



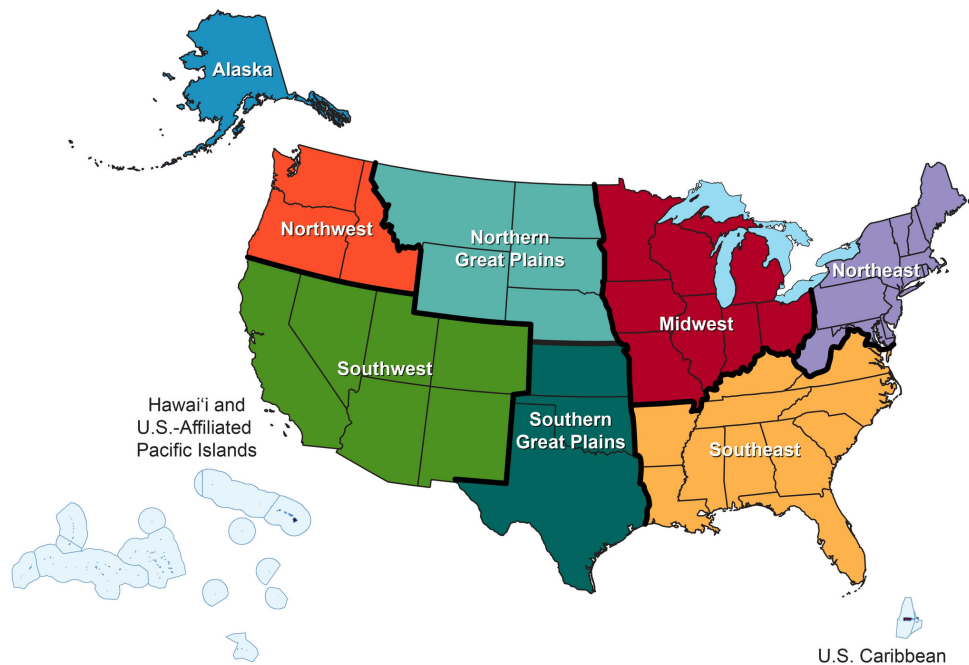
WISC PRESENTS
A FAITH LEADER'S GUIDE TO
THE FOURTH NATIONAL CLIMATE
ASSESSMENT

INTRODUCTION

"If we follow the commandments to seek justice for the entire earth and love our neighbors, we won't dirty our neighbor's air, water, and overuse our resources. We can help make the world healthier and safer for ourselves, others, and generations yet to come. " - Georgia Interfaith Power & Light

Many people of faith, united across theological lines by our commitment to care for all of creation and our call to serve vulnerable communities, have read with alarm recent reports about the growing threats of climate change. One of these reports, the Fourth National Climate Assessment Volume II, drew on expertise of 300 federal and non-federal experts as well as 13 US government agencies to address the impacts of climate change on 10 regions of the United States.

A Washington D.C.-based coalition of faith groups concerned about climate change's impacts on the environment and vulnerable communities has summarized the regional reports. We hope these will be helpful in educating yourself and your communities about how climate change is doing harm where you live, work, and worship, right now and into the future. The full report can be found [here](#).



The regions of the National Climate Assessment

KEY MESSAGES

1. Rising Temperatures
2. Changes in Precipitation
3. Rising Sea Levels
4. Extreme Weather

NORTHEAST

Key Message 1: Rising Temperatures

Temperatures rose by almost 2 degrees Fahrenheit between 1895 and 2011, and precipitation increased by about 5 inches annually. This region has experienced a greater increase in extreme precipitation than anywhere else in the United States, with 70% precipitation in heavy events. Meanwhile, coastal flooding has increased due to a rise in sea level of approximately one foot since 1900, more than the global average of about 8 inches.

With more increases in carbon emissions, the frequency, intensity, and duration of heat waves are expected to increase. Much of the southern portion of the region, including the majority of Maryland and Delaware, southwestern West Virginia and New Jersey, are projected by mid-century to experience many more days per year above 90°F compared to the end of the last century.

Heat stress and the greater air pollution that often results from higher temperatures are particularly concerning for vulnerable populations such as young children, the elderly, and people with conditions such as asthma. With higher temperatures also come a greater geographic range for insect-borne illnesses such as Lyme Disease and West Nile Virus.

Key Message 2: Changes in Precipitation

While projections of precipitation changes are less certain, increased rain and snow are expected during the winter and spring, especially in the northern part of the region. The frequency of heavy downpours is projected to continue increasing as the century progresses. At the same time, seasonal drought risk is also projected to increase in the summer and fall as higher temperatures lead to greater evaporation and earlier winter and spring snowmelt.

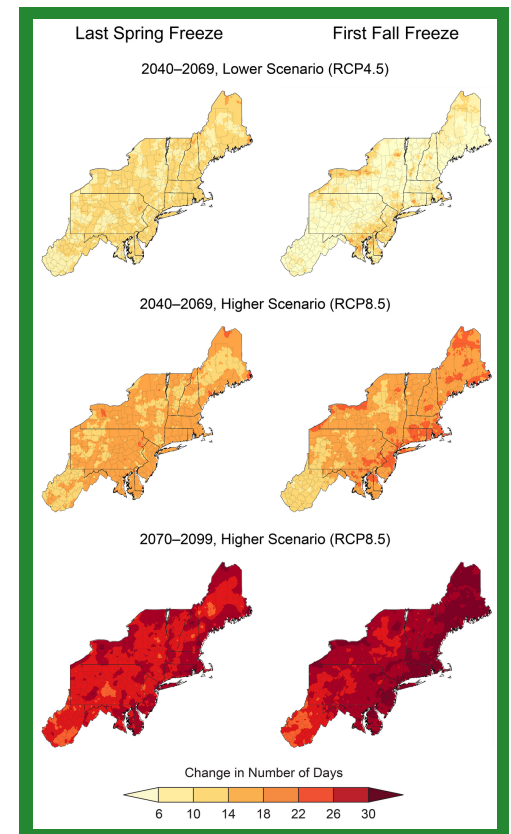
Greater precipitation can overwhelm municipal sewage systems and will delay spring planting as well as lead to more crop damage. Farmers may also face water shortages with drier summers and longer growing seasons. Commercial fishing will be harmed by warmer oceans, with habitats for species like cod and lobster moving north.

Key Message 3: Rising Sea Levels

Global sea levels are projected to rise 1 to 4 feet by 2100, depending on a number of variables. Sea level rise of two feet, without any changes in storms, would more than triple the frequency of dangerous coastal flooding throughout most of the Northeast.

Key Message 4: Extreme Weather

The region will also become more vulnerable to extreme weather, such as hurricanes like Irene (2011) and Sandy (2012).



KEY MESSAGES

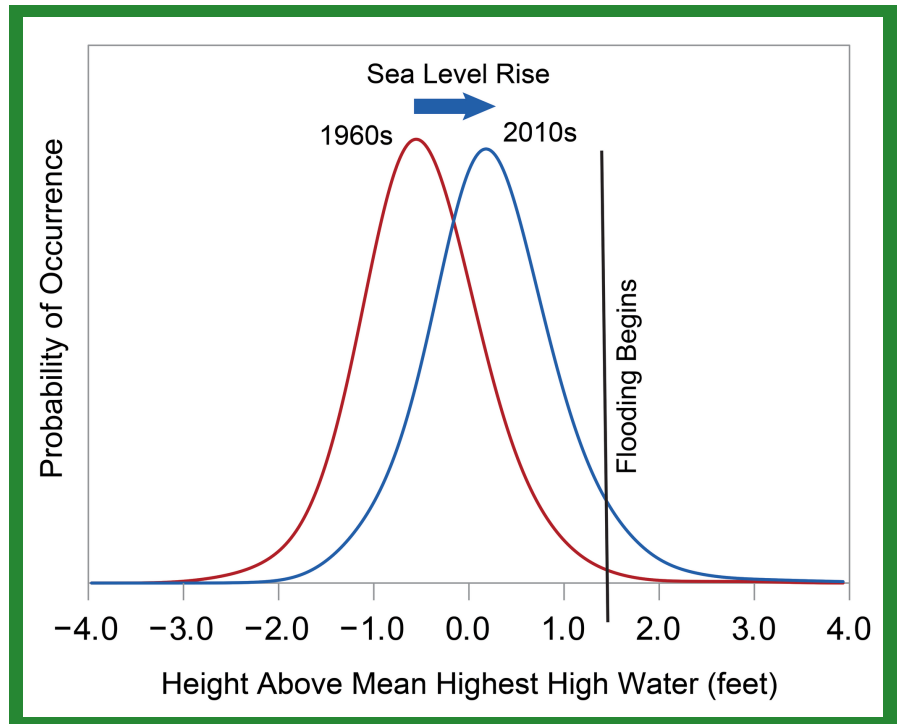
1. Urban Impacts
2. Coastal Flooding
3. Ecosystem Impacts
4. Rural Impacts

SOUTHEAST

Key Message 1: Urban Impacts

The Southeast is urbanizing rapidly - 12 of the top 20 fastest-growing metro areas in 2015 were in the region. 61% of major cities in the region are experiencing aspects of worsening heat waves, the most in any region.

The Southeast is the most favorable region for mosquitoes, which can carry disease, and climate change is expected to worsen vector-borne diseases. By 2050, the Southeast is expected to have the most vulnerable bridges, and other infrastructure is threatened by increasing extreme weather events. These weather events affect tourism, transportation, and other sectors of urban economies.



Graphic Sourced from Fourth National Climate Assessment

Key Message 2: Rising Sea Levels

Low-lying areas of the Southeast have seen 1 to 3 feet of local relative sea level rise in the last 100 years. Several cities such as Charleston, Miami, and Key West experience all-time records of flooding occurrences in 2015. Increases in high tide flooding frequency are directly tied to sea level rise, which is worsened by climate change. Many cities are projected to experience more than 30 days of high tide flooding in all modeling scenarios. Under the higher climate change scenario, flooding could cost up to \$60 billion per year in damage and lost property values. Warm waters contribute to hurricanes, which have had devastating impacts throughout the region.

Key Message 3: Potential Water Shortages

Climate change is leading to warmer winter air temperatures, which will cause species migration in plants and animals. Coastal areas are heavily impacted by rising sea levels and intensifying hurricanes as well as drought and warming waters. Between 1932 and 2016, Louisiana lost 2,006 square miles of land area in part due to climate change-worsened sea level rise.

Key Message 4: Rural Impacts

More than 56% of land is rural in the Southeast, and the region has the second highest number of farmworkers hired per year. Climate change threatens agriculture and fisheries - under a lower climate change scenario annual oyster harvests are projected to decline by roughly 20%. Wildfire is also a risk, and occurs more frequently in the Southeast than in any other region. By 2090 under the higher scenario the region could lose \$47 billion per year in heat-related labor productivity decline.

KEY MESSAGES

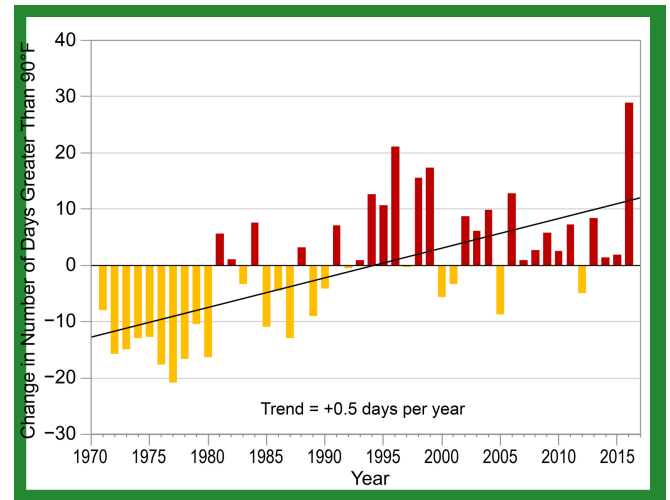
1. Freshwater
2. Marine Resources
3. Coastal Systems
4. Rising Temperatures
5. Extreme Events
6. Adaptive Capacity

2018 US CLIMATE ASSESSMENT

US CARIBBEAN

Key Message 1: Freshwater

Increasing carbon emissions are projected to reduce average rainfall in this region by the end of the century, constraining freshwater availability. Extreme rainfall events are expected to increase in intensity. Saltwater intrusion associated with sea level rise will reduce the quantity and quality of freshwater in coastal aquifers. Droughts and extreme rainfall events in recent years have resulted in economic loss and social disruption. Excessive rainfall coupled with mixed construction practices, unpaved roads, and steep slopes can exacerbate erosion rates and reduce reservoir capacity, water quality, and nearshore habitat quality.



Graphic Sourced from Fourth National Climate Assessment

Key Message 2: Marine Resources

Marine ecological systems, which provide key ecosystem services such as commercial and recreational fisheries and coastal protection, are threatened by changes in ocean surface temperature, ocean acidification, sea level rise, and changes in the frequency and intensity of storm events. Corals are a major component of the coastal protection, fisheries, and tourism economy of Caribbean islands. Ocean warming results in coral bleaching and, after prolonged periods, results in mortality of the colonies. Ocean acidification impacts the structural integrity of habitats, affecting fisheries. Cultural and historic sites in the region are threatened by sea level rise and storm surges.

Key Message 3: Coastal Systems

Sea level rise, combined with stronger wave action and higher storm surges, will worsen coastal flooding and increase coastal erosion, likely leading to diminished beach area, loss of storm surge barriers, decreased tourism, and negative effects on livelihoods and well-being.

Key Message 4: Rising Temperatures

Continued increases in average temperatures will likely lead to decreases in agricultural productivity, changes in habitats and wildlife distributions, and risks to human health, especially in vulnerable populations.

Key Message 5: 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. Increasing hurricane intensity and associated rainfall rates will likely affect human health and well-being, economic development, conservation, and agricultural productivity.

Key Message 6: Adaptive Capacity

Shared knowledge, collaborative research and monitoring, and sustainable institutional adaptive capacity can help support and speed up disaster recovery, reduce loss of life, enhance food security, and improve economic opportunity in the U.S. Caribbean. Increased regional cooperation and stronger partnerships in the Caribbean can expand the region's collective ability to achieve effective actions that build climate change resilience, reduce vulnerability to extreme events, and assist in recovery efforts.

KEY MESSAGES

1. Agriculture
2. Forestry
3. Biodiversity and Ecosystems
4. Human Health
5. Transportation and Infrastructure
6. Adaptation

2018 US CLIMATE ASSESSMENT MIDWEST

Key Message 1: Agriculture

Increases in precipitation and temperature have resulted in soil erosion and ideal conditions for mold and insects. Summer temperatures in the Midwest are expected to increase more than any other region and to move above optimum growing temperatures. This increase in growing-season temperature in the Midwest is projected to be the largest contributor to crop yield decline.

Key Message 2: Forestry

The economic output of the Midwest forestry sector totals around \$122 billion per year, not including forest-related activities, such as hunting, fishing, and hiking. Increased precipitation and warmer winters are exacerbating issues as invasive species, increasing disease and tree mortality. This trend will result in the loss of economically and culturally important trees and lead to the change of some forests to other forest types or even to non-forested ecosystems by the end of the century.

Key Message 3: Biodiversity and Ecosystems

The Midwest supports the world's largest freshwater ecosystem, the Great Lakes. The Great Lakes are at risk from rising temperatures, water evaporation, pollution stress, conditions for harmful algae blooms, and invasive species. Changes in range of species habitat, migration patterns, and changes of population size have been observed. Rapid climate change over the next century is expected to cause or further amplify these stressors.

Key Message 4: Human Health

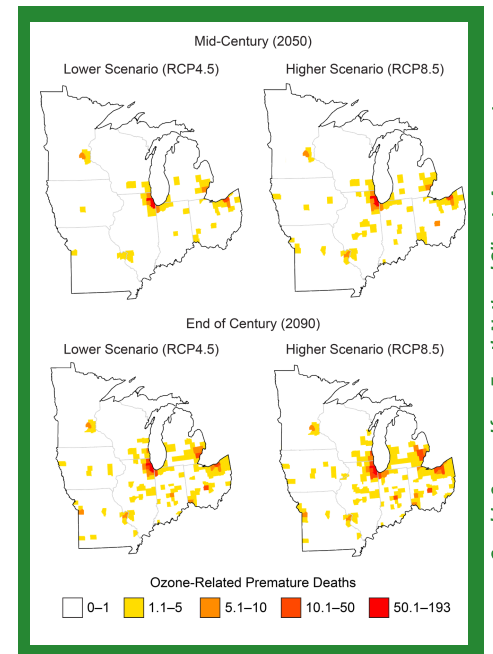
Vulnerable communities have already experienced health impacts because of climate change. Poor air quality is associated with the prevalence of lung and cardiovascular diseases. Pollen season is beginning earlier and lasting longer, which threatens people with asthma. Higher temperatures have caused an increase in prevalence of heat-related diseases. Extreme precipitation can cause flooding resulting in water contamination, damage to buildings, and death. Climate-related habitat changes for pests, such as deer ticks, have increased infection rates.

Key Message 5: Transportation and Infrastructure

Winter and spring precipitation are important for flood risk in the Midwest and are expected to increase up to 30% by the end of this century. Increased precipitation and flooding will damage infrastructure. Extreme heat also causes stress on infrastructure such as roads. Green infrastructure—the use of plants and open space to manage storm water—is helping communities in the Midwest become more resilient to challenges associated with heavy precipitation.

Key Message 6: Adaptation

Negative impacts related to climate change are expected to compound already existing stressors such as economic downturns, shrinking cities, and deteriorating infrastructure. Tribal Nations are especially vulnerable because of their reliance on threatened natural resources for cultural, subsistence and economic needs. Extreme heat, which is expected to intensify, will threaten older individuals, or individuals without financial resources. Transmitting knowledge from research and tribal knowledge and collaborating with impacted communities will increase adaptation.



Graphic Sourced from Fourth National Climate Assessment

KEY MESSAGES

1. Water
2. Agriculture
3. Recreation and Tourism
4. Energy
5. Indigenous Peoples

2018 US CLIMATE ASSESSMENT

NORTHERN GREAT PLAINS

Key Message 1: Water

Water management is critical to the Northern Great Plains economically, culturally, and ecologically. Small changes in precipitation have big impacts downstream. Because this region is centrally located in the U.S. landmass it is prone to climate fluctuations, which results in droughts or flooding. Warmer temperatures and increased precipitation will compound these extremes and increase reliance on reservoir and groundwater storage to buffer these impacts.

Key Message 2: Agriculture

The terrestrial habitats and the goods and services they provide are threatened by rising temperatures, changes in rainfall, increased storminess, and land-use change. These changes promote the spread of invasive species and reduce the ability of habitats to support protected species and sustain human communities. More frequent extreme temperatures and flood or drought conditions will decrease crop yield. Average temperature increases under the lower climate change scenario are expected to be 2-4 degrees F.

Key Message 3: Recreation and Tourism

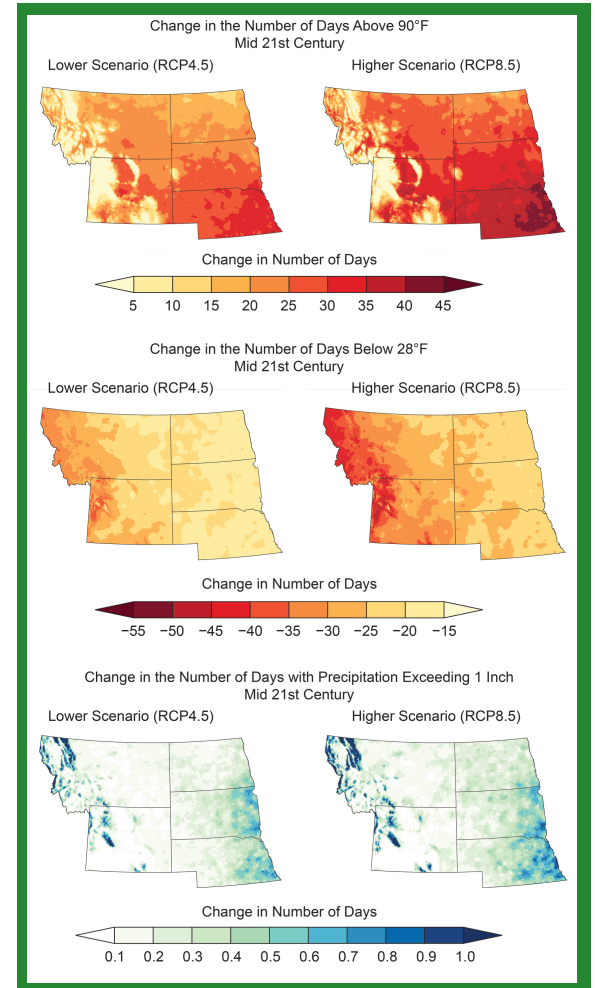
The mountains and rivers of the Northern Great Plains provide recreation activities and attract tourism to the area. Warmer temperature, less snow cover, and more variable precipitation make it challenging to manage these natural areas. For examples, In Wyoming and Montana, snowfall precipitation is expected to decline by 25-40% by 2100 under a lower climate change scenario. Climate-induced changes in agriculture can have cascading effects on local natural ecosystems, which also impacts the recreational opportunities they support.

Key Message 4: Energy

The Northern Great Plains have energy resources such as crude oil, natural gas, coal, and wind. The infrastructure such as railroads and pipelines associated with the distribution and extraction of these resources is vulnerable to climate change damage from rain, erosion and flooding. Decrease in water availability in the summertime will increase the cost of oil production. More variable temperatures will increase electrical use.

Key Message 5: Indigenous Communities

Indigenous People are most at risk from climate change because of the impact on their livelihood, subsistence, and wildlife for healing, ceremonies and medicines. These communities also have some of the highest rates of poverty and unemployment in the region.



KEY MESSAGES

1. Food, Energy, and Water
2. Infrastructure
3. Ecosystems
4. Human Health
5. Indigenous Peoples

2018 US CLIMATE ASSESSMENT

SOUTHERN GREAT PLAINS

Key Message 1: Food, Energy, and Water

The 34 million people residing in the Southern Great Plains rely on food, energy and water systems for their quality of life. Increased average temperatures and drought periods have ripple effects across farm-reliant economies and the region as a whole. The region also imports more than 20% of its food items from the Southwest, a region especially vulnerable to climate change. The growing population in Texas alone will result in a 17% increase in water demand in 50 years, and many water sources, including the Ogallala Aquifer that serves the Texas Panhandle and western Oklahoma, are likely to become partially depleted.

Key Message 2: Infrastructure

An increase in temperatures is virtually certain for the region, which will strain all forms of infrastructure. The urban heat island effect will intensify temperature rise in urban centers. The Texas Water Development Board projects that municipal water use will take up 41% of available supply by 2060. That proportion was 9% in 2010. Increased droughts could therefore result in much higher percentages of the population facing water shortages. By 2030, up to \$20.9 billion in coastal property is projected to be flooded assuming current trends of greenhouse gas emissions.

Key Message 3: Ecosystems

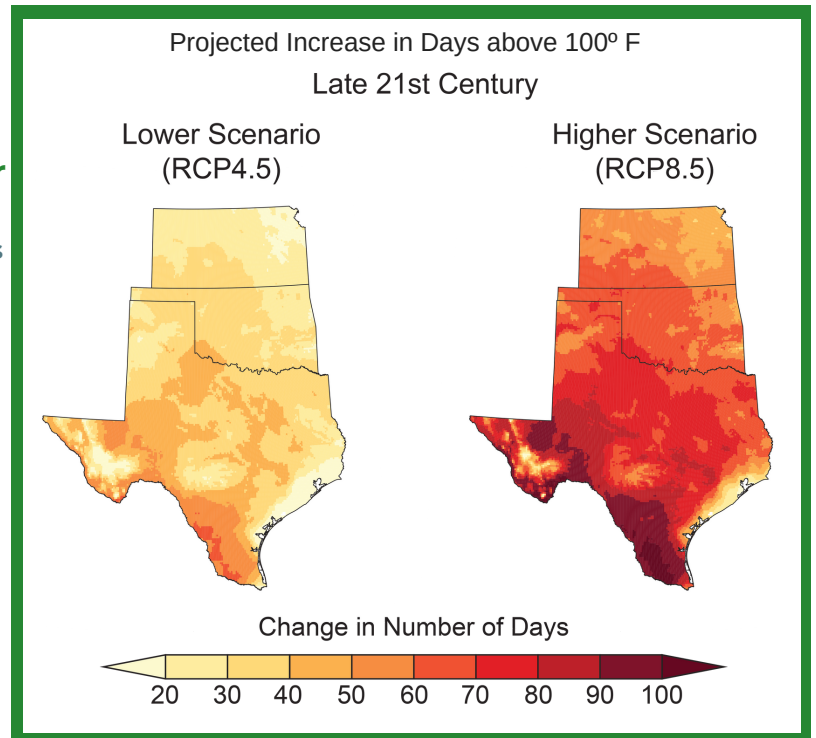
The region is prone to periods of drought as well as heavy infrequent rainfalls, with both of these vents occurring more frequently. Rising temperatures are affecting species distribution, growing seasons, and migration patterns of animals such as birds and butterflies. The coast of Texas, which contributes over \$37 billion to the region's economy, is dependent on its natural features that serve as storm barriers for the region's people as well as its ports. Sea level rise will expose the area to more flooding as well as impact coastal ecosystems.

Key Message 4: Human Health

Health threats such as heat illnesses and food, water, and insect-borne diseases will increase as temperatures rise. Under a higher climate change scenario, changes in extreme temperatures are projected to kill an additional 1,300 people each year by 2100. Under a lower scenario half of these deaths could be avoided. Extreme weather events will change the balance of ecosystems, exposing them to invasive species that can harm human health as well as agriculture. Elevated carbon dioxide levels have been shown to reduce macronutrient and protein content in grain, tubers, and rice.

Key Message 5: Indigenous Peoples

Climate change threatens Indigenous Peoples' ability to procure food, water, shelter, and preserve ancient cultural activities. Lack of physical infrastructure and resources poses an obstacle to adaptation.



NORTHWEST

KEY MESSAGES

1. Natural Resource Economy
2. Natural World and Cultural Heritage
3. Infrastructure
4. Health
5. Frontline Communities

Key Message 1: Natural Resource Economy

The agriculture, forestry, and fishery sectors employ roughly 700,000 people in the region, and roughly 450,000 jobs are supplied by the outdoor recreation sector. These sectors are vulnerable to short-term and long-term climate and weather change. For example, under a higher climate change scenario the salmon fishing industry alone could see \$3.3 billion in losses by 2100 and snow-based recreation revenue could decrease by 70% annually.

Key Message 2: Natural World and Cultural Heritage

Intangible contributors to the quality of life in the region such as natural beauty and access to the outdoors are threatened by climate change. Despite some successes in revitalizing some endangered species, many are expected to become endangered or extinct by 2100. Increased wildfires will impact air quality and access to the outdoors.

Key Message 3: Infrastructure

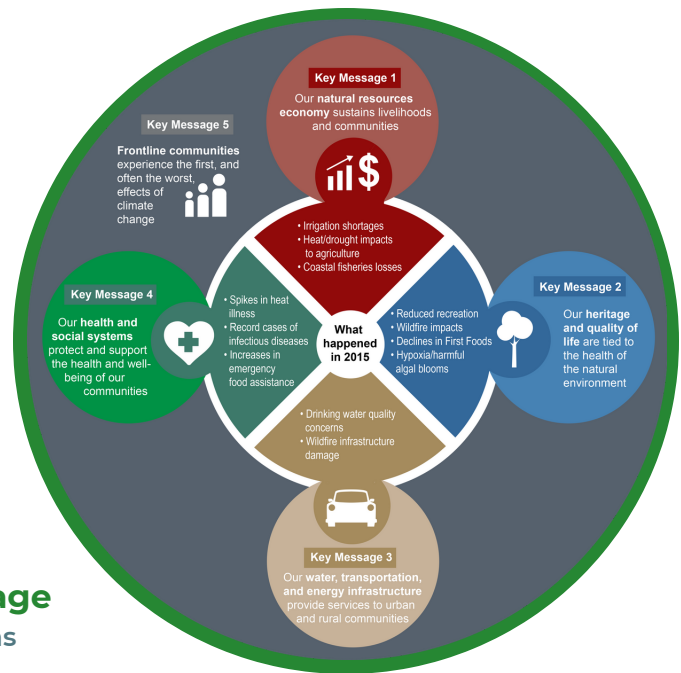
Critical infrastructure such as highway and rail systems, power lines, and water infrastructure is threatened by extreme weather events induced by climate change. Higher annual temperatures are expected to increase precipitation as rainfall rather than snow, leading to increased flooding. This is also expected to contribute to decreased water supplies in areas that rely on snowmelt. The higher climate scenario projection of 4.3 feet of sea level rise by 2100 would impact significant amounts of infrastructure throughout the region, especially in low-lying areas such as the Puget Sound and Portland.

Key Message 4: Health

The Northwest is particularly prone to wildfires, which will increase with rising temperatures and more frequent drought conditions. From 2004 to 2009 smoke events were associated with a 7.2% increase in senior hospital admissions in the region. Extreme heat events have also led to increased hospital admissions throughout the region. Changing drought conditions and water quality contributed to increases in harmful algae blooms -- 2015 saw the largest algae bloom ever recorded off of the west coast, which led to the closure of many shellfish fisheries due to unsafe chemical levels.

Key Message 5: Frontline Communities

Frontline communities are those hit first and hardest by the impacts of climate change. In the Northwest these include indigenous communities, those dependent on natural resources, and economically disadvantaged communities. In urban areas, low-income and communities of color live in the areas most prone to climate and extreme weather events, and thus are disproportionately affected. Farmworkers are especially exposed to extreme temperatures events, air quality issues, and varying work conditions, but often face discrimination and economic and language barriers to accessing services and healthcare. Public and private initiatives are necessary to collaborate with, and provide services to, frontline communities as the climate changes.



SOUTHWEST

KEY MESSAGES

1. Water Resources
2. Ecosystems
3. The Coast
4. Indigenous Communities
5. Energy
6. Food
7. Human Health

Key Message 1: Water Resources

Higher temperatures amplified droughts in California and the Colorado River Basin. Droughts have caused water shortages, record low snowpack. Continued greenhouse gas emissions would cause more frequent and severe droughts, and increase the risk of 10-year or longer megadroughts.

Key Message 2: Ecosystems

Forests and other ecosystems in the Southwest that provide resources and habitats have declined. Climate change has led to excessive wildfire to the point that California ecosystems and Southwest forests are now net carbon emitters. Wildfire has also worsened invasive species and damaged habitat. Continued climate change will cause north-south shifts of vegetation types and shifts in plant and animal life events.

Key Message 3: The Coast

Coastal resources have been affected by sea level rise, ocean warming, and reduced ocean oxygen. Sea levels at the Golden Gate Bridge in San Francisco rose 9 inches between 1854 and 2016. In the higher global warming scenario, climate change could raise sea levels there by 30 inches by 2100. Storm surges and high tides would threaten coastal communities and could cost the California coast as much as \$5 billion by 2100.

Key Message 4: Indigenous Communities

Droughts have harmed traditional staple foods such as acorns, corn, and pine nuts. Many reservations have historically been restricted to the driest portions of tribal homelands, so droughts and high temperatures hit indigenous communities particularly hard. Continued climate change and ocean warming and acidification issues also threaten Indigenous Nations's sustenance practices.

Key Message 5: Energy

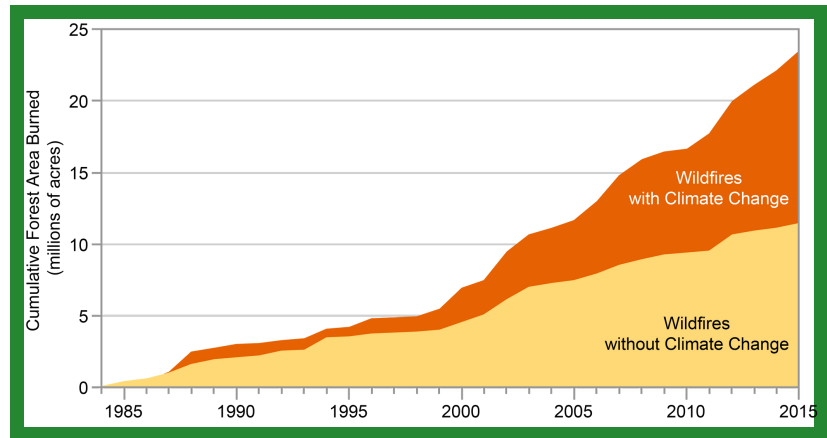
Drought and rising temperatures are limiting the ability of hydropower and fossil fuel electricity to meet growing demand. Continued low rainfall would reduce hydroelectric power potential by 15% by 2050 under a high global warming scenario. Renewable power generation has been increasing—California increased its wind by half and its solar 15 times between 2011 and 2015. Increased electricity generation by renewable sources can cut water needs by up to 90%.

Key Message 6: Food

Food production is vulnerable to water shortages, heat waves, and reduced winter chill hours. The drought in California caused the loss \$900 million in crop revenue. Continued climate change would shift plant hardiness zones northward, and increased heat can increase crop failures. Higher levels of ozone and carbon dioxide in surface soils can reduce food quality and nutritive values of fruits and vegetables. Warmer temperatures also allow harmful invasive species to thrive.

Key Message 7: Human Health

Under the higher global warming scenario, the Southwest would see the highest increase in premature deaths due to heat in the US, an estimated 850 additional deaths per year. The lower scenario would only reduce this number by half. These numbers are associated with labor and economic losses.



ALASKA

KEY MESSAGES

1. Marine Eco Systems
2. Terrestrial Process
3. Human Health
4. Indigenous Peoples
5. Economic Costs
6. Adaptation

Key Message 1: Marine Eco Systems

Sea ice plays a vital role in algae production, which fish, birds, and mammals feed on. Without the ice, their food source will diminish. Ice is necessary for polar bears, walrus, and arctic cod for foraging, reproduction, and resting. Coastal communities subsistence harvest practices have diminished over the last years and will continue to do so as walrus and other food sources decline. Ocean acidification negatively affects sea organisms.

Key Message 2: Terrestrial Processes

Thawing permafrost is estimated to be melted on 16-21% of the land by 2021. This will lead to complications with; safe food storage, infrastructure damage, damage to reservoirs, sinking ground, loss of archaeological indigenous sites & structures. Increased wildfires will cause a change in landscape, a decrease in edible plants, and forested areas to become shrub adapted regions. Increased erosion causes flooding and displacement of communities.

Key Message 3: Human Health

Increased flooding leads to water contamination, loss of power, septic system disruptions, & increase of water-related infectious disease. Increased risk of wildfire causes a heightened risk of respiratory & cardiovascular disease, and decreased indoor & outdoor air quality. Decreased availability of potable water leads to water rationing, poor hygiene, & increase in infectious diseases and decreased access to septic services. Indirect effects include poorer mental health and increased geographic range and lifespan of pathogens and parasites.

Key Message 4: Indigenous People

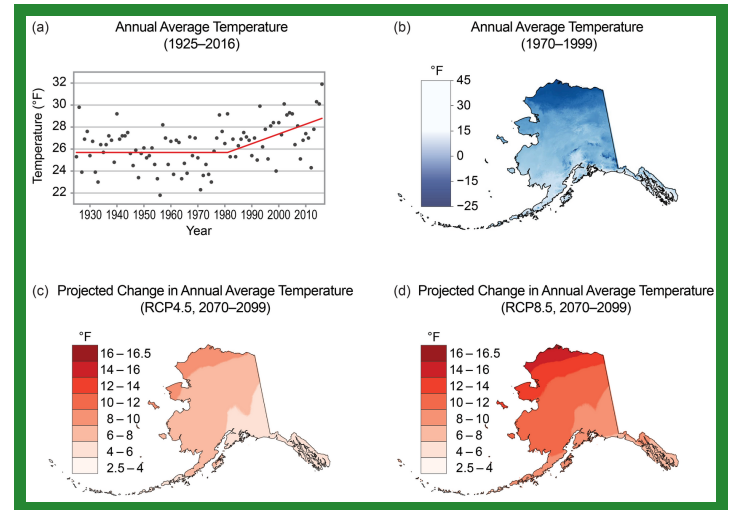
Subsistence activities such as hunting, fishing, and gathering will be severely altered. Poorer access to ice cellars and other traditional ways of storing food. This causes a loss in nutritional benefits as well as the loss of social, cultural, economic, and psychological benefits. Communities will be displaced due to permafrost thaws, erosion, and flooding. Damage will affect traditional, burial, cultural, and spiritual spaces caused by landscape changes. Many Indigenous People will be disproportionately negatively affected by climate change.

Key Message 5: Economic Costs

Displacement & relocation costs will total \$80-200 million per community relocation. An estimated 31 communities need a partial or full relocation. Fisheries will not be able to hit quota. Reconstruction and replacement of public infrastructure damage repair estimates equal 3.6-6.1 billion. Rural areas will be economically harder hit because of the adverse effects on subsistence activities.

Key Message 6: Adaptation

The warming climate will cause decreased spending on heating during the winter. Much adaptation planning is not known yet due to the lack of scientific data on the region. Changes in policy, standard operations, and national security are predicted. There will be an increased need for hazard mitigation planning regarding flooding, wildfires, coastal erosion, and permafrost thaw. Additionally, villages will need to be relocated.



KEY MESSAGES

1. Water Supplies
2. Biodiversity and Ecosystems
3. Coastal Communities
4. Marine Resources
5. Indigenous Communities
6. Adaptation

2018 US CLIMATE ASSESSMENT

HAWAII & US-AFFILIATED PACIFIC ISLANDS



Graphic Sourced from Fourth National Climate Assessment

Key Message 1: Water Supplies

Water supplies 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.

Key Message 2: Biodiversity and Ecosystems

The terrestrial habitats and the goods and services they provide are threatened by rising temperatures, changes in rainfall, increased storminess, and land-use change. These changes promote the spread of invasive species and reduce the ability of habitats to support protected species and sustain human communities. Some species are expected to become extinct and others require protection to prevent extinction.

Key Message 3: Coastal Communities

Sea level rise is threatening ecosystems, cultural sites and practices, economies, housing and energy, transportation, and other forms of infrastructure. This will lead to threats to the food and freshwater supply of Pacific island populations and jeopardize their continued sustainability and resilience.

Key Message 4: Marine Resources

Fisheries, coral reefs, and the livelihoods they support are threatened by higher ocean temperatures and ocean acidification. Rising temperatures will also lead to coral reef bleaching and mortality. Bleaching and acidification will result in loss of reef structure, leading to lower fisheries yields and loss of coastal protection and habitat.

Key Message 5: Indigenous Communities

Indigenous Peoples' knowledge and culture are impacted to the extent of endangering communities' health, well-being, and modern livelihoods, including familial relationships with lands, territories, and resources. Sea level rise is causing impacts on agriculture, coastal infrastructure, food security, livelihoods, and disaster management. Climate change impacts will become cumulative and exacerbate the existing economic conditions of these islands and the livelihoods of the inhabitants; and in some cases, results in climate-induced human migration from their traditional lands, territories, and resources

Key Message 6: Adaptation

The National Climate Assessment report concludes that “in some locations, climate change impacts on ecological and social systems are projected to result in severe disruptions to livelihoods that increase the risk of human conflict or compel the need for migration. Early interventions...can prevent costly and lengthy rebuilding of communities and livelihoods and minimize displacement and relocation.”