehensive training programs targeted at educating agency employees on the impacts of climate change and how it might change the environments in which they live and work. Changes in the hazards people might face in terms of severity and frequency should be emphasized, as well as actions to reduce vulnerability (e.g., resilient infrastructure construction, monitoring, emergency management, adaptive management, and personal safety).
- **Emergency response planning**. USACE must continue to enhance emergency response planning to include climate-related scenarios. Training on emergency protocols is also critical to ensure plans are in place to protect both personnel and critical infrastructure during extreme events including extreme storms, hurricanes, floods, and wildfires. As part of this action, USACE must also promote personal emergency response planning to

provide employees with the tools to protect themselves and their families.

- **Employee wellness programs**. USACE should continue to implement wellness programs that address physical and mental health increasing employee resilience to climate-related stressors (e.g., damage to personal possessions due to extreme storms/wildfire/flooding, trauma related to serving as part of USACE's emergency response mission). USACE's robust Employee Assistance Program (EAP) offers counseling services, financial assistance, and other support mechanisms for employees facing personal or professional challenges.
- **Community engagement and support**. USACE should facilitate community engagement initiatives, especially in the communities in which employees reside, that allow USACE employees to contribute to local resilience efforts. This fosters a sense of purpose and community support during climate-related challenges.

USACE's employees are its most important asset, which is one of the reasons USACE focuses so heavily on safety. The effects of climate change present increasing and new safety challenges to USACE. To address future safety risks, climate change-induced hazards must be tackled by taking effective and proactive action.

3A.3 Addressing Climate Hazard Exposures and Impacts Affecting Federal Lands, Waters and Associated Cultural Resources

TYPE OF LAND OR WATER ASSET: USACE LANDS AND WATERS (APPROXIMATELY 12 MILLION ACRES)	
Climate Hazard Impact on and/or Exposure of the Asset: ☑ Extreme Temperature ☑ Extreme Precipitation ☑ SLR ☑ Flooding ☑ Extreme Weather Events ☑ Wildfire ☑ Coastal Flooding ☑ Drought	
Priority Actions	**USACE Lakes and Reservoirs** • Continue to use and maintain web-based portals such as the Reservoir Sedimentation Portal (also used by the U.S. Bureau of Reclamation [USBR]) and Access to Water (for pool elevation, precipitation, flow status, and water control manuals [WCMs]) to make USACE data public. • Continue to maintain WCMs and drought contingency plans (DCPs) to facilitate monitoring. • Screen existing USACE project sites for climate-driven vulnerabilities using indicators tied to climate projections (CWVAT), as well as the CESL (where applicable). • Reduce extreme weather disruptions at projects by updating WCMs, DCPs, and natural resources management guides to reflect climate as it changes. **USACE Lands** • Screen existing USACE project sites for vulnerabilities using indicators tied to climate projections (CWVAT), as well as the CESL (where applicable). • Continue implementing the Sustainable Rivers Program (SRP) to further demonstrate that a strategic and science-based approach at USACE reservoirs maintains or enhances the environmental benefits and reduces negative environmental consequences of downstream flows. • Continue applying USACE's Environmental Operating Principles, developed so that USACE missions totally integrate sustainable environmental practices, which directly applies to how USACE manages, conserves, and protects natural and cultural resources at USACE-operated projects.

TYPE OF LAND OR WATER ASSET: USACE LANDS AND WATERS (APPROXIMATELY 12 MILLION ACRES)	
Climate Hazard Impact on and/or Exposure of the Asset: ☑ Extreme Temperature ☑ Extreme Precipitation ☑ SLR ☑ Flooding ☑ Extreme Weather Events ☑ Wildfire ☐ Coastal Flooding ☑ Drought	
Priority Actions	**USACE Lakes and Reservoirs** • Apply best practices for shoreline resilience of reservoirs, as vegetation adapts to changes in water level and salinity. **USACE Lands** • Expand use of unmanned aerial vehicles (UAVs) and remote-controlled vessels to collect sedimentation and other information faster and more cheaply, providing insight into sedimentation changes as climate changes. • Develop and deliver workshops on appropriately applying natural and nature-based features that may display some degree of self-adaptation to climate changes but also entail specific climate-related considerations. • Apply best practices for floodplain resilience. • Consider future climate change impacts when developing long-term aquatic ecosystem restoration strategies. • Consider including climate change in existing habitat models to assess impacts on species.
TYPE OF LAND OR WATER ASSET: ARCHAEOLOGICAL SITES, SACRED SITES, TRADITIONAL CULTURAL PLACES, HISTORIC BUILDINGS AND STRUCTURES	
Climate Hazard Impact on and/or Exposure of the Asset: ☑ Wildfire	
Priority Actions	• As necessary and able, provide information to help avoid sites and areas that might be sensitive to cultural resources during firefighting. • During and subsequent to wildfire events, take steps to minimize effects of increased erosion resulting from the loss of vegetation on protected sites. • Subsequent to wildfire events, visually inspect the affected areas to determine any effects to cultural resources.
TYPE OF LAND OR WATER ASSET: ARCHAEOLOGICAL SITES, SACRED SITES, TRADITIONAL CULTURAL PLACES, HISTORIC BUILDINGS AND STRUCTURES	
Climate Hazard Impact on and/or Exposure of the Asset: ☑ Extreme Temperature ☑ Extreme Precipitation ☑ SLR ☑ Flooding ☑ Coastal Flooding ☑ Drought	
Priority Actions	• Use technology, such as drones, to monitor shoreline erosion, which may be related to effects of extreme heat, drought, extreme precipitation, SLR, and flooding (riverine and coastal). • Subsequent to flood events, visually inspect affected areas to determine any adverse effects to cultural resources. • Where erosion is having an adverse effect, consider protective measures, such as the placement of fill or stone.

USACE is actively managing lands and waters for CPR in alignment with EO 14057. The initiative, led by the Directorate of Civil Works at Headquarters USACE (HQUSACE) and supported by key stakeholders, aims to increase the resilience of USACE-managed water resources, natural resources, ecosystems, and the associated communities and economies to SLR, extreme weather, and changing climate conditions.

With over 400 lake and river projects across 43 states, covering 12 million acres of public lands and waters, USACE recognizes the significance of taking proactive management action in response to climate change as illustrated through the environmental stewardship business line and the Environmental Operating Principles. The overall objective of USACE's current lands and water management approach is to reduce recovery costs and minimize impacts on USACE mission readiness. This 2024–2027 CAP is an opportunity to enhance ongoing management practices by incorporating more climate change adaptation while aligning with climate change mitigation goals.

The scale of the effort is national, addressing the diverse portfolio of USACE-managed resources. The timeframe is ongoing. Actions include regularly revising project Water Control Manuals (WCMs), updating project Master Plans, leveraging drought periods for cost-effective remote sensing surveys, conducting vulnerability assessments, continuously maintaining and improving the Reservoir Sedimentation and Access to Water portals, and generating an inventory of projects requiring Drought Contingency Plans (DCPs). Per the 2021 Climate Action Plan, an inventory of WCMs and DCPs and an intermediate climate vulnerability assessment of project sites was performed. Performance actions for priority actions include confirming that 100% of WCM and DCP updates incorporate climate change considerations by FY25 and publishing 100% of Water Control Manuals in Access to Water by FY25. Additional performance actions include an update to the CWVAT and the Comprehensive Evaluation of Projects with Respect to Sea Level (CESL) tool in FY24; updated vulnerability assessments of USACE lands, waters, and pertinent components by FY25; and development of Nature-Based Solutions (NBS) guidance in FY24.

Proposed implementation methods include using web-based portals for public data access, expanding deployment of unmanned aerial vehicles (UAVs) and remote-controlled vessels for efficient data collection, presenting workshops on NBS application, sharing best practices for shoreline resilience, including climate change in habitat models, conducting vulnerability assessments of USACE project sites, implementing the Sustainable Rivers Program (SRP), and incorporating climate adaptation into WCMs, DCPs, and natural resources management guides.

Archaeological sites, sacred sites, traditional cultural places, and historic buildings and structures within USACE lands and waters are susceptible to climate change-driven hazards including wildfire, extreme temperature, flooding, SLR, and extreme precipitation. To monitor sites and protect against these hazards, Districts developed a variety of strategies to identify impacts and recommend and implement remedies for adverse effects. Districts use a variety of techniques to monitor for the effects of climate change. For instance, drones track erosion following a period of prolonged drought or after an extreme event. Where adverse effects are identified, protective measures may be recommended, such as the placement of fill or stone to protect sites from further damage.

Managing USACE lands and waters for CPR while aligning with climate mitigation goals continues to be one of the agency's highest priorities. By implementing these priority actions and continuing the efforts already undertaken, USACE will prioritize climate resilience of its natural resources by mainstreaming climate adaptation into all USACE mission areas.

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Each of the efforts identified highlight program aspects that strengthen the climate resilience of natural resource assets.	
Natural Resources Program Management	To further promote effective and efficient management of USACE's natural resource assets, the program developed a 10-year strategic plan. The plan integrates the management of diverse cultural and natural resource components such as fish, wildlife, forest, wetlands, grasslands, soils, and water with providing recreational opportunities to the public.

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Each of the efforts identified highlight program aspects that strengthen the climate resilience of natural resource assets.	
Natural Resource Conservation	USACE recently issued revised an invasive species policy focused on restoring habitat to remove and prevent re-establishment of invasive species and to promote native, resilient ecological communities. USACE is also finalizing a strategic plan focused on invasive species management. The plan identifies an overarching framework for the broad spectrum of activities that are performed by USACE, nationwide. The strategies reflect both work that is ongoing and opportunities to focus on emerging priorities affecting ecological connectivity and wildlife corridors.
Species Conservation	USACE supports species conservation through efforts such as Migratory Bird Best Management Practices (BMPs), which include considerations for ecological connectivity and wildlife corridors. USACE continues to support collaborative partnerships that promote restoration, conservation, and enhancement of fish, forest, and wildlife habitats. For example, many USACE lakes fall along the central core of the migration pathway for the endangered whooping crane. USACE, is actively managing and researching methodologies to maximize the availability of suitable critical stopover habitat for this species.
Habitat Conservation	USACE furthers habitat conservation through both terrestrial and aquatic measures. USACE work includes managing over 25,000 acres of pollinator-specific habitat. The number of actively managed acres continues to grow, as engagement with partners supports federal initiatives to provide critical habitat for a variety of pollinator species.
Sustainable Recreation Facilities	The USACE Recreation program is supporting sustainable recreation facilities by improving energy and water use efficiency and supporting long-term resilience by ensuring that facilities and infrastructure can withstand increases in climate-driven hazards such as floods, fires, and extreme storms.
Sustainable Rivers Program	In partnership with The Nature Conservancy, the SRP focused on improving the health and life of rivers by changing infrastructure operations. In 2022 and 2023, the program engaged 10 new river systems through collaboration with tribes and other stakeholders and now includes more than 12,000 river miles in 45 river systems.
Bipartisan Infrastructure Law (BIL)-Funded Barrier Removal Carve-Out through the Continuing Authorities Program (CAP 206)	The BIL provided $115 million to the Continuing Authorities Program (CAP 206) to restore rivers by removal of in-stream barriers that contribute to degrading ecosystem health.

USACE will use various strategies and actions that were initiated in 2023 to advance the national conservation goal to protect, sustain, and improve the natural and man-made environment of our nation. The **Natural Resources Management Strategic Plan** supports these strategies. This 10-year plan was developed to advance effective and efficient management of USACE's diverse natural resource assets with the provision of public recreation opportunities. These include initiatives targeted at preventing or reducing invasive species, effective habitat and ecosystem management, and work to support a more resilient and sustainable USACE Recreation program. In 2023, USACE issued a **Revised Invasive Species Policy**. This policy directs that "Measures to either prevent or reduce establishment of invasive and non-native species will be a component of all USACE CW projects and will be applied to invasive species issues in the execution of all CW programs. The intent is to integrate the Invasive Species Policy into all projects and programs to manage invasive and non-native species effectively and efficiently, including harmful algal blooms." This policy focuses on restoring habitat to remove and prevent re-establishment of

invasive species and to promote native, resilient ecological communities. In 2023, USACE also drafted an **Invasive Species Strategic Plan**. This plan, developed according to the John D. Dingell, Jr., Conservation, Recreation, and Management Act (Public Law [PL] 116-9), provides an overarching framework for the broad spectrum of activities that are performed nationwide by USACE related to invasive species. The plan includes goals, objectives, strategies, and metrics. The strategies reflect invasive species related work that is ongoing and identifies opportunities to focus on emerging priorities in which invasive species negatively affect the resilience of native communities, ecological connectivity, and wildlife corridors, along with serving as a catalyst in climate-relate natural disasters (i.e., invasive grasses fueling wildfires). **Noxious Weed Cooperative Agreements** targeted at encouraging the removal of invasive and undesirable vegetation were also implemented in 2023**.** This implementation guidance was issued according to EOs 13751 and 13112 and the Federal Noxious Weed Act of 1974 (7 U.S.C. § 2814) and facilitates using Cooperative Agreements with state or local government partners to remove targeted vegetation from project lands.

USACE focuses on supporting management practices that promote conservation and improve habitat and ecosystem function. In collaboration with the U.S. Fish and Wildlife Service, USACE is developing **Migratory Bird Best Management Practices (BMPs)** that include considerations for ecological connectivity and wildlife corridors. USACE continues to support **collaborative partnerships** that promote climate resilient actions and facilities, restoration, conservation, and enhancement of fish, forest, and wildlife habitat as recognized in over 30 Memorandums of Understanding (MOUs) or Memorandums of Agreements with federal and state partners like the U.S. Department of the Interior, U.S. Department of Agriculture, the Federal Aviation Administration, and the U.S. Forestry Service, as well as nonprofits like the National Fish and Wildlife Foundation and non-governmental organizations like Ducks Unlimited, the National Wild Turkey Federation, the National Audubon Society, The Nature Conservancy, etc. Examples of actions taken to support such partnerships include new national USACE MOUs with Trout Unlimited and the Back Country Hunters and Anglers. The Trout Unlimited MOU provides a foundation for collaboration related to the protection, restoration, and management of cold-water fisheries. The Back Country Hunters and Anglers MOU provides a framework to develop and expand interest in wildlife-dependent outdoor recreation and sustainable wildlife habitat.

The USACE **Recreation Program strategically uses supplemental funds**, when recieved from avenues such as the BIL and the Disaster Relief Supplemental Appropriations Act (DRSAA 2022) (PL 117-43), to conduct work reflective of Administration priorities. Additionally, the USACE Recreation Program is investing in supporting **Sustainable Recreation Facilities** by improving energy and water use efficiency and is supporting **long-term resilience** by ensuring that facilities and infrastructure can withstand increases in climate change-driven hazards like floods, fires, and extreme storms. For example, DRSAA 2022 provided $5.711 billion in supplemental funds for the Army CW program. The Recreation Program received a portion of these funds and used over $20 million for qualifying flood and storm damage repair. These repair efforts included a focus on supporting long-term resilience by relocating impacted facilities to less flood-prone zones, stabilizing shorelines, and restoring infrastructure in a manner that is considerate of climate driven impacts. The FY22–24 BIL provided over $100 million in supplemental funds designated for expenditure by USACE's Recreation Program for investments in infrastructure that strengthen resilience to climate change while benefiting communities with EJ concerns. Across USACE, over 185 CW projects with a recreation mission intersect with at least one ASA focus metric disadvantage tract; nearly 50 of these projects received BIL funding. For example, Carr Creek Lake in Sassafras, Kentucky will work to execute $3 million in FY24 BIL funding to replace a failing chemical wastewater treatment plant with an environmentally friendly ultraviolet light treatment system. Associated sewage lines and lift stations, with energy efficient pumps, controls, and electrical system repairs and replacements, will also occur as part of this effort to support sustainable, reliable, and climate resilient recreation infrastructure. USACE, under the requirements of the 2005 Energy Policy Act (PL 109-58) and the 2007 Energy Independence and Security Act (PL 110-140), identified and implemented energy, water, and petroleum conservation measures, in addition to providing greater long-term infrastructure resilience, as means to gain operational efficiencies and reduce operating costs. To further modernize the USACE Recreation Program, over the past 10 years, USACE focused significant effort and funding to revise project master plans. Project master plans are strategic land-use management documents that guide the comprehensive management and development of all recreational, natural, and cultural resources throughout the water resource project's life. The majority of USACE projects that provide recreational facilities were constructed between the early 1930s and the late 1980s; subsequently, project master

plans were written during that same period. This effort ensures that each project uses a relevant, concise plan for strategic management.

USACE continues to implement its **Sustainable Rivers Program**, a 20-year partnership with The Nature Conservancy. The mission of Sustainable Rivers is to improve the health and life of rivers by changing existing USACE infrastructure operations to restore and protect ecosystems, while maintaining or enhancing other project benefits. The program's primary vehicle for realizing environmental benefits is focused on enabling and supporting local teams to pursue environmental ideas that they propose and that align with program objectives. This proactive approach furthers environmental stewardship by helping teams advance, implement, and incorporate environmental strategies.

In addition to habitat improvements implemented through its $600 million annual Aquatic Ecosystem Restoration Program, USACE received $115 million through the Bipartisan Infrastructure Law (BIL) provided for the Continuing Authorities Program (CAP 206) to restore rivers by **removal of in-stream barriers** that have contributed to degrading ecosystem health. USACE selected several projects for implementation and is working with the Federal Interagency Fish Passage Task Force to leverage multiple funding sources to address high-priority needs throughout the country, in cooperation with multiple other partners. The resulting increases in aquatic connectivity will promote migration pathways for species under changing climate conditions, particularly as they affect water temperature and hydrologic patterns.

3B. Climate-Resilient Operations

3B.1 Accounting for Climate Risk in Planning and Decision-Making

USACE CLIMATE RISK ASSESSMENTS IN PRACTICE	
Established Climate Hazard Risk Exposure Assessment Method	Description of how risk assessments are used in planning and decision-making processes.
Portfolio Risk Assessments	USACE performs portfolio risk assessments to understand and manage risk across USACE-operated and -maintained projects. Portfolio risk assessments enable USACE to understand how infrastructure responds to climate change and prioritize USACE's response. USACE completed an initial Portfolio Risk Assessment using a new tool developed for this purpose, similar to the USACE CWVAT. In FY23–24, the CPR CoP is improving its CWVAT by updating the tool's inputs and rebuilding it to evaluate climate hazard exposure (e.g., wildfire, drought, ecosystem degradation, flood risk, coastal flooding). Upon re-release, a vulnerability screening of USACE projects will inform prioritization for further analysis using existing USACE software.
Coastal Risk Assessments	Under Engineer Regulation (ER) 1100-2-8162, Incorporating Sea Level Change in Civil Works Programs, teams conducting applicable USACE studies must demonstrate how sensitive alternative plans and designs are to the rates of future local mean SLC, how this sensitivity affects calculated risk, and what design or O&M measures to implement to minimize adverse consequences of SLC while maximizing beneficial effects. Alternative plans and designs are formulated and evaluated for three possible future scenarios of SLC. In FY24, USACE will also execute a CESL.
Climate Change Risk Assessments	Engineering and Construction Bulletin (ECB) 2018-14 (rev. 2, 2022), Guidance for Incorporating Climate Change Impacts to Inland Hydrology in Civil Works Studies, Designs, and Projects, requires that climate change and variability be characterized across a project's life cycle. ECB 2018-14 applies to all hydrologic analyses supporting planning and engineering decisions having an extended decision time frame. It provides guidance for incorporating climate change information in hydrologic analyses according to the USACE overarching CPR policy and the USACE Planning Guidance Notebook (ER 1105-2-100).

USACE CLIMATE RISK ASSESSMENTS IN PRACTICE	
Established Climate Hazard Risk Exposure Assessment Method	Description of how risk assessments are used in planning and decision-making processes.
Continuity of Operations Planning (COOP) Program	Under the National Emergency Preparedness Program, USACE maintains a COOP program (ER 500- 1-18) that requires all-hazards COOP planning, including climate change-related hazards, across the USACE enterprise. COOP activities include analyzing resources, preparing and publishing contingency plans to prevent disruptions in communications, and identifying Emergency Relocation Facilities (ERFs) in response to either a natural or man-made disaster/event.
Dam Safety Program	A climate risk assessment is performed as part of all Dam Safety Issue Evaluation Studies (IESs). IES results inform the development of the Future Without Action Condition (FWAC) scenario, which is the baseline against which Dam Safety Risk Management Plans (RMPs) are evaluated and compared. When ECB 2018-14, climate risk, and/or SLC assessments indicate a significant change in future hydrology, the USACE Dam Safety Modification Mandatory Center of Expertise (DSMM) includes greater measures for resilience to account for future climate variability.
Project Risk Registers, Risk-Informed Decision-Making, and Enterprise Risk Register (ERR)	USACE project delivery teams develop risk registers for each study and perform risk-informed decision-making. Risks due to SLC and climate change are documented where relevant within each project's risk register. In addition, the USACE ERR is available to help project teams and leadership better assess, manage, reduce, mitigate for, and view risks to CW projects, including climate financial risks, through a transparent, accessible, and integrated online platform. The ERR adds consistency to USACE's risk-informed decision-making across project life cycles, portfolios, and programs. The ERR lets personnel learn from previously identified risks and mitigation measures, both specific to a project and from USACE's entire portfolio of projects.
Climate Risk Informed Decision Analysis (CRIDA)	The CRIDA approach provides a framework for water managers and policy makers to assess the impact of climate uncertainty and change on their water resources and to work toward effective adaptation strategies. CRIDA is a multi-step, bottom-up process that identifies water security hazards. Scientific modeling and climate analysis teams in local communities provide information that allows tailoring of the design of the analysis, moving away from a "one size fits all" approach. The USACE Interagency and International Services (IIS) program has used CRIDA for international water resources planning, and pilot projects are evaluating the approach for further expansion.
Environmental Justice	EJ has been a part of planning a decision-making process since EO 12898 was issued in 1994. EO 14008, Tackling the Climate Crisis at Home and Abroad, created the Justice40 Initiative, which sets a goal that 40% of overall benefits of investments in climate, clean energy, water, and other areas benefit communities with EJ concerns. EO 14096, Revitalizing Our Nation's Commitment to Environmental Justice for All, has created an opportunity for USACE to reaffirm its commitment toward addressing EJ in all levels of the agency, where applicable. This commitment supports more sustainable and resilient communities with EJ concerns so they are better protected from risks and hazards related to climate change (and SLC).
Wildfire	USACE CW authorities, such as Section 729 and Section 203 Watershed Assessments, and Planning Assistance to States (PAS) support assessing pre- and post-fire flood risk. The USACE CPR CoP is developing the Post-Fire Risk Exposure (Post-FiRE) Decision Support Tool, a pre-hazard planning tool for communities to assess their current and projected future vulnerability to post-fire flood risk if a wildfire significantly impacts their upstream watershed. This tool is slated for development in FY24.

USACE currently considers the risk of climate hazard risk exposure, including the effects of SLC and impacts to inland hydrologic processes, in its missions, operations, programs, and projects. The planning of USACE's water resources development projects in and adjacent to coastal zones must consider the potential for future SLC. Currently, ER 1100-2-8162, Incorporating Sea Level Change in Civil Works Programs, and EP 1100-2-1, Procedures to Evaluate Sea Level Change: Impacts, Response, and Adaptation, both provide direction and procedures for evaluating SLC impacts to coastal studies, designs, and projects.

ECB 2018-14, Guidance for Incorporating Climate Change Impacts to Inland Hydrology (rev. 2, 2022), prescribes a weight-of-evidence-based approach to determining whether evidence exists that climate change presents an operationally significant risk to a given study area, water resources decision, and/or project feature. This approach includes applying the CWVAT, summarizing peer-reviewed literature describing observed and future trends in hydrology and meteorology, a time series-based statistical assessment of the stationarity assumption using the Time Series Toolbox, and an evaluation of watershed-specific projections of hydrology and meteorology via the Climate Hydrology Assessment Tool (CHAT).

In addition to performing risk assessments for USACE studies, project designs, and operation planning, USACE is seeking to conduct climate change and SLC risk vulnerability screenings of existing project sites and programs (e.g., hydropower, navigation) using the CESL approach and the CWVAT. Such evaluations provide a better understanding of vulnerabilities and support developing strategies for addressing climate change risk to USACE projects, operations, and missions. By performing vulnerability assessments, program managers gain a greater understanding of which hazards present an increasing risk at a specific site or within a given watershed or region. CESL integrates a series of progressively more detailed screening-level assessments of the USACE project's vulnerability to SLC. Using the CWVAT and/or CorpsPET to screen USACE projects will result in a ranked list of projects by hazard and categorization into groups corresponding to high, moderate, and low risk or no impact. Vulnerability assessments identify projects that require more detailed analyses and those that require adaptation sooner. For projects identified as high risk, further analysis (using tools like USACE hydrologic modeling software) can determine consequences of inaction and appropriate adaptation steps. The results of the vulnerability assessments help prioritize cost-shared re-evaluation studies (Section 216 of the Flood Control Act of 1970) targeted at altering project design or operations to better manage flood risk as the climate changes.

To prepare, USACE published Engineer Circular (EC) 1100-1-113, and pilot study applications to better quantify risk to inland projects using the outputs from global climate models/earth system models. This includes several pilot studies implementing the Climate Risk Informed Decision Analysis (CRIDA) approach to identify system vulnerabilities.

To further reduce climate change vulnerabilities at existing USACE projects, per ER 500-1-18, the USACE Continuity of Operations Planning (COOP) program ensures USACE missions can be sustained during severe weather events by creating communications redundancies, maintaining COOP sites in strategic locations, and protecting against information loss. To evaluate and identify vulnerabilities, USACE conducts a COOP exercise at least every two years.

3B.2 Incorporating Climate Risk Assessment into Budget Planning

PLANNING AND BUDGET	
High-Level Budget/ Planning Example	Describe how agency leadership incorporates climate risk into high- level budget and planning decisions.
USACE Responses to Climate Change	The USACE CPR CoP helms USACE's Responses to Climate Change (RCC) initiatives. The RCC budget supports the development and improvement of methods, tools, and approaches to evaluate and implement measures to address the effects of climate change and variability on developing, managing, protecting, restoring, and protecting water resources.
Feasibility Studies– Project Planning	USACE policy requires that climate change be incorporated into project planning. In accordance with ER 1100-2-8162 and ECB 2018-14, this includes accounting for SLC when computing costs and benefits and qualitatively evaluating residual risk due to climate change. USACE EP 1100-1-5, USACE Guide to Resilience Practices, requires that projects be prepared, resistant, repairable, and adaptable to reduce downtimes and repair costs after disasters, thereby improving performance and reducing federal financial risk.
Floodplain Management Services (FPMS)	Under the authority provided by Section 206 of the 1960 Flood Control Act (PL 86-645), as amended, USACE can provide the full range of technical services and planning guidance to support effective floodplain management. Efforts under this program are generally conducted at 100% federal expense. USACE considers climate change, among other factors, when prioritizing new requests for FPMS funding. Specifically, as part of the request for funding, requesters are asked to identify whether the project supports planning and/ or preparedness for climate change impacts.
Planning Assistance to States	When reviewing PAS project requests, USACE determines and records whether the proposed project supports/ addresses climate change and climate change resilience. Addressing climate change risk is one of the priority focus areas of the program.
Portfolio Risk Assessments	One area of known, climate-related financial risk is the exposure of USACE projects to extreme events. Risk is evaluated by conducting portfolio-wide vulnerability assessments to identify and budget for climate change financial risk. Risk assessments are conducted using the CWVAT. Coastal risk is tracked by conducting a CESL.
Climate Change Response (CCR) Budget Process	USACE uses targeted, metric-based activities to reduce climate change risk. These metrics report to the OMB Scorecard, inform the Sustainability and CCR budget process, maintain USACE awareness of potential areas for improvement, and highlight success stories across the agency. These metrics also support initiatives to improve energy and water efficiency and transition buildings and vehicle fleets toward using carbon-free energy. Such actions also improve resilience to outages and increase operational sustainability.
Accelerating Nature-Based Solutions (NBS) in USACE CW Planning	Climate change is predicted to cause substantial loss of natural systems, both coastal and inland, that provide significant community resilience. The USACE Institute for Water Resources (IWR) Systems Approach to Geomorphic Engineering (SAGE) program, in coordination with the Engineer Research and Development Center (ERDC) Engineering With Nature (EWN) program, is developing a series of technical notes to identify and communicate innovative financing mechanisms that use unique funding sources from public-private partnerships to apply NBS in CW. SAGE is making these strategies accessible to local, state, and regional stakeholders interested in leveraging existing financing strategies with demonstrated success.

PLANNING AND BUDGET	
High-Level Budget/ Planning Example	Describe how agency leadership incorporates climate risk into high- level budget and planning decisions.
Environmental Justice	Communities with EJ concerns face significant risk from the effects of climate change due to several factors, including decreased ability to recover from climate-related disasters. Under USACE's EJ Strategic Plan and associated planning guidance, USACE provides opportunities for meaningful engagement of persons and communities with EJ concerns who are potentially affected by USACE's activities so that their input is fully considered as part of decision-making processes. USACE policy/guidance is consistent with and includes actions that support the Justice40 initiative, which sets a goal that 40% of the overall benefits of investments in climate, clean energy, water and other areas flow towards communities with EJ concerns. USACE activities stem from congressional authorities and 2020 marked a pivotal year in which the agency was specifically authorized through a WRDA bill to address impacts and benefits to communities with EJ concerns. WRDA Sec. 165a covers our Continuing Authorities Programs (CAP) and focuses on the nine sections within that program to assess small scale water resource related needs in rural, urban, and tribal communities. WRDA Sec. 118 will also yield a number of fully funded projects that can address environmental, climate, coastal, flood, or other needs within these same communities. These activities along with Justice40 activities and guidance outlined in EO 14096 dedicate resource funding to address EJ.

The USACE budget process is based on projects that are individually appropriated by Congress, precluding agency-wide incorporation of climate risk into the Congressional budget process. However, USACE does incorporate climate risk into budget and planning decision-making. USACE has taken significant action to develop and incorporate process(es) and/or tools that incorporate climate risk into planning and budget decisions. The USACE RCC program is 100% federally funded and is authorized by various authorities including Section 216 of the River and Harbor and Flood Control Act of 1970 and sections of the Water Resources Development Act (WRDA) 1986 and Water Resources Reform Development Act of 2014. Annual funding is used to: (1) continue developing and implementing methods, tools, and approaches to translate evolving climate science into actionable information that supports risk-informed decision-making to reduce known vulnerabilities of USACE-owned projects to changing climate; (2) develop practical guidance and policies for planners and engineers that support incorporating climate resilience into USACE planning engineering, construction, operations, and maintenance of USACE-owned projects; and (3) develop and disseminate training on CPR policy, guidance, tools, and methods.

It is the policy of USACE to integrate climate change preparedness and resilience planning and actions in all activities for the purpose of enhancing community resilience through water-resource projects. For CSRM, the federal interest is determined using SLC scenarios that are evaluated to determine the effects on design and performance of project alternatives. SLC scenarios consider the timing and consequences of climate impacts. For inland studies, USACE produced tools and guidance that evaluate the effects of climate change on alternative performance while also identifying residual risks. Overall, identifying potential vulnerabilities and risk due to climate change facilitates adaptable and resilient alternatives for both coastal and inland projects. As part of the USACE Floodplain Management Services (FPMS) and the Planning Assistance to States (PAS) programs climate change preparedness and resilience are prioritized program areas. The Institute for Water Resources (IWR) is collaborating with the Engineering with Nature (EWN) program and the Water Institute to co-produce a report on accelerating NBS in USACE CW planning. This report will include identifying innovative financing mechanisms for supporting NBS, which are critical to offset project future losses of natural systems due to climate change.

One area of known, climate-related financial risk is the exposure of USACE office sites to extreme events. Offices at project sites are evaluated under the vulnerability assessments that pertain to projects and are planned with climate change considerations along with the rest of the project. Climate change risk and exposure for existing projects is evaluated using the CWVAT, the CorpsPET, and the CESL. The USACE CPR CoP supports the development of a Post-FiRE Decision Support Tool slated for FY24 that would enable communities to assess their current and projected vulnerability to post-fire risk as part of a USACE-led watershed assessment. For office spaces leased

from the GSA, other federal agencies, and private entities, USACE identified an action to coordinate with the site owner to manage the risk of climate impacts. For the relatively few office sites that USACE owns outright but are not associated with projects, USACE is developing a process for climate vulnerability assessments like the ones used for project sites.

The uncertainty associated with future conditions driven by climate change presents a recognized financial risk to USACE missions, including emergency management, navigation, water supply, hydropower, and recreation. For example, the Hydropower Program recognizes that climate change impacts the cost of spillway operations. The recreation business line prioritizes actions and investments to make USACE's Recreation Program function more resilient to future climate change impacts. For instance, in FY22, USACE's Sustainability Program provided $10.5 million dollars to fix waterline breaks, reduce water usage, and ensure the availability of USACE recreation facilities for communities. USACE has used its allocation of O&M BIL funding to help ensure water supply projects continue to serve community needs by replacing water intakes and embankment repair. With respect to water management, ER 1110-2-1941, Drought Contingency Plans, recognizes the need to use the best available and actionable science on climate impacts to water resources as part of USACE's overall water management activities, specifically with reference to updating project DCPs.

3B.3 Incorporating Climate Risk into Policy and Programs

AGENCY POLICIES REVIEWED	
Sub-agencies and departmental offices reviewing policies and the type of polices that are being reviewed (memos, MOUs, agency guidance, planning documents) to better incorporate climate adaptive capacity and resilience	10 key policies that could or should be revised to incorporate adaptation and resilience capabilities.
Category: Climate Adaptation and Resilience	
• **U.S. Ocean Climate Action Plan (OCAP)**. The Ocean Policy Committee, co-chaired by the White House Council on Environmental Quality and the White House Office of Science and Technology Policy, released the OCAP to guide and coordinate actions of the federal government and civil society to address ocean-, coastal-, and Great Lakes-based mitigation and adaptation solutions to climate change while building resilience to impacts. The report identifies USACE as a key or supporting agency for 53 actions to meet the OCAP goals. • **ASA(CW) Guidance**. The ASA(CW) published a policy memorandum in July 2022 focused on Army CW programs supporting drought resilience across America's communities. The memorandum calls for action targeted at addressing near-term and long-term drought resilience goals at both local and regional scales. • **USACE Directorate of Civil Works**. At the request of the Directorate of Civil Works multidisciplinary teams from across the agency review and develop resources to address the increasing challenges posed by climate change. Past publications include USACE Civil Works Technical Series (CWTS) 2013-3, Coastal Risk Reduction and Resilience: Using the Full Array of Measures.	1. **Sea Level Change Guidance Update**. Updated SLC guidance for the next National Tidal Datum Epoch in 2026. The USACE CPR CoP is modernizing the USACE Sea Level Change Analysis Tool (SLAT) to support forthcoming guidance updates. 2. **Climate Change and Hydrologic Analysis Update**. Updated guidance on incorporating climate change impacts in hydrologic analyses (inland focus) to replace ECB 2018-14 (rev. 2, 2022) and ETL 1100-2-3, as well as future updates to support EC 1100-1-113. A team is currently working on the ECB 2018-14 and ETL 1100-2-3 guidance update. Updated guidance should be published by the end of FY24. Updates are necessary to respond to the latest actionable science, including the projected 2026 publication of NOAA Atlas 15. To support guidance updates, the USACE CPR CoP is developing high-quality data sets, pilot studies, and research projects to help develop and evaluate options where climate changes may impact USACE projects. USACE recently published a best practice guide for using projected future hydroclimatology (EC 1100-1-113) and has updated the USACE CHAT to facilitate characterizing

AGENCY POLICIES REVIEWED	
Sub-agencies and departmental offices reviewing policies and the type of polices that are being reviewed (memos, MOUs, agency guidance, planning documents) to better incorporate climate adaptive capacity and resilience	10 key policies that could or should be revised to incorporate adaptation and resilience capabilities.
Category: Climate Adaptation and Resilience, cont.	
• **HQUSACE RCC Program/CPR CoP**. The RCC Program is responsible for drafting, reviewing, and updating USACE's: ◦ 2021 Climate Action Plan ◦ CPR Policy Statement ◦ Agency-wide reports (e.g., USACE CWTS 2016-05, Reservoir Sedimentation in the Context of Climate Change). ◦ Engineering and planning guidance targeted at topics such as: ▪ Incorporating SLC considerations (e.g., EP 1100-2-1, ER 1100-2-8162) ▪ Incorporating climate change impacts into hydrologic analysis (e.g., ECB 2018-18, Engineer Technical Letter (ETL) 1100-2-3, EC 1100-1-113) ▪ NBS ▪ Greenhouse gas (GHG) accounting ▪ Ecosystem climate impacts ▪ Maintaining tidal datum information ◦ CPR CoP technical and policy and legal compliance review standards of practice. • **HQUSACE Hydrology, Hydraulics and Coastal (HH&C) CoP**. The HH&C CoP collaborates with the HQ CPR CoP to generate, review, and update engineering and design guidance relevant to HH&C applications. The HH&C CoP seeks to reduce extreme weather disruptions at projects by updating WCMs, DCPs, and natural resources management guides to reflect climate as it changes. Examples of pertinent engineering guidance include: ◦ ER 1110-2-1941, Drought Contingency Plans ◦ ECB 2023-12, Methods for Storage/Yield Analysis ◦ ER 1100-2-8156, Preparation of Water Control Manuals ◦ EM 110-2-1420, Hydrologic Engineering Requirements for Reservoirs.	future hydrologic response. USACE is carrying out a state of the science review on hydrologic nonstationarity to support the forthcoming guidance update and an update to USACE's Timeseries Toolbox application. USACE is also currently working on updating the CWVAT, as well as producing a series of regional literature syntheses to support the guidance update. 3. **New Guidance on Climate Change and Ecosystems**. Guidance in the form of an ecosystem climate impacts and responses ETL. 4. **Update Extant HH&C Guidance**. Update relevant existing guidance (e.g., EM 1110-2-1415, Hydrologic Frequency Analysis) to include the latest actionable science related to CPR (contingent on funding availability). 5. **New Nonstructural Guidance**. With the increase of nonstructural features in USACE FRM and CSRM projects, USACE is in the final stages of releasing interim guidance for nonstructural implementation and is developing an ER to establish a Nonstructural Mandatory Center of Expertise (MCX). A future ER will provide further guidance. HQUSACE is concurrently developing guidance for conducting nonstructural replacements. 6. **EJ Strategic Plan, Program Management Plan, Policy, and Guidance**. HQUSACE issued updates to guidance and policy and will issue an agency EJ strategic plan (per EO 14096) and further update guidance as other rule-making initiatives are finalized. The major subordinate commands (MSCs) endorsed district EJ Strategic Engagement Plans and will post those to the EJ website. Communities with EJ concerns face significant risk from the effects of climate change due to several factors, including decreased ability to recover from climate-related disasters. Inclusion of these communities in the planning process, and policy/guidance updates provide opportunities for USACE to consider impacts and benefits to communities with EJ concerns that help build resilience to climate-driven risks.

AGENCY POLICIES REVIEWED	
Sub-agencies and departmental offices reviewing policies and the type of polices that are being reviewed (memos, MOUs, agency guidance, planning documents) to better incorporate climate adaptive capacity and resilience	10 key policies that could or should be revised to incorporate adaptation and resilience capabilities.
Category: Climate Adaptation and Resilience, cont.	
◦ Required periodic updates to management plans that include revising USACE WCMs and revising project Master Plans. WCMs for reservoirs and other water resource projects are updated to include recent climate information every 10 years (the same frequency as NOAA's updates to 30-year U.S. Climate Normals).[11] Project Master Plans are updated every 15–20 years to reflect the recent climate in management of lands and waters. • **ERDC** conducts research and development (R&D) in support of the USACE CW mission. ◦ Forecast-Informed Reservoir Operations (FIRO) is a research-and-operations partnership strategy that seeks to optimize reservoir management in response to a growing demand for water supply coupled with increasingly frequent drought and flood risk. The FIRO program supports ER 1110-2-240 that allows water management operations planning to use forecasted conditions. ◦ USACE's EWN program consistently promotes collaboration for identifying innovative NBS that lead to more resilient communities and water-based infrastructure. USACE has a EWN strategic plan for 2018–2023. The program recently published International Guidelines on Natural and Nature-Based Features for Flood Risk Management (NNBF). ◦ The Coastal Hazards System (CHS) quantifies coastal hazards, such as storm surge, waves, and flooding, including SLC, using a consistent methodology and level of accuracy. ◦ ERDC is collaborating with Arizona State University to conduct a Managed Aquifer Recharge (MAR) Planning and Guidance Study to identify optimal sites for MAR. MAR are NBS applied to offset drought risk. MAR captures surface water to replenish groundwater. ◦ ERDC's Coastal and Hydraulics Laboratory (CHL), Post-Wildfire Strategic R&D, and IWR-Hydrologic Engineering Center (HEC) are collaborating to improve modeling of erosion, sedimentation, streamflows, and debris flows within post-wildfire landscapes.	7. **New and Updated NBS Guidance**. These include an update to USACE's EWN Strategic Plan and updates to NBS technical reports, pamphlets, guidance, and policy memorandums. 8. **Unified Facilities Criteria (UFC) Updates**. The Army is making ongoing updates to UFCs, and USACE is considering their inclusion in CW guidance. 9. **Policy Memos**. These memos clarify support for, and identify resources and guidance for innovative approaches to including climate change preparedness and resilience in project design/planning. To support this a policy review is underway to identify opportunities to reduce climate uncertainties in costs and benefits computation. 10. **Resilience Guidance/Memorandum Updates**. USACE has acted to promote resilience thinking (e.g., EP 1100-1-5, published 1 December 2020) and engineering judgment (Civil Works Planning Transformation Memo, 8 February 2012) and continues to produce and update guidance and memorandums directed at improving resilience in USACE projects, missions, and operations.

11 The 1991–2002 U.S. Climate Normals are the latest in a series of decadal normals first produced in the 1950s. Climate normals are used to characterize typical climate conditions across the U.S. and consist of representative averages and statistics for various climatological variables.

AGENCY POLICIES REVIEWED	
Sub-agencies and departmental offices reviewing policies and the type of polices that are being reviewed (memos, MOUs, agency guidance, planning documents) to better incorporate climate adaptive capacity and resilience	10 key policies that could or should be revised to incorporate adaptation and resilience capabilities.
Category: Climate Adaptation and Resilience, cont.	
• **National Flood Risk Management Business Line Community of Practice (FRM CoP)**. In September 2023, the FRM CoP published the memorandum Resilience Integration in the USACE Flood Risk Management Mission. • **HQUSACE Civil Works Planning and the Planning Centers of Expertise and Planning Community of Practice (PCoP)**. USACE Planning oversees and develops the CW planning mission. The PCoP develops relevant policy doctrine and guidance that is housed in the Planning Community Toolbox. The PCoP collaborates with the CPR CoP, the HH&C CoP and the FRM CoP to ensure that USACE's Planning Guidance promotes climate adaptive capacity and resilience and that investments strategically consider future conditions and are climate smart. Examples of pertinent guidance are: ◦ Planning Guidance Notebook (ER 1105-2-100 – Sec. E-24 (k) Sea Level Rise. ◦ ER 1105-2-103, Policy for Conducting Civil Works Planning Studies. ◦ ECB 2020-06, Implementation of Resilience Principles in the Engineering & Construction Community of Practice. ◦ EP 1100-1-2, USACE Resilience Initiative Roadmap. ◦ EP 1100-1-5, USACE Guide to Resilience Practices. ◦ Guidance on Nonstructural Implementation. • **The IWR-Led Sustainable Rivers Program**. The SRP is an ongoing national program to increase environmental benefits provided by USACE's already built water resources projects. The SRP is developing and evaluating adaptive management strategies that, if proven effective, can be incorporated into USACE guidance updates. • **Natural Resource Management/Environmental Stewardship: Wildfire**. USACE is required to manage its lands for wildfire, including conducting prescribed burns and fire suppression activities (EP 1130-2-540, Environmental Stewardship Operations and Maintenance Guidance and Procedures).	

AGENCY POLICIES REVIEWED	
Sub-agencies and departmental offices reviewing policies and the type of polices that are being reviewed (memos, MOUs, agency guidance, planning documents) to better incorporate climate adaptive capacity and resilience	10 key policies that could or should be revised to incorporate adaptation and resilience capabilities.
Category: Nature-Based Solutions	
• **PL 84-99/Emergency Management: Wildfire**. ◦ USACE is the responsible agency for water quality permitting under Section 404 of the Clean Water Act. In the case of natural disasters, including wildfire, it establishes Emergency Regional General Permits covering emergency actions such as levee reconstruction, bank stabilization, and debris removal. ◦ Under PL 84-99, USACE can take emergency actions and provide technical assistance to communities to mitigate post-fire flood risk. • **2021 Climate Action Plan**. As part of this plan, USACE sought to develop and deliver workshops on appropriately applying NBS. The CPR CoP led a workshop, in collaboration with EWN, in May 2023 to determine actions toward creating engineering guidance on NBS. • **Beneficial Use of Dredged Material Command Philosophy Notice**. In a Command Philosophy Notice dated January 2023, the Chief of Engineers established the goal of using 70% of dredged material from construction and O&M water resources projects for beneficial uses by the year 2030. To track progress toward the Chief's goal, the USACE Regional Sediment Management (RSM) Program maintains the RSM Sediment Placement Data Viewer to quantify the percent of beneficial use across the enterprise. Currently, USACE beneficially uses approximately 30–40% of its dredged material.	1. **NBS EP and Technical Reports**. USACE is currently developing an Engineering and Planning EP for NBS in conjunction with four technical reports on vegetated bank biostabilization, floodplain reconnection, oyster reefs, and constructed coastal wetlands. Additional technical reports will be created after publication of the first four. 2. **NBS Planning Guidance**. NBS guidance, accompanied by a technical report on coastal NBS, is being developed to quantify or qualify flood resistance benefits and to provide direction to districts for incorporating NBS into alternative plans. 3. **NBS Director's Policy Memo**. This memo is being developed to address opportunities and needs for applying NBS to existing and planned USACE programs and projects. 4. **Papers to Advance NBS**. The USACE IWR SAGE is developing papers to offer approaches to advance planning solutions and guidelines that support NBS in USACE CW planning and beyond. 5. **Joint Technical Research Projects**. IWR SAGE, in coordination with ERDC Environmental Lab (EL), is working on a joint technical research project focused on the design, performance, risk reduction, and long-term adaptation of NBS coastal settings.
Category: Environmental Justice	
• **Modernization Initiatives**. USACE modernized the CW program through several policy initiatives to better serve the needs of communities with EJ concerns. ◦ In FY23, USACE published a new Interim EJ Strategic Engagement Plan. ◦ USACE is drafting an agency EJ strategic plan (per EO 14096) to be completed in FY24. ◦ USACE identified dedicated EJ coordinators at the district and division levels to act as local points of contact to address each region's unique needs and challenges. ◦ USACE also hired an EJ program manager at headquarters to provide program oversight and guidance. EJ input to the CAP was coordinated through the HQUSACE EJ Program Manager.	1. **Interim EJ Strategic Engagement Plan**. A key goal of the new Interim EJ Strategic Engagement Plan is to ensure EJ groups and Tribes are at the center of any climate disaster response or climate preparedness planning and are meaningfully engaged as decision makers. USACE will create a modern system of transparency which seeks to increase access to engagement, technical assistance, funding, cultural access, etc., as well as effective communication to communities on legacy, systemic, past, present, and looming climate impacts. The plan will foundationally change how the USACE CW program supports and communicates with partners in the future. Note the Interim EJ Strategic Plan is specific to USACE CW Planning Studies, not to be confused with the agency EJ Strategic Plan.

AGENCY POLICIES REVIEWED	
Sub-agencies and departmental offices reviewing policies and the type of polices that are being reviewed (memos, MOUs, agency guidance, planning documents) to better incorporate climate adaptive capacity and resilience	10 key policies that could or should be revised to incorporate adaptation and resilience capabilities.
Category: Environmental Justice, cont.	
• **White House Environmental Justice Advisory Council's Recommendations on Climate Planning, Preparedness, Response, Recovery, and Impacts (September 2023)** ◦ "The actions of Federal agencies [...including USACE in response] to climate disasters must not further or exacerbate the harm to vulnerable communities and populations." ◦ "The way that Federal agencies [including USACE...] prepare for, respond to, and prevent climate disasters in vulnerable communities requires an unprecedented amount of coordination within government but also with communities and populations most directly impacted." ◦ USACE "must intimately involve local residents, community groups, EJ groups, and Tribes in creating and implementing community level emergency and climate change adaptation plans." This should be accomplished by: ▪ "Increase[ing] access to engagement, decision-making, planning, research, technical assistance, funding, and resources, including language access, financial access, cultural access, etc." ▪ Ensuring that USACE creates "an interoperable, modern system of transparency on progress of programs and communications to communities on legacy, systemic, past, present, and looming climate impacts." ◦ In the face of climate driven disaster, the goal of USACE should be first and foremost to support communities to emerge stronger and more secure than before. If a community incurs insurmountable damages, or it is no longer safe for the community to remain, a just approach to relocation should be adopted. When relocation is necessary USACE should ensure it is done in a transparent way, in consultation with the community. Relocation must prioritize, life, property, and wellbeing, as well as cultural integrity of the displaced community. Relocation should improve the conditions of communities with EJ concerns.	2. Once the **agency EJ Strategic Plan** is approved it will be posted on the USACE Headquarters' EJ webpage.

AGENCY POLICIES REVIEWED	
Sub-agencies and departmental offices reviewing policies and the type of polices that are being reviewed (memos, MOUs, agency guidance, planning documents) to better incorporate climate adaptive capacity and resilience	10 key policies that could or should be revised to incorporate adaptation and resilience capabilities.
Category: Tribal Nations	
• **Tribal Partnership Program (TPP) Guidance**. In FY24, the ASA (CW) issued the updated USACE Tribal Consultation Policy and USACE issued EP 1105-2-64, Tribal Partnership Program. The EP provides a strategy for the program established by WRDA 2000 (Section 203), as amended. The TPP guidance includes specific sections for USACE consultation with tribes for the assessment of climate change risk and to implement climate change preparedness and resilience projects on tribal lands.	As a result of consultation with tribes, the guidance includes specific reference for using the TPP to provide tribes with information and potential courses of action to understand climate risk to resources on tribal lands.
Category: Co-Benefits of Adaptation	
• **UFC 1-200-02**. USACE, working with the Navy and Air Force, regularly updates UFC 1-200-02, High Performance and Sustainable Building Requirements, to incorporate principles of climate change mitigation, installation resilience, and climate resilience into military construction. • **Updated Standards and Guidance**. Other documents created or updated in the last year include: ◦ Electrification of Standard Building Operations DoD Memo, 29 March 2023. ◦ Army Electrification Guidance for Military Construction (MILCON) Projects, 18 May 2023. ◦ Metrics and Standards for Energy Resilience at Military Installations, 20 May 2021. ◦ UFC 3-550-04, Installation Microgrid Design (Pending Final Approval and Publication). ◦ UFC 3-520-02, Facility Energy System Resilience and Reliability. • **Application to CW Construction**. USACE also applies these criteria in support of USACE CW construction, e.g., project offices, visitor centers, and access ramps. • **Guidance Related to Sustainability**. In 2023, USACE published the Army Sustainability Implementation Guide, and ECBs on LEED, ASHRAE 90.1, Electrification, and Mass Timber.	1. **Updates to the UFC 1-200-02**. These include incorporating American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) 90.1 and the International Energy Conservation Code and Leadership in Energy and Environmental Design (LEED) Silver Certification. 2. **Pilot Construction Projects**. USACE Engineering and Construction and ERDC are partnering with the Navy, Air Force, and private industry to execute pilot construction projects that reduce carbon emissions on military installations through sustainable materials and net-zero operations. These projects will seek to use innovative acquisition processes with the goal to exceed energy use intensity targets, produce net-zero emissions, electrify building operations, achieve elements of passive design, and use sustainable building materials. ◦ Examples of sustainable materials pilots include the FY24 Army barracks project at Joint Base Lewis-McChord JBLM), Washington, which will use low global warming potential concrete, and the FY25 JBLM Army Barracks project, which will use mass timber. ◦ Army net-zero pilot projects include the FY24 Army Barracks at Fort Liberty, North Carolina; FY24 Army Barracks renovation at Fort Campbell, Kentucky; and the FY25 Component Rebuild Shop at Fort Letterkenny, Pennsylvania.

AGENCY POLICIES REVIEWED	
Sub-agencies and departmental offices reviewing policies and the type of polices that are being reviewed (memos, MOUs, agency guidance, planning documents) to better incorporate climate adaptive capacity and resilience	10 key policies that could or should be revised to incorporate adaptation and resilience capabilities.
Category: Co-Benefits of Adaptation, cont.	
	3. **Data Tracking System Enhancements and Sustainable Project Dashboard**. USACE is currently enhancing its data tracking systems to ensure compliance with relevant sustainability-related laws, policies, and criteria at every level of the enterprise. This endeavor involves establishing new reporting fields, which necessitates routine updates from Project Delivery Teams (PDTs). As part of this comprehensive sustainability initiative, USACE is set to introduce a novel tool known as the "USACE Sustainable Project Dashboard." This innovative dashboard consolidates data from various sources, enabling real-time project status monitoring in relation to sustainability goals. The dashboard will be a dynamic and accessible resource, offering transparency and insights into the progress of ongoing initiatives. 4. **Assistance to PDTs**. Assists PDTs in meeting Code of Federal Regulations (CFR) 433.100, EO 14057, the Army sustainable design and development policy, and 2023 DoD and Army policies on electrification of building infrastructure, reducing climate change vulnerability, and decreasing emissions.

The USACE RCC program and CPR CoP provide planning and engineering guidance to enhance resilience and reduce vulnerability of USACE projects, systems, and programs to observed or expected changes in climate. The CPR CoP regularly issues and updates technical guidance to support climate change and SLC considerations in decision-making, planning, and design. Focus areas include SLC, U.S. Ocean Climate Action Plan (OCAP) goals, climate change impacts to hydrologic processes, wildfire frequency and ecosystems, NBS, resilience, and climate change impacts on reservoir management (i.e., reservoir sedimentation). In June 2023, the CPR CoP released a new EC 1100-1-113 and is currently updating ECB 2018-14. USACE is also initiating an update of guidance for incorporating SLC in advance of NOAA's next National Tidal Datum Epoch publication, anticipated in 2026. Guidance updates are supported by advances in tool and resource development.

The CPR CoP prioritizes initiatives targeted at advancing applications, planning solutions, and technical guidelines that support NBS. USACE's commitment to using NBS will be highlighted in a FY24 NBS Director's Memorandum. Concurrent to this policy memorandum, initiatives are being undertaken to develop CW NBS guidance documents and technical reports. To further these initiatives, USACE's IWR and Engineer Research and Development Center (ERDC) are conducting research on design criteria and developing papers aimed at advancing NBS solutions and guidelines. The CPR CoP collaborates with the Hydrology, Hydraulics and Coastal Community of Practice (HH&C CoP), the Planning Centers of Expertise and Planning Community of Practice (PCoP), and the Flood Risk Management Business Line Community of Practice (FRM CoP) to generate management plan updates, reports, policies, memorandums, and guidance targeted at increasing USACE's climate change resilience. USACE recently released a Memorandum for Resilience Integration in the USACE FRM Mission. As part of this guidance, USACE will identify ways to further actualize resilience throughout the FRM project life cycle and encourage resilience-focused thinking when discussing FRM-related

community needs, while aligning with the USACE FRM mission of reducing the threat to life and property from flooding and coastal storms. USACE is also in the final stages of releasing interim guidance for nonstructural implementation and is developing an ER with guidance for nonstructural elevations, floodproofing, acquisition, relocation, and replacement.

Additional USACE initiatives targeted at improving climate change preparedness, adaptive capacity, and resilience include Forecast Informed Reservoir Operations (FIRO), the Coastal Hazards System (CHS), and the SRP. FIRO addresses challenges posed by climate change-driven increases in frequency and intensity of extreme events to management activities at existing water resources infrastructure. FIRO is designed to make USACE's water management projects more adaptive in continuing to manage flood risk while also providing increased flexibility to improve water availability during intense droughts. The CHS is a national coastal storm hazard data resource for probabilistic coastal hazard assessment results and statistics, storing numerical and probabilistic modeling results including storm surge, astronomical tide, waves, currents, and wind. Hazards from hurricanes and extratropical storms include storm surge, waves, wind, rainfall, compound coastal-inland flooding, seiche, and extreme tides, among others. CHS is targeted at developing a consistent and accurate methodology to characterize coastal storm hazards. The IWR SRP is an interagency program with The Nature Conservancy demonstrating that a strategic, science-based approach at USACE reservoirs maintains or enhances the environmental resilience. Both ERDC and the USACE CPR CoP lead research and pilot studies targeted at supporting a better understanding of climate change impacts due to hydrologic drivers like permafrost melt, rain-on-snow events and ice jams, SLR, coastal storm risk, connectivity (e.g. power, road, waterway) resilience, compounding hazards, and mitigation co-benefits. Many CPR CoP research efforts involve collaborations with the National Atmospheric Research Center and are focused on identifying and developing actionable climate change science that supports decision-making for and design of water resources.

USACE worked to modernize the CW program through several policy initiatives to better serve the needs of communities with EJ concerns as it relates to climate change. These policies were developed to meet the directives put forth by the WRDAs of 2020 (PL 116-260) and 2022 (PL 117-263), which address EJ in CW programs, projects, and construction activities. For example, USACE produced an EJ Strategic Engagement Plan with associated guidance that creates an enterprise-wide structure for effective engagement. Communities with EJ concerns have been demonstrated to lack sufficient resources for expedited recovery from flood events, and the actions identified in the Strategic Engagement Plan provide direction for USACE to combat the effects of climate change on vulnerable populations through greater inclusion in decision-making and the analysis of comprehensive benefits beyond cost effectiveness. USACE is committed to meeting the goals of the Justice40 Initiative, including transforming its covered programs and policies to address the needs of communities with EJ concerns. In FY24, the ASA (CW) issued the updated USACE Tribal Consultation Policy and USACE issued EP 1105-2-64, Tribal Partnership Program. The Tribal Partnership Program (TPP) guidance includes specific sections for USACE consultation with tribes for the assessment of climate change risk and to implement climate change preparedness and resilience projects on tribal lands. In FY24, USACE is expected to complete requirements of EO 14096 in the development of an agency-wide EJ strategic plan to address not only CW activities, but all business lines as appropriate.

To slow the rate of climate change and increase climate resilience associated with USACE missions and operations, the agency must continually improve processes while also meeting performance targets for energy and water reduction, reduction in GHG emissions, and electric vehicle fleet implementation. Some sustainability and mitigation actions may provide adaptation co-benefits, as when water-efficiency upgrades to buildings provide resilience against droughts. USACE works with the Navy and Air Force to regularly update Unified Facilities Criteria (UFC) to include principles of climate resilience and mitigation. In addition to updating UFCs, USACE published new or updated implementation guides, memos, guidance, and standards to assist USACE Project Delivery Teams (PDTs) in meeting CFR 433.100, EO 14057, the army sustainable design and development policy, and 2023 DoD and Army policies on electrification of building infrastructure. Updated UFCs and publications include provisions to reduce climate change vulnerability and emissions. The ERDC develops codes, standards, and construction methodologies for additive construction to meet the needs of expeditionary and installation infrastructure to address a changing climate. The ERDC initiatives support structural integrity, sustainable material solutions, building envelope performance, assessing structure lifespan, and reducing GHG emissions.

Within the HQUSACE Operations and Regulatory Division, actions are being taken to better understand climate

change-driven risks to business lines like hydropower, recreation, navigation, and water supply. For example, a pilot study to support the water supply business line is currently underway to evaluate how downscaled global climate model projections can inform USACE's understanding of future water availability. USACE is taking action through its Enhancing Reservoir Sedimentation Information for Climate Preparedness and Resilience effort and its tracking of Drought Contingency Plan implementation to better track and understand the impact that climate change and SLC have on reservoir storage.

3B.4 Climate-Smart Supply Chains and Procurement

SUPPLY CHAIN AND PROCUREMENT – HYDROPOWER	
Agency has assessed climate hazard risk to critical supplies and services.	(Yes, No, Partial) Explain assessment and steps taken to improve adaptive capacity of critical supply chains.
Hydropower	**Partial**. As part of the Federal Hydropower Council, USACE, USBR, and the Department of Energy's Power Marketing Administrations established a multi-agency PDT with the following objectives: 1. Identify and evaluate impact of supply chain risks. 2. Identify existing best practices (including benchmarks from industry) to manage risks. 3. Define new risk management practices. 4. Recommend actions for specific entities to develop guidance, policy, and/or further analysis to implement risk management actions. The outcome of this PDT was a supply chain risk guide analyzing five major components that are critical to hydropower. Note that while climate hazards received some consideration, that was not the only focus of the report.
Agency has identified priorities, developed strategies, and established goals based on the assessment of climate hazard risks to critical supplies and services.	(Yes, No, Partial) Explain priorities identified, strategies developed, and goals established, or the steps to develop them.
Hydropower	**No**
Agency has developed an implementation plan to address supplies and/or services disruption from climate hazards.	(Yes, No, Partial) Explain the implementation plans or the steps to develop one.
Hydropower	**No**

SUPPLY CHAIN AND PROCUREMENT – EMERGENCY MANAGEMENT/PUBLIC LAW 84-99	
Agency has assessed climate hazard risk to critical supplies and services.	(Yes, No, Partial) Explain assessment and steps taken to improve adaptive capacity of critical supply chains.
PL 84-99 Program	**Yes**. The PL 84-99 Program is a multifaceted USACE CW program that encompasses disaster preparedness, flood response, and recovery activities in support of federal, state, local, and tribal stakeholders. The program's goals are to provide timely and effective disaster preparedness, response, recovery, and mitigation projects and services on a nationwide basis to reduce loss of life and property damage. Critical supply chains include flood response supplies and equipment. Through climate hazard risk analysis, USACE addresses redundancies by maintaining existing stockpiles and established contracts with the private sector. Further analysis is planned for private sector supply chain resilience.

SUPPLY CHAIN AND PROCUREMENT – EMERGENCY MANAGEMENT/PUBLIC LAW 84-99, CONT.	
Agency has identified priorities, developed strategies, and established goals based on the assessment of climate hazard risks to critical supplies and services.	(Yes, No, Partial) Explain priorities identified, strategies developed, and goals established, or the steps to develop them.
PL 84-99 Program	**Yes**. Supply chain priorities include maintaining supplies and equipment for flood response efforts.
Agency has developed an implementation plan to address supplies and/or services disruption from climate hazards.	(Yes, No, Partial) Explain the implementation plans or the steps to develop one.
PL 84-99 Program	**Yes**. USACE districts have developed flood response standard operating procedures, to include properly maintained supply stockpiles, to enhance supply chain resilience.

SUPPLY CHAIN AND PROCUREMENT – NAVIGATION	
Agency has assessed climate hazard risk to critical supplies and services.	(Yes, No, Partial) Explain assessment and steps taken to improve adaptive capacity of critical supply chains.
Navigation	**Yes**. From the very conception of its navigation projects, USACE CW considered the potential for severe flooding impacts. The original designs provide for complete and repeated inundation of the facilities. Site warehouses contain stocks of supplies to provide O&M during extreme events when access to materials might be otherwise limited. USACE navigation facilities have on-site maintenance staff and/or access to fleet staff who have the skills to address any damage to USACE facilities and equipment induced by extreme weather conditions.
Agency has identified priorities, developed strategies, and established goals based on the assessment of climate hazard risks to critical supplies and services.	(Yes, No, Partial) Explain priorities identified, strategies developed, and goals established, or the steps to develop them.
Navigation	**Yes**. The agency houses locally adapted plans within O&M manuals to manage supplies and services for individual facilities. Plans are developed for each site and the conditions/vulnerabilities of that site. These manuals prescribe weather-related response and contingency plans to operate the facility during severe weather conditions.
Agency has developed an implementation plan to address supplies and/or services disruption from climate hazards.	(Yes, No, Partial) Explain the implementation plans or the steps to develop one.
Navigation	**Yes**. USACE CW formulates and designs its navigation facilities around severe weather and hydrologic conditions, so implementation is via mainstreaming climate considerations into normal business processes.

SUPPLY CHAIN AND PROCUREMENT – CONSTRUCTION	
Agency has assessed climate hazard risk to critical supplies and services.	(Yes, No, Partial) Explain assessment and steps taken to improve adaptive capacity of critical supply chains.
Construction	**Yes**. One of the primary actions being considered and implemented by USACE incorporates climate risk assessments into supply chain management. Recognizing the vulnerabilities posed by extreme weather events and rising sea levels, USACE is evaluating its suppliers' locations, infrastructure, and vulnerability to climate-related risks. This assessment includes identifying critical supply chain modes that could be impacted by climate change, such as ports, warehouses, and transportation routes. Furthermore, USACE encourages adopting innovative technologies and practices that reduce GHG emissions and enhance the resilience of supply chain operations.
Agency has identified priorities, developed strategies, and established goals based on the assessment of climate hazard risks to critical supplies and services.	(Yes, No, Partial) Explain priorities identified, strategies developed, and goals established, or the steps to develop them.
Construction	**Partial**. USACE is revising its guidance, specifications, and requirements to align with climate adaptation and mitigation goals. This includes incorporating criteria that prioritize environmentally friendly and climate-resilient products and services. USACE is implementing technology like Internet of Things (IoT) devices to help identify supply chain vulnerabilities and investing in research targeted at developing climate-resilient infrastructure and technologies. Some USACE districts (e.g., Transatlantic Middle East District [TAM]) have been proactive in identifying multiple suppliers for required commodities and use multiple-award contracts to have more than one vendor available.
Agency has developed an implementation plan to address supplies and/or services disruption from climate hazards.	(Yes, No, Partial) Explain the implementation plans or the steps to develop one.
Construction	**Partial**. USACE is taking proactive steps to adapt to climate change in its construction supply chains and procurement processes. By integrating climate risk assessments, fostering partnerships with resilient suppliers, revising procurement criteria, investing in research, and fostering collaboration, USACE is building more resilient and sustainable infrastructure in the face of climate challenges.

AT RISK SUPPLIES/SERVICES	OUTLINE ACTIONS TO ADDRESS HAZARD(S)	IDENTIFY PROGRESS TOWARD ADDRESSING HAZARD(S)
Describe the acute and/or long-term climate hazard posed to mission-critical supply chains or services.	Outline actions to address the hazard(s).	Identify any current progress made toward addressing the hazard(s).
1. USACE Navigation Mission: Harbors and Waterways (Services). Changes in floods and drought frequency, intensity, and duration due to climate change (including SLC impacts) can impact waterways and channels, damaging facilities and navigation aids or reducing sailing drafts that can limit access or require lightering. This can undermine USACE's navigation mission thereby undermining national supply chains.	The USACE navigation mission is both a user of services and supplies and a critical component of the nation's supply chains. Actions to maintain coastal and inland navigation, and by extension supply chains, include continued emphasis on maintenance of the USACE locks and dams and ongoing studies to reevaluate existing locks for potential replacement. For coastal projects, actively monitoring SLC is also important. Such proactive actions make these waterway networks more resilient to floods, droughts, and other weather disruptions expected to become more frequent with a warming climate.	USACE integrates climate change and SLC in vulnerability assessments and project planning through the multiple sea level scenario approach required by ER 1100-2-8162, the CESL initiative, and the qualitative characterization of residual risk due to climate change required by ECB 2018-14 (rev. 2, 2022). Applying this guidance increases the resilience and adaptability of ports and navigable waterways to climate change impacts.
2. Labor and Lodging (Supplies). When USACE constructs a large project in a low population area, skilled or specialized labor is often scarce, requiring adjustment to standard contract labor rates. This is especially true when local populations are disrupted by severe weather events, as during post-disaster repairs or when workers are exposed to atypical risks. After disasters, worker housing is also often disrupted. To the extent that disasters could become more common in the future, the limited supplies of labor and lodging could become more impactful to the USACE supply chain over time.	Recognized, proactive actions to address this risk are to conduct cost engineering research and studies of local area market labor availability. Based on such investigations, specific locales or regions can address labor supply issues by adjusting independent government estimates (IGEs) to account for labor premium and overtime pay.	USACE employs GSA Emergency Lodging Services and makes use of military housing or temporary housing when necessary. For example, in the aftermath of Hurricane Maria in Puerto Rico, emergency housing was scarce, requiring the use of a hospital ship, the U.S. Naval Ship Comfort, for lodging.

AT RISK SUPPLIES/SERVICES	OUTLINE ACTIONS TO ADDRESS HAZARD(S)	IDENTIFY PROGRESS TOWARD ADDRESSING HAZARD(S)
Describe the acute and/or long-term climate hazard posed to mission-critical supply chains or services.	Outline actions to address the hazard(s).	Identify any current progress made toward addressing the hazard(s).
3. Dredging (Supplies and Services). Dredging demand is anticipated to increase for coastal restoration and channel maintenance due to anticipated increases in extreme weather events and flooding on U.S. rivers. There is also a strong demand for deeper channels to support supply chains. This strain on a limited dredge fleet can cause draft restrictions, longer wait times, and load lightening for vessels. **4. Emergency Response (Supplies and Services)**. A flood, hurricane, tornado, or other weather disruption limits emergency supplies to fight floods and reduce damage during severe weather events (e.g., Hesco bastions, one-ton "supersack" sandbags, sandbag filling machines, and dewatering pumps). Additionally, after a severe weather event the road network is frequently damaged, blocked by debris and downed utility poles, or otherwise compromised. This limits the response time for USACE's emergency management mission and causes supply chain disruptions for emergency supplies. As discussed in Chapter 4 of the 5th National Climate Assessment, this may be a more severe problem in the future as climate change leads to more compound or coincident events, including regional floods that require large amounts of supplies to be deployed to numerous areas simultaneously.	USACE is investigating improved planning approaches to be better equipped to manage storm response and emergency surges and dredging demand. Better understanding is needed as to whether climate change and SLC are resulting in higher or altered sedimentation rates and consequently changes in the required location and volume of dredging, particularly in coastal areas. USACE is investigating state of the art sustainable maintenance dredge design solutions that limit impacts to the environment. Long-term, sustainable FRM solutions are the best hope for avoiding supply chain issues in future emergencies. Further analysis of private sector supply chain resilience is necessary. Further analysis of government personnel required to deliver longer term mission-critical supply chains and services may also be needed. USACE is investigating additional measures and policy to strengthen this system, while promoting action so that emergency repairs do not evolve into unsustainable long-term solutions.	The dredging industry is responding to this market pressure with increased investment in new dredging capacity. The Government is responding with dredge fleet recapitalization efforts with focus on: • Vessel energy efficiency, including emission reduction, vessel "future proofing" to accept energy transition towards renewable energy, propulsive efficiency, and automation, • Marine life enhancements, and • Marine environmental considerations. Sustainment of dredge recapitalization efforts will enable continued climate-related advancements and adaptation in the USACE dredge fleet. During emergency response events, USACE presently uses manned and unmanned aerial vehicles to perform roadway to perform roadway route reconnaissance and identify barriers to accessing affected areas but is investigating usage of satellite data and other potential improvements. USACE policy and guidance requiring consideration of SLR and inland flood-frequency changes in design of infrastructure help maintain performance despite changing conditions. USACE manages the PL 84-99 emergency repair program to identify emerging FRM issues and partners with local and state flood managers through interagency Silver Jackets teams to address them in a comprehensive manner.

AT RISK SUPPLIES/SERVICES	OUTLINE ACTIONS TO ADDRESS HAZARD(S)	IDENTIFY PROGRESS TOWARD ADDRESSING HAZARD(S)
Describe the acute and/or long-term climate hazard posed to mission-critical supply chains or services.	Outline actions to address the hazard(s).	Identify any current progress made toward addressing the hazard(s).
5. Construction Supplies. Materials required for USACE construction missions, such as mechanical and electrical equipment and raw material like lumber and steel, may be disrupted by climate or severe weather impacts in the form of shipping or manufacturing bottlenecks and/or long lead times. This causes and exacerbates delays in maintenance and repairs. Additionally, construction material prices are subject to fluctuation (i.e., inflation) depending on economic conditions. When procuring construction materials in support of USACE applications, the need to adopt innovative technologies and practices that reduce GHG emissions is recognized.	To identify critical supply chain nodes that could be impacted by climate change, USACE is starting to conduct climate risk assessments as part of supply chain management. Additional actions taken to better understand construction supply chain vulnerabilities include cost engineering research and market studies, which are used to help predict procurement lead times and fluctuations in market price. In the procurement of construction materials for infrastructure projects, USACE has modified its specifications and contract requirements to prioritize materials that demonstrate climate resilience and contribute to climate change mitigation strategies (lower carbon footprint, energy efficiency, etc.).	USACE uses a three-level redundant supply chain to ensure sufficient supply of emergency materials: district-level stockpiles, the National Flood Fight Materiel Center located at the Rock Island (Illinois) Arsenal, and pre-negotiated private supply contracts. In emergencies, districts may also borrow materials from each other. In extreme cases, the Defense Production Act may be exercised to acquire certain supplies, within legal limitations and when authority is granted from FEMA. USACE has completed climate risk assessments related to supply chain management. Leveraging IoT devices across supply chains enables monitoring and tracking goods in real time and collects data to advance analytics and machine learning algorithms to help USACE predict potential risks from climate-related events. USACE contracts increasingly include clauses that prompt contractors to integrate climate adaptation measures into their construction and operation plans. Contractors are encouraged or mandated to develop and implement strategies that account for climate change impacts throughout the project life cycle. Due to high inflation rates post-covid, cost engineers are required to obtain up-to-date pricing from manufactures and apply market adjustments to IGEs based on the local construction market. USACE is already taking action to account for mechanical and electrical procurement schedule delays due to equipment procurement in the overall construction schedule of the project. USACE is leveraging multiple-award contracts and identifying multiple vendor options as strategies to address construction material supply chain issues.

USACE recognizes the critical need to address climate change impacts on its supply chains and procurement processes, as well as in executing USACE's navigation mission as a critical component of the nation's supply chains. The four USACE mission areas with particularly notable significant supply chain and procurement exposure due to climate change hazards are hydropower, emergency management (PL 84-99), navigation, and construction. The navigation mission includes maintenance and new work dredging completed by USACE's dredge fleet and contract dredges. Damages from extreme weather disruptions (floods and droughts), as well as coastal storms and SLR, are expected to increase in frequency and severity. These disruptions have the potential to compromise USACE's procurement processes, supply chains, and navigation mission. As climate change increasingly affects infrastructure, operations, and logistics, USACE is taking climate adaptation steps to maintain resilience and sustainability by placing emphasis on related EJ activities, including the Justice40 Initiative, enhancing the resilience of supply chain operations and encouraging the adoption of innovative technologies and practices that reduce GHG emissions.

While most USACE construction contractors are experienced in supply chain management and address potential issues proactively, an internal assessment of business line managers, acquisitions professionals, and logistics leaders revealed foreseeable shortages in goods and services, which could result in contract modifications and/or negative impacts on project delivery. USACE seeks to apply resilient procurement practices by diversifying suppliers across multiple regions, minimizing reliance on single points of failure, and adopting flexible procurement and sourcing practices, as well as using multiple-award contracts for redundant sources. USACE is seeking to incorporate climate risk assessments into agency supply chain management. Recognizing the vulnerabilities posed by extreme weather events and SLR, USACE is evaluating its suppliers' locations, infrastructure, and vulnerability to climate-related risks. Assessments include identifying critical supply chain nodes vulnerable to climate change impacts, such as ports, warehouses, and transportation routes.

USACE is revising its procurement specifications and requirements to align with climate adaptation and mitigation goals. This includes incorporating criteria that prioritize environmentally friendly and climate-resilient products and services. USACE prioritizes suppliers that offer sustainable materials, use energy-efficient technologies, or implement measures to reduce their carbon footprint. Examples include incorporating LEED and Green Procurement in designs and construction and using sustainable acquisition tools. USACE uses the sustainable acquisition tool to confirm that contracting officers include the necessary sustainability clauses in contracts. These clauses include using materials with recycled content, bio-based products, and water-efficient and energy-efficient products. The following are specific procurement actions USACE takes to meet climate adaptation and mitigation goals:

- When working with supply chains for procurement actions, USACE works with external stakeholders to ensure materials, storage facilities, and transport activities minimize impacts on communities with EJ concerns in the vicinity.
- In May 2022, USACE signed a Partnership Charter with the Association of General Contractors of America in a joint effort to overcome obstacles and increase innovation, resiliency, sustainability, agility, and efficiency.
- USACE is also taking action targeted at increasing the use of government and privately owned electric vehicles and reducing emissions associated with government travel. Besides directly reducing USACE GHG emissions, electric vehicles offer mobile, redundant energy storage to use during severe weather events.
- USACE procures a number of supplies and services through GSA. USACE will formally partner with GSA by providing a list of its mission-critical and mission-dependent products and services. USACE will address its supply chain vulnerabilities to climate change (as well as extreme weather incidents) at the order level, and GSA will determine if opportunities exist to address vulnerabilities in contract vehicles.

Moreover, USACE is investing in R&D targeted at developing climate-resilient infrastructure and technologies. This includes exploring advanced materials to withstand extreme weather events, integrating renewable energy solutions into infrastructure projects, and employing NBS for flood protection and ecosystem restoration. USACE construction materials guidance advances initiatives targeted at purchasing low-carbon products to support adaptation and/or resilience strategies. For example, ECB 2023-14 requires mandatory consideration of mass timber in Army Military Construction (MILCON) and CW vertical construction projects. The guidance identifies mass timber as a lower carbon alternative to energy-intensive structural materials. EO 14057 and ECB 2023-08 emphasize implementing clean

energy initiatives in construction to promote Federal Sustainability. The guidance is specific to MILCON projects but is a reference for applicable CW construction projects as well. It highlights the need to "incorporate building design techniques, building features, and proven efficiency technologies to ensure energy and water conservation and resilience." When DD Form 1391 programming documents are submitted as justification for MILCON vertical construction projects to Congress, emphasis is placed on incorporating renewable energy sources and resilient features such as portable/fire protection water storage and emergency generators, as well as requirements for recycled contents. Additionally, USACE is fostering collaboration with other government agencies, academia, and industry partners to share best practices, leverage expertise, and develop strategies for climate adaptation in supply chains and procurement processes. USACE aims to create a comprehensive framework that integrates climate resilience into every aspect of its supply chains and procurement operations.

USACE's navigation mission consists of providing the nation with safe, reliable, efficient, and environmentally sustainable waterborne transportation systems (i.e., channels and harbors). Floods and droughts impact ports and channels, damaging facilities or reducing sailing drafts, which limits access or requires lightering. USACE navigation infrastructure like locks and dams (L&Ds) are designed to withstand extreme conditions; for instance, they are engineered for repeated inundation and quick return back into service. On-site warehouses at the L&Ds contain stocks of oils and grease to allow sustained O&M during extreme conditions where external supply chains may be interrupted. One recognized risk is that some older L&Ds are single points-of-failure in waterway networks that are critical nodes in larger supply chains.

The USACE dredge fleet serves in a ready-reserve role, with private contract dredges acting as the first option for dredging (per PL 95-269). With SLR, sedimentation patterns in coastal channels will change, and demand for dredged material may increase to replace eroding shorelines. Increasing interest in natural and NBS for ecosystem restoration and shoreline protection, such as beaches, dunes, and coastal wetlands, is expected to cause increases in demand for dredged material as well. Climate change-induced changes in drought frequency/intensity and increases in extreme storm and flood occurrence and intensity will result in more frequent disruptions of dredge activities. This could result in longer wait times for shipping vessels or for them to lighten while they await dredges to arrive. Increased drought frequency also increases the need for dredging to keep navigation channels open, as observed during the severe summertime droughts on the Mississippi River in 2022 and 2023, which, for both years, extended into the fall and winter months. The 2022 and 2023 drought events resulted in 92 navigation vessel groundings and 57 closures. In 2023, USACE significantly reduced the negative effects on navigation during droughts, with 70% fewer hours of closures than in 2022. USACE achieved this improvement by using nine dredges to remove 22.5 million cubic yards of material throughout the drought event, which illustrates USACE's capacity to learn from previous events and adapt to low water conditions. This impact to navigation not only compromises the USACE supply chain of goods normally moved by barge (e.g., fuels, rock, sand, metals), and that of the nation at large, but also causes increased emissions of GHGs when shipping is diverted to more carbon-intensive road and rail options.

3B.5 Climate-Informed Funding to External Parties

USACE partnerships with external parties are critical to addressing climate change-driven issues. When working with external partners, USACE seeks to integrate EJ principles into its operations and activities. In general, USACE is not a grant/loan agency, though one program that it can use to offer external funding is the Corps Water Infrastructure Financing Program (CWIFP). CWIFP enables local investment in infrastructure projects that enhance community resilience to flooding, promote economic prosperity, and improve environmental quality. Through CWIFP, USACE provides long-term, low-cost loans to external partners. CWIFP prioritizes projects that serve communities with EJ concerns and projects related to climate adaptation or resilience. For projects that serve communities with EJ concerns, CWIFP increases financing limits from 49% to 80% of the total project cost and waives the $25,000 loan application fee. R&D grants are another avenue for external funding; the ERDC has issued a Broad Agency Announcement (BAA) to solicit proposals for R&D. Awards may be issued through contracts, grants, and other agreements, pending funding availability. A grant can be used when the principal purpose of a transaction is for a public support or stimulation effort that is authorized by federal statute and that may be related to climate change R&D as outlined in the BAA solicitation.

The Interagency and International Services (IIS) program allows USACE to provide management and technical services

to requesting federal agencies domestically and abroad. Most IIS work is funded on a reimbursable basis.[12] IIS initiatives include USACE's work with interagency partners on the U.S. Global Water Strategy and the President's Emergency Plan for Adaptation and Resilience with goals of improving water security and supporting climate change adaptation.

USACE works closely with non-federal partners to develop water resources projects. Many of these projects are ultimately owned and operated by non-federal partners. Additionally, USACE uses several programs to support non-federal planning for climate change. Through USACE's PAS program, USACE provides technical expertise through cost-shared (50% federal/50% non-federal) planning level projects that include consideration for SLR and CPR. The TPP supports cost-shared projects on tribal lands and specifically references addressing climate change risk. Through the FPMS program, USACE provides information on flood hazards to external parties. FPMS requests targeted at reducing climate change risk and encouraging adaptation and resilience are prioritized for funding. Under the National Flood Risk Management (NFRM) program, USACE supports interagency Silver Jackets teams. Recent Silver Jackets initiatives have focused on reducing climate change-driven risks, including adaptive management/ resilient features in design and pre- and post-hazard wildfire flood risk planning.

The need to review the disproportionate impacts to and outcomes of the cost sharing agreement (CSA) requirements presented to communities with EJ concerns is often cited as a recommended action for federal agencies. To start to address the burden these impacts place on these communities, WRDA 2022 (Section 8119) provides a PAS cost-share waiver for eligible communities with EJ concerns. Under WRDA 2020 (Section 165a), USACE's Continuing Authorities Program (CAP) launched a pilot program to fund small water resources projects for communities with EJ concerns. While Continuing Authorities Program (CAP) projects typically require a CSA with a non-federal sponsor, this pilot program will fully fund the selected projects. Under the TPP, feasibility CSAs qualify for a cost-share waiver of up to $665,000, and project partnership agreements (PPAs) qualify for an additional waiver of $665,000 regarding the tribe's cost share.

3C. Climate Training and Capacity Building for a Climate-Informed Workforce

TRAINING AND CAPACITY BUILDING	
Agency Climate Training Efforts	Percentage of the agency's federal staff who have taken a 60+ minute introductory climate training course (e.g., Climate 101): **Unknown**. • USACE Climate 101 Training is offered on-demand in five parts. The availability of the web-based training module has been widely publicized throughout the agency. USACE embedded an optional survey into the course material as a mechanism to help track participation and receive feedback on content. Because the training module is relatively new, its survey has not yet gathered enough data to report on participation. • USACE CPR in-person technical training is offered periodically to USACE divisions. This course covers introductory and intermediate topics related to sea level and climate change. ◦ Since 2021, division training has been offered to six of the seven USACE CONUS divisions: Mississippi Valley Division (MVD), Northwestern Division (NWD), Great Lakes and Ohio River Division (LRD), South Atlantic Division (SAD), the South Pacific Division (SPD) and the North Atlantic Division (NAD). ◦ Participation is comprised mostly of working-level planners, project managers (PMs) and HH&C CoP members. ◦ Participation since 2021: ▪ March 2021 NWD & LRD: 177 participants (50% HH&C CoP and 50% planners & PMs). ▪ February 2022 SPD: 75 participants (90% HH&C CoP and 10% planners & PMs). ▪ March 2022 NAD & SAD: 39 participants (80% HH&C CoP and 20% planners). ▪ June 2022 MVD: 56 participants (90% HH&C CoP and 10% planners & PMs).

12 *Economy Act (31 U.S.C. § 1535) or Project Order authority (41 U.S.C. § 6307).*

TRAINING AND CAPACITY BUILDING	
Agency Climate Training Efforts, cont.	Percentage of the agency's senior leadership (e.g., Secretary, Deputy Secretary, SES, Directors, Branch Chiefs) who have completed climate adaptation training): **Limited Participation/Percentage Unknown**. • In February of 2022, the CPR CoP lead, Dr. Will Veatch, delivered an executive climate briefing to the ASA(CW), the Honorable Mr. Michael L. Connor. • USACE does not currently have a CPR training program specifically targeted at senior leadership (SES, Deputy Secretary, Directors, etc.) and is not tracking how many senior leaders have taken Climate 101 training. • About 10%–20% of the participants in the in-person, 3-day division CPR Training are senior leaders (district section chiefs, branch chiefs, program managers, division leadership, national leadership). ◦ NWD & LRD training (17% of participants in senior leadership roles). ◦ SPD training (17% of participants in senior leadership roles). ◦ SAD & NAD training (10% senior leadership roles). ◦ MVD training (16% in senior leadership roles).
	Percentage of budget officials who have received climate adaptation-related training: **0%**.
	Percentage of acquisition officials who have received climate adaptation-related training: **0%**.
	Additional efforts the agency is taking to develop a climate-informed workforce: **Conference Participation**. District, division, and headquarters staff involved with the CPR CoP attend, present, participate on panels, and generate posters in support of numerous conferences that include presentations targeted at climate change science, SLC science, and climate change preparedness and resilience. Examples include participation in the annual American Geophysical Union Fall Meeting, the annual Northwest Climate Conference, the annual Midwest Climate Resilience Conference, Environmental & Water Resources Institute (EWRI) Conferences, and the American Meteorological Society Conferences. Most recently, the USACE CPR CoP presented a workshop on USACE's CPR program, tools, and resources at the 2023 Sedimentation and Hydrologic Modeling Conference. **Workshops**. District, division, and headquarters staff involved with the CPR CoP participate in workshops on behalf of USACE and the CPR CoP. Examples include the Department of Energy Puget Sound Earth-Human System Dynamic Workshop and 2023 the Nature-Based Solutions Upper Mississippi River Basin Workshop. The USACE IWR, in collaboration with the Rijkwaterstaat (Netherlands) held a workshop in July 2023 on Mainstreaming Nature-Based Solutions. The purpose of the workshop was to 1. Develop a shared vision for NBS; 2. Identify goals and actions to reach the vision; 3. Make connections across USACE teams working on NBS. **National Working Groups**. Members of the USACE CPR CoP participate in numerous national working groups such as the USACE FRM CoP and FRM CoP Advisory Board (FRM CAB), Climate-Smart Infrastructure Working Group, Flood Resilience Interagency Working Group, U.S. OCAP working groups, and the Coastal Working Group. **CPR CoP**. The USACE CPR CoP hosts periodic in-person meetings and targeted training (reviewer training, etc.), as well as monthly calls that include a presentation on a climate change- or SLC-related topic. Some USACE districts and divisions have dedicated CPR leads, regional technical specialists, and CPR sub-CoPs that provide guidance and support to technical personnel and provide climate training in the form of periodic web-based and in-person presentations.

TRAINING AND CAPACITY BUILDING	
Agency Climate Training Efforts, cont.	**EWN Program.** In 2020, the ERDC launched its Engineering with Nature podcast series. This podcast covers the application of EWN principles and practices. The podcast brings together collaborators from local, national, and international agencies; private and not-for-profit organizations; and academia to discuss idea and applications of NBS. The Network for Engineering with Nature (N-EWN) also holds webinars monthly, since 2021. These webinars focus on various NBS topics, including best practices, cutting-edge research, and the latest developments in the field of natural infrastructure (continuing education credits are available for these webinars). In collaboration with Texas A&M, EWN also held its first Short Course on Coastal Engineering and Nature-Based Solutions. The course was an immense success and will be offered again next year. **Sustainability Training.** USACE delivers sustainability training to the workforce through live and on-demand webinars and formal training, such as PROSPECT Course 244 Sustainable Military Building Design and Construction. Content for this training is consistently updated to reflect new sustainable and resilient building policies. **ERDC's CHL, Post-Wildfire Strategic R&D, and IWR-HEC Training**. This training improves USACE's ability to perform hydrologic and hydraulic modeling to represent wildfire-impacted stream flows and flood extents. • Corps Water Management System (CWMS) Wildfire Workshop (April 2023). • 2023 Federal Interagency Sedimentation and Hydrology (SEDHYD) Modeling Conference Short Course and Presentation (May 2023). • California (CA) Department of Water Resources (DWR) Wildfire Workshop (2023).
Agency Capacity	In support of the development of this 2024–2027 CAP, USACE performed a review of its FASCLASS system (repository of position descriptions [PDs]). As per USACE's 2021 Climate Preparedness and Resilience Policy Statement, planners, project managers, engineers, and scientists throughout USACE are required "to integrate climate change preparedness and resilience planning and actions in all activities." Based on the FASCLASS system review, USACE employs more than 6,500 civil engineers. USACE's HH&C CoP staff perform most of the technical analyses related to the effects of climate change. HH&C CoP staff consist of nearly 900 hydrologic and/or hydraulic engineers. Additionally, the CoP has over 300 environmental engineers, 40 hydrologists and 69 hydrologic technicians. Finally, USACE has three meteorologists, and 15 oceanographers. In all, USACE has nearly 1,500 HH&C scientists and engineers whose duties involve planning for and responding to climate change. For FY22 and FY23 combined, USACE had 366 job announcements for the above positions.
	Some of USACE's HH&C professionals are also part of the USACE CPR CoP, which has over 250 members and meets monthly. Although many USACE employees perform tasks related to CPR, only a small number of USACE district and division employees have tasks relevant to climate change in their official job descriptions. Nine employees have "Sea Level Rise" as part of the duties, and 28 employees have duties pertaining to "Army Climate Strategy" or "Climate Action Plan" in their PDs. Outside the HH&C CoP, USACE has 47 foresters and 2 forest technicians whose duties, among others, include preventing wildfires associated with climate change.

TRAINING AND CAPACITY BUILDING	
Agency Capacity, cont.	Within USACE, several leadership positions directly support the CPR CoP. HQUSACE currently has four dedicated full-time CPR CoP-specific positions. In addition, HQUSACE employs an EJ/Justice40 Program Manager, who coordinates across the Civil Works Directorate. The USACE IWR, in collaboration with the CPR CoP, employs an FTE specifically focused on climate science, whose responsibilities include translating climate science into all USACE missions, coordinating on climate adaptation guidance, and collaborating as the USACE climate science liaison with other federal agencies. IWR is also considering the establishment of an NBS detail to provide support throughout the USACE CW program, enabling a wide range of employees to support USACE's climate change mission. Within CW, approximately three senior Regional Technical Specialist (RTS) GS-13 positions officially have "climate change" in the job description. Beginning in 2021, ERDC created a Climate Change Tiger Team that informally reviewed which of ERDC's 2,400+ personnel have climate relevant skills and expertise. The review indicated that over 300 employees had a level of expertise and background related to climate mitigation and/or climate adaptation. ERDC actively recruits both mid- and entry-level employees with advanced degrees in fields related to climate change/SLC science, adaptation, and mitigation. Both ERDC personnel and USACE CPR CoP members are serving or have served in temporary details in support of the Office of the Deputy Assistant Secretary of Defense's (Energy Resilience & Optimization) Climate Action Team.

USACE employs thousands of dedicated professionals working together and with its valued partners to provide safe, sustainable solutions for planning, designing, building, and operating the agency's projects and facilities. Since the publication of the 2021 Climate Action Plan, the USACE CPR CoP coordinated several strategic efforts targeted at improving climate literacy including updating the CorpsClimate website, integrating context related to climate change into other training programs offered throughout the agency, delivering of presentations from USACE and external climate experts, and participating in a multitude of interagency efforts. The USACE IWR supports CPR CoP activities by executing contracts, government orders, and Intergovernmental Personnel Act (IPA) agreements, which help produce resources for improving and building tools and data necessary for climate resilience and adaptation activities within USACE.

The CPR CoP offers a forum for new and experienced practitioners to learn about USACE climate resilience efforts and advancements across disciplines. Through CoP engagement, staff suggest topics, offer presentations, and engage in unique opportunities. USACE also continues to identify skills and disciplines (including engineering disciplines, such as electrical and structural, and social science disciplines, such as sociology, demography, and anthropology) that future climate change mitigation and adaptation programs and projects will require. USACE continues to support science, technology, engineering, and mathematics (STEM) learning in schools with a focus on climate change skills and abilities to build the future workforce. Staff from divisions and districts routinely participate in STEM events at schools. In recognition of Earth Day 2023, the ERDC hosted a STEM event for approximately 120 eighth graders that featured demonstrations of various technologies that support sustainability and resilience. Annually, USACE engages in outreach activities online and in-person that support National Engineers Week. Activities include online posts and gatherings, which serve to recognize achievements in the engineering profession, improve understanding of USACE contributions to the nation through engineering, and promote professional development of engineers.

The USACE CPR CoP's climate and SLC training program currently includes on-demand training, in-person technical training, monthly web-based technical presentations, and specified reviewer training. As a first step to improve climate literacy across the enterprise, the USACE CPR CoP released a five-part, on-demand Climate 101 training course in April 2023. This course includes novice- and intermediate-level climate change-related content. A new module specifically targeting senior leaders (i.e., Commanders and SES) is under consideration as well. Additionally, a more technically oriented CPR training course is offered periodically to USACE divisions. The interactive, 3-day course is targeted at engineers, planners, project managers, and scientists and covers topics

like policy, planning, science, SLC, CPR tools, and vulnerability assessments. Other ongoing activities to increase climate literacy include USACE climate guidance and tools; training on risk-informed decision-making; and several USACE working groups on Adaptation, Non-Structural Solutions, the U.S. OCAP, and a Federal Climate Change Water Working Group. Between FY24 and FY27, USACE will continue to expand existing training, working groups, and interagency partnerships through varied and recurring communications infused across the agency. This includes continuing to engage USACE social scientists to develop multi-tiered, innovative communication tools and training plans that support the climate literacy of USACE's practitioners, supervisors, and managers.

The ERDC EWN program is also active in creating opportunities for USACE practitioners to gain expertise in applying NBS. EWN hosts "The Engineering with Nature" podcast, which brings together internal and external collaborators to discuss ideas and applications of NBS. EWN has held webinars monthly since 2021. These webinars focus on various NBS topics including best practices, cutting-edge research, and the latest developments in the field. In collaboration with Texas A&M, EWN also held its first Short Course on Coastal Engineering and NBS.

At a district and division level, integrating climate change into long-term planning studies is flagged as a priority, with district Commanders increasing the emphasis on initiatives targeted at NBS, EWN, SLC, EJ, and climate change impacts relevant to inland applications. In addition to integrating climate change expertise into existing roles, USACE established CPR-specific positions. This includes hiring an EJ National Program Manager and recently hiring two new headquarters employees dedicated to furthering USACE's CPR mission areas. The CPR CoP is also working alongside USACE districts and divisions to establish SMEs and RTSs in each major subordinate command (MSC) to provide on-site training, review, and on-call assistance as needed to the local workforce. USACE also established EJ leads at all eight MSCs and identified EJ coordinators at each district office to address EJ in USACE missions, projects, and studies. Future FTE positions may be established based on MSC or district needs.

In 2022, USACE contracted an external expert panel to evaluate barriers that limit USACE's ability to incorporate CPR into its activities. The project team identified 12 overarching barriers and provided 21 recommendations for more proactive climate change preparedness and resilience in USACE. In response to these findings, USACE will convene a high-level panel charged with examining these barriers and tasked with evaluating and implementing recommendations.

3D. Summary of Major Milestones

SECTION OF THE IMPLEMENTATION PLAN	DESCRIPTION OF MILESTONE	CLIMATE RISK ADDRESED	INDICATORS FOR SUCCESS
Section 3A.1. Addressing Climate Hazard Impacts on and Exposures of Federal Buildings	• Perform enterprise-wide vulnerability assessment of USACE building portfolio. • Integrate climate vulnerability assessments and hazard-specific plans into the Strategic Asset Management Plan.	Comprehensive climate hazard exposure (e.g., wildfire, drought, ecosystem degradation, flood risk, coastal flooding)	• Complete assessment – FY24. • Conduct future assessments on 5-year interval. • Develop hazard-specific mitigation plans for critical climate hazards. • Develop hazard-specific mitigation plans – FY25. • Update the Strategic Asset Management Plan – FY27 or sooner depending on an update to current management plan.

SECTION OF THE IMPLEMENTATION PLAN	DESCRIPTION OF MILESTONE	CLIMATE RISK ADDRESED	INDICATORS FOR SUCCESS
Section 3A.1. Addressing Climate Hazard Impacts on and Exposures of Federal Buildings	• Develop climate-informed design standards or update existing design standards to include climate-resilient designs.	Comprehensive climate hazard exposure (e.g., wildfire, drought, ecosystem degradation, flood risk, coastal flooding)	• Evaluate existing design standards to prioritize needs – FY24. • Develop/Update standards based on prioritization – FY25–27.
Section 3A.1. Addressing Climate Hazard Impacts on and Exposures of Federal Buildings	• Coordinate with managing federal agencies where USACE leases buildings/ office space.	Comprehensive climate hazard exposure (e.g., wildfire, drought, ecosystem degradation, flood risk, coastal flooding)	• Establish dedicated liaisons with federal agencies responsible for USACE office leases – FY24–25. • Include assessment of climate impacts to leased USACE building/office space to the USACE POCs responsible for liaising with managing federal agencies.
Section 3A.1. Addressing Climate Hazard Impacts on and Exposures of Federal Buildings	• Implement smart building technologies to monitor temperature, precipitation, and other environmental parameters critical to building function.	Comprehensive climate hazard exposure (e.g., wildfire, drought, ecosystem degradation, flood risk, coastal flooding)	• Investigate potential technologies for investment – FY25. • Develop an implementation plan for smart building technologies – FY26.

SECTION OF THE IMPLEMENTATION PLAN	DESCRIPTION OF MILESTONE	CLIMATE RISK ADDRESED	INDICATORS FOR SUCCESS
Section 3A.2. Addressing Climate Hazard Impacts on and Exposures of Federal Employees	• Expand Climate 101 training to educate employees across the USACE organization on topics that provide general overviews of climate hazards. • Augment existing training materials on heat safety with regional estimations of projected extreme temperatures. • Incorporate climate considerations into personal employee emergency response planning materials through collaboration with the Safety and Occupational Health Office. • Improve climate resilience in communities where USACE employees reside by promoting climate resilience planning through USACE planning authorities (e.g., floodplain management services and Silver Jackets) and upon request of state, local, tribal, or territorial entities.	Comprehensive climate hazard exposure (e.g., wildfire, drought, ecosystem degradation, flood risk, coastal flooding)	• Develop Climate 101 modules based on need – FY25–27. • Update heat safety training – FY24. • Develop personal emergency response planning materials – FY25.

SECTION OF THE IMPLEMENTATION PLAN	DESCRIPTION OF MILESTONE	CLIMATE RISK ADDRESED	INDICATORS FOR SUCCESS
Section 3A.3. Addressing Climate Hazard Impacts on and Exposure of Federal Lands, Waters, and Cultural Resources	• Continue to use and maintain web-based portals such as the Reservoir Sedimentation Portal (also used by the USBR) and Access to Water (for pool elevation, precipitation, flow status, and WCMs) to make USACE data public. • Continue to maintain WCMs and DCPs to facilitate monitoring. • Screen existing USACE project sites for climate-driven vulnerabilities using indicators tied to climate projections (CWVAT), as well as the CESL (where applicable). • Expand use of UAVs and remote-controlled vessels to collect sedimentation and other information faster and more cheaply, providing insight into sedimentation changes as climate changes. • Develop and deliver workshops on appropriately applying natural and nature-based features that may display some degree of self-adaptation to climate changes but which also entail specific climate-related considerations. • Apply best practices for shoreline resilience of reservoirs as vegetation adapts to changes in water level and salinity. • Apply best practices for floodplain resilience.	Comprehensive climate hazard exposure (e.g., wildfire, drought, ecosystem degradation, flood risk, coastal flooding)	• Maintain web portals with latest information. • Establish a series of NBS workshops. Develop content FY24; begin hosting FY25. • Partner with the Ecosystem Restoration business line to incorporate climate change into habitat models – begin FY25. • Perform a portfolio vulnerability assessment – FY25. • Maintain manuals, plans, and guides on the schedules prescribed in policy and guidance. • Update all DCPs by FY28. Where necessary, collect updated hydrologic data and incorporate that information into the contingency plans.

SECTION OF THE IMPLEMENTATION PLAN	DESCRIPTION OF MILESTONE	CLIMATE RISK ADDRESED	INDICATORS FOR SUCCESS
Section 3A.3. Addressing Climate Hazard Impacts on and Exposure of Federal Lands, Waters, and Cultural Resources, cont.	• Consider future climate change impacts when developing long-term ecosystem restoration strategies. • Consider including climate change in existing habitat models to assess impacts on species. • Continue implementing the SRP to further demonstrate that a strategic and science-based approach at USACE reservoirs maintains or enhances the environmental benefits and reduces negative environmental consequences of downstream flows. • Continue applying USACE's Environmental Operating Principles, developed so that USACE missions totally integrate sustainable environmental practices, which directly apply to how USACE manages, conserves, and protects natural and cultural resources at USACE-operated projects. • Reduce extreme weather disruptions at projects by updating WCMs, DCPs, and natural resources management guides to reflect climate as it changes.		

SECTION OF THE IMPLEMENTATION PLAN	DESCRIPTION OF MILESTONE	CLIMATE RISK ADDRESED	INDICATORS FOR SUCCESS
Section 3A.3. Addressing Climate Hazard Impacts on and Exposure of Federal Lands, Waters, and Cultural Resources	• As necessary and able, provide information to help avoid sites and areas that might be sensitive cultural resources during firefighting. • During and subsequent to wildfire events, take steps to minimize effects of increased erosion resulting from the loss of vegetation on protected sites. • Subsequent to wildfire events, visually inspect the affected areas to determine any adverse effects to cultural resources.	Wildfire	• Continue to implement and establish new technologies (e.g., unmanned vehicles) to more efficiently inspect and evaluate sites.
Section 3A.3. Addressing Climate Hazard Impacts on and Exposure of Federal Lands, Waters, and Cultural Resources	• Use technology, such as drones, to monitor shoreline erosion that may be related to effects of extreme heat, drought, extreme precipitation, SLR, and flooding (riverine and coastal). • Subsequent to flood events, visually inspect the affected areas to determine any adverse effects to cultural resources. • Where erosion is having an adverse effect, consider protective measures, such as the placement of fill or stone.	Flooding, SLR, extreme temperature, drought, extreme precipitation	• Continue to implement and establish new technologies (e.g., unmanned vehicles) to more efficiently inspect and evaluate sites.

SECTION OF THE IMPLEMENTATION PLAN	DESCRIPTION OF MILESTONE	CLIMATE RISK ADDRESED	INDICATORS FOR SUCCESS
Section 3A.4. Accounting for Climate Risk in Planning and Decision-Making: Portfolio Risk Assessments	• Update CWVAT. • Conduct portfolio risk assessments using the CWVAT and CESL and develop strategy for the application of results and next steps. • Release the Coastal Hazards and Risk Toolkit (CHART) for CSRM life-cycle planning assessments.	Comprehensive climate hazard exposure (e.g., wildfire, drought, ecosystem degradation, flood risk, coastal flooding)	• Release the improved CWVAT – FY24. • CWVAT Portfolio Risk Assessments Report and Results – FY25. • Portfolio-wide CESL Report and Results. • Determine how to use portfolio risk assessments to inform USACE actions, including budgeting. • Demo and refine CHART numerical model and online user documentation with two case studies via field user group – FY26.
Section 3B. Incorporating Climate Risk into Policy and Programs: United States OCAP Goals	Inclusion of communities with EJ concerns in the planning process, and policy/guidance updates provide opportunities for USACE to consider impacts and benefits to communities with EJ concerns that help build resilience to climate driven risks. Relevant milestones are as follows: • Integrate EJ principles into the federal government's ocean activities. • Improve ports to help facilitate offshore wind energy deployment and "green" the nation's ports. • Take actions to support the Accelerate Nature-Based Solutions goal. • Promote coastal community resilience strategies that are adaptive, equitable, and based on best practices.	EJ (communities with EJ concerns face significant climate change driven risks [e.g., decreased ability to recover from climate-related disasters]), resilient supply chains, SLR/coastal flooding	• Develop ocean justice strategy. • Assist in upgrading port facilities infrastructure. • Incorporate nature-based features and performance monitoring in coastal resilience projects; augment engineered projects with NBS; and promote managed wetland migration in response to SLR. • Plan and construct coastal storm risk reduction projects that meet community needs, employ best-available science, including NBS, and protect ecosystems.

SECTION OF THE IMPLEMENTATION PLAN	DESCRIPTION OF MILESTONE	CLIMATE RISK ADDRESED	INDICATORS FOR SUCCESS
Section 3B. Incorporating Climate Risk into Policy and Programs: USACE CPR Guidance Updates	• Update climate change and inland hydrology guidance and supporting resources. • Update SLC guidance and tools. • Create climate change- and ecosystem-specific guidance. • Update relevant HH&C guidance (contingent on funding availability).	SLR, coastal flooding, extreme precipitation, shifts in drought frequency/intensity, riverine flooding, ecosystem degradation	• Publish updated SLC guidance for the next National Tidal Datum Epoch in 2026. • Modernize the USACE SLAT. • Publish guidance on characterizing climate change impacts in hydrologic analyses (inland focus) to replace ECB 2018-14 and ETL 1100-2-3, as well as updates and/or resources to support in-depth inland climate change analysis guidance EC 1100-1-113. • Publish standalone guidance or new verbiage in updated, existing CPR, HH&C, and/or PCoP guidance specific to addressing climate change hazards to ecosystems. • Update relevant HH&C guidance to include the latest actionable science related to CPR (contingent on funding availability).
Section 3B. Incorporating Climate Risk into Policy and Programs: Wildfire and Drought Initiatives	• Embed drought resilience in all existing and future USACE projects. • Develop the Post-FiRE Decision Support Tool and corresponding technical guidance. • Develop regional post-wildfire flood and debris flow models. • Develop a low-water operational model for the Mississippi River System. • Conduct FIRO site-specific viability assessments and pilot studies. • Develop post-crisis debris removal technologies.	Drought, wildfire	• Create an agency-wide, strategic approach to drought resilience. Supporting products to include: ◦ A technical report on drought lessons learned. ◦ An interactive GIS-based webpage providing access to DCPs, current conditions, and other resources at a project scale. ◦ Continue to update HEC's Hydrologic Modeling System (HEC-HMS) to better represent post-wildfire conditions. ◦ Release the Post-FiRE Decision Support Tool. Release engineering guidance covering post-wildfire modeling best practices in conjunction with the tool.

SECTION OF THE IMPLEMENTATION PLAN	DESCRIPTION OF MILESTONE	CLIMATE RISK ADDRESED	INDICATORS FOR SUCCESS
Section 3B. Incorporating Climate Risk into Policy and Programs: Wildfire and Drought Initiatives, cont.			• Deliver region-specific models to mitigate post-fire flood and debris flows, integrating remote sensing data for flow forecasting – FY26. • Deliver beta debris classification and quantification software, demo unmanned equipment for route clearance and debris removal, and test model to estimate debris for unplanned extreme events – FY26. • Deliver beta version of Low Water Operational Model for Mississippi River System for navigation resilience – FY27. • Complete FIRO viability assessment of 14 dams in Willamette River Basin, initiate national application of FIRO screening process to USACE dams, and complete viability assessments of at least eight systems of dams in non-Western regions – FY27.
Section 3B. Incorporating Climate Risk into Policy and Programs: EJ Initiatives	• Update USACE CW policy and guidance to include EJ/Justice40 initiatives. • Develop an agency-wide EJ strategic plan (per EO 14096). • Develop a preliminary EJ Program Management Plan (PgMP). • Develop a training module for CW to address EJ.	EJ (communities with EJ concerns face significant climate change driven risks [e.g., decreased ability to recover from climate-related disasters])	• Implement updated policies in the planning process. • Obtain MSC endorsement of EJ strategic engagement plans. • Obtain HQUSACE approval of EJ PgMP. • Launch pilot EJ training.

SECTION OF THE IMPLEMENTATION PLAN	DESCRIPTION OF MILESTONE	CLIMATE RISK ADDRESED	INDICATORS FOR SUCCESS
Section 3B. Incorporating Climate Risk into Policy and Programs: NBS Initiatives	• Develop NBS guidance for engineering and construction. • Meet the requirements of the Beneficial Use of Dredged Material Command Philosophy Notice (per 2023 Notice). • Assess short- and long-term climate change impacts to AER projects. • Develop methods to incorporate GHG and carbon capture in AER projects. • Develop methods and tools to quantify the multi-mission benefits of NBS/EWN, including improvements to water quantity and reduction of wildfire and drought impacts. • Develop guidance, methods, and tools to incorporate MAR into USACE operations.	Riverine flooding, coastal flooding, SLR, drought	• Publish an NBS Director's Policy Memorandum. • Publish an EP specific to NBS. • Publish technical reports on oyster reefs, constructed coastal wetlands, alternative bank protection, and floodplain reconnection. • Publish the NBS Planning Guidance and Coastal NBS Technical Report. • Make progress toward goal of using 70% of dredged material from construction and O&M water resources projects for beneficial uses by 2030. • Complete a MAR Planning and Guidance Study and develop tools and guidance based on the study's findings.
Section 3B. Incorporating Climate Risk into Policy and Programs: Nonstructural Solutions	• Develop nonstructural guidance, to include the following: ◦ Develop interim nonstructural guidance. ◦ Establish a nonstructural MCX to provide expertise in addressing SLR and extreme precipitation through nonstructural projects. ◦ Develop a nonstructural ER to provide guidance and policy for implementing nonstructural projects to reduce the risk of inland and coastal flooding (includes SLR and extreme precipitation).	Inland flooding, coastal flooding, SLR, extreme precipitation	• Publish Interim Nonstructural Guidance (slated for publication in May 2024). • Establish a nonstructural MCX (expected by 4th quarter FY25). • Publish a nonstructural ER – covering further guidance (planning, real estate, engineering and construction) (expected by 4th quarter FY25). • Deliver Chief's reports with nonstructural plans; construct authorized projects.

SECTION OF THE IMPLEMENTATION PLAN	DESCRIPTION OF MILESTONE	CLIMATE RISK ADDRESED	INDICATORS FOR SUCCESS
Section 3E. Climate Training and Capacity Building for a Climate-Informed Workforce: Training	• Expand training for senior leadership. • Conduct technical training. • Increase the number of recognized CPR-related SME and RTS positions within districts and divisions.	Comprehensive climate hazard exposure (e.g., wildfire, drought, ecosystem degradation, flood risk, coastal flooding)	• Update the Technical Review Training and Review Guide. • Generate on-demand training for SLAT and CWVAT. • Conduct in-person or web-based division training for the Southwest Division, Pacific Ocean Division, and Transatlantic Division. • Add a module to Climate 101 specifically for senior leaders. • Establish CPR SMEs and RTSs at each MSC.
Section 3E. Climate Training and Capacity Building for a Climate-Informed Workforce: Climate Literacy	• Translate the Barriers to CPR report into an implementation plan.	Comprehensive climate hazard exposure (e.g., wildfire, drought, ecosystem degradation, flood risk, coastal flooding)	• Stand up a high-level internal panel to identify barriers. • Develop an evaluation and implementation plan to address barriers identified.

Section 4: Demonstrating Progress

4A. Measuring Progress

KEY PERFORMANCE INDICATOR: Climate adaptation and resilience objectives and performance measures are incorporated in agency program planning and budgeting by 2027		
Section of the CAP	Process Metric	Agency Response
3A – Addressing Climate Hazard Impacts and Exposures	**Step 1**: Agency has an implementation plan for 2024 that connects climate hazard impacts and exposures to discrete actions that must be taken. (Y/N/Partially) **Step 2**: Agency has a list of discrete actions to take through 2027 as part of their implementation plan. (Y/N/ Partially)	Step 1: **Partially**. A detailed implementation plan with discrete actions will be developed internally on publication of the CAP. The goal is to identify actions to address as many climate hazard impacts and exposures as is reasonably feasible given resource constraints and USACE's authority. Step 2: **Partially**. The discrete actions identified as part of the detailed implementation plan above will be acted on through 2027 as is feasible given resource constraints.
3B.1 – Accounting for Climate Risk in Decision-making	Agency has an established method of including results of climate hazard risk exposure assessments into planning and decision-making processes. (Y/N/Partially)	**Yes**. USACE currently considers the risk of climate hazard risk exposure, including the effects of SLC and impacts to inland hydrologic processes, in its missions, operations, programs, and projects. Please see Section 3B.1 Table for more detail.
3B.2 –Incorporating Climate Risk Assessment into Budget Planning	Agency has an agency-wide process and/or tools that incorporate climate risk into planning and budget decisions. (Y/N/Partially)	**No**. The USACE budget process is based on projects that are individually appropriated by Congress, precluding agency-wide incorporation of climate risk into the Congressional budget process. However, USACE does incorporate climate risk into budget and planning decision-making as detailed in the table in Section 3B.2, and individual projects are required to mainstream climate considerations into planning, including their projected costs and benefits.

KEY PERFORMANCE INDICATOR: Climate adaptation and resilience objectives and performance measures are incorporated in agency program planning and budgeting by 2027, cont.		
Section of the CAP	Process Metric	Agency Response
3B.5 – Climate-Informed Funding to External Parties	**Step 1**: By July 2025, agency identifies grants that include considering and/or evaluating climate risk. **Step 2**: Agency modernizes all applicable funding announcements/ grants to include a requirement for the grantee to consider climate hazard exposures. (Y/N/Partially)	Step 1: **Yes**. In general, USACE is not a grant/loan agency. One exception is the CWIFP. The only other grants USACE offers are in support of ERDC R&D. Step 2: **Yes**. CWIFP already prioritizes projects that serve communities with EJ concerns and projects related to climate adaptation or resilience. Climate change/SLR science, impacts, resilience, adaptation, and mitigation are already high priorities for ERDC's R&D program.
KEY PERFORMANCE INDICATOR: Data management systems and analytical tools are updated to incorporate relevant climate change information by 2027		
Section of the CAP	Process Metric	Agency Response
3A – Addressing Climate Hazard Impacts and Exposures	Agency has identified the information systems that need to incorporate climate change data and information and incorporates climate change information into those systems by 2027. (Y/N/Partially)	**Partially**. USACE uses a wide range of information systems that have the potential to be modified to better incorporate climate change data and information. The CPR CoP actively works with other USACE programs to identify systems that better support agency-wide CPR. Examples of information systems that are actively managed to reduce climate hazard risk to USACE are CPR-specific tools and databases that include the suite of tools to perform vulnerability assessments (CWVAT, CorpsPET, CESL, DCAT), tidal gauge datum maintenance, the Reservoir Sedimentation Information database, and inventorying DCPs and CPR training models (i.e., Climate 101). Climate Change is also incorporated into regular updates to USACE WCMs and project Master Plans. Other systems or programs identified as priorities for incorporation of climate change information or vulnerability assessment results include USACE's ERR, the Civil Works Asset Management System, the CHS, and the FIRO program. USACE is also dedicated to modernizing and maintaining its disaster response systems that are critical in responding to climate-driven hazards like extreme storms, flooding, and wildfire. These systems include the DoD Alert Mass Notification System and the U.S. Army Disaster Personnel Accountability and Assessment System (ADPAAS), as well as updates in support of the USACE COOP program.

KEY PERFORMANCE INDICATOR: Agency CAPs address multiple climate hazard impacts and other stressors, and demonstrate NBS, equitable approaches, and mitigation co-benefits to adaptation and resilience objectives		
Section of the CAP	Process Metric	Agency Response
3B.3 – Incorporating Climate Risk into Policy and Programs	By July 2025, 100% of climate adaptation and resilience policies have been reviewed and revised to (as relevant) incorporate NBS, mitigation co-benefits, and equity principles. (Y/N/Partially)	**Partially**. The CPR CoP leadership is dedicated to continually reviewing and updating climate adaptation and resilience policies, guidance, resources, and directives. Resources permitting, policy, guidance, etc. will be updated. This includes the initiatives specifically highlighted within Section 3F Timeline Summary for Major Milestones. Efforts to incorporate NBS, mitigation co-benefits, and equity principles into new and existing guidance/policy are high priority actions and many related initiatives are already planned or underway. USACE has an extensive library of active and proposed policy and guidance documents with relevance to climate adaptation and resilience in the queue for revision, updates, and development. Availability of resources to support all potential updates and new guidance/policy documents by July 2025 is unlikely.
KEY PERFORMANCE INDICATOR: Federal assets and supply chains are evaluated for risk to climate hazards and other stressors through existing protocols and/or the development of new protocols; response protocols for extreme events are updated by 2027		
Section of the CAP	Process Metric	Agency Response
3B.4 – Climate-Smart Supply Chains and Procurement	**Step 1**: Agency has assessed climate exposure to its top 5 most mission-critical supply chains. (Y/N/Partially) **Step 2**: By July 2026, agency has assessed services and established a plan for addressing/overcoming disruption from climate hazards. (Y/N/Partially)	Better understanding is needed of how climate and SLR impacts affect USACE's dredging supplies and services. Further analysis of the supply chains that support and provide emergency response services and materials for USACE construction missions is required. Additionally, USACE is investigating specifications, measures, and policies to strengthen these systems. Step 1: **Partially**. This step is considered complete for the Navigation and Labor and Lodging supply chains Step 2: **Partially**. By July 2026, USACE anticipates additional progress toward identifying and planning for supply chain/procurement disruptions driven by climate change-related hazards. However, USACE's ability to address/overcome supply chain disruptions is limited, because USACE relies on the private sector to obtain construction materials and emergency response supplies. Similarly, USACE relies on privately owned dredge vessels to supplement the agency's in-house dredge fleet. As a result, USACE cannot unilaterally address climate change-driven supply chain issues. These risks, at least in part, have to be recognized and mitigated within the private sector.
	Agency has identified priorities, developed strategies, and established goals based on the assessment of climate hazard risks to critical supplies and services. (Y/N/Partially)	**Partially**. The four USACE mission areas with particularly significant supply chain and procurement exposure to climate change hazards are hydropower, emergency management (PL 84-99), navigation, and construction. This metric was evaluated separately for each mission area as indicated below. More detail is provided within the tables in Section 3B.4. • Hydropower: No • PL 84-99: Yes • Navigation: Yes • Construction: Partial

KEY PERFORMANCE INDICATOR: By 2027, agency staff are trained in climate adaptation and resilience and related agency protocols and procedures		
Section of the CAP	Process Metric	Agency Response
3C – Climate Training and Capacity Building for a Climate-Informed Workforce	Step 1: By December 2024 100% of agency leadership have been briefed on current agency climate adaptation efforts and actions outlined in their 2024 CAP. (Y/N/Partially) Step 2: Does the agency have a Climate 101 training for your workforce? (Y/N/ Partially) If yes, what percent of staff have completed the training? Step 3: By July 2025, 100 % employees have completed Climate 101 trainings. (Y/N/Partially)	Step 1: **Partially**. Efforts are currently made to provide USACE leadership with briefings targeted at providing an overview of USACE's CPR-related actions, policy, guidance, etc. Technical leaders are encouraged to participate in CPR CoP monthly calls and to attend USACE's 3-day, in-person CPR training course. A goal of this 2024–2027 CAP is to add a module targeted at senior leadership to USACE's Climate 101 on-demand training course. Once added, a concerted effort will encourage participation. However, having 100% of the agency's leadership take a course or be otherwise briefed on USACE's CPR-related activities by December 2024 is unlikely. The goal as is presented herein is to move toward **partial** completion by that timeline. Step 2: **Yes**. However, the percentage of staff who have completed the training is currently unknown. The training module currently has no means of tracking participation. It does have an optional survey that could potentially help track participation in the future. Since the training module is relatively new, its survey has not yet gathered enough data to report on participation. Step 3: **Partially**. Likely to be partially completed by 2025. To accomplish this, a more robust mechanism for tracking participation would also have to be developed.

4B. Adaptation in Action

Actions to promote climate change adaptation and resilience span all of USACE's activities for the purposes of enhancing community resilience and the effectiveness of the military support mission. USACE CPR initiatives support communication with stakeholders and the public. USACE has been addressing climate change issues like SLR since the late 1970s. Actions initiated in response to EO 14008, the 2021 Climate Action Plan, and this document build on USACE's existing programs. USACE strives to integrate climate change considerations across its business processes so that agency projects, programs, missions, and operations perform as intended despite uncertain future conditions. For example, USACE requires that projected SLR (with uncertainty) be incorporated into plans and designs to support project performance over a full range of plausible future scenarios. This approach informs adaptation pathways that specify triggers, thresholds, and lead times for future adaptation. For other applications, where future conditions are too uncertain to project with confidence, USACE employs techniques for decision-making under deep uncertainty. For these applications, potential vulnerabilities are identified and tied to potential future hazards. In cases marked by deep uncertainty, resilience strategies focusing on preparedness and rapid recovery may be more appropriate. A few specific examples of successes or challenges in implementing climate adaptation are detailed in the following paragraphs.

Since the publication of the 2021 Climate Action Plan, USACE updated and published numerous **policy and technical guidance documents**. This includes the development of a CPR Technical Review Guide and the publication of EC 1100-1-113. USACE is also dedicated to enhancing its implementation of NBS, as demonstrated by the USACE EWN program producing International Guidelines on NBS for FRM in September 2021 and helping facilitate a National Academy of Engineering workshop on NBS policy and guidance in May 2022. USACE also published its updated planning guidance ER 1105-2-103, Policy for Conducting Civil Works Planning Studies, that reflects the need and

requirement to consider climate change, NBS, and nonstructural features in formulating CW projects. The 2021 Climate Action Plan placed emphasis on the **provision of actionable climate information, tools, and projections**. USACE continues to produce rigorous, actionable climate information and to update and improve its suite of climate change-related tools and resources. To reduce cybersecurity threats and improve reliability, all USACE's climate web tools were migrated to the Amazon Web Services (AWS) cloud in 2022. Since 2021, USACE updated CHAT to better communicate climate change impacts and risk based on downscaled climate model outputs. The widespread uncertainty in climate model-based projections of hydrometeorology remains a challenge for its application to project planning and design. USACE continues to work with the science agencies and other partners to reduce and understand uncertainty in climate model output, while also developing planning approaches that do not rely on precisely characterizing future climate. In contrast to hydrometeorology, projecting SLR has relatively lower uncertainty and thus more direct applicability in project design. In 2023, the Sea Level Curve Calculator and Sea Level Tracker tools were consolidated into the Sea Level Analysis Tool to improve efficiency, streamline application, and reduce costs.

USACE has also evolved how the agency **manages its lands and waters** for CPR. Since 2021, USACE completed screening-level assessments of existing USACE FRM project sites for climate change vulnerabilities and is committed to applying its CESL tool to characterize vulnerabilities to SLR. USACE is currently working on updating CWVAT, the tool used to perform vulnerability assessments. USACE WCMs and DCPs are continually updated to reflect climate change-driven challenges to project management.

USACE is dedicated to **enabling state, local, and tribal government preparedness** in the face of changing conditions. USACE leverages its NFRM program through support for interagency Silver Jackets teams, as well as the TPP, FPMS, PAS, Silver Jackets, and Continuing Authorities programs to improve the awareness and understanding that state partners, local governments, and tribes have regarding flood risk challenges in the face of climate change.

The 2021 Climate Action Plan placed particular emphasis on USACE's tribal partnerships. Since the publication of the 2021 Climate Action Plan, several project-specific examples of climate change consideration have supported projects on tribal lands. For instance, the Lower Brule Sioux Tribe Sewage Lagoon and Ecosystem Restoration Project addresses climate change risk by leveraging both USACE's technical support, closely collaborating with the Lower Brule Sioux Tribe and integrating indigenous knowledge.

In addition to collaborating with state, local, and tribal partners, USACE builds relationships with other federal agencies, academia, interagency groups, and science organizations to further USACE's ability to address climate change risk and create robust climate adaptation and resilience strategies. Key collaborations since 2021 include work in support of the Columbia River Treaty with Canada and a United States Geological Survey-led study of the stationarity in the Upper Mississippi River Basin. USACE continues to participate in numerous interagency working groups focused on climate adaptation, including the White House Flood Resilience Interagency Working Group and the DoD Coastal Assessment Regional Scenario Working Group.

USACE is also undertaking actions to better **plan for climate change-related risks**. Since 2021, USACE prioritized initiatives targeted at increasing electrical vehicle usage. Besides directly reducing USACE GHG emissions, electric vehicles offer mobile, redundant energy storage to use during severe weather events. USACE also launched an Enterprise Risk Register (ERR) to help project and leadership teams better review project financial risks, including those driven by climate change, to USACE CW projects.

Improving **climate literacy** is an agency priority highlighted in both the 2021 Climate Action Plan and this 2024–2027 CAP. USACE conducted climate and sea level technical training for all USACE CONUS divisions except for the Southwestern Division (postponed due to flood events). Between FY24 and FY27, USACE will conduct in-person or web-based training for the remaining three divisions (Southwest, Pacific Ocean, and Transatlantic). USACE also developed and delivered a Climate 101 training module for a general audience and climate assessment-specific training for technical reviewers.

Since the publication of the 2021 Climate Action Plan, USACE made substantial progress in implementing **EJ initiatives**. In March 2022, the ASA(CW) issued interim guidance for implementing EJ and the Justice40 initiative. In the summer of 2022, the ASA(CW), with support from USACE, conducted a series of public and tribal virtual meetings to gather feedback targeted at modernizing the USACE CW program to reduce the negative impacts of climate change on

communities with EJ concerns. USACE district offices have also developed EJ strategic communication plans endorsed by division Commanders, which are updated periodically and maintained on district websites. USACE is currently developing its Environmental Justice Strategic Plan per EO 14096 and based on guidance provided by the Chair of CEQ under section 9 of that order. This plan will set forth the USACE vision, goals, priority actions, and metrics to address and advance EJ, including through the identification of new staffing, policies, regulations, or guidance documents, and will identify opportunities through regulations, policies, permits, or other means to improve accountability and compliance with any statute the agency administers that affects the health and environment of communities with EJ concerns.

In addition to these specific examples of successes and challenges, USACE remains committed to engaging in critical self-reflection to facilitate continuous improvement in implementing climate adaptation. In FY23, USACE assessed barriers to climate change adaptation within the agency. The identified barriers are the basis for defining discrete actions as part of the 2024–2027 CAP to improve USACE's ability to adapt to climate change.

Glossary of Terms and Acronyms

Assistant Secretary of the Army for Civil Works (ASA(CW) or ASA): The political appointee responsible for overseeing the USACE Civil Works program.

Civil Works (CW): The portion of the USACE mission that focuses on managing and developing the nation's water resources and infrastructure through projects that address national problems and opportunities related to water resources challenges such as flood risk management, navigation, or environmental restoration. The program aims to collaborate with federal, state, local, and tribal partners to provide sustainable solutions for water-related challenges, enhance economic development, and promote environmental stewardship across the United States.

Climate Change Response (CCR) budget process: A targeted, metric-based budgeting process to reduce climate change risk. Metrics are used to report emissions, identify potential areas for improvement, and highlight successes. Metrics also support initiatives to improve energy and water efficiency and transition toward lower carbon energy sources. Such actions also support climate resilience through improved readiness to outages and increased operational sustainability.

Climate Preparedness and Resilience (CPR): The collection of activities that serve to ensure USACE missions, programs, projects, and operations are prepared to perform now and in the future despite the uncertainties of changing climate conditions. CPR may also refer to the Climate Preparedness and Resilience Community of Practice (CPR CoP), a collective of professionals working to improve USACE preparedness to the effects of climate change.

Coastal Hazards System (CHS): A national coastal storm hazard data resource for probabilistic coastal hazard assessment results and statistics, including storm surge, astronomical tide, waves, currents, and wind. Based on high-resolution numerical modeling of coastal storms spanning practical probability and forcing parameters, these results directly support probabilistic design or risk assessment.

Community of Practice (CoP): A voluntary collective of employees and partners organized to share knowledge and practices on a particular area of professional specialization.

Engineer Circular (EC): A guidance document containing policy that is parallel to an ER (i.e., directive in nature) but with applicability that is transitory (one-time occurrence or otherwise temporary). ECs remain active for up to two years.

Engineering and Construction Bulletin (ECB): A guidance document that disseminates important information, updates, and guidance related to engineering and construction activities. ECBs provide timely communication on specific issues and/or changes in policies, procedures, or technical requirements that may impact ongoing or future engineering projects.

Engineer Manual (EM): A guidance document that provides detailed procedures, methods, and standards for executing engineering projects or activities. EMs are more specific and detailed than ERs, offering guidance on how to carry out tasks within the framework set by ERs.

Engineer Pamphlet (EP): A guidance or reference document of a continuing nature, which may be either procedural or informational. A procedural EP contains functional, instructional, or procedural guidance needed to implement programs or systems directed in regulations. An informational EP is a non-policy publication designed for information only. It may consist of booklets, leaflets, and/or folders on various information, recruitment literature, historical studies, and reference texts.

Engineer Regulation (ER): A guidance document that establishes policies, assigns responsibilities, and provides procedures for implementing engineering programs or activities. ERs are directive documents that cover broad topics and set the framework for specific engineering areas.

Engineering With Nature (EWN): A program of the Engineer Research and Development Center (ERDC) that promotes sustainable and environmentally friendly engineering practices by integrating natural processes and ecosystems into engineering solutions.

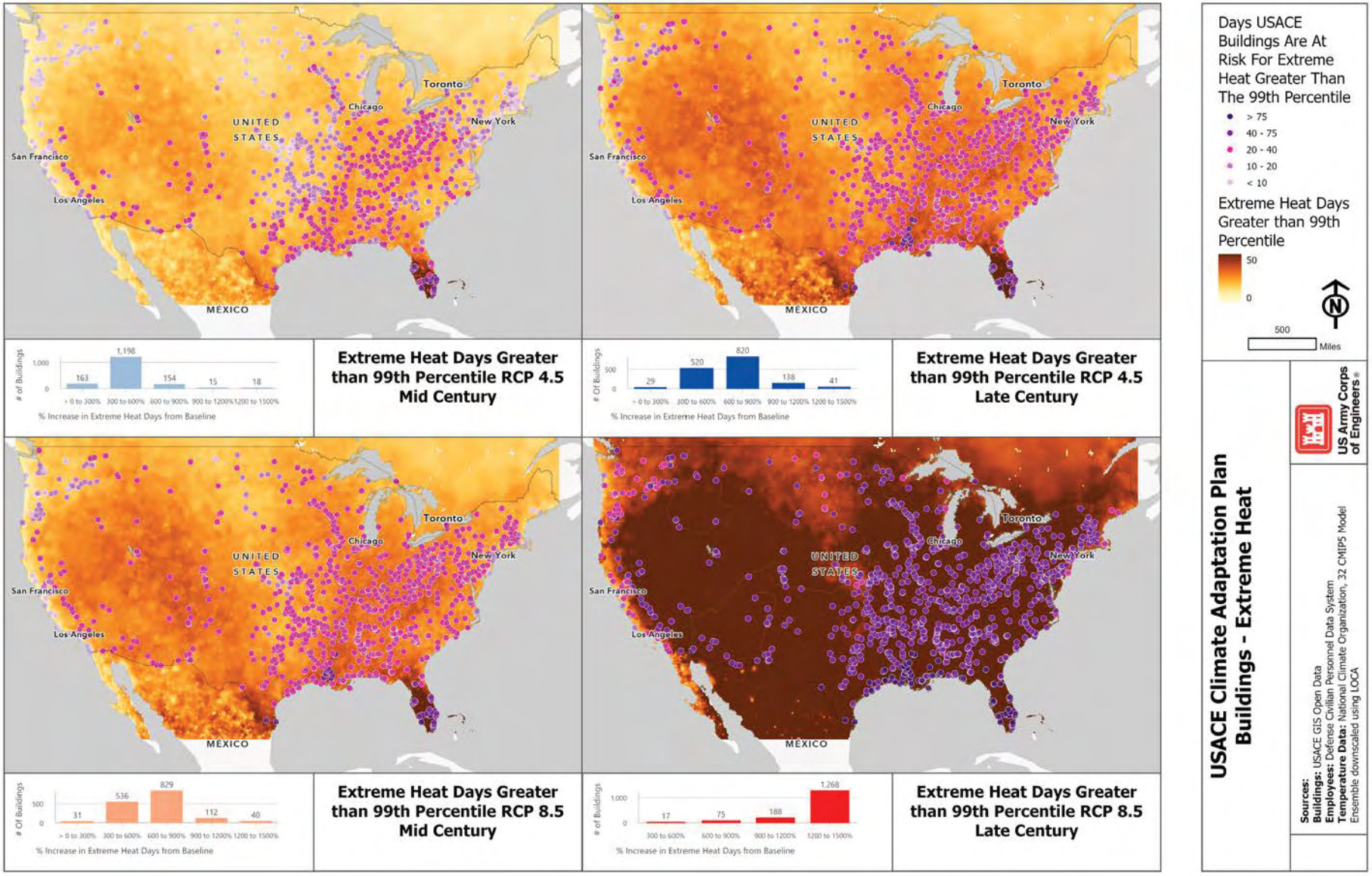
Forecast-Informed Reservoir Operations (FIRO): An approach to managing reservoirs that integrates real-time weather forecasts into operational decision-making processes. The goal of FIRO is to optimize the release of water from reservoirs based on accurate and timely weather predictions, improving the reservoir's ability to balance water supply, flood control, and environmental needs. FIRO represents a shift from traditional reservoir operations that rely on observed data to a more dynamic and forward-looking approach that considers forecasted weather conditions.

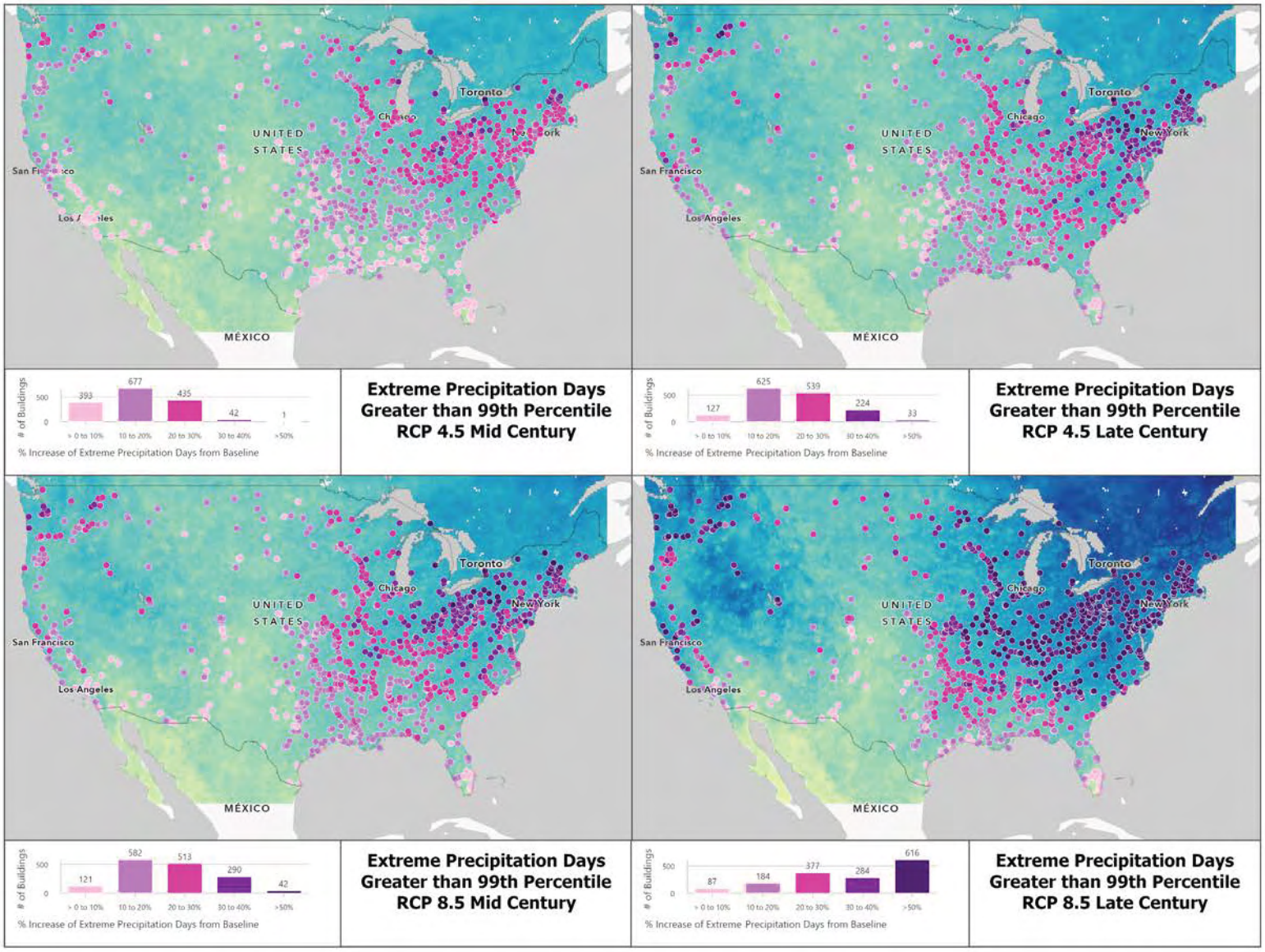
Flood Risk Management (FRM): A mission area that includes activities and projects aimed at reducing the risks and impacts of flooding on communities, infrastructure, and the environment.

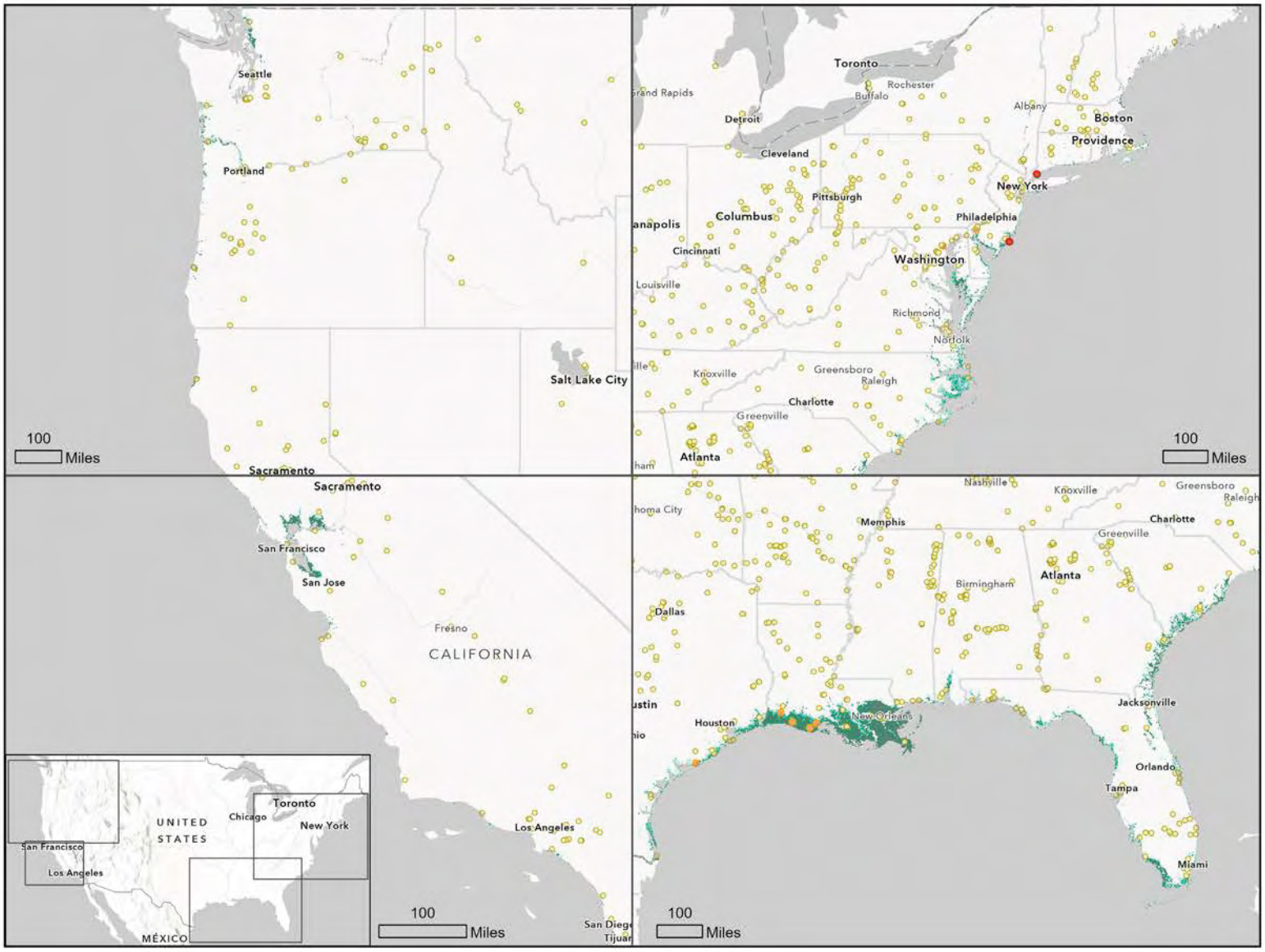
Military Program (MP): The portion of the USACE mission that focuses on providing engineering expertise and support to the U.S. military and DoD. This program involves the planning, design, construction, and maintenance of military infrastructure, including military bases, training facilities, and other defense-related projects.

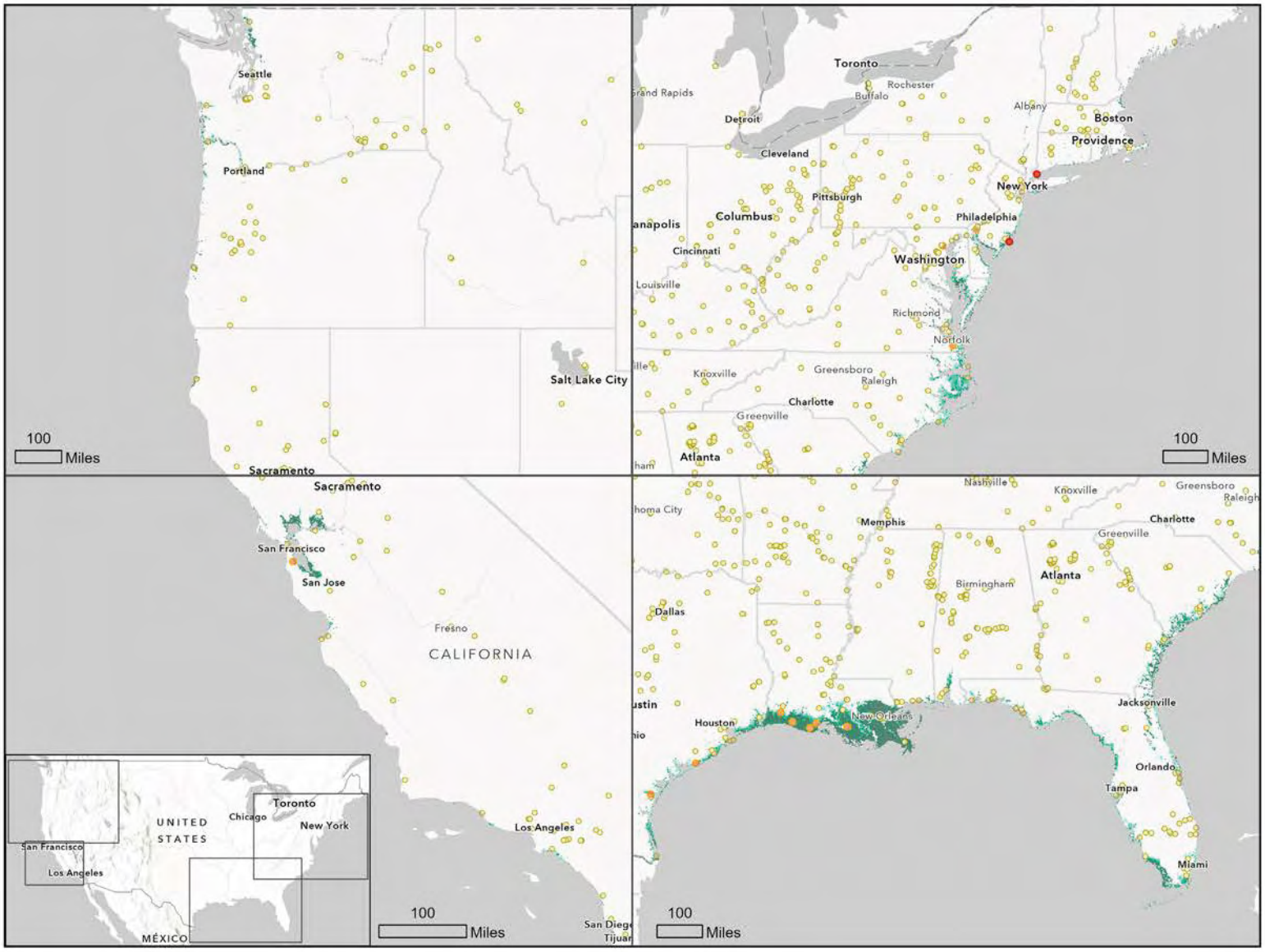
Sustainable Rivers Program (SRP): A USACE initiative that focuses on managing river systems in a sustainable and environmentally friendly manner. The program aims to balance the multiple uses of rivers, including navigation, flood risk management, water supply, and environmental conservation.

Appendix A – Climate Exposure Maps for Buildings




Toronto
Chicago
New York
UNITED STATES
San Francisco
Los Angeles
MÉXICO
# of Buildings
500
0
393
677
435
42
1
> 0 to 10%
10 to 20%
20 to 30%
30 to 40%
>50%
% Increase of Extreme Precipitation Days from Baseline
Extreme Precipitation Days Greater than 99th Percentile RCP 4.5 Mid Century
127
625
539
224
33
Extreme Precipitation Days Greater than 99th Percentile RCP 4.5 Late Century
121
582
513
290
42
Extreme Precipitation Days Greater than 99th Percentile RCP 8.5 Mid Century
87
184
377
284
616
Extreme Precipitation Days Greater than 99th Percentile RCP 8.5 Late Century
% Increase Of Days USACE Buildings Can Expect Extreme Precipitation
>50%
30 to 40%
20 to 30%
10 to 20%
> 0 to 10%
Extreme Precipitation Days Greater than 99th Percentile
8
2
500
Miles
N
USACE Climate Adaptation Plan
Buildings - Extreme Precipitation
US Army Corps of Engineers®
Sources:
Buildings: USACE GIS Open Data
Employees: Defense Civilian Personnel Data System
Precipitation Data: National Climate Organization, 32 CMIP5 Model Ensemble downscaled using LOCA


Seattle
Portland
Salt Lake City
Sacramento
San Francisco
San Jose
Fresno
CALIFORNIA
Los Angeles
San Diego
Tijuana
100 Miles
Toronto
Rochester
Buffalo
Albany
Detroit
Boston
Providence
Cleveland
New York
Pittsburgh
Columbus
Philadelphia
Cincinnati
Washington
Louisville
Richmond
Norfolk
Knoxville
Greensboro
Raleigh
Charlotte
Greenville
Atlanta
Nashville
Memphis
Birmingham
Dallas
Houston
New Orleans
Jacksonville
Orlando
Tampa
Miami
UNITED STATES
Chicago
MÉXICO
USACE Buildings
At Risk By Late Century
At Risk By Mid Century
No Risk
Sea Level Rise By Late Century
Sea Level Rise By Mid Century
N
USACE Climate Adaptation Plan
Buildings - RCP 4.5 Sea Level Rise
US Army Corps of Engineers®
Sources:
Buildings: USACE GIS Open Data
Employees: Defense Civilian Personnel Data System
Sea Level Rise Data: NOAA Coastal Digital Elevation Models (DEMs) and 2022 Interagency Sea Level Rise Technical Report Data



USACE Buildings
- At Risk By Late Century
- At Risk By Mid Century
- No Risk

Sea Level Rise By Late Century

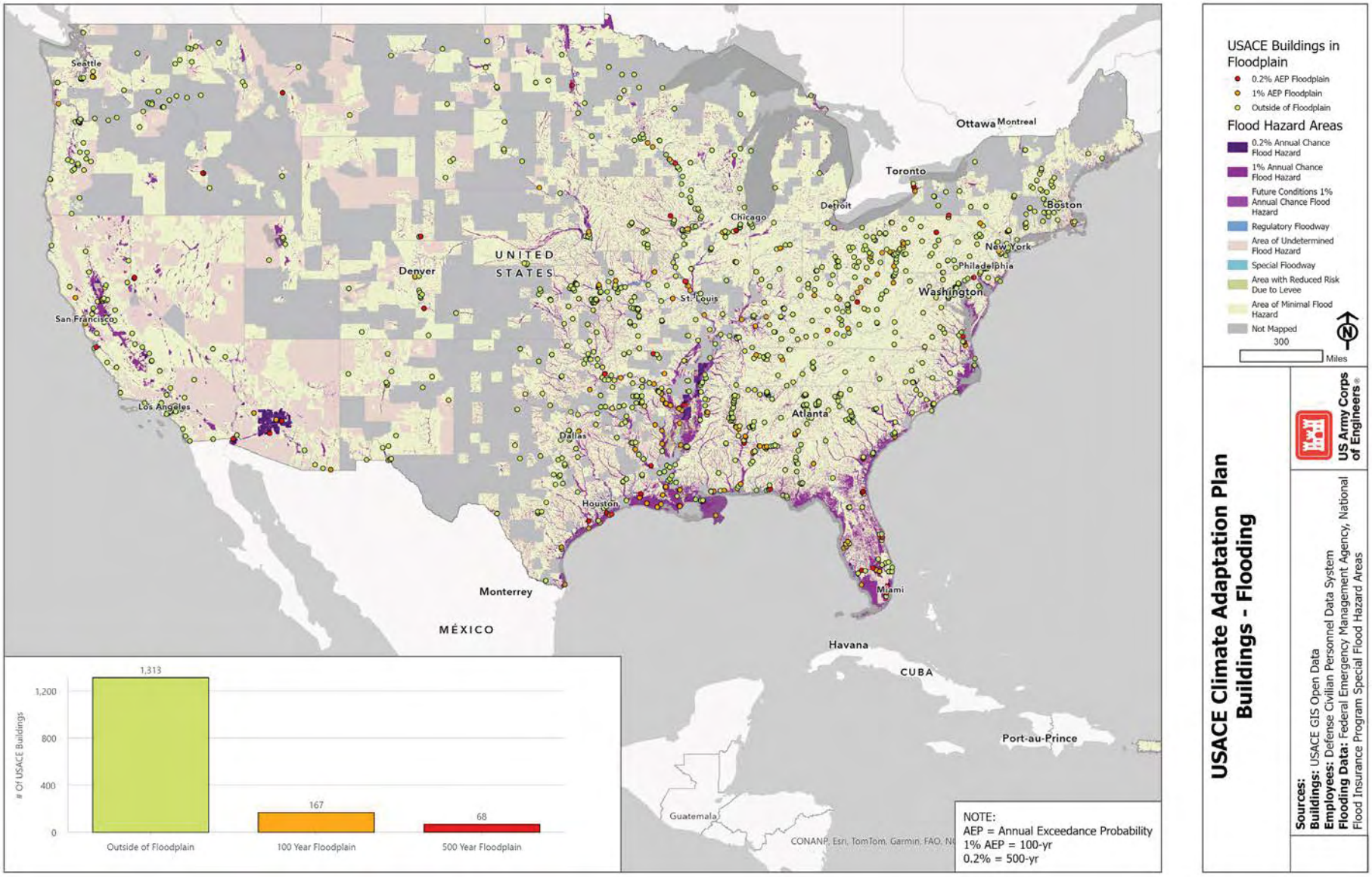
Sea Level Rise by Mid Century

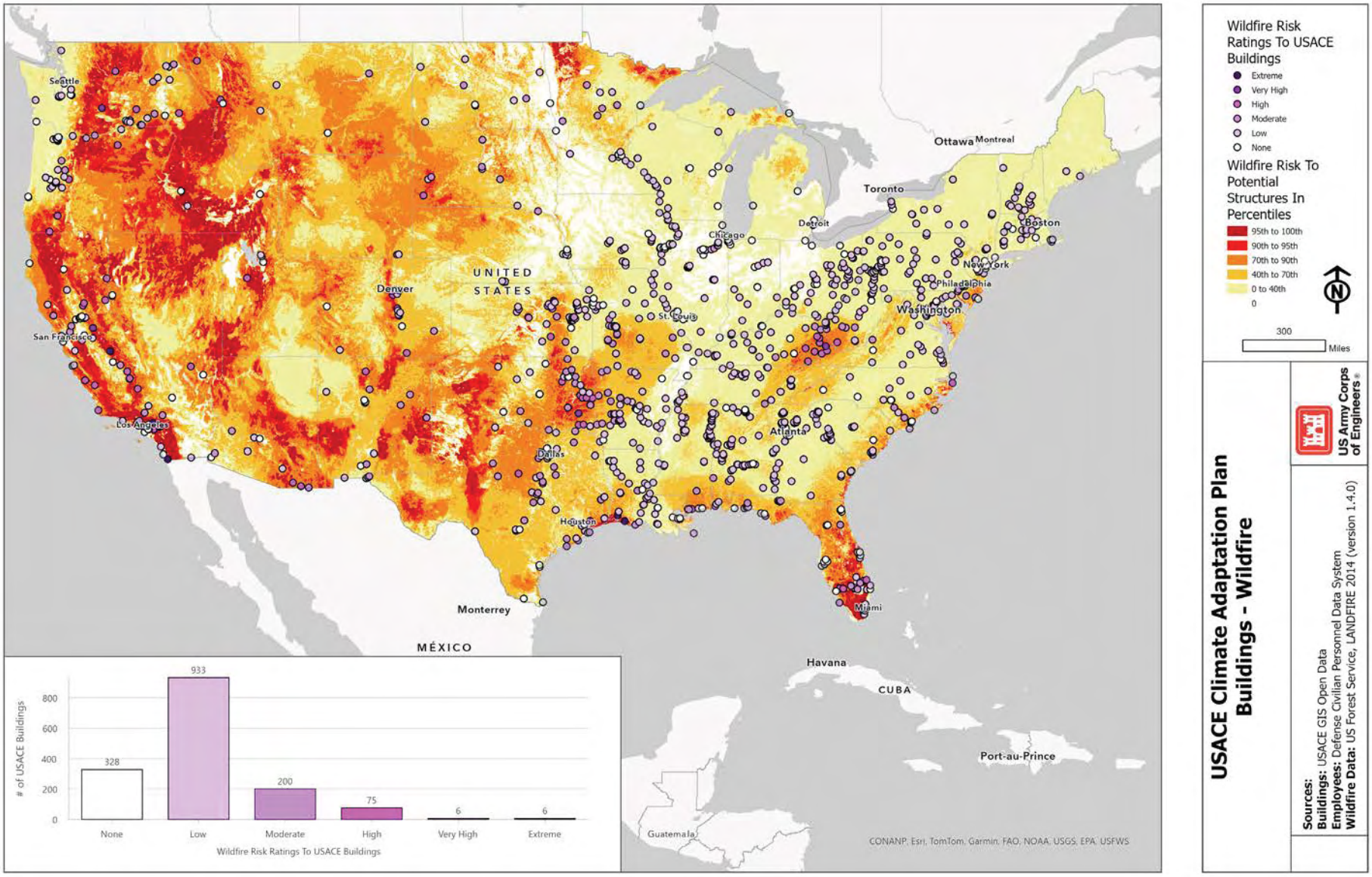
N

USACE Climate Adaptation Plan
Buildings - RCP 8.5 Sea Level Rise

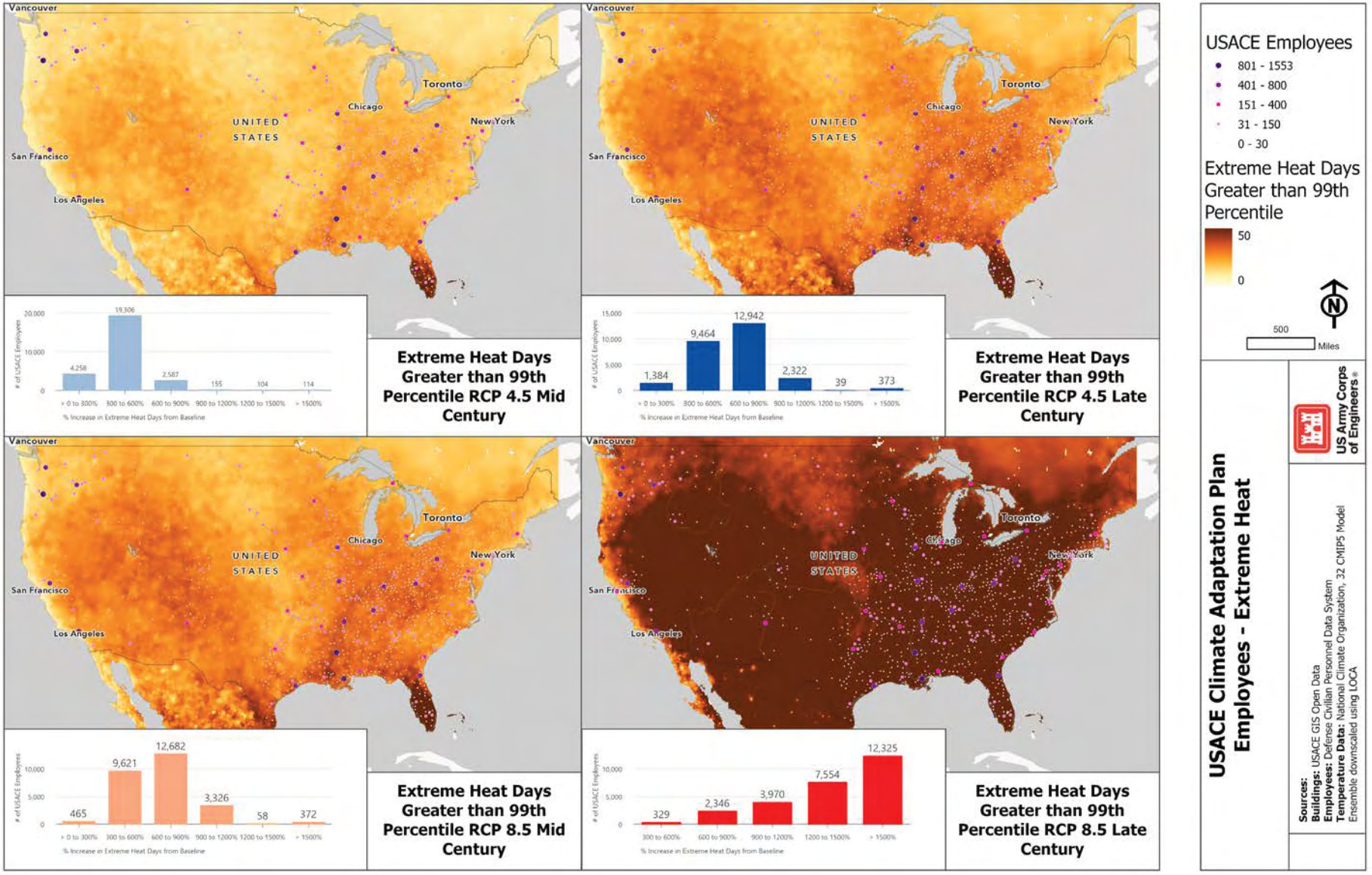
US Army Corps of Engineers®

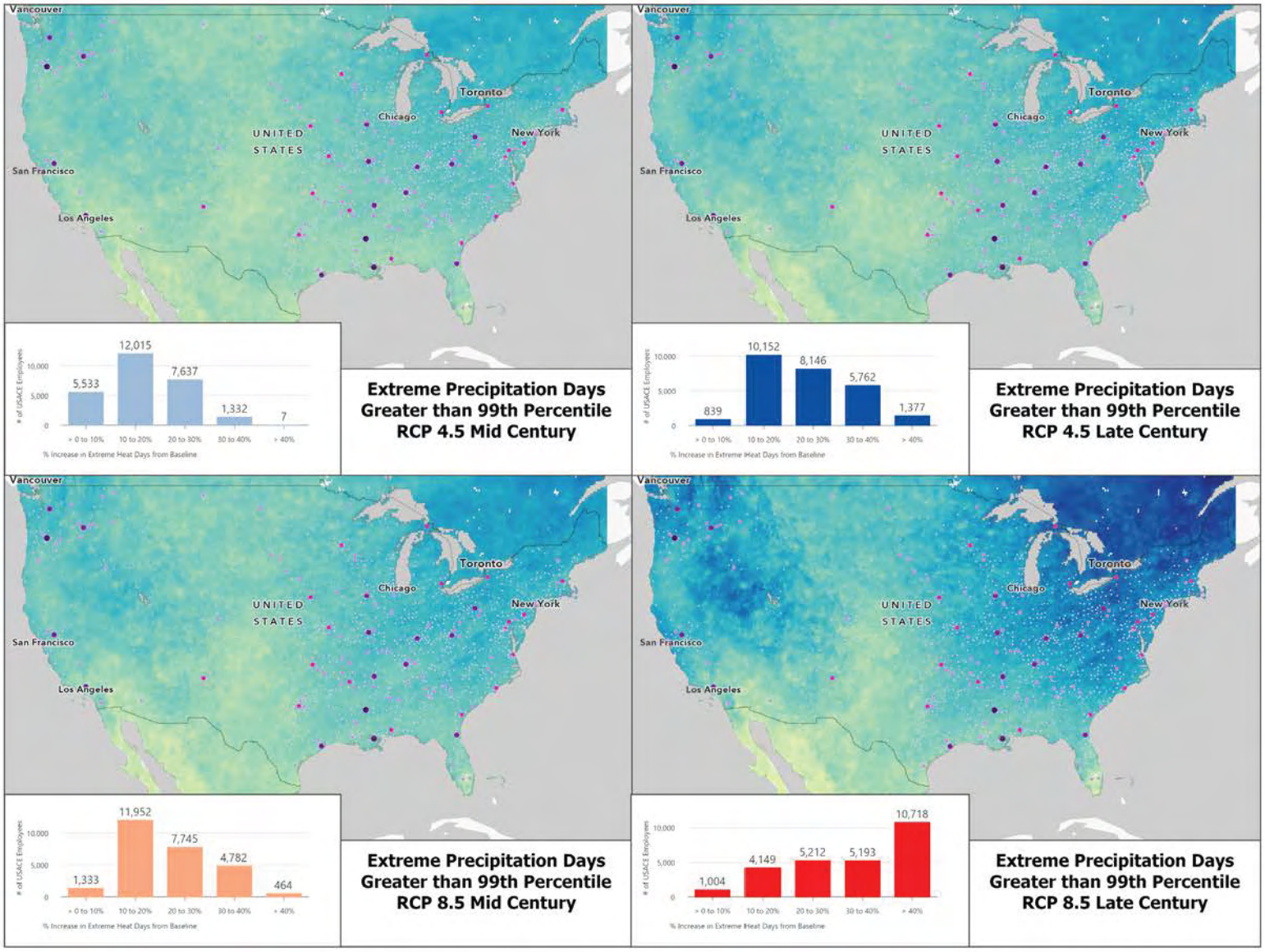
Sources:
Buildings: USACE GIS Open Data
Employees: Defense Civilian Personnel Data System
Sea Level Rise Data: NOAA Coastal Digital Elevation Models (DEMs) and 2022 Interagency Sea Level Rise Technical Report Data

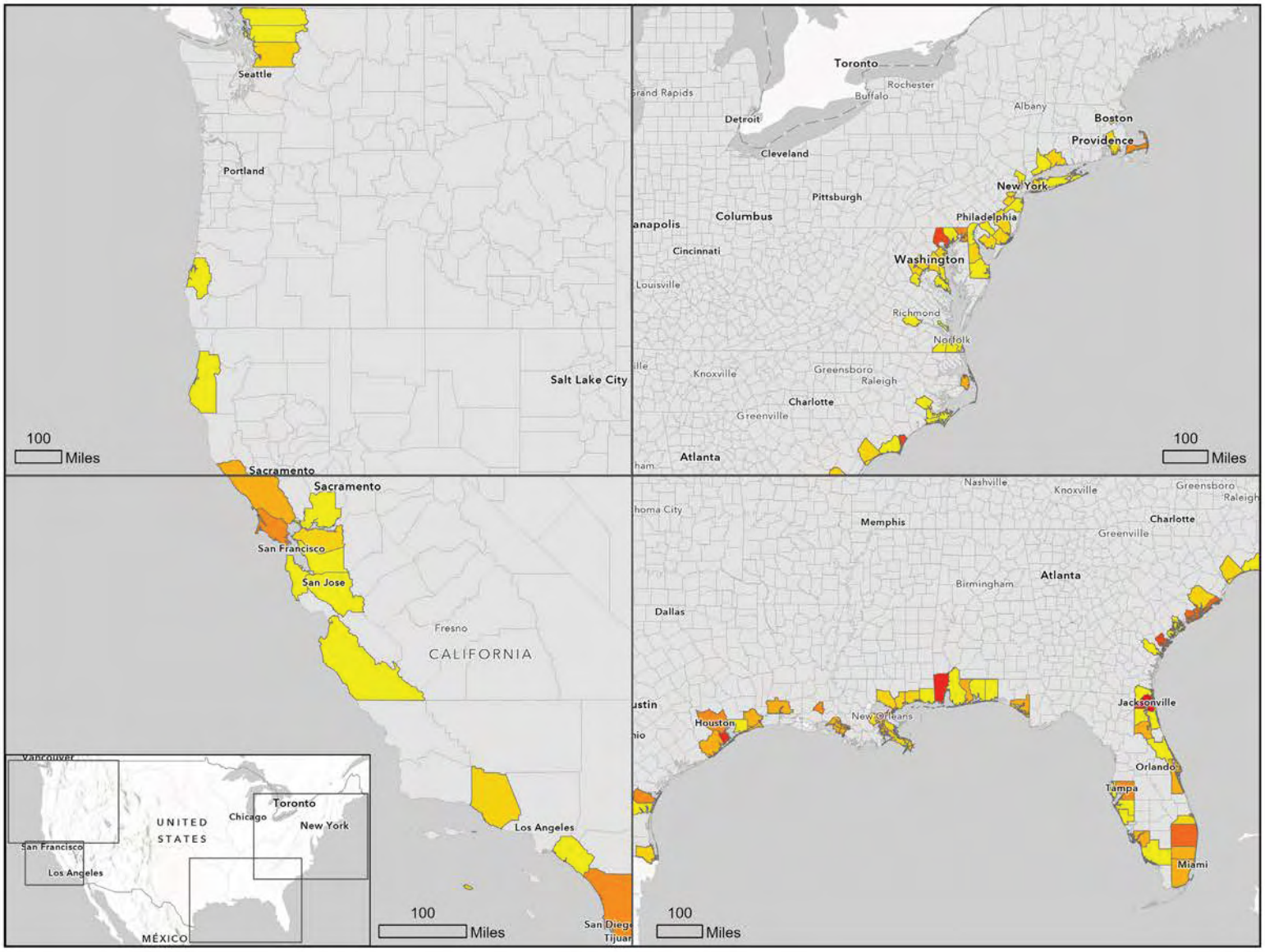

Seattle
San Francisco
Los Angeles
Denver
UNITED STATES
Chicago
Detroit
Toronto
Ottawa
Montreal
Boston
New York
Philadelphia
Washington
St. Louis
Atlanta
Dallas
Houston
Miami
Monterrey
MÉXICO
Havana
CUBA
Port-au-Prince
Guatemala
CONANP, Esri, TomTom, Garmin, FAO, N
Of USACE Buildings
1,200
800
400
0
1,313
167
68
Outside of Floodplain
100 Year Floodplain
500 Year Floodplain
NOTE:
AEP = Annual Exceedance Probability
1% AEP = 100-yr
0.2% = 500-yr
USACE Buildings in Floodplain
0.2% AEP Floodplain
1% AEP Floodplain
Outside of Floodplain
Flood Hazard Areas
0.2% Annual Chance Flood Hazard
1% Annual Chance Flood Hazard
Future Conditions 1% Annual Chance Flood Hazard
Regulatory Floodway
Area of Undetermined Flood Hazard
Special Floodway
Area with Reduced Risk Due to Levee
Area of Minimal Flood Hazard
Not Mapped
300
Miles
USACE Climate Adaptation Plan
Buildings - Flooding
US Army Corps of Engineers
Sources:
Buildings: USACE GIS Open Data
Employees: Defense Civilian Personnel Data System
Flooding Data: Federal Emergency Management Agency, National Flood Insurance Program Special Flood Hazard Areas


Wildfire Risk Ratings To USACE Buildings
Extreme
Very High
High
Moderate
Low
None
Wildfire Risk To Potential Structures In Percentiles
95th to 100th
90th to 95th
70th to 90th
40th to 70th
0 to 40th
0
300
Miles
USACE Climate Adaptation Plan
Buildings - Wildfire
US Army Corps of Engineers®
Sources:
Buildings: USACE GIS Open Data
Employees: Defense Civilian Personnel Data System
Wildfire Data: US Forest Service, LANDFIRE 2014 (version 1.4.0)
Seattle
San Francisco
Los Angeles
Denver
UNITED STATES
Chicago
Detroit
Toronto
Ottawa
Montreal
Boston
New York
Philadelphia
Washington
St. Louis
Atlanta
Dallas
Houston
Monterrey
MÉXICO
Miami
Havana
CUBA
Port-au-Prince
Guatemala
CONANP, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, USFWS
# of USACE Buildings
800
600
400
200
0
328
933
200
75
6
6
None
Low
Moderate
High
Very High
Extreme
Wildfire Risk Ratings To USACE Buildings

Appendix B – Climate Exposure Maps for Employees




Vancouver
Toronto
Chicago
New York
UNITED STATES
San Francisco
Los Angeles
5,533
12,015
7,637
1,332
7
Extreme Precipitation Days Greater than 99th Percentile RCP 4.5 Mid Century
839
10,152
8,146
5,762
1,377
Extreme Precipitation Days Greater than 99th Percentile RCP 4.5 Late Century
1,333
11,952
7,745
4,782
464
Extreme Precipitation Days Greater than 99th Percentile RCP 8.5 Mid Century
1,004
4,149
5,212
5,193
10,718
Extreme Precipitation Days Greater than 99th Percentile RCP 8.5 Late Century
# of USACE Employees
% Increase in Extreme Heat Days from Baseline
Extreme Precipitation Days Greater than 99th Percentile
8
2
USACE Employees
801 - 1553
401 - 800
151 - 400
31 - 150
0 - 30
500
Miles
USACE Climate Adaptation Plan
Employees - Extreme Precipitation
US Army Corps of Engineers®
Sources:
Buildings: USACE GIS Open Data
Employees: Defense Civilian Personnel Data System
Precipitation Data: National Climate Organization, 32 CMIPS Model Ensemble downscaled using LOCA


Seattle
Portland
Salt Lake City
Sacramento
San Francisco
San Jose
Fresno
CALIFORNIA
Los Angeles
San Diego
Tijuana
100 Miles
Toronto
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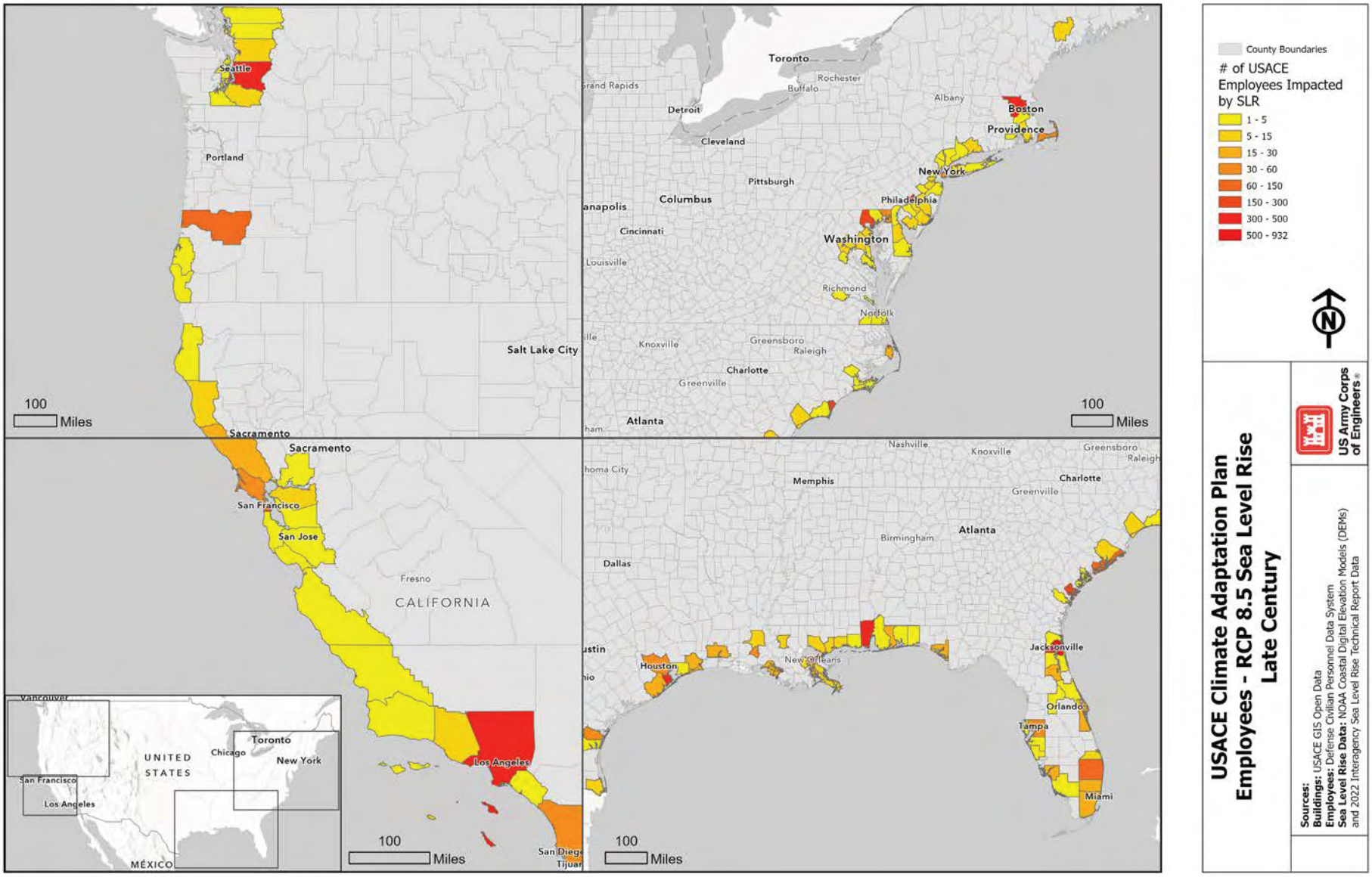
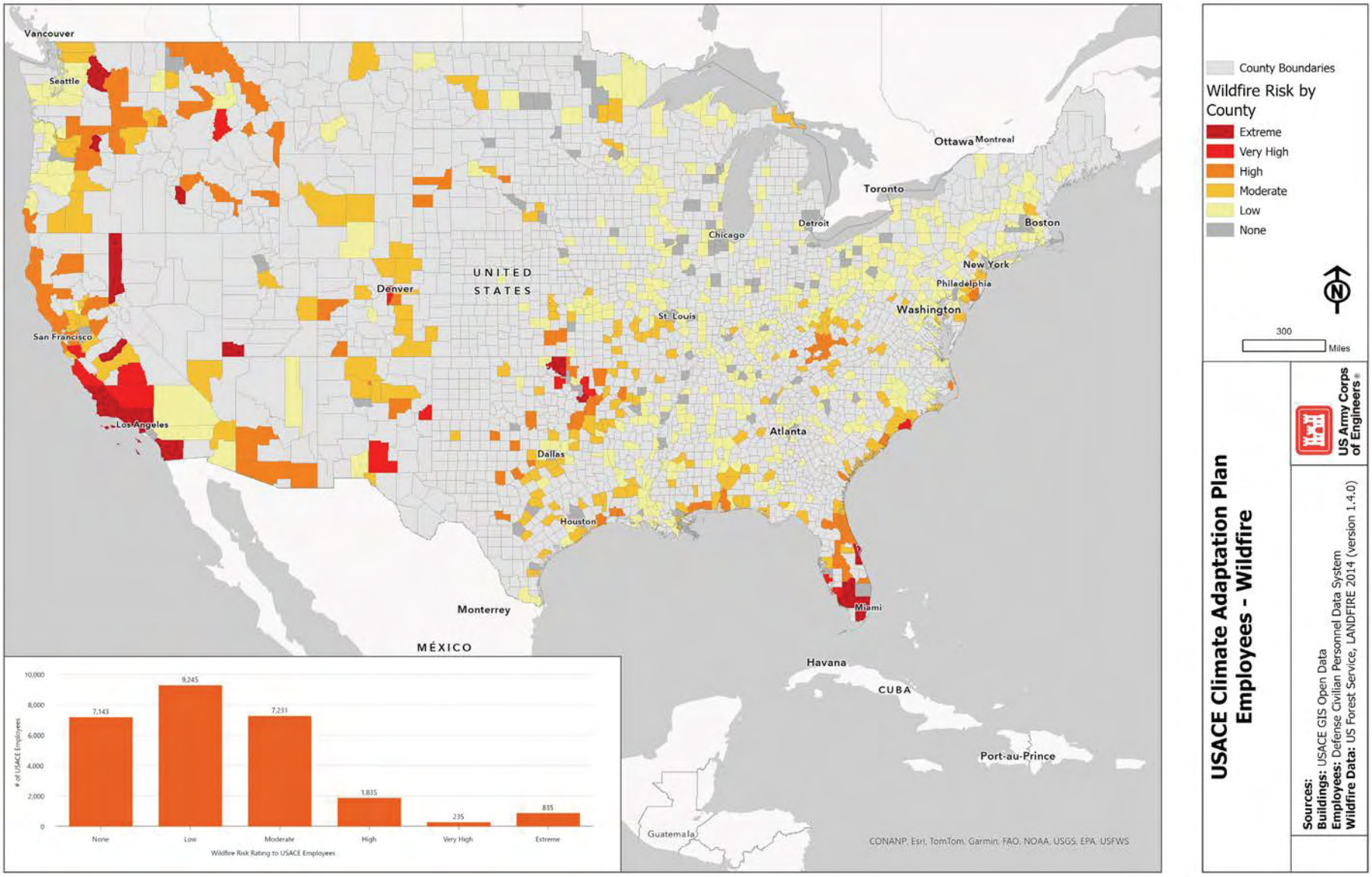
Buffalo
Albany
Boston
Providence
Detroit
Cleveland
Pittsburgh
New York
Columbus
Philadelphia
Cincinnati
Washington
Louisville
Richmond
Norfolk
Knoxville
Greensboro
Raleigh
Charlotte
Greenville
Atlanta
Nashville
Memphis
Birmingham
Dallas
Houston
New Orleans
Jacksonville
Orlando
Tampa
Miami
Vancouver
Chicago
UNITED STATES
MÉXICO
County Boundaries
# of USACE Employees Impacted by SLR
1 - 5
5 - 15
15 - 30
30 - 60
60 - 150
150 - 300
300 - 500
500 - 932
N
USACE Climate Adaptation Plan
Employees - RCP 4.5 Sea Level Rise
Late Century
US Army Corps of Engineers®
Sources:
Buildings: USACE GIS Open Data
Employees: Defense Civilian Personnel Data System
Sea Level Rise Data: NOAA Coastal Digital Elevation Models (DEMs) and 2022 Interagency Sea Level Rise Technical Report Data


County Boundaries
# of USACE Employees Impacted by SLR
1 - 5
5 - 15
15 - 30
30 - 60
60 - 150
150 - 300
300 - 500
500 - 932
N
Seattle
Portland
Salt Lake City
Sacramento
San Francisco
San Jose
Fresno
CALIFORNIA
Los Angeles
San Diego
Tijuana
Toronto
Detroit
Cleveland
Pittsburgh
Columbus
Cincinnati
Louisville
Buffalo
Rochester
Albany
Boston
Providence
New York
Philadelphia
Washington
Richmond
Norfolk
Knoxville
Greensboro
Raleigh
Charlotte
Greenville
Atlanta
Nashville
Memphis
Birmingham
Dallas
Houston
New Orleans
Jacksonville
Orlando
Tampa
Miami
100 Miles
UNITED STATES
MÉXICO
Vancouver
Chicago
Toronto
New York
San Francisco
Los Angeles
USACE Climate Adaptation Plan
Employees - RCP 8.5 Sea Level Rise
Late Century
US Army Corps of Engineers®
Sources:
Buildings: USACE GIS Open Data
Employees: Defense Civilian Personnel Data System
Sea Level Rise Data: NOAA Coastal Digital Elevation Models (DEMs) and 2022 Interagency Sea Level Rise Technical Report Data


Vancouver
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Ottawa
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New York
Philadelphia
Washington
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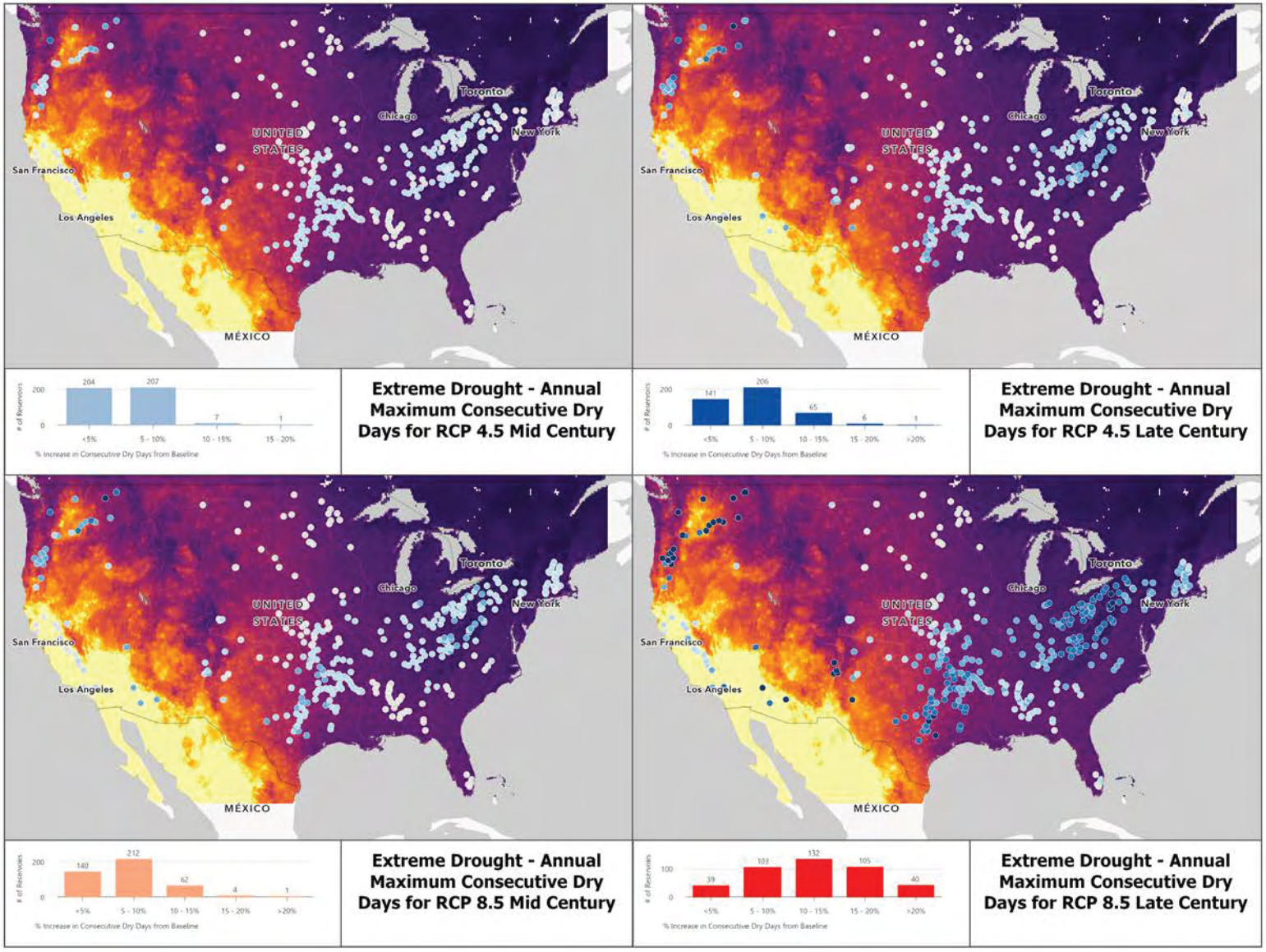
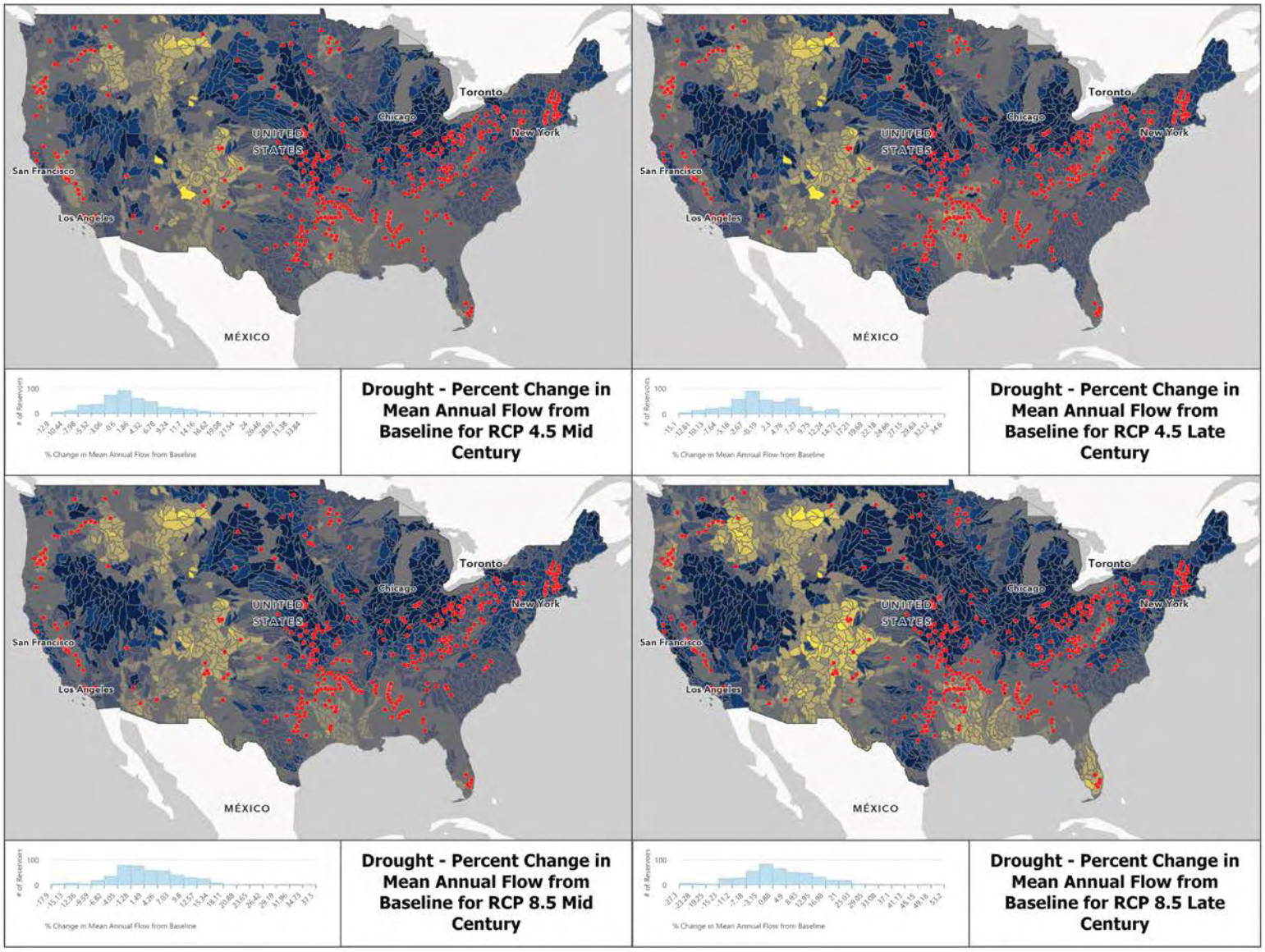
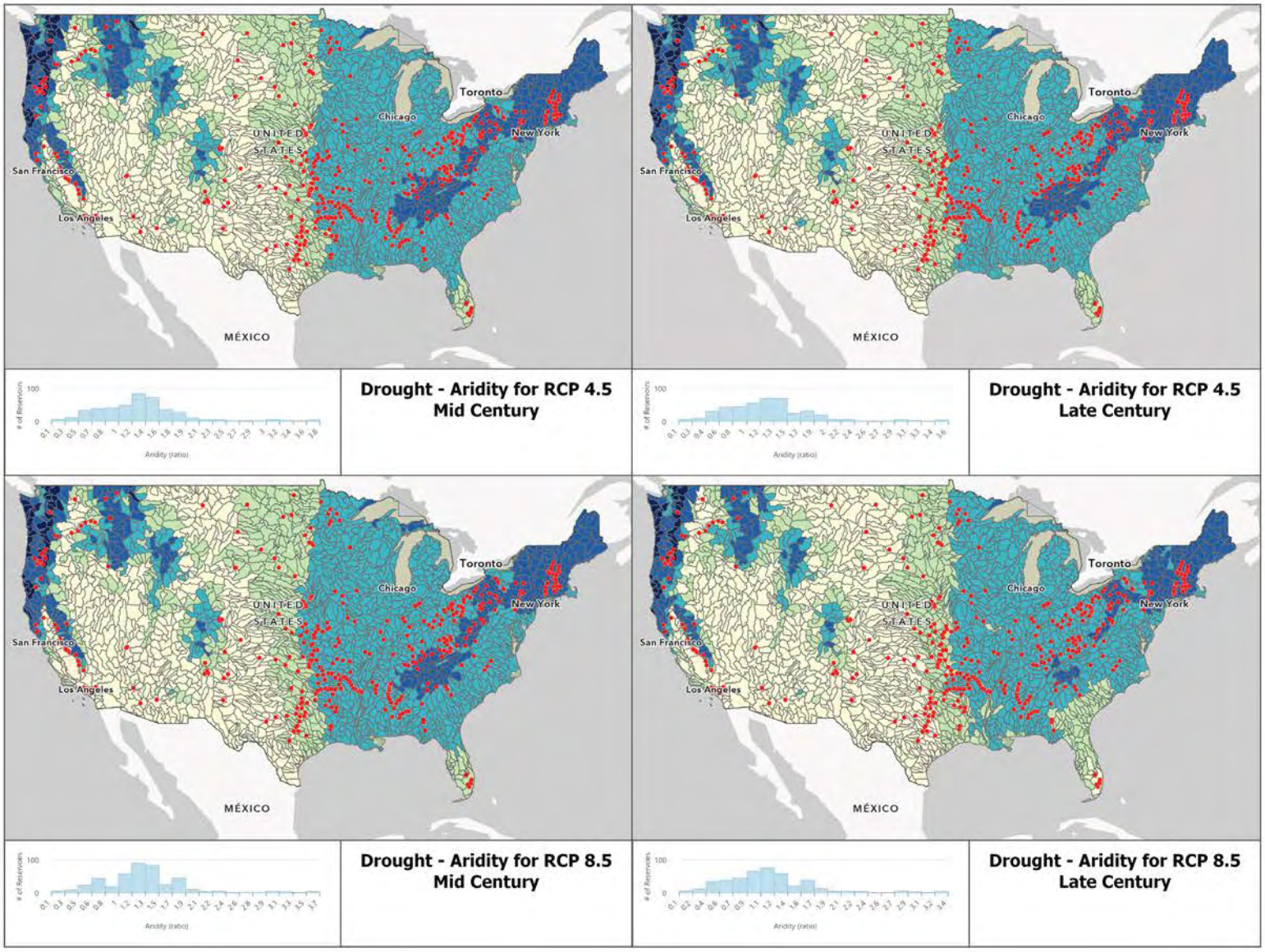
Atlanta
Dallas
Houston
Miami
Monterrey
MÉXICO
Havana
CUBA
Port-au-Prince
Guatemala
CONANP, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, USFWS
10,000
8,000
6,000
4,000
2,000
0
# of USACE Employees
7,143
9,245
7,231
1,835
235
835
None
Low
Moderate
High
Very High
Extreme
Wildfire Risk Rating to USACE Employees
County Boundaries
Wildfire Risk by County
Extreme
Very High
High
Moderate
Low
None
N
300
Miles
USACE Climate Adaptation Plan
Employees - Wildfire
US Army Corps of Engineers®
Sources:
Buildings: USACE GIS Open Data
Employees: Defense Civilian Personnel Data System
Wildfire Data: US Forest Service, LANDFIRE 2014 (version 1.4.0)

Appendix C – Drought Exposure Maps for USACE Reservoirs




Toronto
Chicago
New York
UNITED STATES
San Francisco
Los Angeles
MÉXICO
# of Reservoirs
% Change in Mean Annual Flow from Baseline
Drought - Percent Change in Mean Annual Flow from Baseline for RCP 4.5 Mid Century
Drought - Percent Change in Mean Annual Flow from Baseline for RCP 4.5 Late Century
Drought - Percent Change in Mean Annual Flow from Baseline for RCP 8.5 Mid Century
Drought - Percent Change in Mean Annual Flow from Baseline for RCP 8.5 Late Century
USACE Reservoirs
% Change in Mean Annual Flow from Baseline
<-30%
-30 - -20%
-20 - -10%
-10 - -5%
-5 - 0%
0 - 5%
5 - 10%
>10%
N
500
Miles
USACE Climate Adaptation Plan
Drought - Mean Annual Flow
US Army Corps of Engineers®
Sources:
Reservoirs: USACE GIS Open Data
Drought Data: DoD Climate Assessment Tool



USACE Reservoirs

Aridity - Average Dryness of Climate (<0.65 = Arid Climate)

- <0.65
- 0.65 - 1
- 1 - 1.5
- 1.5 - 3
- >3

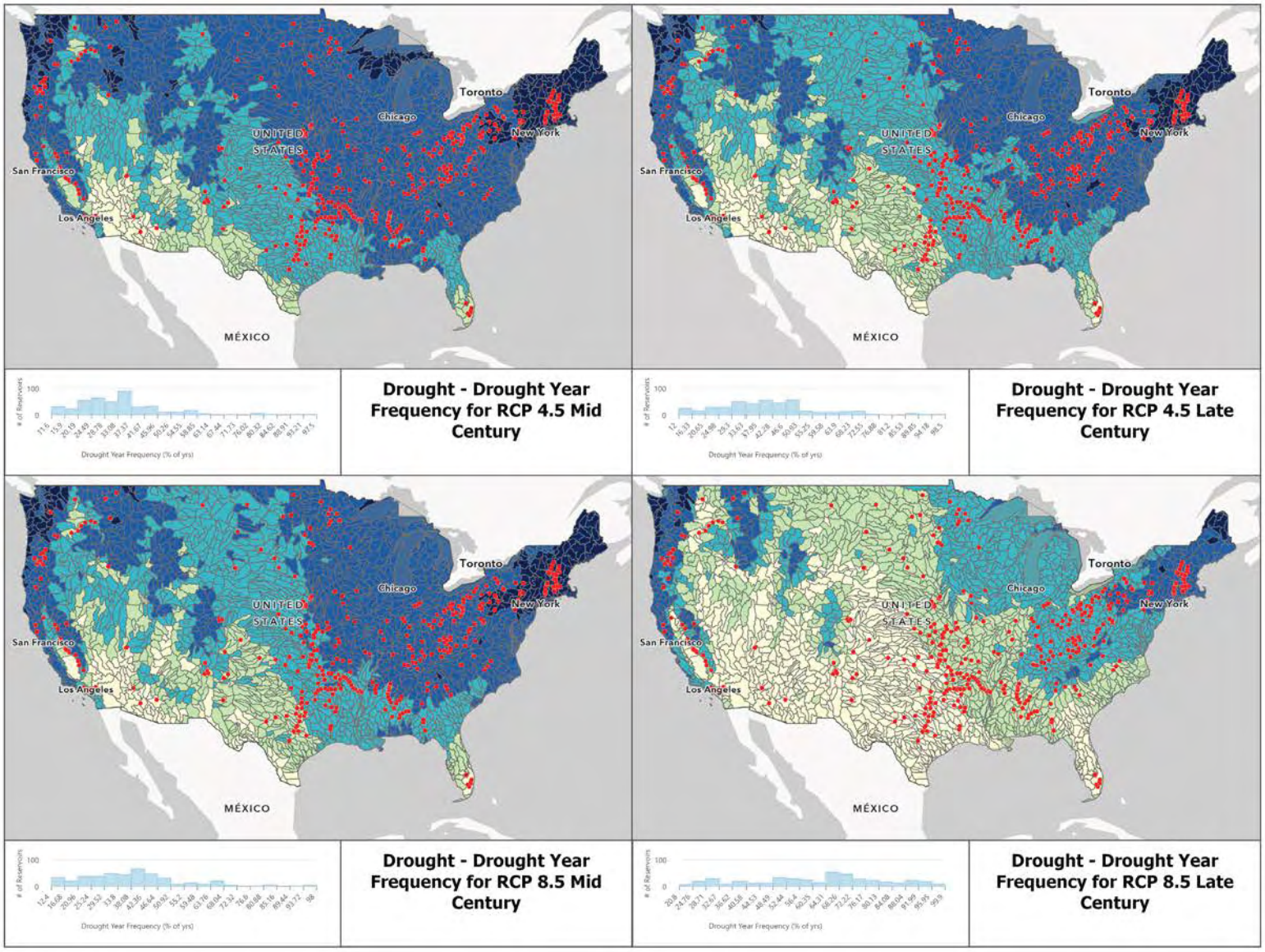
N

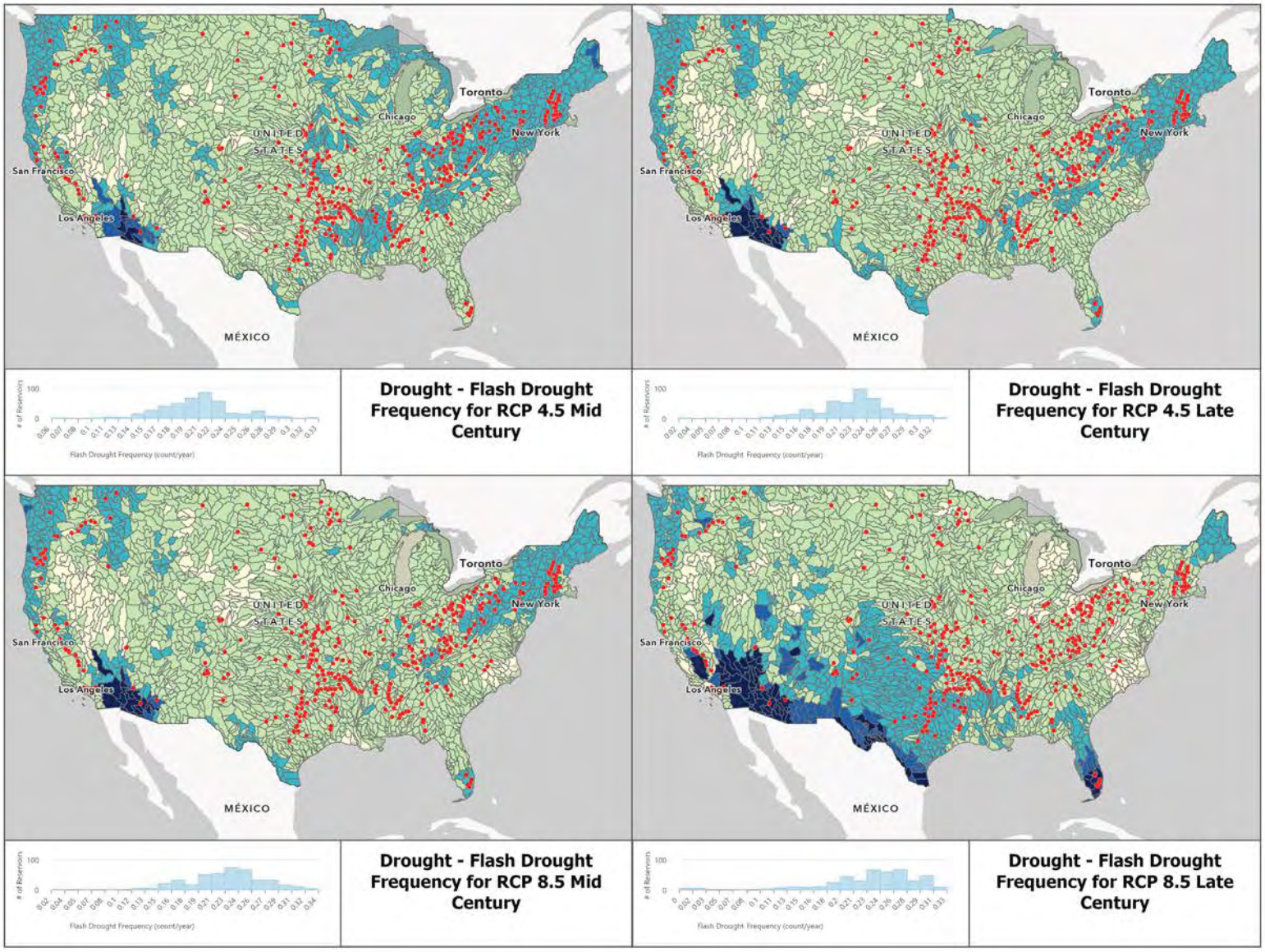
500 Miles

USACE Climate Adaptation Plan
Drought - Aridity

US Army Corps of Engineers®

Sources:
Reservoirs: USACE GIS Open Data
Drought Data: DoD Climate Assessment Tool


Toronto
Chicago
New York
UNITED STATES
San Francisco
Los Angeles
MÉXICO
Drought - Drought Year Frequency for RCP 4.5 Mid Century
Drought - Drought Year Frequency for RCP 4.5 Late Century
Drought - Drought Year Frequency for RCP 8.5 Mid Century
Drought - Drought Year Frequency for RCP 8.5 Late Century
USACE Reservoirs
Drought Year Frequency (% of drought years in the epoch)
80 - 100%
60 - 80%
40 - 60%
20 - 40%
<20%
500
Miles
USACE Climate Adaptation Plan
Drought - Drought Year Frequency
US Army Corps of Engineers®
Sources:
Reservoirs: USACE GIS Open Data
Drought Data: DoD Climate Assessment Tool


Toronto
Chicago
New York
UNITED STATES
San Francisco
Los Angeles
MÉXICO
# of Reservoirs
Flash Drought Frequency (count/year)
Drought - Flash Drought Frequency for RCP 4.5 Mid Century
Drought - Flash Drought Frequency for RCP 4.5 Late Century
Drought - Flash Drought Frequency for RCP 8.5 Mid Century
Drought - Flash Drought Frequency for RCP 8.5 Late Century
USACE Reservoirs
Flash Drought Frequency (average # of flash droughts per year)
>0.3
0.2 - 0.3
0.1 - 0.2
0.05 - 0.1
<0.05
N
500
Miles
USACE Climate Adaptation Plan
Drought - Flash Drought Frequency
US Army Corps of Engineers®
Sources:
Reservoirs: USACE GIS Open Data
Drought Data: DoD Climate Assessment Tool

Appendix D – Risk Assessment Data

This risk assessment uses the following data:

Buildings

Buildings data come from two sources: the USACE real property database maintained by USACE's Real Estate Division and a GIS buildings layer maintained by the USACE GIS and Remote Sensing Center of Expertise. The buildings records in the USACE real property database are comprehensive and include the full range of building sizes from large office buildings down to small utility sheds located at USACE projects. The USACE real property database provides the asset-level data, such as square footage, property type, and property ownership; therefore, the information in the real property database is utilized to compute the summary numbers provided in Section 1. The GIS buildings layer includes major buildings and captures the location of all buildings in the real property database, therefore, the GIS database is used to perform the climate risk assessment in Section 2. Building locations are denoted by a single point and do not represent the entirety of a structure or could represent multiple structures. These databases are the best available datasets for USACE real property. Despite these limitations, this data is sufficient for screening-level exposure assessments to provide a sense of potential exposure of federal buildings to climate hazards.

Personnel

Personnel data comes from DCPDS non-public dataset of all personnel employed by USACE that was provided in 2023. DCPDS is a multifunction, web-based civilian HR information management and transaction processing system. This data represents the best available personnel data and is appropriate for screening-level exposure assessments to provide a sense of key areas of climate hazard exposure for agency personnel.

Climate Hazards

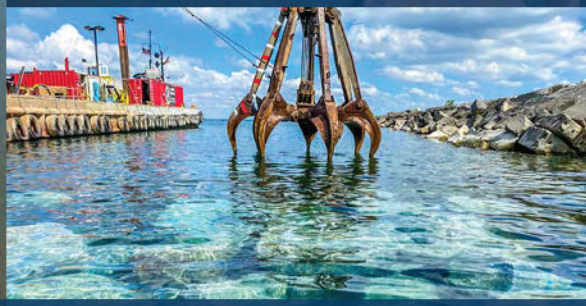
The climate data used in the risk assessment comes from the data in Climate Mapping for Resilience and Adaptation (CMRA) Assessment Tool. When agency climate adaptation plans were initiated in 2023, CMRA data included climate data prepared for the 4th National Climate Assessment. Additional details on this data can be found on the CMRA Assessment Tool Data Sources page. Due to limited data availability, exposure analyses using the Federal Mapping App are largely limited to CONUS. Additional information regarding Alaska, Hawaii, U.S. Territories, and marine environments has been included as available.

In addition to this data, USACE used the underlying climate hazard information from DCAT, which will also serve as the underlying data for the USACE CWVAT. The data from DCAT was used to fill the climate hazard information gaps in the CMRA database for Alaska and Hawaii as well as to perform a risk assessment associated with drought. Drought is a primary concern for USACE's portfolio of dams and reservoirs and USACE's responsibilities to maintaining navigable waterways.

U.S. Army Corps of Engineers
2024–2027 Climate Adaptation Plan
Prepared per Executive Orders 14008, 14030, and 14057

1,740 feet of seawall USACE built helps protect Atlantic City, NJ, from sea level rise and storm surge

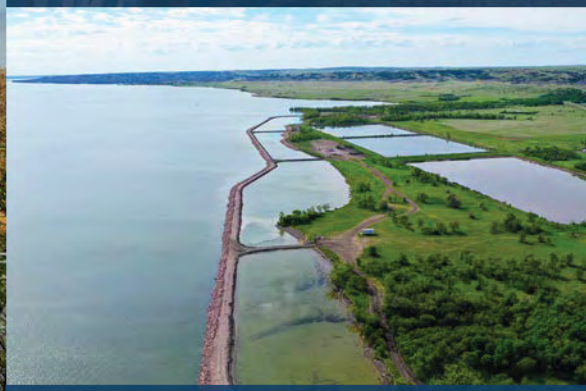
Lock and Dam 1 in Minneapolis on the Mississippi River, one of over 700 lock and dam USACE projects nationwide



USACE repairs the south breakwater in New York's Buffalo Harbor

Crooked Creek Lake, one of 16 flood control reservoirs within the Pittsburgh District of the U.S. Army Corps of Engineers

Flooding in a small Virginia fishing community experiencing subsidence and relative sea level rise



Aquatic Ecosystem Restoration Project (breakwater structure) that was the result of a feasibility study completed through a partnership with the Lower Brule Sioux Tribe

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