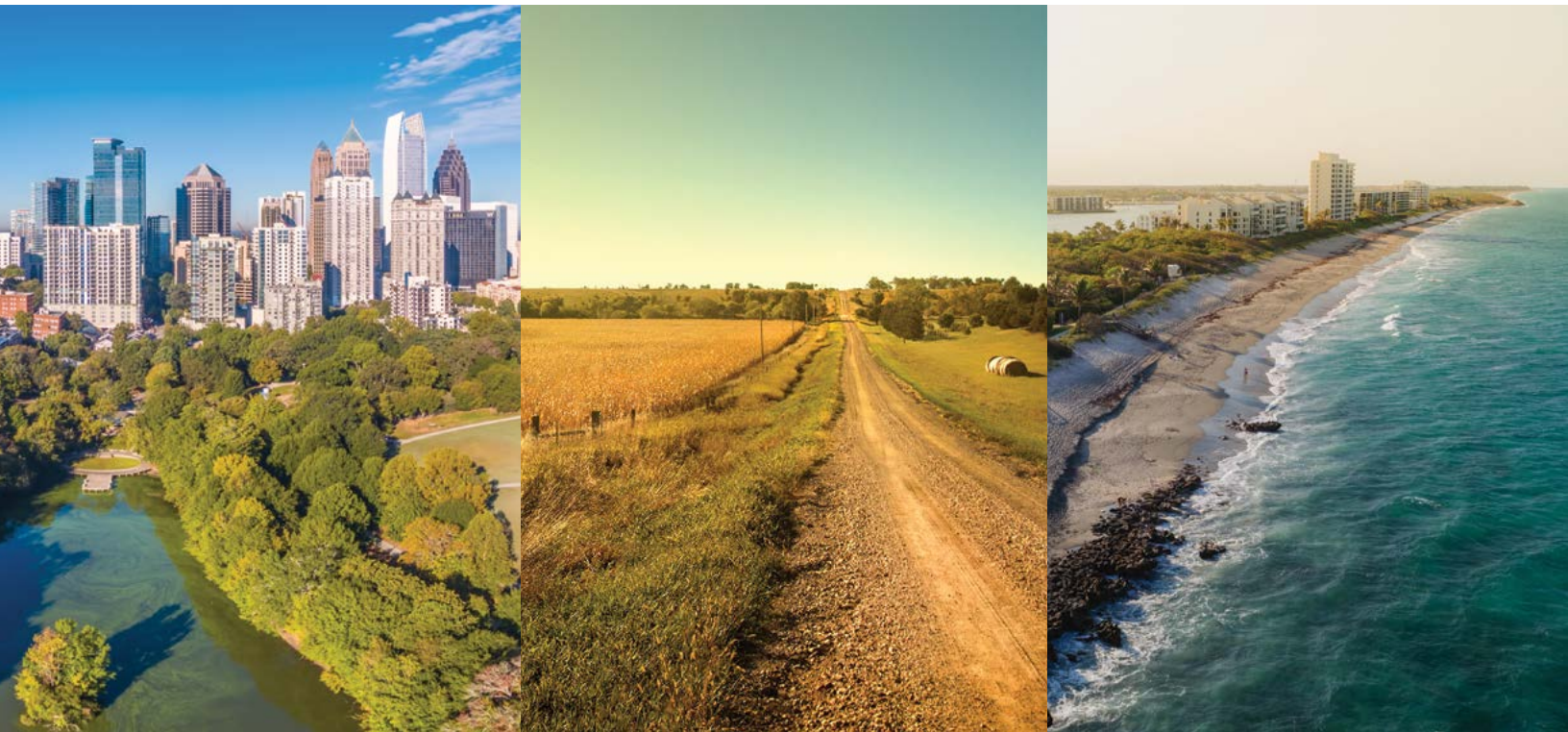


PREPARING FOR THE REGIONAL HEALTH IMPACTS OF CLIMATE CHANGE IN THE UNITED STATES



A summary of health effects, resources, and adaptation examples from health departments funded by CDC's Climate and Health Program

July 2020 / Climate and Health Program



**Centers for Disease
Control and Prevention**
National Center for
Environmental Health

Contents

Executive Summary	3
Background	3
Regions	6
Alaska	7
Hawaii and U.S.-Affiliated Pacific Islands	10
Midwest	13
Northeast	16
Northern Great Plains	20
Northwest	22
Southeast	25
Southern Great Plains	28
Southwest	30
U.S. Caribbean	33
Conclusion	36
Selected Links and Resources	36
Appendix: Explanation of Graphics for Accessibility	36

Executive Summary

Each region of the United States experiences climate change and its impacts on health differently, due to the regions' location-specific climate exposures and unique societal and demographic characteristics. The Centers for Disease Control and Prevention (CDC) Climate and Health Program supports states, counties, cities, tribes, and territories to assess how climate change will affect their community, identify vulnerable populations, and implement adaptation and preparedness

strategies to reduce the health effects of climate change. This document describes the various health impacts climate change will have on different regions of the United States as outlined in the Fourth National Climate Assessment (NCA4), actions taken by the CDC Climate and Health Program's health department partners to prepare for and respond to climate change in their communities, and relevant tools and resources.

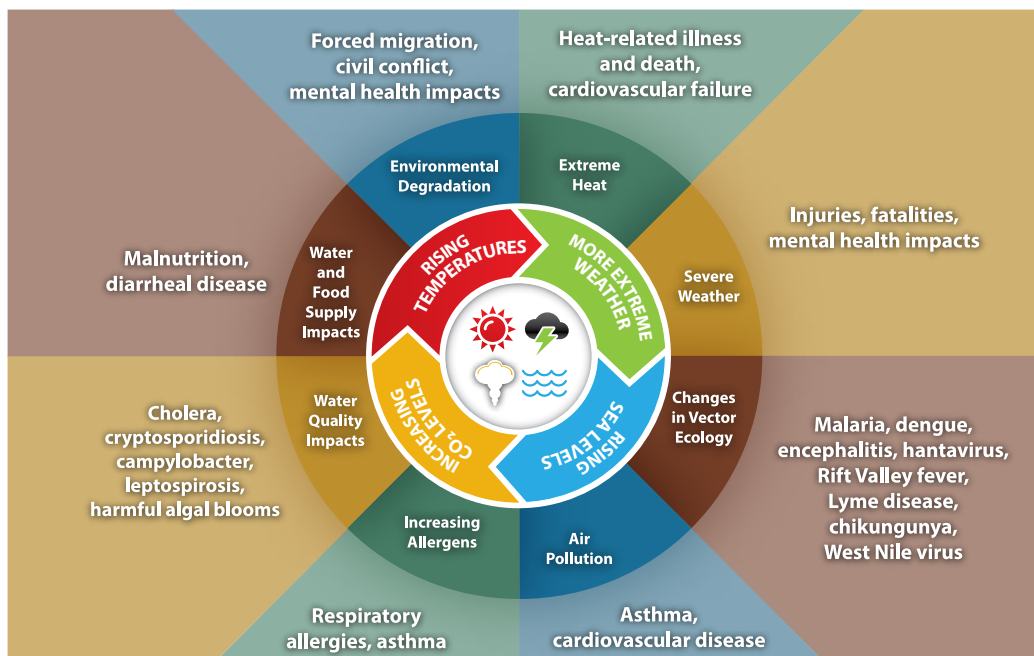
Background

Climate change, together with other natural and human-made health stressors, influences human health and disease in numerous ways. Some existing health threats will intensify and new health threats will emerge (<https://www.cdc.gov/climateandhealth/effects/default.htm>). For example, changes in temperature and precipitation are increasing health risks associated with wildfire and ground-level ozone pollution. Rising air and water temperatures and more intense extreme events are expected to shift exposure to waterborne and foodborne diseases, affecting food and water safety. With continued warming, cold-related deaths are projected to decrease and heat-related deaths are projected to increase, and in most regions, increases in heat-related deaths are expected to outpace reductions in cold-related deaths. The frequency and severity of allergic illnesses, including hay fever, are expected to increase as a result of shorter winters and earlier

and longer pollen seasons. Climate change is also projected to alter the geographic range and distribution of insects and pests, potentially exposing more people to ticks and mosquitoes that carry the agents that cause diseases like Lyme disease, Zika, West Nile and dengue. Communities in the Southeast, for example, are particularly vulnerable to the combined health impacts from heat and flooding, which can result in large populations of nuisance mosquitoes and potential disease risk. Finally, extreme weather and climate-related events can have lasting mental health consequences in affected communities, particularly if they result in degradation of livelihoods or community relocation. For more information on the health impacts of climate change in the United States, see the health chapter of the fourth National Climate Assessment: <https://nca2018.globalchange.gov>.

Impact of Climate Change on Human Health

Climate change impacts a wide range of health outcomes. This image illustrates some of the most significant components of climate change (rising temperatures, more extreme weather, rising sea levels, and increasing carbon dioxide levels), their effect on exposures, and the subsequent health outcomes that can result from these changes in exposures. Source: <https://www.cdc.gov/climateandhealth/effects/default.htm>. For accessibility see [appendix, page 36](#).

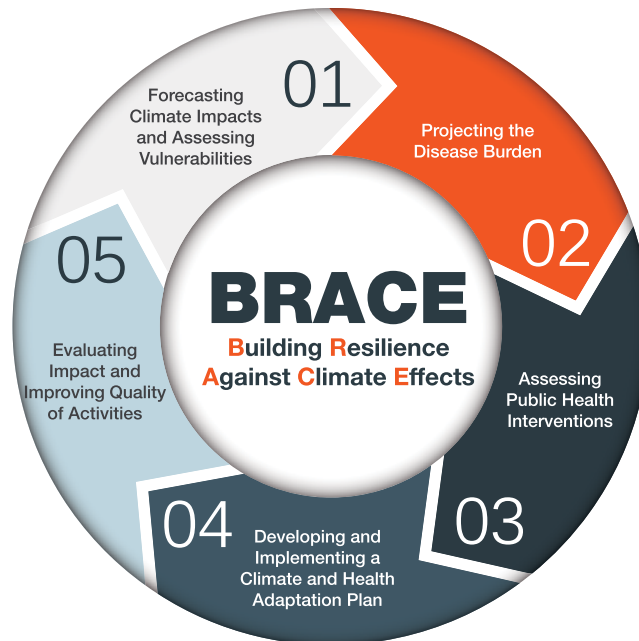


Importantly, not everyone is equally at risk. The impacts on health due to climate change are both place-specific and path-dependent, meaning the impacts of climate change depend on where you are and who you are, as there are varying degrees of climate exposure and differences in individual and societal characteristics that can either protect you or make you more vulnerable to the impacts of climate change. For example, populations including older adults, children, low-income communities, and some communities of color are often disproportionately affected by, and less resilient to, the health impacts of climate change. Adaptation and mitigation policies and programs help individuals, communities, and states prepare for the risks of a changing climate and reduce the number of injuries, illnesses, and deaths from climate-related health outcomes.

CDC's Climate and Health Program is the national leader in empowering communities to protect human health from a changing climate. Beginning in 2010, the Climate and Health Program implemented the Climate-Ready States and Cities Initiative (CRSCI) to help state and city health departments prepare for and respond to the health effects that a changing climate may bring to their communities. Sixteen states and two cities are funded to implement the five-step Building Resilience Against Climate Effects (BRACE) framework to identify likely climate impacts in their communities, potential health effects associated with these impacts, and their most at-risk populations and locations so that they can then develop and implement health adaptation plans and address gaps in critical public health functions and services. For more information see: https://www.cdc.gov/climateandhealth/climate_ready.htm

Five sequential steps comprise the BRACE framework

The Building Resilience Against Climate Effects (BRACE) framework is a five-step process that allows health officials to develop strategies and programs to help communities prepare for the health effects of climate change. Accessibility source: <https://www.cdc.gov/climateandhealth/BRACE.htm>



Step 1: Anticipate Climate Impacts and Assessing Vulnerabilities

Identify the scope of climate impacts, associated potential health outcomes, and populations and locations vulnerable to these health impacts.

Step 2: Project the Disease Burden

Estimate or quantify the additional burden of health outcomes associated with climate change.

Step 3: Assess Public Health Interventions

Identify the most suitable health interventions for the identified health impacts of greatest concern.

Step 4: Develop and Implement a Climate and Health Adaptation Plan

Develop a written adaptation plan that is regularly updated. Disseminate and oversee implementation of the plan.

Step 5: Evaluate Impact and Improve Quality of Activities

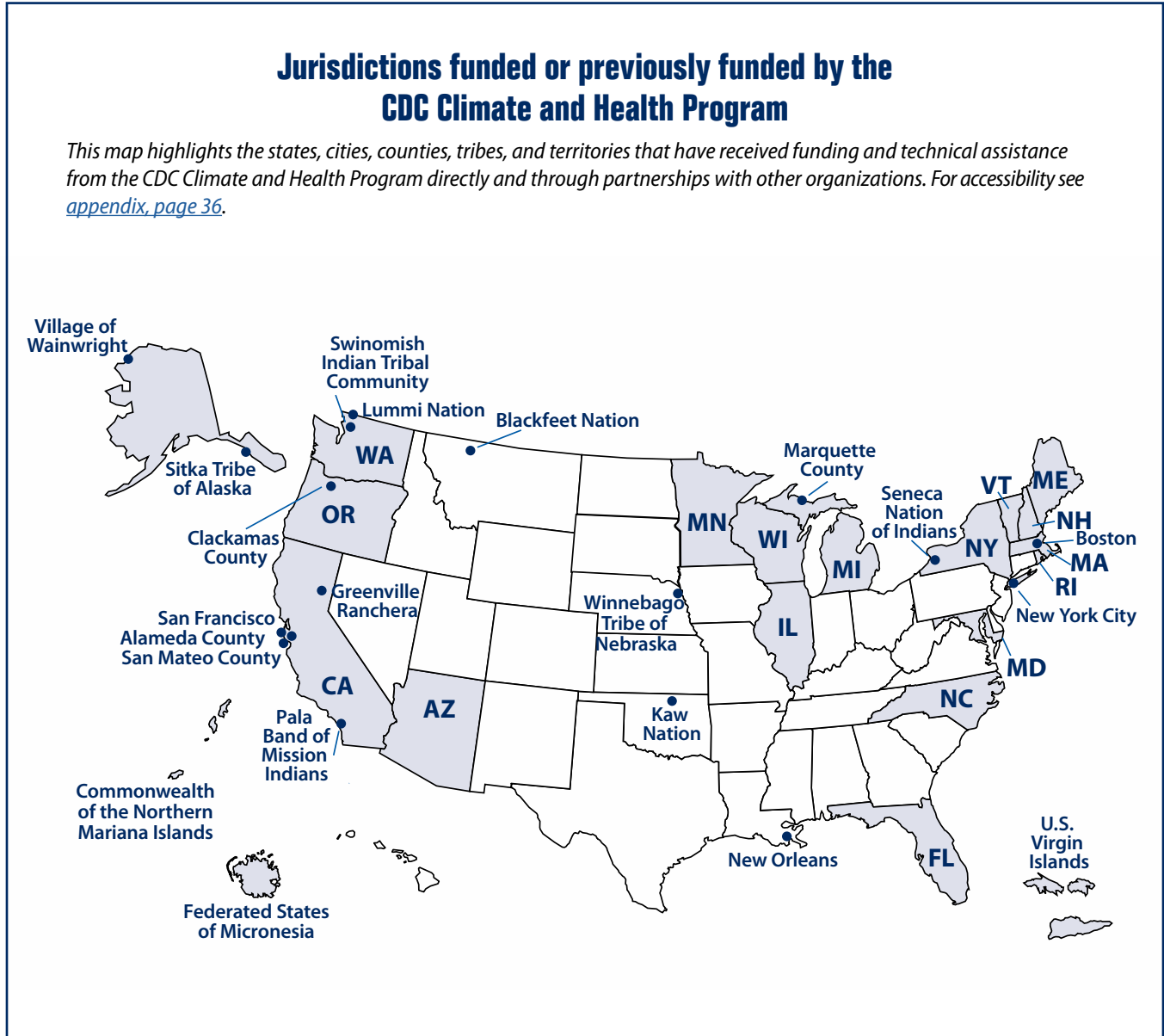
Evaluate the process. Determine the value of information attained and activities undertaken.

The Climate and Health Program also supports tribes, territories, and other communities that are not part of the Climate-Ready States and Cities Initiative (CRSCI) through the “Building Capacity of the Public Health System to Improve Population Health through National, Nonprofit Organizations” program managed by CDC’s Center for State, Tribal, Local and Territorial Support (CSTLTS). Funded partners include the National

Indian Health Board (NIHB) Climate-Ready Tribes Initiative; the Association of State and Territorial Health Officials (ASTHO) Climate-Ready Territories Initiative; the Council for State and Territorial Epidemiologists (CSTE); the National Environmental Health Association (NEHA); and the National Association of County and City Health Officials (NACCHO).

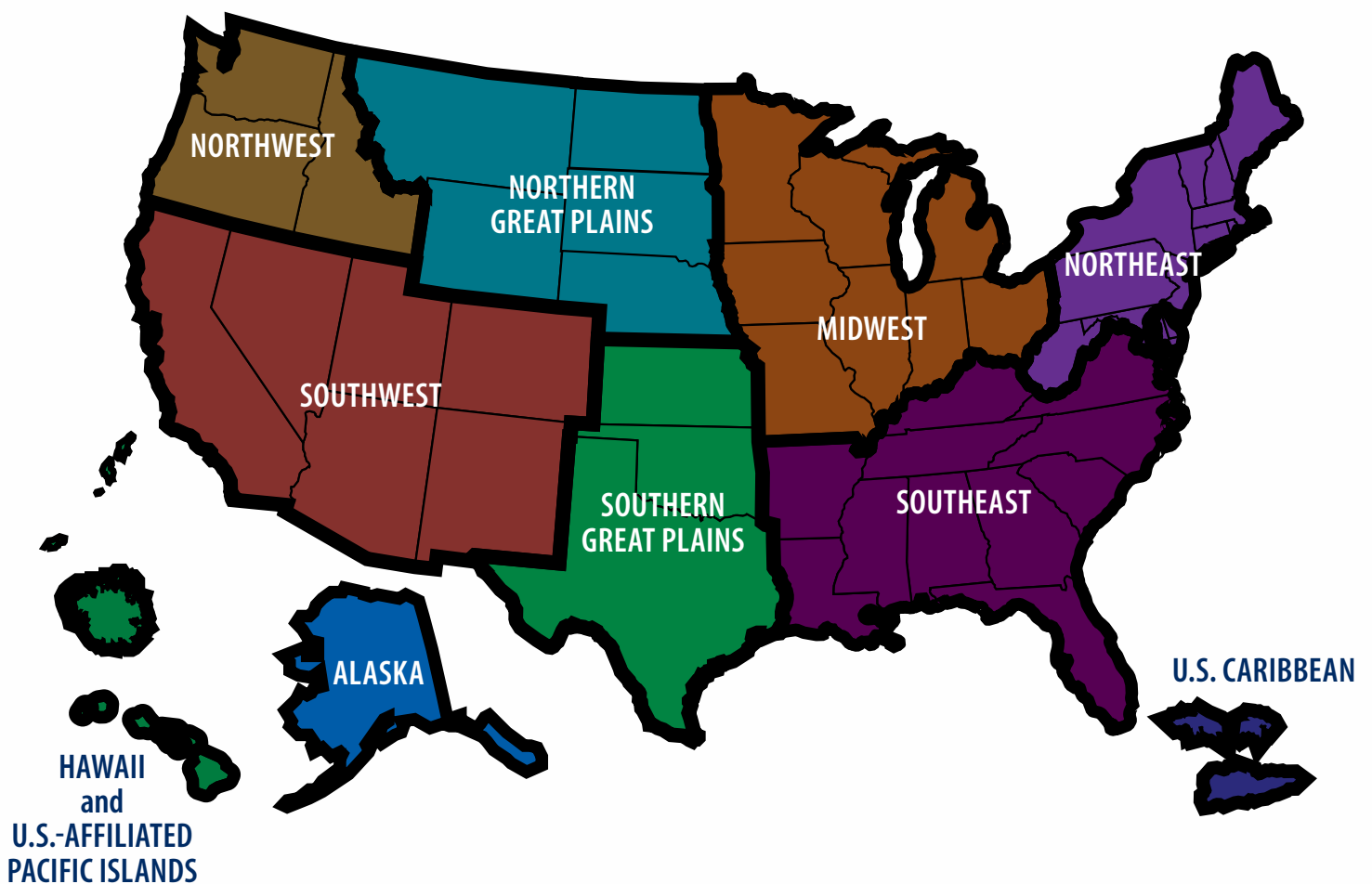
Jurisdictions funded or previously funded by the CDC Climate and Health Program

This map highlights the states, cities, counties, tribes, and territories that have received funding and technical assistance from the CDC Climate and Health Program directly and through partnerships with other organizations. For accessibility see [appendix, page 36](#).

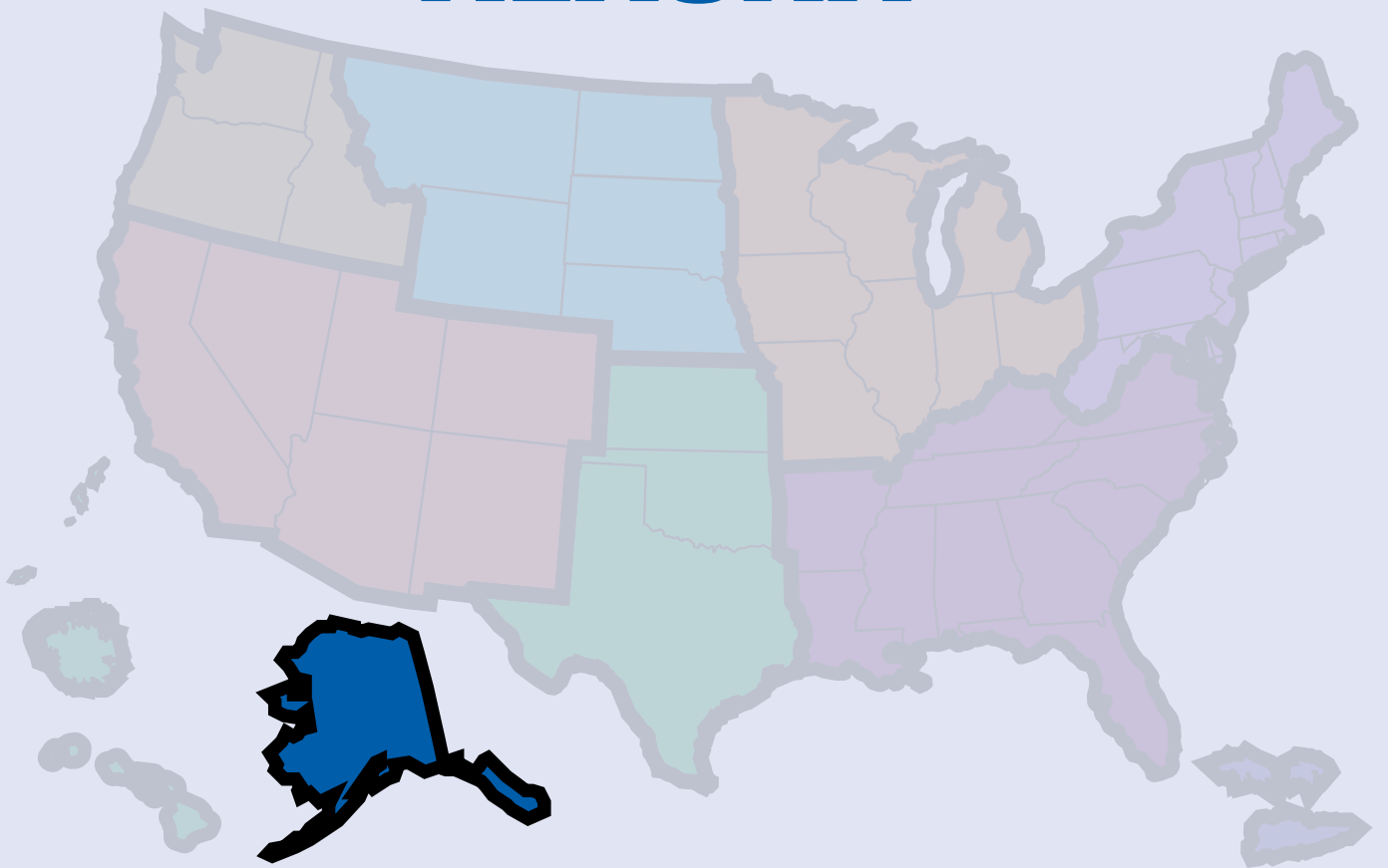


Regions

Outlined on the following pages are the unique climate-related health impacts for each region of the United States (as defined by the Fourth National Climate Assessment) and relevant highlights of actions taken by the CDC Climate and Health Program's health department partners to prepare for and respond to climate change in their communities. The climate impacts described in each region are not comprehensive, as additional threats may exist that were not included in the Fourth National Climate Assessment. This document synthesizes the impacts that are directly health-relevant, but is not meant to be all-encompassing. In addition, the descriptions of local adaptation activities are not comprehensive. A variety of climate-relevant health adaptation activities that are not funded by CDC are taking place across the country, and are not reflected in this document.



ALASKA



Health Impacts



Temperature-Related Death and Illness

Winter travel has long been a key feature of subsistence food gathering activities for rural Alaska communities. Higher winter temperatures and shorter durations of ice seasons may delay or disrupt usual patterns of ice formation on rivers, lakes, and the ocean. For hunters and other travelers, this increases the risk of falling through the ice, having unplanned trip extensions, or attempting dangerous routes, leading to exposure injury, deaths, or drowning (NCA4 Alaska Chapter, Key message (KM) 3, Direct Exposures).



Air Quality Impacts

Climate-driven increases in air pollution in Alaska are primarily linked to the increases in wildfire frequency and intensity. Wildfires threaten individual safety in adjacent communities and pose risks downwind from smoke inhalation, particularly for children and persons with chronic respiratory and cardiovascular conditions. Air conditioning in homes is rare in Alaska, so relief is seldom available for at-risk persons to escape smoke exposure due to wildfires, assuming proper filters are not installed. It is also likely that there will be an increased risk of respiratory allergies related to longer and more intense seasonal pollen blooms and mold counts. Increased respiratory symptoms have also been reported in communities that are experiencing increased windblown dust (NCA4 Alaska Chapter, KM3, Direct Exposures).



Extreme Events

Extreme weather events such as major storms, floods, and heavy rain events have all occurred in Alaska with resulting threats to human health. For coastal areas, the damage from late-fall or winter storms is likely to be compounded by a lack of sea ice cover, high tides, and rising sea levels, which can increase structural damage to tank farms, homes, and buildings and can threaten loss of life from flooding. Similar events threaten communities on rivers, where flooding due to increased glacial melt or heavy rains can cause extensive structural damage and loss of life (NCA4 Alaska Chapter, KM3, Direct Exposures).



Vector-Borne Diseases

Changes in insect and arthropod ranges due to climate change have raised human health concerns, such as the documented increase in venomous insect stings in Alaska. Tick-borne human illnesses are uncommon in Alaska, but new reports of ticks on domestic dogs without travel exposure outside Alaska raise concerns about tick range extension into Alaska and the potential for introduction of new pathogens (NCA4 Alaska Chapter, KM3, Indirect Effects).



Water-Related Illness

Climate-related environmental changes that can affect access to water and sanitation services have been well-documented. These changes include loss of surface water through drainage of tundra ponds, lower source-water quality through increased riverbank erosion due to permafrost thaw or saltwater intrusion in coastal communities, and increased coastal erosion or storm surge leading to wastewater treatment system damage. Permafrost thawing poses a threat to centralized water and wastewater distribution systems that need stable foundations to maintain system integrity. Likewise, the documented northward range expansion of beavers has been postulated to increase the threat of waterborne Giardia infections in humans; however, human Giardia illness reports have been stable in Alaska and show no increasing regional trends (NCA4 Alaska Chapter, KM3, Indirect Effects).



Food Safety, Nutrition and Distribution

In Alaska, disruption of ice cellars from thawing permafrost and coastal erosion has raised concerns about food spoilage or infectious outbreaks, but documented human illness events are lacking. Additionally, harmful algal blooms (HABs) produce toxins that can harm wildlife and pose a health risk to humans through consumption of contaminated shellfish. Because phytoplankton growth is increased in part by higher water temperatures, risks for HAB-related illnesses, including paralytic shellfish poisoning (PSP), may increase with climate change. PSP is a long-recognized, untreatable, and potentially fatal illness caused by a potent neurotoxin in shellfish (NCA4 Alaska Chapter, KM3, Indirect Effects).



Mental Health and Well-Being

Climate change is a common concern among Alaskans and is associated with feelings of depression and uncertainty about the potential changes to communities, subsistence foods, culture, and traditional knowledge and the potential of relocation from long-established traditional sites. These uncertainties and threats have effects on mental health and on family and community relationships and may lead to unhealthy responses such as substance abuse and self-harm (NCA4 Alaska Chapter, KM3, Psychological and Social Effects).



Populations of Concern

The Alaskans most vulnerable to these climate-related changes are those who are most dependent on subsistence foods, the poor, the very young, the elderly, and those with existing health conditions that require ongoing care, that limit mobility, or that reduce capacity to accommodate changes in diet, family support, or stress (NCA4 Alaska Chapter, KM3, Psychological and Social Effects). Native American and Alaska Native communities are particularly vulnerable as the health risks of climate change

are expected to compound existing health issues, in part due to the loss of traditional foods and practices, the mental stress from permanent community displacement, increased injuries

from lack of permafrost, storm damage and flooding, smoke inhalation, damage to water and sanitation systems, decreased food security, and new infectious diseases.

CDC-Funded Jurisdictions

Village of Wainwright, NIHB Mini-Grant, funded in 2017-2018

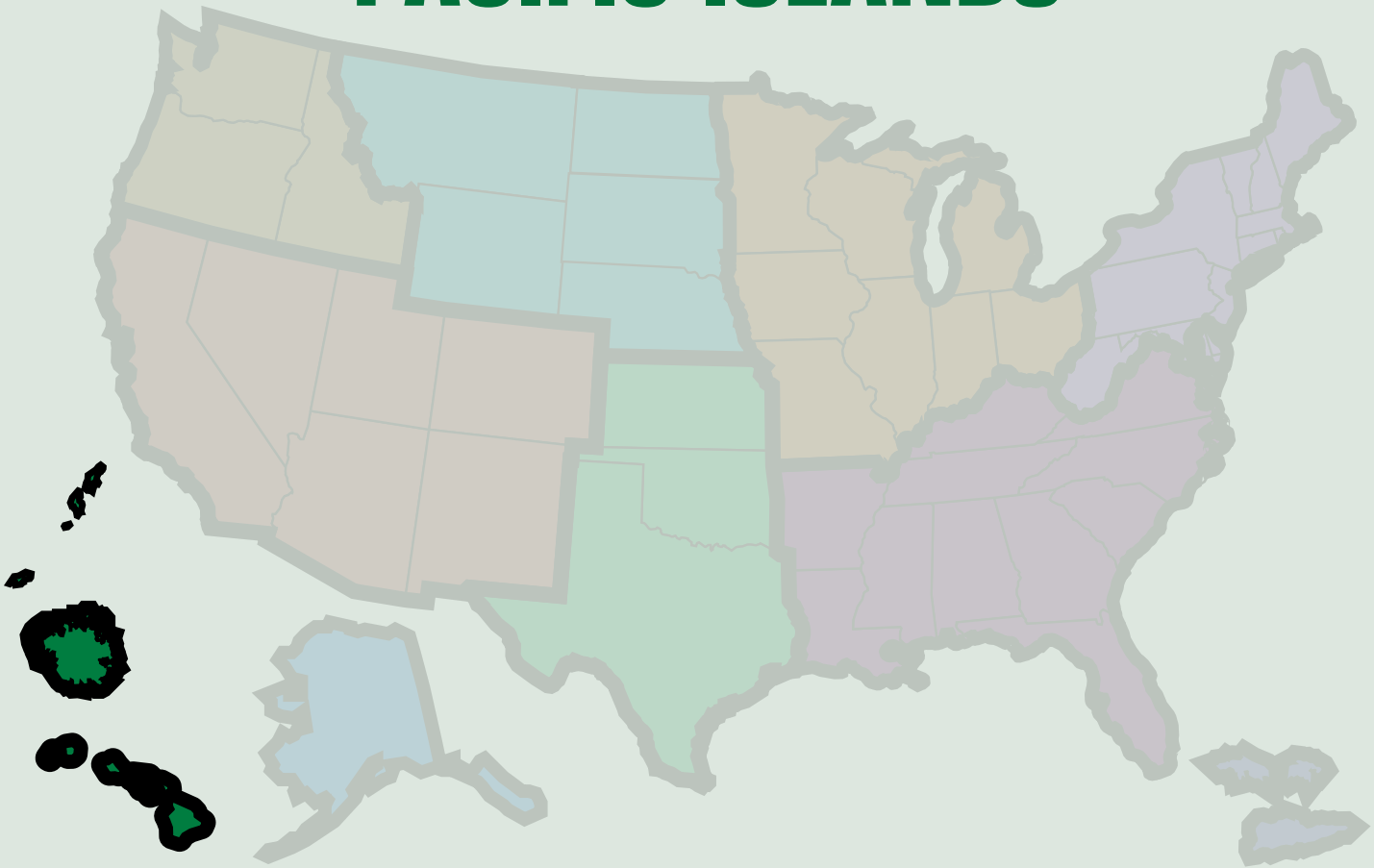
The Tribal Village of Wainwright identified that the effects of climatic changes on sea ice are of particular concern to community members. In response, a project was implemented that augmented existing accident prevention and rescue programs through the promotion of the use of location technology (inReach devices) and developed new community-based programs that increase knowledge of health risks due to climate change to reduce morbidity and mortality due to subsistence and travel activities.

Sitka Tribe of Alaska, NIHB Mini-Grant, funded in 2019-2020

The Sitka Tribe of Alaska relies heavily on shellfish and seafood for nutrition and cultural purposes. Warming water temperatures threatened the safety of shellfish for human consumption. The Tribe is coordinating a regional project to monitor shellfish contamination.



HAWAII and U.S.-AFFILIATED PACIFIC ISLANDS



Health Impacts



Extreme Events

The rate of global average sea level rise has accelerated and has become very damaging in the region. Impacts include coastal erosion, episodic flooding, permanent inundation, heightened exposure to marine hazards, and saltwater intrusion to surface water and groundwater systems. Already apparent on many shorelines, these problems endanger human communities by negatively impacting basic societal needs, such as food and freshwater availability, housing, energy and transportation infrastructure, and access to government services. Climate-related migration in U.S.-affiliated island also directly impacts health (NCA4 Hawai'i & U.S.-Affiliated Pacific Island Chapter, KM3).



Vector-Borne Diseases

An increase in the incidence of vector-borne diseases such as malaria and dengue in the Pacific Islands has been linked to climate variability and is expected to increase further as a result of climate change. For example, in late 2013 and early 2014, Fiji experienced the largest outbreak of dengue in its history, with approximately 28,000 reported cases (NCA4 Hawai'i & U.S.-Affiliated Pacific Island Chapter, KM6).



Water-Related Illness

Dependable and safe water supplies for Pacific island communities and ecosystems are threatened by rising temperatures, changing rainfall patterns, sea level rise, and increased risk of extreme drought and flooding. Islands are already experiencing saltwater contamination due to sea level rise, which is expected to catastrophically impact food and water security, especially on low-lying atolls. Additionally, chronic water shortages are possible as rainfall decreases and both evaporation and the water requirements of a growing human population increase (NCA4 Hawai'i & U.S.-Affiliated Pacific Island Chapter, KM1).



Food Safety, Nutrition and Distribution

Away from urban areas, many island communities rely on food gathered from the ocean and land. Rising sea surface temperatures are shifting the location of fisheries. Ocean warming and acidification, coupled with damaging watershed and reef practices, converge on island shores to increasingly limit the food resources that can be gathered from

the sea (NCA4 Hawai'i & U.S.-Affiliated Pacific Island Chapter, KM3). In Hawaii, climate change impacts, such as reduced streamflow, sea level rise, saltwater intrusion, and long periods of drought, threaten the ongoing cultivation of taro and other traditional. These kinds of climate impacts lead to an increased dependence on imported food that is of little nutritional value. This is a public health concern for Hawaii and the USAPI, as Indigenous Pacific Islanders have the highest rates of obesity and chronic diseases, such as diabetes, in the region (NCA4 Hawai'i & U.S.-Affiliated Pacific Island Chapter, KM5).



Mental Health and Well-Being

Sea level rise imperils Indigenous communities of the Pacific. The sea that surrounds Pacific island communities continues to rise at a rate faster than the global average, with documented impacts on agriculture, coastal infrastructure, food security, livelihoods, and disaster management in the Republic of Palau and the Republic of the Marshall Islands. In Hawaii, sea level rise impacts on traditional and customary practices (including fishpond maintenance, cultivation of salt, and gathering from the nearshore fisheries) have been observed. Detachment from traditional lands has a negative effect on the spiritual and mental health of the people (NCA4 Hawai'i & U.S.-Affiliated Pacific Island Chapter, KM5).



Populations of Concern

Indigenous communities of the Pacific have an inseparable connection to and derive their sense of identity from the lands, territories, and resources of their islands. Climate change threatens this familial relationship with ancestral resources and is disrupting the continuity that is required for the health and well-being of these communities (this experience is common to many tribal and Indigenous communities across the United States). Women have also been identified as a more vulnerable population to regional climate risks due to the role they have in terms of economic activities, safety, health, and their livelihoods (NCA4 Hawai'i & U.S.-Affiliated Pacific Island Chapter, KM5).

CDC-Funded Jurisdictions

Commonwealth of the Northern Mariana Islands

Commonwealth Healthcare Corporation, ASTHO grant, funded in 2017-2018

To bolster capacity to address the public health threats associated with climate change, the Commonwealth of the Northern Mariana Islands (CNMI) Commonwealth Health Care Corporation planned and executed a climate change training for staff throughout the agency. This helped to build knowledge and expertise locally. In addition, the project team also developed a CNMI-specific health impact scoping report to assess the local risk of various impacts. Throughout the project, the team also identified and built relationships with key partners outside of public health, including other governmental agencies, who can provide expertise and input on climate and health work across CNMI.

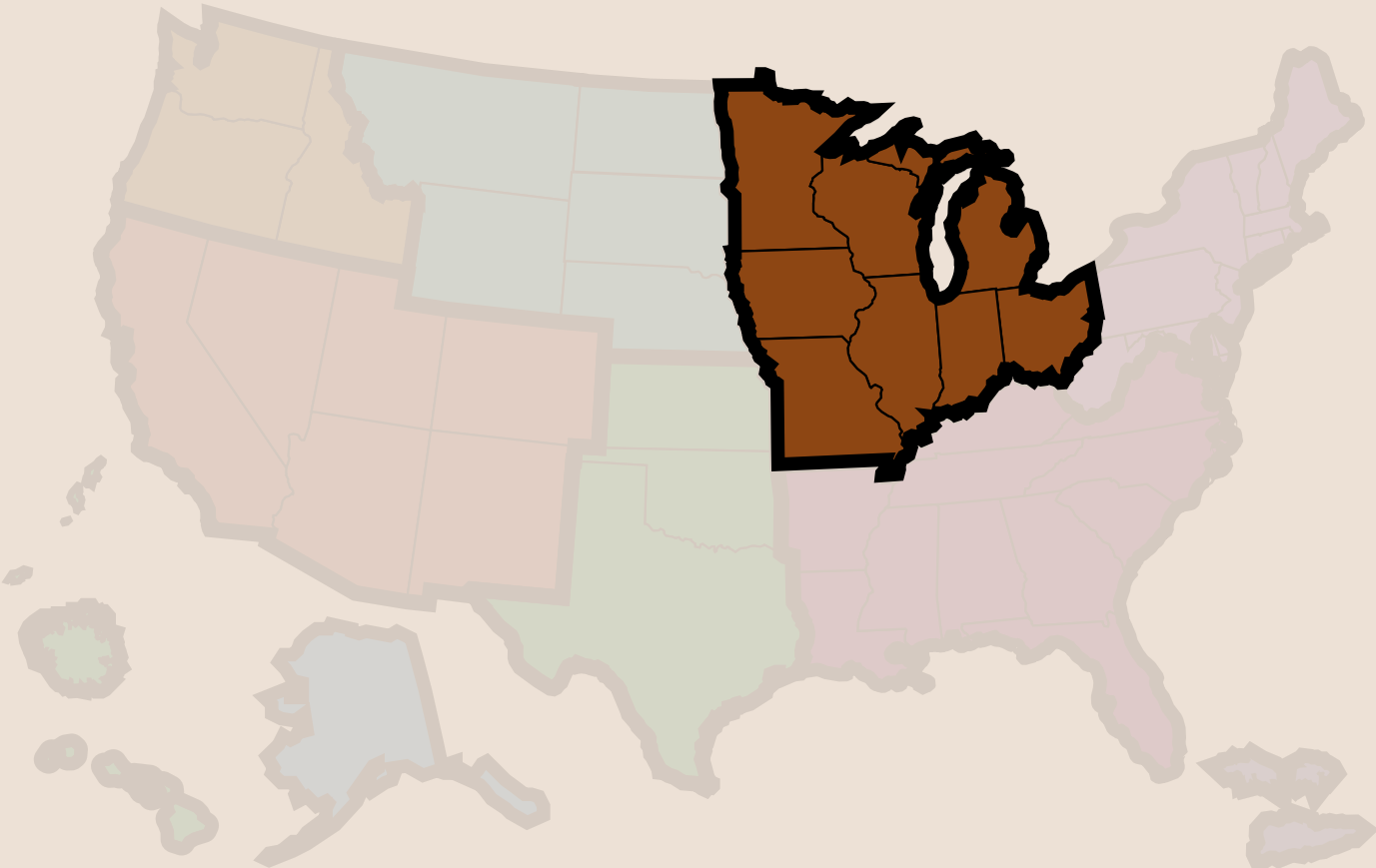
The Federated States of Micronesia

Department of Health and Social Affairs, ASTHO grant, funded in 2017-2018

This project aimed to assist the people of the low-lying islands in the states of Chuuk and Pohnpei in the Federated States of Micronesia with knowledge, skills and techniques to maintain a healthy island diet in a changing environment. The project consisted of educational workshops and hands-on exercises. In this collaborative project, local agricultural and diet-related knowledge and practices were paired with outside technical assistance (geographic information system training provided by CDC and ASTHO) to empower the communities on the low-lying islands to adapt to climate change with regard to food security and water management



MIDWEST



Health Impacts

Temperature-Related Death and Illness

Increased daytime and nighttime temperatures are associated with heat-related diseases (for example, dehydration and heatstroke) and death in the Midwest. High rates of heat-related illness also have been observed in rural populations, where occupational exposure to heat and access to care is a concern. Compared to other regions where worsening heat is also expected to occur, the Midwest is projected to have the largest increase in extreme temperature-related premature deaths under the higher scenario (RCP8.5). Northern midwestern communities and vulnerable populations that historically have not experienced high temperatures may be at risk for heat-related disease and death. Risk of death from extremely cold temperatures will decrease under most climate projection scenarios (NCA4 Midwest Chapter, KM4, Temperature).

Air Quality Impacts

Increases in ground-level ozone and particulate matter are associated with the prevalence of various lung and cardiovascular diseases, which can lead to missed school days, hospitalization, and premature death. In the absence of mitigation, ground-level ozone concentrations are projected to increase across most of the Midwest, resulting in an additional 200 to 550 premature deaths in the region per year by 2050. People, particularly children, with asthma and other respiratory diseases are especially vulnerable to aeroallergens. Aeroallergens can cause allergic rhinitis and exacerbate asthma and sinusitis (NCA4 Midwest Chapter, KM4, Air Quality). Additionally, flooded buildings can experience mold growth that can also trigger asthma attacks and allergies during cleanup efforts (NCA4 Midwest Chapter, KM4, Precipitation).

Extreme Events

ERiver flooding in large rivers like the Mississippi, Ohio, and Missouri Rivers and their tributaries can flood surface streets and low-lying areas, resulting in drinking water contamination, evacuations, damage to buildings, injury, and death (NCA4 Midwest Chapter, KM4, Precipitation). Projected increases in the number of extreme precipitation events have been linked to an increased risk of traffic crashes (NCA4 Midwest Chapter, KM5).

Vector-Borne Diseases

Climate-related changes in habitats for disease-carrying insects like the mosquito found in the Midwest (*Culex pipiens* and *Culex tarsalis*) that transmits West Nile virus (WNV) and the blacklegged, or deer tick (*Ixodes scapularis*) that transmits Lyme disease have been associated with higher rates of infection. Overall warmer temperatures are linked to increased numbers of deer ticks in the upper Midwest which has led to earlier seasonal exposure and longer season of risk. Northern expansion of the *Culex* species in the Midwest is

expected to result in upwards of 450 additional WNV cases above the 1995 baseline by 2090 absent greenhouse gas mitigation (NCA4 Midwest Chapter, KM4, Habitat Conditions).

Water-Related Illness

Precipitation events can transport pathogens that cause gastrointestinal illnesses, putting populations who rely on untreated groundwater (such as wells) at an increased risk of disease, particularly following large rainfall events (NCA4 Midwest Chapter, KM4, Precipitation). Contact with and consumption of water contaminated with cyanobacteria (from harmful algal blooms, for example) have been associated with skin and eye irritation, respiratory illness, gastrointestinal illness, and liver and kidney damage (NCA4 Midwest Chapter, KM4, Habitat Conditions). In metropolitan areas with older sewer systems that combine sanitary sewage with storm water, extreme rain can result in the release of raw sewage into rivers and streams, posing both health risks and challenges to major sources of drinking water including the Mississippi River and the Great Lakes (NCA4 Midwest Chapter, KM5).

Mental Health and Well-Being

Mental stress following flooding events can cause substantial health impacts, including sleeplessness, anxiety, depression, and post-traumatic stress disorder. Similarly, drought has been identified as a slow-moving stressor that contributes to acute and chronic mental health impacts such as anxiety and depression (NCA4 Midwest Chapter, KM4, Precipitation).

Populations of Concern

The health risks of climate change are especially high for people who are less able to cope because characteristics like age, income, or social connectivity make them more vulnerable (NCA4 Midwest Chapter, KM4). For those who are chronically ill or reliant on electronic medical devices, the increased cost of electricity, which contributes to energy insecurity, may introduce financial and health burdens (NCA4 Midwest Chapter, KM4, Temperature). Tribes in the Midwest have been among the first to feel the effects of climate change as it impacts their culture, sovereignty, health, economies, and ways of life (NCA4 Midwest Chapter, KM6, Tribal Adaptation).

CDC-Funded Jurisdictions

Minnesota Department of Health, CRSCI Recipient and NEHA Mini-Grant recipient, funded by CDC since 2010

The Minnesota Climate and Health Program protects public health by engaging, informing, and guiding health and climate champions throughout the state to create healthy, equitable, and resilient communities. The program works with partners and stakeholders to educate about the health impacts of

a changing climate through trainings and communication materials. For example, the program released a seven-part training and companion materials to educate on climate and health in Minnesota, including agriculture and food security, air quality, extreme heat, water changes, well-being, and vector-borne diseases. To help planners and decision-makers in emergency management understand regional climate trends, the program co-developed climate and health data profiles in 2019. The profiles are tailored to each of the six Homeland Security and Emergency Management (HSEM) regions across the state, acting as a framework for discussing projected local risks related to our changing climate and supporting the development of climate adaptation strategies that protect community health and safety.

Minnesota also received a mini-grant in 2019 from CDC and the National Environmental Health Association (NEHA) to develop an online climate and health vulnerability assessment tool to allow communities across the state to visualize and analyze health, climate, and environmental data to aid planning and adaptation.

Michigan Department of Health and Human Services, CRSCI Recipient, funded by CDC since 2010

The Michigan Climate and Health Adaptation Program (MICHAP) primarily addresses extreme heat, air quality and respiratory illnesses, flooding, vector-borne diseases, water-borne diseases, extreme weather events, and power outages from such events. Some of MICHAP's adaptation activities include integrating climate health adaptation in community planning and the built environment, building adaptive capacity in urban and rural communities based on their specific vulnerabilities, and working with other local and state level public health partners to collect, assess, and share climate and health information and data. Addressing these hazards serves and benefits all the Michigan residents, and especially the vulnerable populations in each locale where work is being done. An important climate driver of negative health outcomes in Michigan is extreme precipitation. Major health impact pathways identified through the BRACE framework include exposure to waterborne diseases from combined sewer overflows, harmful algal blooms due to increased runoff, impacts on drinking water sources from flooding and drought, and injury or stress from flooding-related damage to homes and infrastructure. MICHAP partners across sectors to address many of these issues.

University of Illinois at Chicago School of Public Health and Illinois Department of Public Health, CRSCI Recipient, funded by CDC since 2012.

The BRACE-Illinois Program is preparing for the impacts of a changing climate by focusing on extreme heat, air quality and respiratory illnesses, flooding, vector-borne diseases, water-borne diseases, and mental health. The program's main activities to address these hazards are education, capacity building in the local health departments, and use of planning tools. Through a competitive selection process, local health departments have the opportunity to receive training and support in the areas of climate science, public health effects linked to climate sensitive events, public health

hazard vulnerability assessment, strategic planning to address prioritized climate sensitive health effects, and incorporating climate change into current programs and planning processes. The program also provides educational opportunities by providing continuing medical education credits to a variety of audiences through multiple modalities with an emphasis on the medical community (an identified key stakeholder). BRACE-Illinois also develops toolkits designed to help guide public health and emergency preparedness professionals in their efforts to prepare their communities for the new normal of extreme weather events.

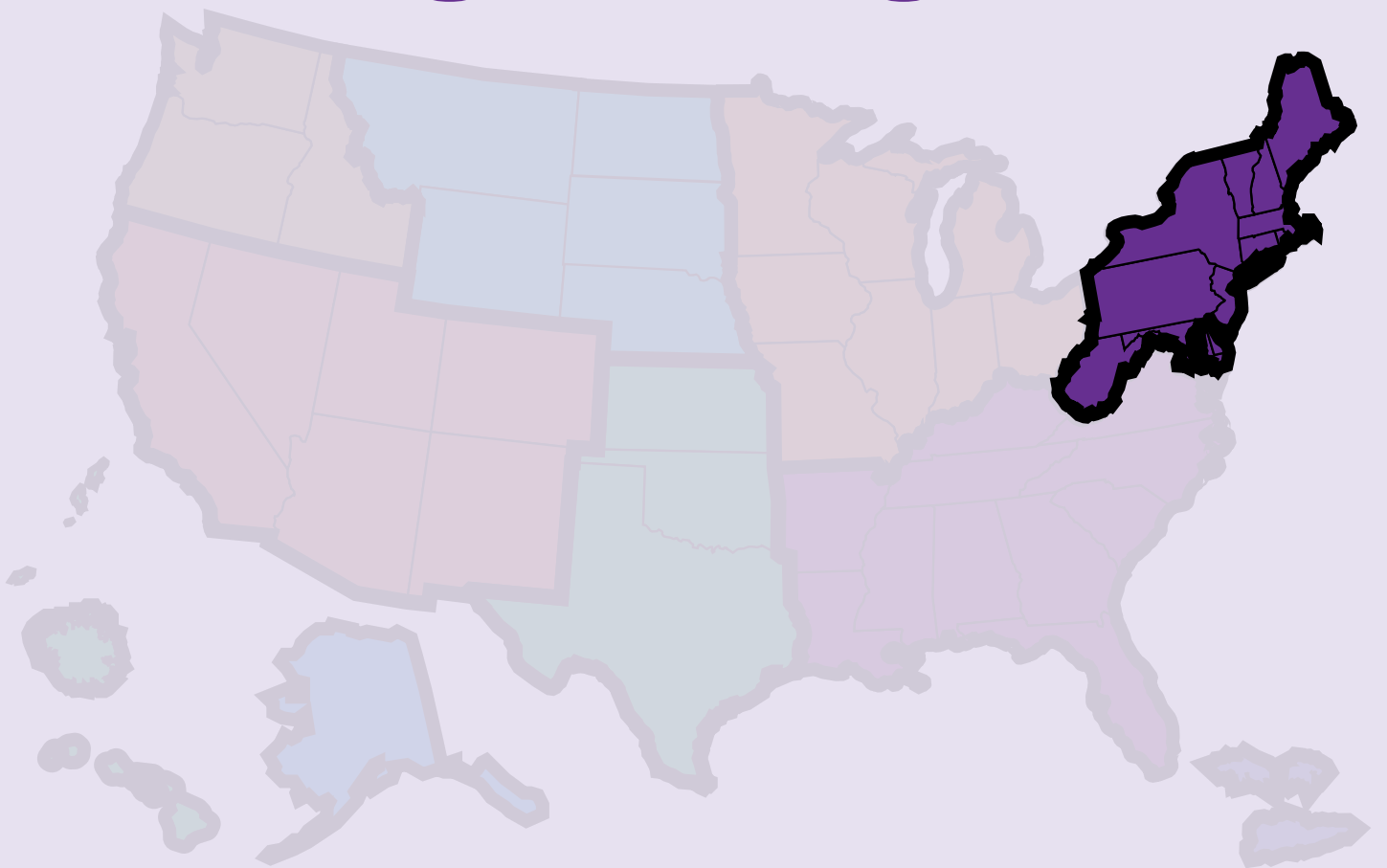
Wisconsin Division of Public Health, CRSCI Recipient, funded by CDC since 2012

The Wisconsin Climate and Health Program addresses health effects related to extreme heat, extreme cold, flooding, and vector-borne diseases. The program is advised by a health equity advisory team so that implementation and evaluation efforts can be focused on those most at-risk. One of the adaptation activities has been a prospective extreme heat-related community assessment of public health emergency response (CASPER) in Milwaukee, which a previous heat vulnerability index project identified as extremely vulnerable during an extreme heat event. This tool is being evaluated for use during extreme weather events. The data being collected will be used to inform future extreme heat plans in Milwaukee. The program has also worked on a flood vulnerability and a risk map. An interactive ArcGIS online web platform was created to assess vulnerability to and risk for flooding based on a variety of variables including a social vulnerability index, flood plains, and critical health care infrastructure. Additionally, a flood resilience scorecard is being produced through the program. This scorecard is a comprehensive checklist that assesses social, institutional, and environmental variables so that local municipalities can better assess their vulnerabilities to flooding events. It also allows local municipalities to better plan for future flooding events by using the tool's recommendations based on their individual scores.

Marquette County Health Department, Michigan, NACCHO Mini-Grant, funded in 2019.

In addition to collaborating with the CDC-funded Michigan Climate and Health Adaptation Program (MICHAP), Marquette County also received a mini-grant from CDC and the National Association of County and City Health Officials (NACCHO) in 2019 to support local adaptation efforts. The Marquette County Health Department developed a "Public Health Response to Flooding Disasters" plan to protect their population from increasing extreme rain events. Local decision makers are using the resource to assess climate impacts on their communities' health and using built environment design concepts to incorporate health adaptations into community planning.

NORTHEAST



Health Impacts

Temperature-Related Death and Illness

During extreme heat events, nighttime temperatures in the region's big cities are generally several degrees higher than surrounding regions, leading to higher risk of heat-related death. In urban areas, the hottest days in the Northeast are also often associated with high concentrations of urban air pollutants including ground-level ozone (NCA4 Northeast Chapter, KM3, Climate-Infrastructure Interaction and Heightened Risks).

Extreme Events

Much of the historical development of industry and commerce in New England occurred along rivers, canals, coasts, and other bodies of water, these areas often have a higher density of contaminated sites, waste management facilities, and petroleum storage facilities that are potentially vulnerable to flooding. As a result, increases in flood frequency or severity could increase the spread of contaminants into soils and waterways, resulting in increased risks to human health (NCA4 Northeast Chapter, Background). When coupled with storm surges, sea level rise can pose severe risks of flooding, with consequent physical and mental health impacts on coastal populations (NCA4 Northeast Chapter, KM2, Sea Level Rise, Storms, and Flooding).

Water-Related Illness

Increased soil erosion and agricultural runoff—including manure, fertilizer, and pesticides—are linked to excess nutrient loading of water bodies as well as possible food safety or public health issues from food and waterborne infections. Warmer winters are expected to increase pressure from weeds and pests, demand for pesticides, and therefore the risk of human health effects from increased chemical exposures (NCA4 Northeast Chapter, KM 1, Intense Precipitation).

Food Safety, Nutrition and Distribution

Increased soil erosion and agricultural runoff—including manure, fertilizer, and pesticides—are linked to excess nutrient loading of water bodies as well as possible food safety or public health issues from food and waterborne infections. Warmer winters are expected to increase pressure from weeds and pests, demand for pesticides, and therefore the risk of human health effects from increased chemical exposures (NCA4 Northeast Chapter, KM 1, Intense Precipitation). Increasing prevalence of shell disease in lobsters and several pathogens in oysters have been associated with rising water temperatures; other pathogens that infect shellfish pose risks to human health (NCA4 Northeast Chapter, KM2, Ocean Warming).

Mental Health and Well-Being

When coupled with storm surges, sea level rise can pose severe risks of flooding, with consequent physical and mental health impacts on coastal populations (NCA4 Northeast Chapter, KM2, Sea Level Rise, Storms, and Flooding).

Populations of Concern

Older or sicker individuals and those persons who are without access to air conditioning, living in older homes, socially isolated, or working outdoors are considered particularly vulnerable to the effects of heat (NCA4 Northeast Chapter, KM4, Health Effects of Extreme Heat). The combination of heat stress and poor urban air quality can pose a major health risk to vulnerable groups: young children, elderly, socially or linguistically isolated, economically disadvantaged, and those with preexisting health conditions, including asthma. Similarly, poor, elderly, historically marginalized, recent immigrants, and linguistically or socially isolated individuals as well as those populations with existing health disparities are more vulnerable to precipitation events and flooding due to a limited ability to prepare for and cope with such events (NCA4 Northeast Chapter, KM3, Climate-Infrastructure Interaction and Heightened Risks).

CDC-Funded Jurisdictions

Maine Department of Health and Human Services, CRSCI Recipient, funded by CDC since 2010

Extreme heat, extreme cold, and vector-borne diseases are the primary hazards addressed through Maine's program. The program has developed school and community-based educational interventions and delivered them to high risk age groups. The program has also worked to develop extreme-weather response plans for state and local agencies. A large focus of work has been on vector-borne disease and ticks as a changing climate is expected to impact the migration of insects. Lyme disease has been increasing the last eight years in Maine, and Lyme disease is reported in every county in Maine. Maine's program has developed a real-time data dashboard to track cases of tick borne disease, such as Lyme disease, and tick-related emergency department visits. The data collected through this surveillance helps health officials understand the spread of ticks and how a changing climate affects the tick's lifecycle. The surveillance also supports and helps create educational campaigns regarding Lyme disease. The program is also working with the University of Maine Climate Change Institute to develop fine-scale climate models specific to Maine. The models predict disease rates which, in turn, can provide data for local response planning.

Massachusetts Department of Health, CRSCI Recipient, funded by CDC since 2010

The Massachusetts Department of Public Health (MDPH) Bureau of Environmental Health (BEH) has assisted local and state partners in preparing for the health impact of climate change, with a focus on inland flooding, heat, air quality, sea level rise, and extreme weather events. MDPH/BEH activities include a previous needs assessment of local health departments, development of a Climate Vulnerability Mapping Tool, risk-based assessment of climate related impacts (e.g., asthma, waterborne disease), identification of intervention and adaptation strategies, and evaluation of local climate and health action strategies using a Health Impact Assessment (HIA) framework. The MDPH program also leverages the BEH Environmental Public Health Tracking Network, utilizing the Massachusetts portal as a gateway for providing regionally relevant resources for evaluating health outcomes, environmental exposures, and vulnerability to climate change impacts at the community level. MDPH also works collaboratively with state agency partners to assess climate hazards and recommend specific adaptation strategies. For example, the 2018 State Hazard Mitigation and Climate Adaptation Program Report, combines the state's FEMA Hazard Assessment with climate data to inform adaptation recommendations for local climate change planning.

New York City Department of Health and Mental Hygiene, CRSCI Recipient, funded by CDC since 2010

The New York City Climate and Health Program (NYC CHP) focuses on the health impacts of current and future climate-related hazards, primarily, extreme heat, extreme cold, and power outages. The program relies on several approaches to analyze the magnitude of these impacts and which populations and communities are most at risk to these impacts, develop, promote, or evaluate climate resilient policies and interventions, and communicate climate-health risk messages. In addition, the program works to ensure that health is a consideration in larger, multi-sectoral planning or resiliency initiatives. The program does this by helping to prioritize local communities for climate mitigation and adaptation investments. One example of this is the NYC Heat Vulnerability Index, developed by NYC CHP and Columbia University, which provides an understanding of how the risk for dying during a heat emergency varies across neighborhoods. To achieve program success, the program relies heavily on partnerships with internal sister agency programs including, the Air Quality Program, the Environmental Public Health Tracking Program, Healthy Homes, Office of Emergency Preparedness and Response, and the Center for Health Equity.

New York State Department of Health, CRSCI Recipient, funded by CDC since 2010

New York State (NYS) has primarily focused on the health impacts of heat, as well as flooding and heavy precipitation events. These climate hazards are being addressed through the development and implementation of adaptation activities in coordination with program partners. These adaptations include development of Heat and Health profile reports that summarize extreme heat exposure, sensitivity, vulnerability,

and adaptive capacity for NYS counties, and working with the National Weather Service to revise the thresholds for issuing heat advisories in NYS. A partnership with the NYS Office of Temporary and Disability Assistance increases utilization of their program to provide air conditioners to vulnerable populations. Staff also worked with the NYS Environmental Public Health Tracking Program to create a mapping application to display cooling center locations across the state and track heat stress hospitalization and emergency department visits annually, and published in peer-reviewed public health journals on lessons learned from the response to Hurricane Sandy. The program also partners with the NYS Department of Environmental Conservation Climate Smart Communities (CSC) program, which helps local governments take action to reduce greenhouse gas emissions and adapt to a changing climate.

Maryland Department of Health, CRSCI Recipient, funded by CDC since 2012

The Maryland Climate Change Health Adaptation Program is the lead for integration of health adaptation into the state's response to a changing climate. Located in the Maryland Department of Health, the program provides a health focus to climate response efforts across the state, through technical assistance, development of epidemiologic tools and data products, and education and outreach. The program primarily addresses extreme heat, air quality and respiratory illness, water-borne diseases, and extreme weather events, such as hurricanes and tornadoes. The program, which is closely integrated with the Maryland Commission on Climate Change, includes education and outreach for school age youth (K-12), minority groups, community health workers, and informal healthcare networks. Among the products of the program is a climate change training curriculum for community health workers and extension workers. The training increases competency among informal healthcare networks in order to advise patients and community members on how to understand climate impact on themselves and their health. The program's Climate Ambassador program, which is a program targeted at school age youth in Maryland, provides students with tools and information to educate and empower themselves and their communities to respond to the impacts of a changing climate.

New Hampshire Division of Public Health Services, CRSCI Recipient, funded by CDC since 2012

The New Hampshire Climate and Health Program works to build community resilience to threats such as extreme heat and injury, flooding and injury, tick habitat, and vector-borne disease. The program serves the public via a focus on target populations, including the elderly, lower-income communities, and individuals spending time outdoors. The program funds partners for two multi-year interventions to address 1) severe weather and home emergency preparedness among older adults in a river valley, and 2) expanding insect seasons, tick exposure, and tick-safe practices among outdoor counselor and campers in the Seacoast region. A heat-safety flyer was created for the elderly population to warn about hot weather and provide suggestions on how to stay cool, hydrated, and

informed. One of the program's internal agency adaptation activities is updating a state-level extreme heat response plan. Another internal adaptation activity is to fund the testing of shellfish in warming waters to reduce the risk of food-borne disease. The Climate and Health Program has collaborated with the Environmental Public Health Tracking Program to post information for heat injuries on an interactive data portal.

Rhode Island Department of Health, CRSCI Recipient, funded by CDC since 2012

The Rhode Island Climate Change and Health Program primarily addresses community resilience, extreme heat, air quality and respiratory illnesses, flooding, sea level rise, and vector-borne diseases. Vulnerable populations such as seniors, youth, outdoor workers, and residents in the urban core are the focus of the program's work. The program's main adaptation activities include extreme heat messaging to outdoor workers, Lyme disease outreach to local communities, and climate resiliency in the urban core communities. Strategic plans for both vector-borne disease and extreme heat have been developed. Communications campaigns have also been used to spread awareness and provide guidance on personal protection against Lyme disease and other tick-borne illnesses, and extreme heat. The program has developed a climate change and health guide for Rhode Island residents in English, Spanish, and Portuguese. A focus of the program has been on community resiliency and supporting Rhode Island Health Equity Zones to adapt to climate change. The Health Equity Zones have focused their work on emergency preparedness and neighborhood flooding. The Senior Resiliency project focused on preparing long-term care and assisted living senior housing for possible climate-related health effects. The project conducted resiliency audits and developed plans for emergency situations. A facility self-assessment tool was also developed to allow individual facilities to evaluate their resiliency and emergency preparedness.

Vermont Department of Health, CRSCI Recipient and NEHA mini-grant recipient, funded by CDC since 2012

The Vermont Climate and Health Program addresses key climate-related health risks in Vermont including heat illnesses, poor air quality and allergenic pollen, vector-borne diseases, water-borne diseases, cyanobacteria, mental health impacts, and extreme weather events, such as flooding and storms. While all Vermonters are at risk for climate-related health impacts, the program focuses on mitigating health impacts for especially high-risk populations including older adults, low income households, and residents with pre-existing health conditions. Some of the program's main adaptation activities include increasing hot weather preparedness, promoting home weatherization, and providing energy-saving shade trees. Many of the program's activities help to provide health co-benefits as part of statewide climate mitigation efforts focused on the transportation, housing, forestry, and energy sectors.

Vermont also received an additional grant from the National Environmental Health Association (NEHA) focused on Health in All Policies (HiAP). This grant will be used to implement two new HiAP strategies: 1) Integrate heat-related climate, health, vulnerability, and adaptive capacity data into Vermont's

Environmental Public Health Tracking Data Explorer. These data will be used to raise awareness about heat risks and inequities, communicate with the public about adaptation resources, and identify gaps in adaptive capacity. 2) Implement accountability structures for hot weather preparedness and response through a "Hot Weather Workgroup" of multi-sectoral partners, including representatives from emergency management, hospital preparedness, human services, senior services, education, occupational safety, and regional planning agencies.

Boston Public Health Commission, NACCHO mini-grant recipient, funded in 2019

The Boston Public Health Commission developed heat awareness materials and translated them into ten languages to assist a wide range of communities across the city. These products are designed as communication tools to reach particularly at-risk populations, to reduce health impacts during heat waves.

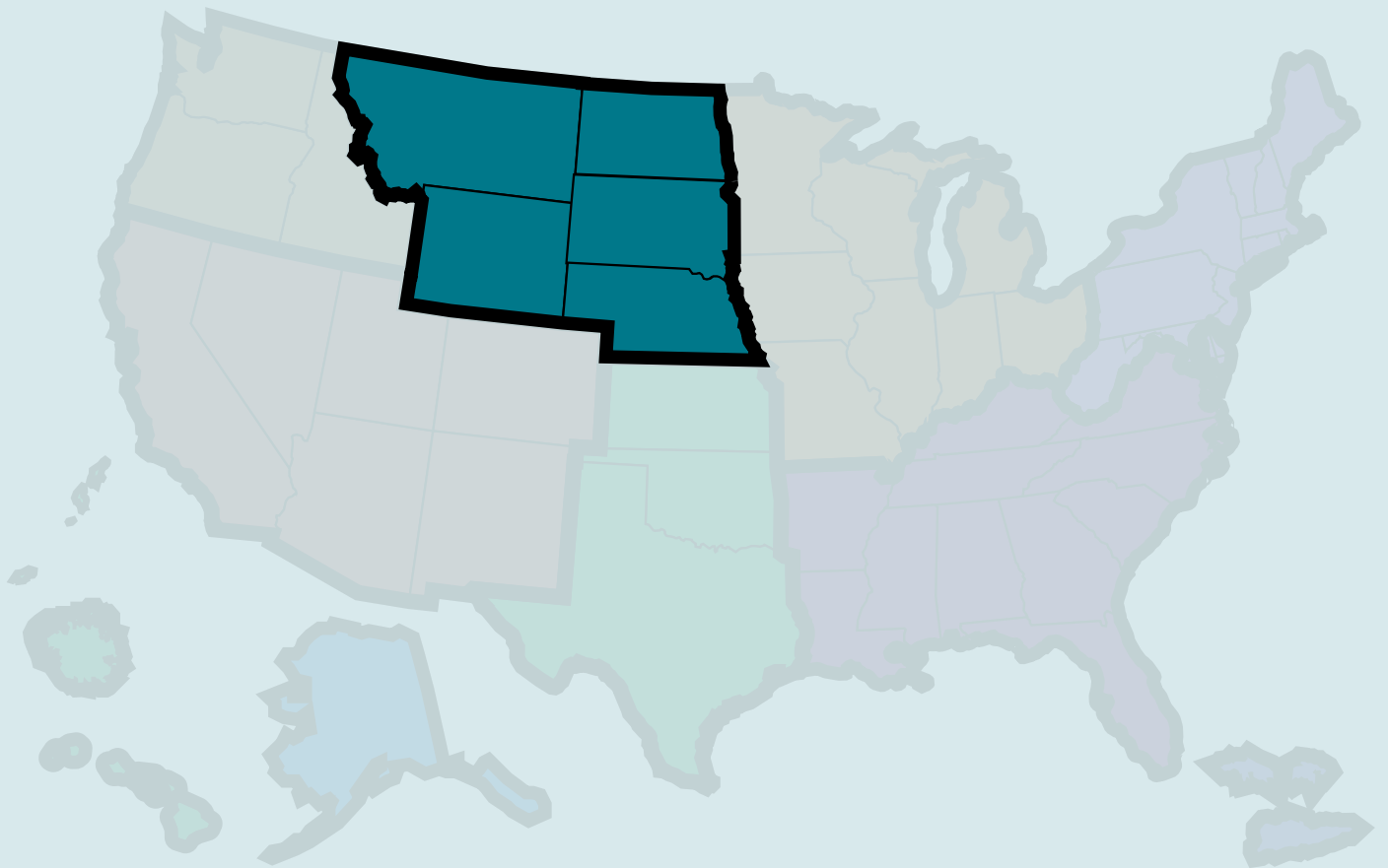
Seneca Nation of Indians, NIHB Mini-Grant, funded in 2020

The Seneca Nation of Indians (located in what is now called New York) is working to address impacts from flooding and storm water, including prevention of vector-borne disease, by incorporating health into existing collaborative climate work. The mini-grant project focuses on health communication.

Collaborating to Protect Health: Extreme Heat in the Northeast

CDC-funded state health departments in Rhode Island, Maine, New Hampshire, and Vermont partnered with the National Weather Service to form a Northeast Regional Heat Collaborative (NERHC). This multiagency partnership led to increased understanding of heat-related hospitalizations and deaths and successfully changing the NWS Heat Advisory Policy for all of New England to better improve health outcomes. The Regional Collaborative pooled data across New England in order to better represent the association between the impacts of heat on hospitalizations and deaths and help inform public health policy.

NORTHERN GREAT PLAINS



Health Impacts



Air Quality Impacts

Major dust activity in the United States is centered in the Great Plains, extending from Montana to southern Texas, where sources are mainly from human activities associated with land use, such as agriculture. These are also regions where climate change is expected to affect drought patterns (CHA 2016, 4. Extreme Events, 4.5 Droughts, Wind Erosion and Dust Storms Box).



Extreme Events

Over the last two decades, tribes have experienced unusually catastrophic fires, floods, and droughts that are already straining response capacities, and climate change is expected to increase the need for the ability to fight fires, floods, and droughts. This has widespread impacts on tribal economies and livelihoods, domestic and municipal water supplies, and health and well-being (NCA4 Northern Great Plains Chapter, KM5).



Vector-Borne Diseases

In the northern Great Plains—a hotspot for West Nile Virus (WNV) activity—increased precipitation has been shown to lead to higher *Cx. tarsalis* abundance a few weeks later. The locations of annual WNV outbreaks vary, but several states have reported consistently high rates of disease over the years, including North Dakota and South Dakota (CHA 2016, 5. Vector-Borne Diseases, 5.3 West Nile Virus, Observed Impacts and Indicators, Impacts of Climate and Weather).



Food Safety, Nutrition and Distribution

The Northern Great Plains region plays an important role in U.S. food security, and agriculture has been integral to the history and development of the region (NCA4 Northern Great Plains Chapter, KM2). The probability for more very hot days (days with maximum temperatures above 90°F) is expected to increase, with potential impacts on agriculture (NCA4 Northern Great Plains Chapter, KM1). Additionally,

indigenous peoples in the region are observing many climate and seasonality changes to their natural environment and ecosystems, many of which are impacting livelihoods as well as traditional subsistence and wild foods, wildlife, plants and water for ceremonies and medicines, and health and well-being (NCA4 Northern Great Plains Chapter, KM5).



Populations of Concern

Because Tribes are among those in the region with the highest rates of poverty and unemployment, and because many are still directly reliant on natural resources, they are among the most at risk to climate change (NCA4 Northern Great Plains Chapter, KM5). Additionally, pregnant women and newborns are uniquely vulnerable to flood health hazards. Flood exposure was associated with adverse birth outcomes (preterm birth, low birth weight) after the 1997 floods in North Dakota, connected to maternal experience of traumatic stress. (CHA 2016, 4. Extreme Events, 4.4 Flooding Related to Extreme Precipitation, Hurricanes, and Coastal Storms)

CDC-Funded Jurisdictions

Blackfeet Nation, NIHB Mini-Grant, funded in 2017-2018

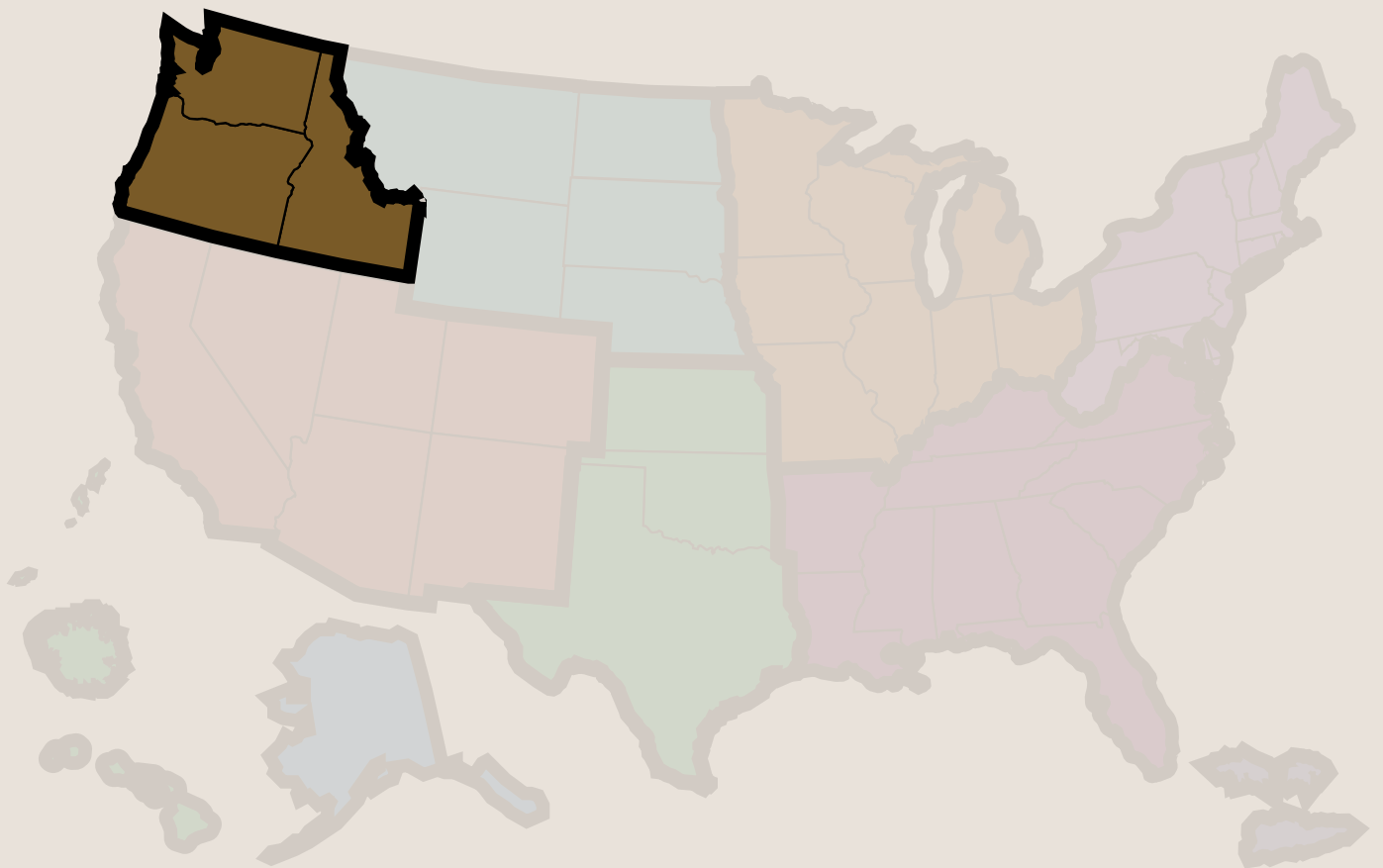
The Blackfeet Nation (located in what is now called Montana) project produced a Blackfeet Community Climate Health Guide that addresses climate impacts and develops activities for engaging tribal community members and leaders in best practices for addressing climate-related health impacts. This collaborative process was community-driven and responsive to local climate and health needs.

Winnebago Tribe of Nebraska, NIHB Mini-Grant, funded in 2020

The Winnebago Tribe of Nebraska is implementing a climate and health communication strategy to inform community members, including specific outreach to farmers. The mini-grant project will involve local stakeholders and address the unique climate and health needs of this rural community, which may include impacts on agriculture and effects of flooding and drought.



NORTHWEST



Health Impacts

Temperature-Related Death and Illness

While the Northwest is not typically considered a high-risk area for heat-related illness, heat waves (defined as 5-day, 1-in-10-year events) across the country are projected to increase in frequency and intensity. In the Northwest, nighttime heat waves (defined as 3-day, 1-in-100-year events) have a greater influence on human health than daytime heat waves and have increased in frequency since 1901. These changes are projected to make heat-related illness more common in the future (NCA4 Northwest Chapter, KM5, Future Climate Change Relevant to Regional Risks). In particular, agricultural workers are at increased risks for heat-related injuries because they work outside during the summer harvest season (NCA4 Northwest Chapter, KM4, Linkage Between Climate Change and Regional Risks).

Air Quality Impacts

More frequent wildfires and poor air quality are expected to increase respiratory illnesses in the decades to come (NCA4 Northwest Chapter, KM4, Future Climate Change Relevant to Regional Risks). Wildfire smoke can be severe, particularly in communities in the eastern Northwest. Smoke events during 2004–2009 were associated with a 7.2% increase in respiratory hospital admissions among adults over 65 in the western United States. In Boise, Idaho, 7 of the last 10 years have included smoke levels considered “unhealthy for sensitive groups” (including children) for at least a week during the fire season, causing some cancellation of school-related sports activities (NCA4 Northwest Chapter, KM4, Linkage Between Climate Change and Regional Risks). Additionally, projected increases in ground-level ozone (smog), small particulate matter (PM2.5), and airborne allergens can further complicate respiratory conditions. (NCA4 Northwest Chapter, KM4, Future Climate Change Relevant to Regional Risks).

Vector-Borne Diseases

In the last several years, the region has seen an increase in some infectious diseases. A potential increase in Lyme disease cases in some states is associated with rising temperatures and changing tick habitat. The Washington Department of Health’s vector surveillance program has observed an earlier onset of West Nile virus-carrying mosquitoes, likely associated with higher temperatures, and an increasing number of human infections, with some resulting in fatalities. Before 1999, *Cryptococcus gattii* infections were limited to the tropics, but *Cryptococcus gattii* is now established in Northwest soil, with 76 cases occurring in Oregon in 2015 (NCA4 Northwest Chapter, KM4, Linkage Between Climate Change and Regional Risks).



Water-Related Illness

Future extreme precipitation events could increase the risk of exposure to water-related illnesses as the runoff introduces contaminants and pathogens (such as *Cryptosporidium*, *Giardia*, and viruses) into drinking water (NCA4 Northwest Chapter, KM4, Future Climate Change Relevant to Regional Risks). The Oregon Health Authority recorded spikes in cases of *Salmonella* and *E. coli* during months with extreme heat in 2015. A large outbreak of Shigellosis (a bacterial diarrheal disease) occurred in late 2015, affecting a large number of homeless people in the Portland Metro region; this outbreak was associated with unusually extreme precipitation (NCA4 Northwest Chapter, KM4, Linkage Between Climate Change and Regional Risks).



Food Safety, Nutrition and Distribution

Climate change is projected to impact First Foods, or foods that tribes have historically cultivated for subsistence, economic, and ceremonial purposes (NCA4 Northwest Chapter, KM2, Linkage Between Observed Climate and Regional Risks). The cultural practice of harvesting and consuming First Foods is integral to Tribes (NCA4 Northwest Chapter, KM2, Challenges, Opportunities, and Success Stories for Reducing Risk). The loss or decline of First Foods is projected to have cascading physical and mental health impacts for Tribes (NCA4 Northwest Chapter, KM2, Emerging Issues). Changes in drought conditions and increased water temperatures have increased the potential for freshwater harmful algal blooms in recreational waters. Toxins from marine harmful algal blooms can accumulate in shellfish, leading to illnesses for those who eat them (NCA4 Northwest Chapter, KM4, Linkage Between Climate Change and Regional Risks).



Mental Health and Well-Being

Climate-driven hardships can also affect mental health, resulting in outcomes ranging from stress to suicide. Oregon, Washington, and Idaho all rank among the top 10 states in terms of prevalence of mental illness and lowest access to mental health care (NCA4 Northwest Chapter, KM4, Future Climate Change Relevant to Regional Risks).

Children and youth, in general, will likely experience cumulative mental health effects of climate change over their lifetimes (NCA4 Northwest Chapter, KM4, Linkage Between Climate Change and Regional Risks).

The cultural practice of harvesting and consuming First Foods is integral to tribes and Indigenous health (NCA4 Northwest Chapter, KM2, Challenges, Opportunities, and Success Stories for Reducing Risk). First Foods are foods that tribes have historically cultivated for subsistence, economic, and ceremonial purposes (NCA4 Northwest Chapter, KM2, Linkage Between Observed Climate and Regional Risks). The loss or decline of

First Foods is projected to have cascading physical and mental health impacts for tribes and Indigenous peoples (NCA4 Northwest Chapter, KM2, Emerging Issues).



Populations of Concern

Tribes, farmworkers, and low-income populations in urban and rural environments are three sets of frontline communities (those communities likely to experience climate impacts first and worst) in this region (NCA4 Northwest Chapter, KM5, Linkage Between Observed Climate and Regional Risks).

CDC-Funded Jurisdictions

Oregon Health Authority, CRSCI Recipient, funded by CDC since 2010

The Oregon Climate and Health Program addresses the health effects of climate change by focusing on developing cross-sectoral partnerships and promoting systems and policy changes that build resilience across a broad range of climate impacts, including extreme heat, extreme cold, wildfire, air quality and respiratory illnesses, flooding, sea level rise, vector-borne diseases, water-borne disease, mental health, drought, harmful algal blooms, and extreme weather events, such as hurricanes and tornadoes. This work primarily serves local and tribal health departments, partner state agencies, community health workers, and other state public health programs, including emergency preparedness, chronic disease prevention, and acute and communicable disease. Some of the program's activities include developing the public health workforce, informing statewide climate policy and planning, and supporting partners in building social resilience. The Oregon Public Health Division (OPHD) has trained public health practitioners, health care providers, emergency response personnel, community health workers, partner state agencies, and the general public through workshops, trainings, and materials development. The focus of these training and education efforts has been on the health impacts of climate change, health equity, and strategies for reducing health impacts and building resilience. The OPHD has provided funding, training, and technical assistance to five local health jurisdictions to understand and prioritize the health effects of a changing climate in their communities and to develop and implement strategies for building resilience.

Swinomish Indian Tribal Community, NIHB Mini-Grant, funded in 2017-2018

The Swinomish Indian Tribal Community (located in what is now called Washington State) created the "Swinomish climate change health impact assessment and action plan" by tailoring CDC's BRACE framework using Swinomish-specific health values, definitions, and priorities. Extensive community input and "values-driven" data informed the plan. They documented and shared the process with other Tribes (i.e., through educational materials) so that they may be better informed to move forward with their impact assessment and action plans.

Clackamas County Public Health, Oregon, NEHA Mini-Grant, funded in 2019

Clackamas County Public Health partnered with multiple neighboring counties (Multnomah County Health Department and Washington County Public Health) to form a regional collaborate. They developed a comprehensive climate change and health impact assessment report and an accompanying data visualization tool for the Portland metropolitan region. The project involved engagement of stakeholders to ensure inclusion of local needs.

Washington State Department of Health, ASTHO, CSTE, and NEHA Mini-Grants, funded in 2019-2020

With a 2019 mini-grant from CDC and the Council of State and Territorial Epidemiologists (CSTE), Washington state assessed climate and respiratory health issues. They developed best practice guidance on wildfire communications outreach and tested the utility of low-cost air quality sensors during wildfires.

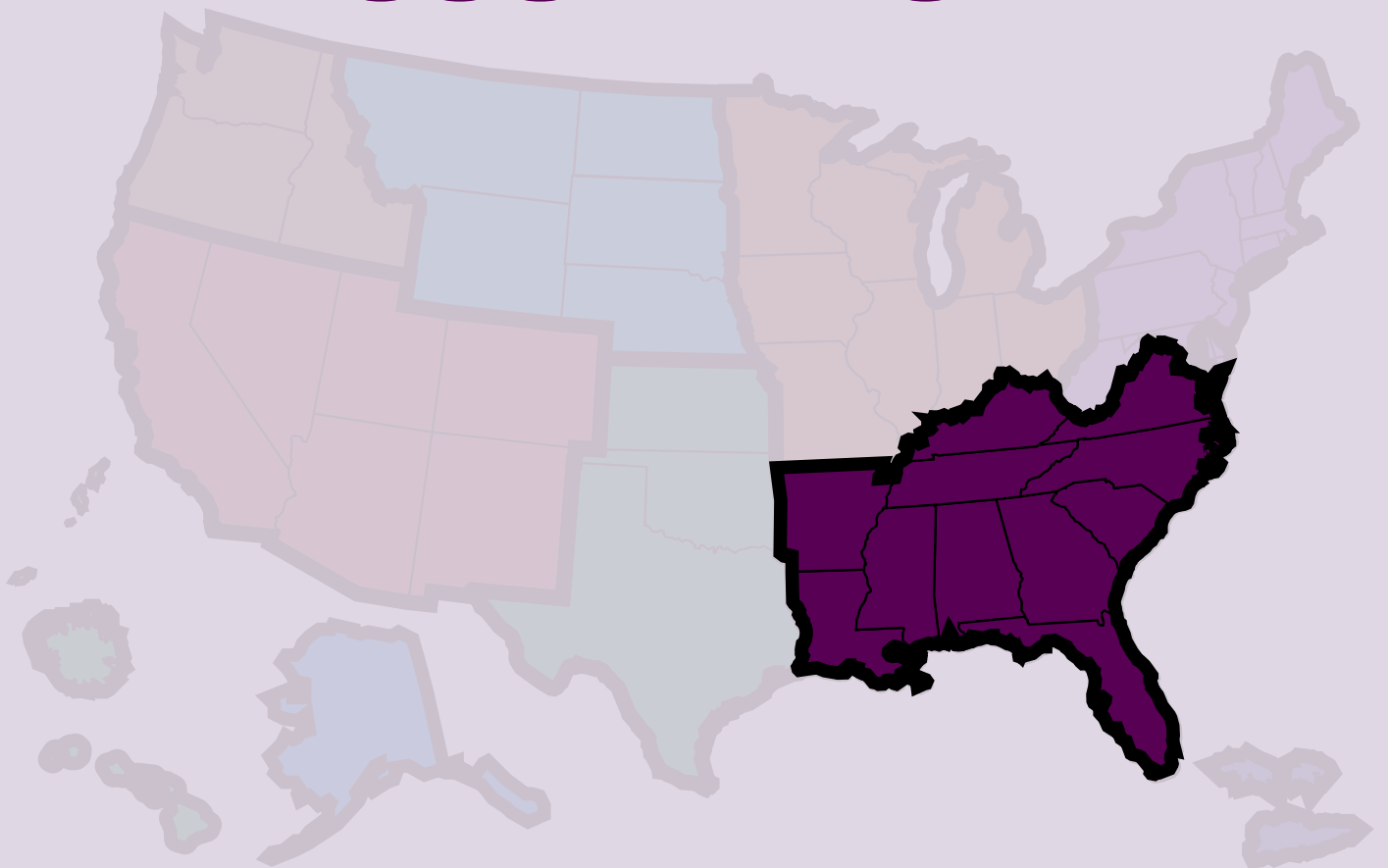
Washington State also received an additional grant from CDC in partnership with the Association of State and Territorial Health Officials (ASTHO) in 2019 to aid development of regional climate and health profiles and climate-related risk communication efforts. This project allowed for localized input to address specific needs in regions throughout the state.

Washington State also received an additional grant in 2020 from CDC and the National Environmental Health Association (NEHA) focused on Health in All Policies (HiAP), which will help support local partners in identifying climate-sensitive health risks and generate resilience strategies that could inform local planning decisions, including county comprehensive management plans. In particular, Washington State plans to provide mini-grants to local health agencies and nonprofit community organizations, as well as host a workshop with local agencies, community organizations, and academic partners to share mini-grant learnings and generate next steps to increase consideration of climate change, health, and equity in local planning.

Lummi Nation, NIHB Mini-Grant, funded in 2019-2020

The Lummi Nation (located in what is now called Washington State) is developing plans to protect their community from harmful algal blooms and toxins in shellfish that are influenced by warming waters. This included communication activities and assessment of local community needs.

SOUTHEAST



Health Impacts

Temperature-Related Death and Illness

Cities across the Southeast are experiencing more and longer summer heat waves. Sixty-one percent of major Southeast cities are exhibiting some aspects of worsening heat waves, which is a higher percentage than any other region of the country (NCA4 Southeast Chapter, KM1, Increasing Heat).



Air Quality Impacts

In the Southeast, poor air quality can result from emissions (mostly from vehicles and power plants), wildfires, and airborne allergens. The major urban centers in the Southeast are already impacted by poor air quality during warmer months. The Southeast has more days with stagnant air masses than other regions of the country (40% of summer days) and higher levels of fine (small) particulate matter (PM2.5), which cause heart and lung disease. The fast growth rate of urban areas in the Southeast also contributes to aeroallergens, which are known to cause and exacerbate respiratory diseases such as asthma. Urban areas have higher concentrations of CO₂, which causes allergenic plants, such as ragweed, to grow faster and produce more pollen allergen than in rural areas (NCA4 Southeast Chapter, KM1, Air Quality and Human Health).



Extreme Events

An assessment by the Florida Department of Health determined that 590,000 people in South Florida face “extreme” or “high” risk from sea level rise, with 125,000 people living in these areas identified as socially vulnerable and 55,000 classified as medically. In addition to causing direct injury, storm surge and related flooding can impact transportation infrastructure by blocking or flooding roads and affecting access to healthcare facilities (NCA4 Southeast Chapter, KM2, Sea Level Rise Is Contributing to Increased Coastal Flooding in the Southeast).



Vector-Borne Diseases

The Southeast is the region of the country with the most favorable conditions for the *Aedes aegypti* mosquito and thus faces the greatest threat from diseases the mosquito carries. Summer increases in dengue cases are expected across every state in the Southeast (NCA4 Southeast Chapter, KM1, Vector-Borne Disease). Warmer conditions may have facilitated expansion of the geographic range of mosquito populations and could potentially increase their capacity to transmit Zika virus. Zika virus can cause a wide range of symptoms, including fever, rash, and headaches, as well as birth defects (NCA4 Health Chapter, Box 14.2: Transboundary Transmission of Infectious Diseases).



Populations of Concern

Workers in the agriculture, forestry, hunting, and fishing sectors together with construction and support, waste, and remediation services work are the most highly vulnerable to heat-related deaths in the United States, representing almost 68% of heat-related deaths nationally. Six of the ten states with the highest occupational heat-related deaths in these sectors are in the Southeast region, accounting for 28.6% of occupational heat-related deaths between 2000 and 2010 (NCA4 Southeast Chapter, KM4, Heat, Health, and Livelihoods).

CDC-Funded Jurisdictions

North Carolina Department of Health and Human Services, CRSCI recipient, funded by CDC since 2010

The North Carolina Climate and Health Program primarily focuses on health effects related to extreme heat and wildland fire smoke. The work aims to serve elementary school students, farmworkers, local public health preparedness and emergency management staff, low income earners, older adults requiring nutritional support, and young adults attending county parks. To address smoke from wildland fires, a health curriculum for elementary students was designed to teach them about smoke and health, to be taught in connection with Smokey the Bear in Hoke County. Additionally, an implementation and monitoring strategy was created to plan for health impacts of wildland fires and to provide health education on the topic. A main focus of the North Carolina Climate and Health Program has also been on heat. The program has conducted statewide heat-related illness emergency department visit syndromic surveillance. Heat health alert systems were implemented in Bladen, Robeson, Sampson, and Scotland counties. Education campaigns were also conducted in these four counties and were personalized by county to target each county’s at-risk population. The campaigns focused on agricultural workers, low income people, mobile home residents, the elderly, and the youth.

Florida Department of Health, CRSCI recipient, funded by CDC since 2012

The Florida Building Resilience Against Climate Effects (FLBRACE) Program is working to improve the ability of the public health sector to respond to the health effects of climate variability by incorporating the best available science into routine public health practice. The primary hazards addressed by FLBRACE include extreme heat, wildland fires, flooding, water-borne diseases, and extreme weather events, such as hurricanes and tornados. Primary health outcomes include allergies, asthma, heat-related illness and death, injury, mental health disorders, stress-related disorders, and stroke. FLBRACE primarily assists community health departments, especially

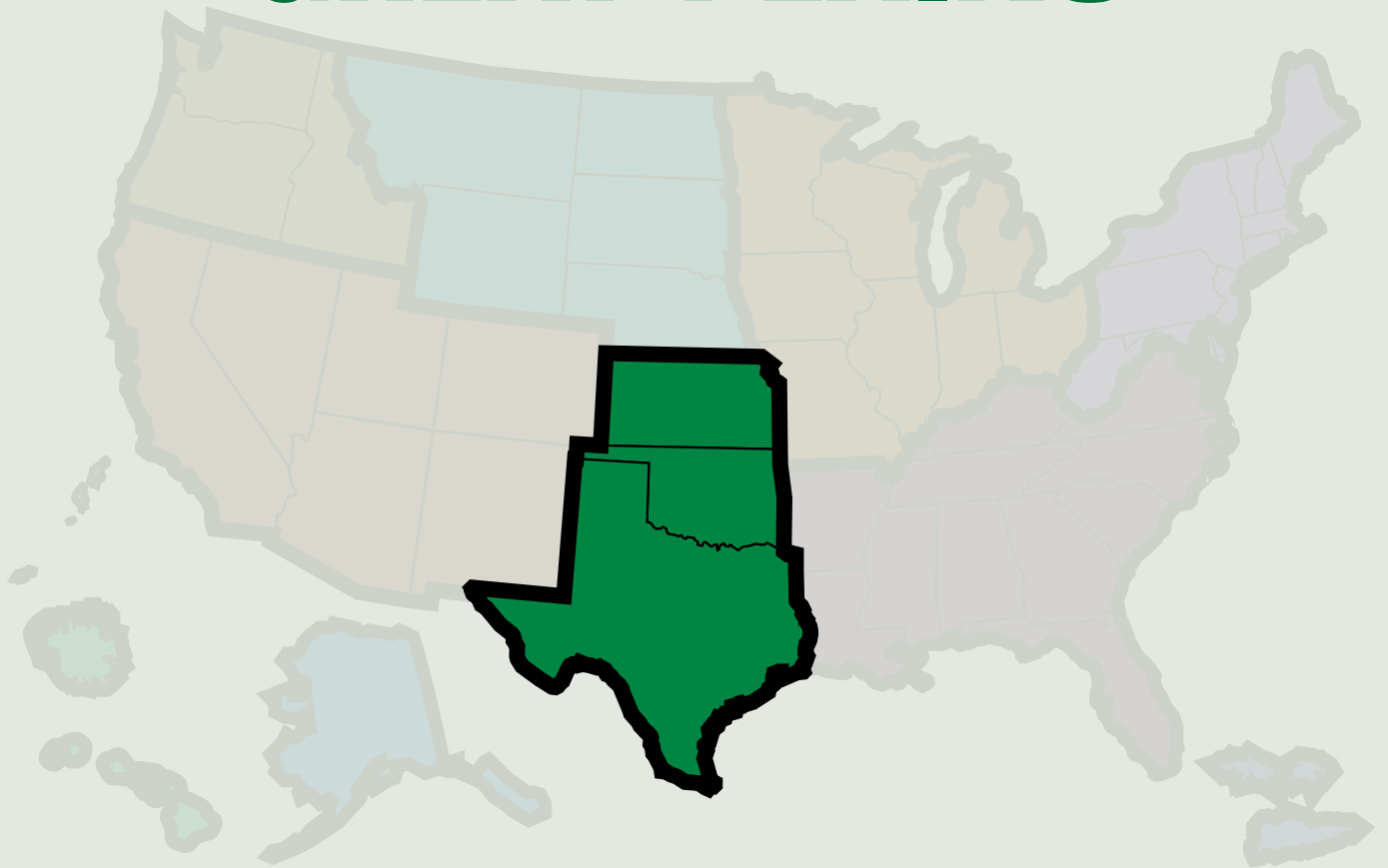
those serving vulnerable populations, such as the elderly or residents living in coastal communities. FLBRACE has developed a series of climate and health profiles that identify and describe key risk factors and health impacts anticipated in Florida. Among these is a study of the health effects of tropical storms and hurricanes in Florida using emergency department data, birth records, carbon monoxide poisoning data, and food-borne and water-borne reports. The program has also developed a series of touchstone event summaries that highlight exceptional weather events and related health outcomes in Florida.

**City of New Orleans Department of Health,
NACCHO mini-grant, funded in 2020**

New Orleans will develop a heat monitoring pilot program, through which thermometers and heat sensors will be distributed in the community to gather temperature data in partnership with a local community organization, with the eventual goal of developing a better outreach campaign about extreme heat and heat-related illness. The project will focus on improving messaging and health for at-risk populations.



SOUTHERN GREAT PLAINS



Health Impacts

Temperature-Related Death and Illness

Warmer temperatures will likely lead to an increase in heat stress, especially during the summertime (NCA4 Southern Great Plains Chapter, KM2). Notably, heat stress is strongly correlated with complications of lung disease, such as asthma and emphysema, as well as dehydration and injurious electrolyte abnormalities (NCA4 Southern Great Plains Chapter, KM4).



Air Quality Impacts

Major dust activity in the United States is centered in the Southwest, where sources are mostly natural, and the Great Plains, extending from Montana to southern Texas, where sources are mainly from human activities associated with land use, such as agriculture. Exposure to dust can cause respiratory and cardiovascular health problems. These are also regions where climate change is expected to affect drought patterns (Climate and Health Assessment 2016, 4. Extreme Events, 4.5 Droughts, Wind Erosion and Dust Storms Box).



Extreme Events

Extreme weather events with resultant physical injury and population displacement are a threat to this region. These threats are likely to increase in frequency and distribution and are likely to create significant economic burdens. (NCA4 Southern Great Plains Chapter, KM3) For example, widespread flooding during Hurricane Harvey affected dozens of communities, including those in the Houston and Beaumont metropolitan areas. Immediate effects included deaths from drowning and trauma that claimed the lives of at least 63 individuals. Additionally, more than 30,000 people were evacuated. Displacement of patients from their communities and healthcare providers led to interruptions in medical treatment (NCA4 Southern Great Plains Chapter, Box 23.1: Hurricane Harvey).



Vector-Borne Diseases

In the Southern Great Plains, hantavirus, Rocky Mountain spotted fever, leptospirosis, and West Nile virus are all currently endemic and could be impacted by climate change. Tropical diseases, such as dengue virus, chikungunya virus, and Zika virus are transmitted by Aedes mosquitoes, which are currently expanding their geographic range in the southern United States (NCA4 Southern Great Plains Chapter, KM4).



Water-Related Illness

As water evaporates during periods of drought, the remaining water can have higher concentrations of chemicals and solid particles, lower dissolved oxygen levels, and a higher density of pathogens that cause infectious diseases.

Drought conditions reduce the number of sources and overall quantity of water available to both human and animal users. Because these users are sharing a reduced supply, germ transmission and outbreaks of infectious disease become more likely. Waterborne diseases that have been linked to drought include amoebiasis, hepatitis A, salmonellosis, schistosomiasis, shigellosis, typhoid and paratyphoid fevers, infection with E. coli, cholera, and leptospirosis (NCA4 Southern Great Plains Chapter, KM4).



Food Safety, Nutrition and Distribution

Increases in CO₂ are changing the nutritional composition of food crops. Elevated CO₂ levels have been shown to reduce the protein composition of grains, tubers, rice, wheat, and barley. Micronutrient contents are also affected by rising CO₂ levels, with atmospheric CO₂ concentrations of 550 parts per million being associated with reductions in zinc, iron, phosphorus, potassium, calcium, sulfur, magnesium, copper, and manganese across a wide range of crops (NCA4 Southern Great Plains Chapter, KM4).



Populations of Concern

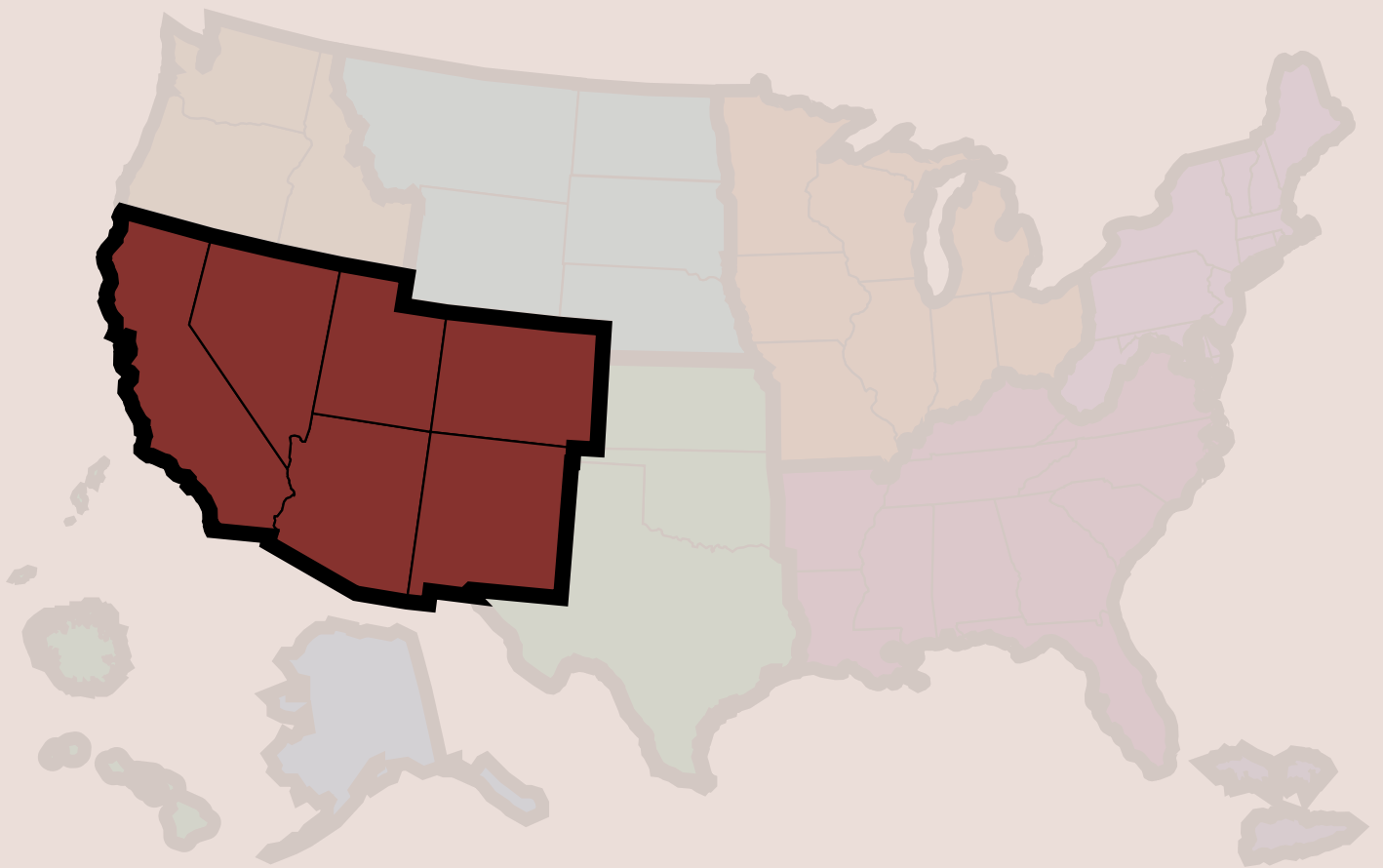
Extreme temperatures and aridity pose health risks to outdoor agricultural workers (NCA Southern Great Plains Chapter, KM4). Tribal and Indigenous communities are particularly vulnerable to climate change due to water resource constraints, extreme weather events, higher temperature, and other likely public health issues (NCA4 Southern Great Plains Chapter, KM5).

CDC-Funded Jurisdictions

Kaw Nation, NIHB Mini-Grant, funded in 2019

The Kaw Nation (located in what is now called Oklahoma) received a one-time mini-grant from CDC and the National Indian Health Board (NIHB) in 2019 for a project focused on local community education and outreach related to climate and health. They created fact sheets and other communications materials to help inform community members of potential climate-related threats and steps to protect health. A major focus was the health impacts of heat.

SOUTHWEST



Health Impacts

Temperature-Related Death and Illness

Under continued climate change, projected increases in hot days and extreme heat events in the Southwest will increase the risk of heat-associated deaths. Under the higher scenario (RCP8.5), the Southwest would experience the highest increase in annual premature deaths due to extreme heat in the country, with an estimated 850 additional deaths per year by 2050. Under a lower scenario (RCP4.5), deaths would be reduced by half compared to the higher scenario (RCP8.5). By 2090, deaths and economic losses would more than double from 2050 under all emissions scenarios. Heat and other environmental exposures particularly affect outdoor workers (NCA4 Southwest Chapter, KM7).



Air Quality Impacts

Other environmental conditions of greatest concern for human health are ground-level ozone air pollution, dust storms, particulate air pollution (such as from wildfires and dust storms), and aeroallergens (airborne proteins that trigger allergic reactions). The risk of onset or exacerbation of respiratory and cardiovascular disease is associated with a single or a combined exposure to ground-level ozone pollution, particulate air pollution, and respiratory allergens. These conditions may also lead to new cases or exacerbation of allergy and asthma (NCA4 Southwest Chapter, KM7). Drier conditions can also increase reproduction of a fungus found in soils, potentially leading to the disease coccidioidomycosis, or Valley fever (NCA4 Health Chapter, Box 14.1: Health Impacts of Drought and Periods of Unusually Dry Months).



Vector-Borne Diseases

Infectious diseases like plague and hantavirus pulmonary syndrome disproportionately affect the Southwest region. Heat extremes, warming, changes in precipitation, and potentially an intensified El Niño-Southern Oscillation may influence the distribution and occurrence of vector-borne diseases like West Nile virus and may lead to the emergence of new disease (NCA4 Southwest Chapter, KM7).



Water-Related Illness

Prolonged droughts can affect drinking water availability, reduce water quality, and send more people seeking medical treatment (NCA4 Southwest Chapter, KM7).



Food Safety, Nutrition and Distribution

Food production in the Southwest is vulnerable to water shortages. Increased drought, heat waves, and reduction of winter chill hours can harm crops and livestock; exacerbate competition for water among agriculture, energy generation, and municipal uses; and increase future food

insecurity (NCA4 Southwest Chapter, KM6). Droughts and wildfire in the Southwest have contributed to declines in traditional Indigenous staple foods, including fish, wildlife, acorns, corn, and pine nuts. Additionally, ocean warming and acidification, as well as sea level rise, increase risks to shellfish beds (which reduces access for traditional harvesting), pathogens that cause shellfish poisoning, and damage to shellfish populations, which can cause cascading effects in food and ecological systems upon which some tribes depend (NCA4 Southwest Chapter, KM4).



Mental Health and Well-Being

Climate change may weigh heavily on mental health in the general population and those already struggling with mental health disorders. One impact of rising temperatures, especially in combination with environmental and socioeconomic stresses, is violence towards others and towards self. Slow-moving disasters, such as drought, may affect mental health over many years. Communities that rely especially on well-functioning natural and agricultural systems in specific locations may be especially vulnerable to mental health effects when those systems fail. In the Southwest, the loss of stability and certainty in natural systems may affect physical, mental, and spiritual health of Indigenous peoples with close ties to the land (NCA4 Southwest Chapter, KM7).



Populations of Concern

Native Americans are among the most at risk from climate change, often experiencing the worst effects because of higher exposure, higher sensitivity, and lower adaptive capacity for historical, socioeconomic, and ecological reasons. With one and a half million Native Americans, 182 federally recognized tribes, and many state-recognized and other non-federally recognized tribes, the Southwest has the largest population of Indigenous peoples in the country (NCA4 Southwest Chapter, Background).

CDC-Funded Jurisdictions

Arizona Department of Health Services, CRSCI recipient, funded by CDC since 2010

The Arizona Extreme Weather and Public Health Program facilitates the development and sharing of local knowledge of climate and health effects and the implementation of public health interventions for climate-related hazards affecting the state's residents and visitors, including extreme heat, wildfires, air quality, drought, flooding, extreme cold, and vector-borne diseases. Partnerships have led to heat alerts for schools and healthcare facilities, projects to assess and improve cooling center networks, and the distribution of heat safety toolkits for various specific at-risk populations, including outdoor workers, older adults, and school children. The program and local partners have also increased their capacity to perform

heat illness surveillance activities and coordinated a state heat preparedness workgroup. Other program work has focused on understanding climate impacts on vector-borne diseases and the fungal disease called Valley fever, as well as developing public health emergency response plans for wildfires and flooding. This work benefits various populations such as the homeless, elderly, children, local officials, and residents of low income and minority neighborhoods.

San Francisco Department of Health, CRSCI recipient, funded by CDC since 2010

The San Francisco Department of Public Health's Climate and Health Program works to address the local health impacts of extreme heat, flooding and extreme storms, drought and wildfire, and allergies and air pollution through the development of vulnerability assessments, literature reviews and emergency plans, data analysis and mapping, outreach and engagement to community-based organizations and other stakeholders, and working interdepartmentally to bring a health perspective to citywide climate action and preparedness efforts. San Francisco is particularly vulnerable to the health impacts of extreme heat. A study of a 2006 California heat wave found that during extreme heat events, San Francisco's emergency department visits increased more than almost anywhere else in the state. The Climate and Health Program has helped San Francisco prepare for future extreme heat events by informing the city's extreme heat emergency response plan, developing and deploying extreme heat preparedness trainings specifically for older adults, and engaging local clinicians about how to discuss extreme heat preparedness with their patients.

California Department of Public Health, CRSCI recipient, funded by CDC since 2012

The California Building Resilience Against Climate Effects (CalBRACE) project aims to prevent and reduce health effects associated with a change climate through state and local actions. In the past decade, California experienced more frequent and intense heat events, wildfires and droughts, and reduced air quality that outpaced historic records. CalBRACE primarily assists agencies, tribes, and community partners in developing policy, data, and strategies to embed climate adaptation, public health, and health equity benefits into their operations and investment plans. The staff also provides leadership on climate change and health equity within the California Department of Public Health (CDPH), and contributes

to state publications and peer-reviewed journals. Participation in adaptation planning and implementation occurs through meetings, consultation, and technical assistance activities. Aligned with the Building Resilience Against Climate Effects (BRACE) Framework, CalBRACE maintains web-based tools and resources for adaptation planning, including consultation and engagement; hazard, vulnerability, and disease burden assessments; and strategies for implementation and evaluation.

San Mateo County, California, CSTE Mini-Grant, funded in 2019

San Mateo County assessed the magnitude and trends of asthma burden and adapted the Community Health Vulnerability Index for their jurisdiction. This allowed them to address specific local climate and respiratory health issues, especially among at-risk populations.

Pala Band of Mission Indians, NIHB Mini-Grant, funded in 2019-2020

The Pala Band of Mission Indians (located in what is now called Southern California) developed climate and health communication and outreach materials tailored to the specific needs of the Pala community, including a plan highlighting the importance of culture-based psychosocial resilience strategies.

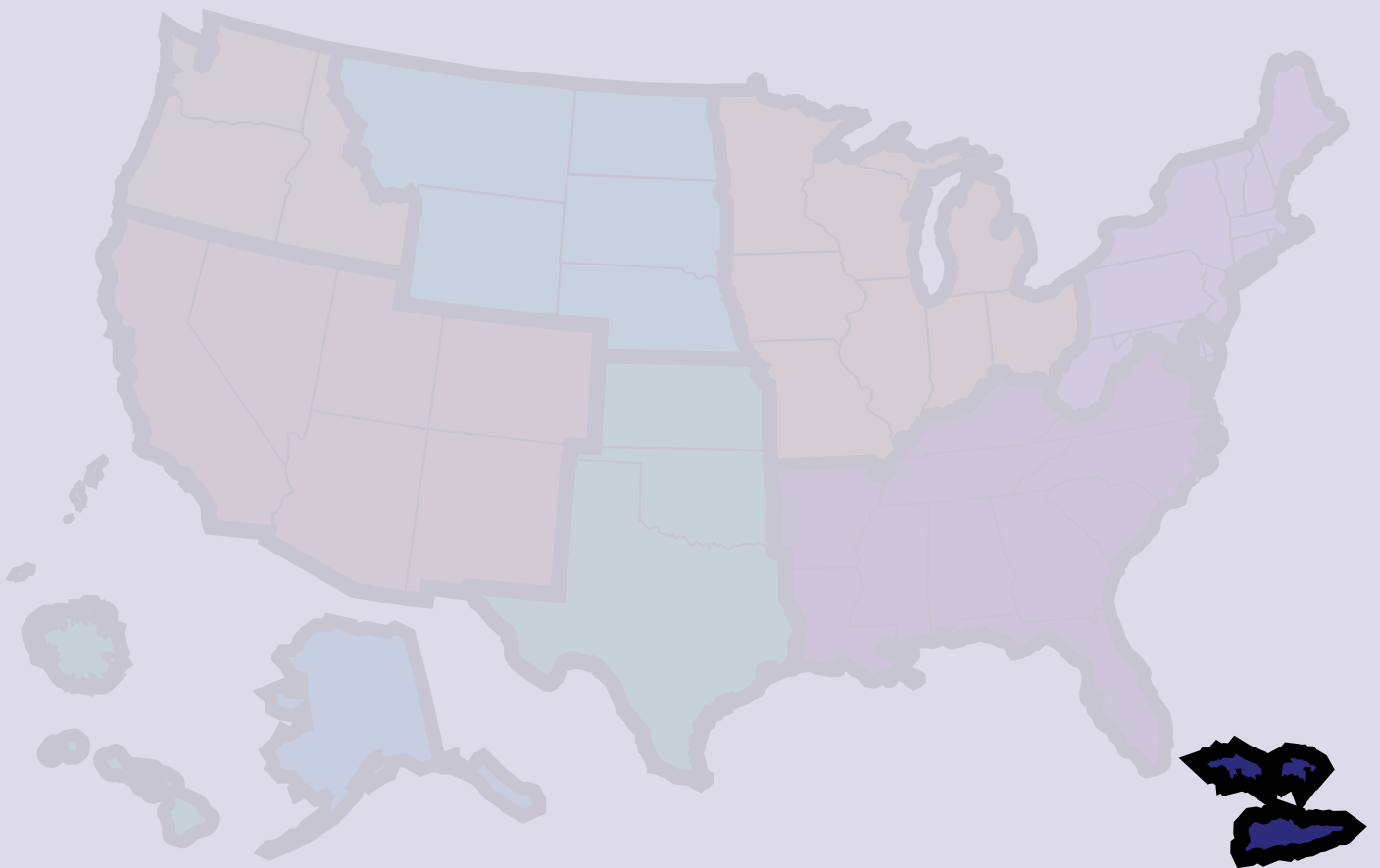
Alameda County, California, NACCHO Mini-Grant, funded in 2020

Alameda County will work to improve communication to vulnerable populations on protective actions and smoke alerts to decrease morbidity. Specifically, Alameda County plans to engage community stakeholders through focus groups to develop preferred methods of communication regarding air quality levels and protective action, and also develop a county communication flow protocol to be used by government agencies to send smoke alerts and information to disadvantaged communities and those vulnerable to smoke impacts.

Greenville Rancheria, NIHB Mini-Grant, funded in 2020

Greenville Rancheria (located in what is now called California) is building community health department capacity to respond to power outages during wildland fires and other disasters. This mini-grant project will focus on communication efforts and will be tailored to specific local needs of this rural community that is greatly impacted by wildfires.

U.S. CARIBBEAN



Health Impacts



Temperature-Related Death and Illness

Records from weather stations in Puerto Rico indicate that the annual number of days with temperatures above 90°F has increased over the last four and a half decades. A number of extreme temperature events occurred in Puerto Rico during the summers of 2012–2014, when most days exceeded 90°F. During San Juan's record heat episode in 2012, stroke and cardiovascular disease were the primary causes of death due, in part, to the elevated summer temperatures in the municipalities of San Juan and Bayamón (NCA4 U.S. Caribbean Chapter, KM4, Linkage Between Climate Change and Regional Risks).



Extreme Events

Extreme events pose significant risks to life, property, and economy in the Caribbean, and some extreme events, such as flooding and droughts, are projected to increase in frequency and intensity (NCA4 U.S. Caribbean Chapter, KM 5). Additionally, a high concentration of population and critical infrastructure in low-lying coastal areas increases vulnerability to sea level rise and storm surge and magnifies the effects of coastal flooding and beach erosion (NCA4 U.S. Caribbean Chapter, KM3, Linkage Between Climate Change and Regional Risks). Increasing hurricane intensity and associated rainfall rates will likely affect human health and well-being, economic development, conservation, and agricultural productivity (NCA 4 U.S. Caribbean Chapter, KM 5).

The health impacts across the Caribbean Small Island Developing States (SIDS) span a large range, including physical injury from wind and water during hurricane passage and during post-event rescue and cleanup efforts, heat-related injury due to loss of access to air conditioning and fans, inability to manage chronic disease due to loss of access to electrical power or medical services, and increased exposure to vector-borne diseases and diseases from contaminated water. Mental health impacts are also notable, as most survivors experience a high degree of psychological trauma during and after hurricane events (NCA4 U.S. Caribbean Chapter, Box 20.1: 2017 Atlantic Hurricane Season Impacts).



Vector-Borne Diseases

Warmer conditions may have facilitated expansion of the geographic range of mosquito populations and potentially increased their capacity to transmit Zika virus. Zika virus can cause a wide range of symptoms, including fever, rash, and headaches, as well as birth defects. The outbreak began in South America and spread to areas with mosquitoes capable of transmitting the virus, including Puerto Rico, the U.S. Virgin Islands, Florida, and Texas (NCA4 Health Chapter, Box 14.2: Transboundary Transmission of Infectious Diseases).



Water-Related Illness

Dependable and safe water supplies for the communities and ecosystems of the U.S. Caribbean, Hawai'i, and the U.S.-Affiliated Pacific Islands are threatened by rising temperatures, sea level rise, saltwater intrusion, and increased risk of extreme drought and flooding (NCA4 Water Chapter, Regional Summary).

Puerto Rico and the USVI are projected to lose 3.6% and 4.6% of total coastal land area, respectively. Were such a rise to take place, Puerto Rico's critical infrastructure near the coast would be negatively impacted, including drinking water pipelines and pump stations, sanitary pipelines and pump stations, and one wastewater treatment plant. In the USVI, infrastructure and historical buildings in the inundation zone for sea level rise include pipelines for water and sewage (NCA4 U.S. Caribbean Chapter, KM3, Critical Infrastructure, Property, and Real Estate).



Food Safety, Nutrition and Distribution

Studies show that major shifts in fisheries distribution, coupled with structural and compositional changes in marine habitats such as coral reefs due to climate change, adversely affect food security, shoreline protection, and economies throughout the Caribbean (NCA4 U.S. Caribbean Chapter, KM2, Linkage Between Climate Change and Regional Risks). Additionally, increases in average temperature and extreme heat events will likely have detrimental effects on agricultural operations throughout the U.S. Caribbean region. Climate change affects cattle ranchers and dairy farmers in the U.S. Caribbean by reducing productivity of rangeland, causing a shortage of nutritional feed, increasing heat stress on animals, and increasing energy costs for cooling (NCA 4 U.S. Caribbean Chapter, KM4, Linkage Between Climate Change and Regional Risks).



Mental Health and Well-Being

Mental health impacts are also notable in the Caribbean SIDS, as most survivors experience a high degree of psychological trauma during and after hurricane events (NCA 4 U.S. Caribbean Chapter, Box 20.1: 2017 Atlantic Hurricane Season Impacts).



Populations of Concern

Urban areas are particularly vulnerable to extreme heat events, given the concentration of built structures, traffic, and other factors that drive the urban heat island (UHI) effect. Since the middle of the last century, urbanization and population growth have increased the UHI effects in San Juan. Such effects are becoming even more life threatening with a growing and more vulnerable aging population (NCA4 U.S. Caribbean Chapter, KM4, Linkage Between Climate Change and Regional Risks).

CDC-Funded Jurisdictions

U.S. Virgin Islands, University of the Virgin Islands,
ASTHO Mini-Grant, funded in 2017-2018

Through informal community focus groups and surveys, this project captured community-level knowledge and perceptions of climate change and water safety. Families from low-income communities in St. Thomas, St. John, and St. Croix were invited to participate in educational focus groups wherein they were encouraged to discuss climate change, food and water safety, as well as extreme weather. Participants were then surveyed to

assess their knowledge and perceptions of those topics leading to a better understanding of where future education should be offered. Compiled results informed climate and health adaptation and communication actions.



Conclusion

Climate change looks different across regions of the United States. Some areas may face coastal flooding, while other areas are already experiencing more heat waves or elongated wildfire seasons. This leads to different health effects in different localities. Local governments and their partners can assess risk and vulnerability and implement tailored programs and interventions to help protect health. CDC's Climate and Health Program provides funding, guidance, and technical assistance to aid state, local, tribal, and territorial health agencies and staff. The regional examples in this document outline climate impacts that can affect health (synthesized from the Fourth National Climate Assessment) and examples of CDC-funded local activities in each of the regions. As climate change continues to impact human health, CDC resources will help localities to plan and prepare.

Selected Links and Resources

- CDC's Climate and Health Program webpage: www.cdc.gov/climateandhealth
- Fourth National Climate Assessment: <https://nca2018.globalchange.gov/>
- NOAA State Climate Summaries: <https://statesummaries.ncics.org/>
- NOAA Regional Integrated Sciences and Assessments (RISA) Program: <https://cpo.noaa.gov/Meet-the-Divisions/Climate-and-Societal-Interactions/RISA/RISA-Teams#739083-risa-teams>
- EPA's state-level climate and health impacts map: <https://www3.epa.gov/climatechange/impacts/map-index.html>

Appendix: Explanation of Graphics for Accessibility

Page 3—Impact of Climate Change on Human Health

This graphic illustrates some of the various health impacts that can result from changes in climate. The graphic demonstrates that rising temperatures, more extreme weather, rising sea levels, and increases in carbon dioxide levels, can cause the following environmental conditions and subsequent health impacts:

- Extreme heat, which can cause heat-related illness and death and cardiovascular failure
- Severe weather, which can cause injuries, fatalities, and have mental health impacts
- Changes in vector ecology, which can cause malaria, dengue, encephalitis, hantavirus, Rift Valley fever, Lyme disease, chikungunya, and West Nile virus
- Air pollution, which can cause asthma and cardiovascular disease
- Increasing allergies, which can cause respiratory allergies and asthma
- Water Quality Impacts, which can cause cholera, cryptosporidiosis, campylobacteria, leptospirosis, and harmful algal blooms
- Water and food supply impacts, which can cause malnutrition and diarrheal disease
- Environmental degradation, which can cause forced migration, civil conflict, and have mental health impacts

[\(Return to page 3\)](#)

Page 5—Jurisdictions funded or previously funded by the CDC Climate and Health Program

This national map highlights the states, cities, counties, tribes, and territories that have received funding and technical assistance from the CDC Climate and Health Program directly and through partnerships with other organizations. Jurisdictions include:

- Alameda County
- Arizona
- Blackfeet Nation
- Boston
- California
- Clackamas County
- Commonwealth of the Northern Mariana Islands
- Federated States of Micronesia
- Florida
- Greenville Rancheria
- Illinois
- Kaw Nation
- Lummi Nation
- Maine
- Marquette County
- Maryland
- Massachusetts
- Michigan
- Minnesota
- New Hampshire
- New Orleans
- New York
- New York City
- North Carolina
- Oregon
- Pala Band of Mission Indian
- Rhode Island
- San Francisco
- San Mateo County
- Seneca Nation of Indians
- Sitka Tribe of Alaska
- Swinomish Indian Tribal Community
- U.S. Virgin Islands
- Vermont
- Village of Wainwright
- Washington
- Winnebago Tribe of Nebraska
- Wisconsin

[\(Return to page 5\)](#)



