Comments of the Attorneys General of Massachusetts, New York, California, Connecticut, Arizona, Colorado, Delaware, Hawai‘i, Illinois, Maine, Maryland, Michigan, Minnesota, Nevada, New Jersey, New Mexico, North Carolina, Oregon, Rhode Island, Vermont, Washington, Wisconsin, and the District of Columbia, and the Chief Legal Officers of the City of Chicago, Illinois; the City of New York, New York; the City of Oakland, California; Martin Luther King, Jr., County, Washington; the City and County of Denver, Colorado; the City and County of San Francisco, California; and the County of Santa Clara, California

on

the Proposed Reconsideration of 2009 Endangerment Finding and Greenhouse Gas Vehicle Standards, 90 Fed. Reg. 36,288 (Aug. 1, 2025)

EPA-HQ-OAR-2025-0194

September 22, 2025

Appendix 1: State and Local Government Climate Change Impacts

Our States and Local Governments are currently experiencing the devastating effects of climate change. Rising temperatures, extreme heat events, wildfires, sea level rise, and coastal flooding are just some of the impacts causing significant and ongoing harm to our communities. The Intergovernmental Panel on Climate Change's Sixth Assessment Report confirms that these impacts are unequivocally caused by anthropogenic climate change and warns that they will intensify in the years ahead.[1] As average surface temperatures rise and extreme weather events become more frequent and severe, our States and Local Governments will continue to face direct and compounding challenges to protect the health and welfare of our residents, sustain our economies, and preserve our vital natural resources. Some of the most serious of these threats are summarized below.

Arizona

Arizona is facing significant challenges due to the accumulating negative effects of climate change. Over the last several decades, climate change has increased average and peak temperatures, intensified droughts, and contributed to longer and more severe wildfire seasons. As a result, the impacts of climate change are already jeopardizing the health, safety, and prosperity of Arizona's residents. While Arizona is preparing for these adverse effects, swift action to reduce greenhouse gas emissions is imperative to prevent these challenges from progressing beyond Arizona's adaptive capacity.[2]

Increased greenhouse gas emissions will exacerbate historic temperature increases.

Arizona temperatures have risen about 2.5 degrees Fahrenheit (°F) since 1900.[3] Portions of the state already experience extremely hot conditions, and summer temperatures can exceed 119°F.[4] Extreme heat is of particular concern for Phoenix and other urban areas due to the urban heat island effect that raises nighttime temperatures. In 2024, Phoenix experienced 70 days with temperatures at or above 110°F, and the city reached 100°F for 113 consecutive days.[5] Without a reduction of greenhouse gas emissions, the National Oceanic and Atmospheric Administration

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[1] Intergovernmental Panel on Climate Change (IPCC), Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change 1, 5 (2023), https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_SPM.pdf.

[2] Gregg Garfin et al., Assessment of Climate Change in the Southwest United States: A Report Prepared for the National Climate Assessment (2013), https://www.resolutionmineeis.us/sites/default/files/references/garfin-jardine-merideth-black-leroy-2013.pdf.

[3] Rebekah Frankson et al., Nat'l Oceanic & Atmospheric Admin. (NOAA), Nat'l Ctrs. for Env't Info., Arizona State Climate Summary (2022), https://statesummaries.ncics.org/chapter/az/.

[4] *Historical Extreme Temperatures in Phoenix and Yuma*, Nat'l Weather Serv., https://www.weather.gov/psr/ExtremeTemps (last visited Aug. 2, 2025) (reporting historical maximums of 122°F in Phoenix and 124°F in Yuma).

[5] *Id.*; Hayleigh Evans, *Arizona Weather Wrapped: A Broken Record of Broken Records in Phoenix During 2024,* AZ Central (Dec. 21, 2024), https://www.azcentral.com/story/news/local/arizona-weather/2024/12/21/phoenix-az-weather-breaks-records-2024/77089660007/.

predicts that average statewide temperatures will continue rising at an unprecedented rate, with potentially catastrophic consequences for Arizona's people, economy, and ecosystems.[6]

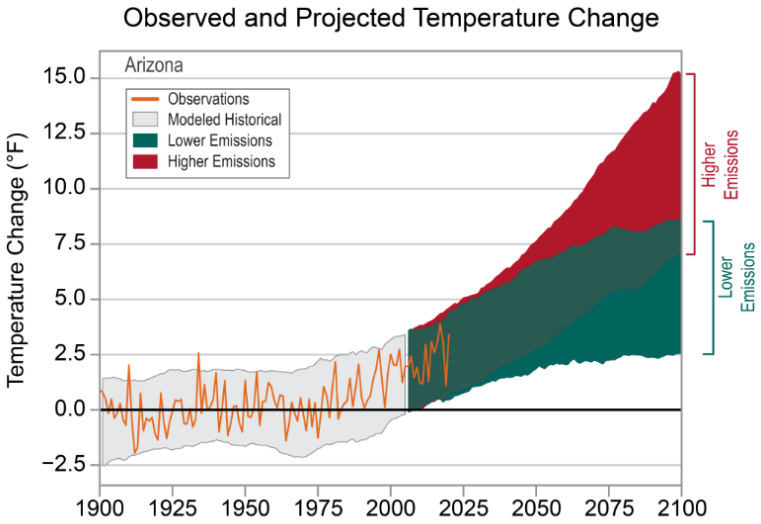


Figure 1 – Comparison of observed and projected temperature change in Arizona comparing lower versus high greenhouse emissions. Source: CISESS and NOAA NCEI

Extreme heat results in increased illnesses and fatalities and adversely impacts public health.

Increased temperatures pose the greatest risk to Arizona's most vulnerable populations, including its outdoor workers and elderly, young, disabled, and unhoused populations. Outdoor workers, especially those in the agricultural and construction industries, face a higher risk of heat-related illness and death. Extreme heat exposure is a leading cause of work-related deaths in the United States, responsible for 600 to 2,000 work fatalities annually.[7] The risk to outdoor workers from rising temperatures is expected to increase; by 2100, temperatures in the Phoenix metropolitan area could reach levels rendering outdoor working conditions unsafe for workers for nearly half of the year.[8]

While other states' heat-related deaths have doubled over the last twenty years, Arizona's heat-related deaths have increased *tenfold*.[9] Statewide, almost 1,000 people died in 2023 due, at

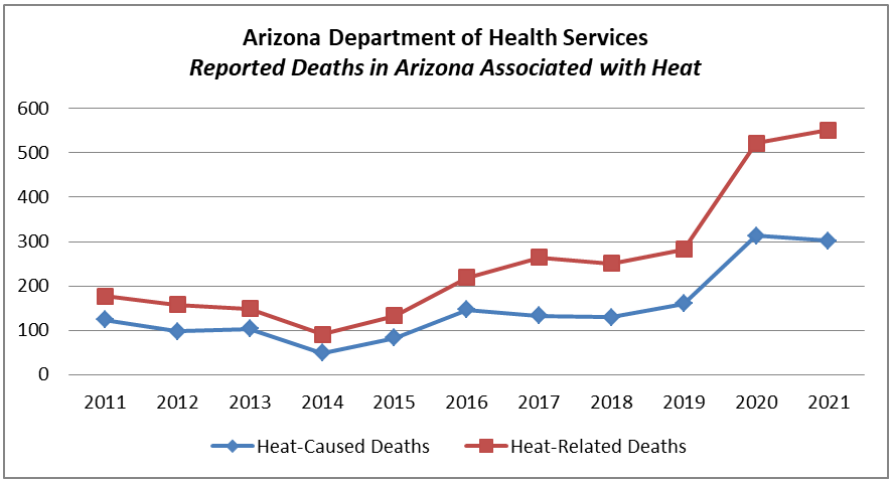
[6] Frankson et al., *supra* note 3.

[7] Juley Fulcher, Pub. Citizen, *Boiling Point: OSHA Must Act Immediately to Protect Workers from Deadly Temperatures* (June 28, 2022), https://www.citizen.org/article/boiling-point/.

[8] Press Release, Climate Analytics, Extreme Heat in Phoenix Could Make Outdoor Work 'Impossible' for Nearly Half the Year—New Data (July 11, 2024), https://climateanalytics.org/press-releases/extreme-heat-in-phoenix-could-make-outdoor-work-impossible-for-nearly-half-the-year-new-data.

[9] Slade Smith et al., Making Action Possible for S. Ariz., Why Has Arizona's Heat-Related Death Rate Increased Tenfold in Twenty Years? (2024), https://www.mapazdashboard.arizona.edu/sites/default/files/2024-08/Heat-

least in part, to extreme heat exposure.[10] According to the Arizona Department of Health Services (ADHS), there were at least 5,974 emergency room visits for heat-related illness in 2024.[11]



Climate change will also increase the frequency and intensity of heatwaves, leading to a rise in heat-related injuries and deaths, as well as increased cooling-related energy needs. Increased energy needs, in turn, will boost greenhouse gas emissions from fossil fuel-fired energy generating units and further accelerate planet-wide warming.[12] Greater indoor cooling needs will increase electricity bills, disproportionately affecting low-income households and placing the state's most vulnerable populations at heightened risks of heat-related illness and death if they cannot afford or access cool air. Arizona utilities are continuing to set new records for peak energy demand, which strains the electric power grid infrastructure as air temperatures continue to rise.[13] Should Arizona ever face a multi-day grid blackout event concurrently with

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Related%20Deaths%20White%20Paper.pdf; *see also* Ariz. Dep't of Health Serv. (ADHS), Heat-Caused and Heat-Related Deaths in Arizona by Year (2011–2021), https://www.azdhs.gov/documents/preparedness/epidemiology-disease-control/extreme-weather/pubs/heat-related-mortality-year.pdf.

[10] ADHS, Heat-Caused & Heat-Related Deaths from Exposure to Excessive Natural Heat in Arizona (2012–2023) at 2, https://www.azdhs.gov/documents/preparedness/epidemiology-disease-control/extreme-weather/pubs/heat-related-mortality-year-2012-2023.pdf.

[11] *Heat-Related Illness Dashboard*, ADHS, https://www.azdhs.gov/preparedness/epidemiology-disease-control/extreme-weather/heat-safety/index.php#heat-dashboard (last visited Aug. 2, 2025) (select "2024" from dropdown menu).

[12] Frankson et al., *supra* note 3.

[13] Nick Karmia, *Like SRP, APS Also Broke Peak Electricity Demand Record on 116-Degree Day*, KJZZ: Phoenix (Aug. 8, 2024), https://www.kjzz.org/kjzz-news/2024-08-08/like-srp-aps-also-broke-peak-electricity-demand-record-on-nearly-116-degree-day.

extreme heat conditions, more than half of the total population of Phoenix would require immediate medical attention as a result.[14]

As temperatures continue to rise due to climate change, state and local governments will need to expend greater resources to help the public seek relief from the heat. Arizona cities will need to expand cooling centers and hydration stations. For example, one library funded by the City of Phoenix will spend nearly $600,000 to create the first 24/7 cooling center accessible from May through September.[15] Private residences, businesses, and government agencies will pay even more in energy costs to cool buildings and for related services during heat waves. For instance, summer heatwaves have forced the Maricopa County Medical Examiner's Office to bring in coolers to cope with an overflow of bodies.[16]

Climate change causes other public health harms beyond heat-related illness. While air quality in Arizona has generally improved over the past few decades—largely due to federal regulations—higher temperatures associated with climate change could stymie this progress. Excessive sunlight and high air temperatures make criteria air pollutants such as ozone and particulate matter more difficult to control, which worsens public health and challenges state efforts to achieve and maintain National Ambient Air Quality Standards (NAAQS). Climate change is also increasing the frequency and intensity of wildfires, which release air pollutants, such as particulate matter, that are harmful to human health. Poor air quality increases the risk of heart and lung disease—while worsening existing cases—and increases healthcare costs.[17]

Intensified droughts will strain Arizona's already limited water resources.

Due to Arizona's arid and semi-arid climate, drought poses a serious threat to the state's public health, environment, and economy. Arizona has been in designated drought conditions since 1994, and annual statewide precipitation over the last 30 years is 8% below the long-term average.[18] The duration and severity have been amplified by anthropogenic climate change.[19]

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[14] Michael Levenson, *Heat Wave and Blackout Would Send Half of Phoenix to E.R., Study Says,* N.Y. Times (May 23, 2023), https://www.nytimes.com/2023/05/23/climate/blackout-heat-wave-danger.html.

[15] Katherine Davis-Young, *Phoenix's First 24/7 Cooling Center to Open in an Old Library Cafe After Deadly 2023 Heat,* KJZZ: Phoenix (Apr. 29, 2024), https://www.kjzz.org/2024-04-29/content-1878492-phoenixs-first-247-cooling-center-open-old-library-cafe-after-deadly-2023-heat.

[16] Fernando Cervantes Jr., *Maricopa County Medical Examiner's Office Brings in Coolers After Running Out of Room to Hold Bodies Amid Heatwave*, Ariz. Republic (July 27, 2023), https://www.azcentral.com/story/news/local/phoenix/2023/07/27/maricopa-county-medical-examiners-office-bring-in-coolers-heatwave/70480061007/.

[17] Ariz. State Univ. & ADHS, Arizona Extreme Weather, Climate and Health: Synthesis Report (2015), https://www.azdhs.gov/documents/preparedness/epidemiology-disease-control/extreme-weather/pubs/climate-and-health-profile-synthesis-report-2015.pdf.

[18] Ariz. Dep't of Water Res. (ADWR), Arizona Drought Preparedness Annual Report 4 (2023), https://www.azwater.gov/sites/default/files/2023-12/ADPAR_2023_FINAL.pdf.

[19] A. Park Williams et al., *Rapid Intensification of the Emerging Southwestern North American Megadrought in 2020–2021*, 12 Nature Climate Change 232 (2022).

Arizona's water supplies come from groundwater (41%), the Colorado River (36%), in-state rivers (18%), and reclaimed water (5%).[20] The depletion of the Colorado River and its reservoirs has already reduced Arizona's water allocation.

At higher elevations, snowpack plays a critical role in maintaining freshwater cycles, including supplying water for urban and agricultural areas in the state. Rising temperatures associated with climate change are already reducing snowpack and causing early snowmelt.[21] These impacts will decrease water resources needed for healthy streams and riparian areas and crop irrigation during the hot summer months. Even if precipitation does not decrease, higher temperatures will intensify droughts due to water loss through evaporation, further reducing streamflow, soil moisture, and water supplies.[22]

As this occurs, Arizona will need to steward its water resources more carefully to avoid unsustainable groundwater withdrawals. Increased groundwater pumping to support population growth in south-central Arizona, including in the Tucson and Phoenix areas, has already resulted in water table declines in much of the area.[23] Over-pumping of groundwater (that is, pumping faster than it can be replenished) has further negative effects, including the drying up of wells, the reduction of water in streams and lakes, the deterioration of groundwater quality and potable drinking water supplies, increased energy costs for pumping, and land subsidence.[24] Less and lower quality water will also increase water utilities' operating costs, which will be passed along to customers.

The risk of very large wildfires is likely to increase if greenhouse gas emissions are not reduced.

Wildfires are a natural occurrence across the Western United States, but climate change has adversely impacted natural ecological processes, increasing the size and intensity of wildfires.[25] During the 2020 wildfire season, one of the worst seasons in nearly a decade,

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[20] *Arizona's Water Supply*, Ariz. Water Facts, ADWR, https://www.arizonawaterfacts.com/water-your-facts (last visited Aug. 2, 2025).

[21] Philip W. Mote et al., *Declining Mountain Snowpack in Western North America*, 86 Bull. Am. Meteorological Soc'y 39 (2005), https://doi.org/10.1175/BAMS-86-1-39.

[22] Frankson et al., *supra* note 3.

[23] Courtney Lee et al., Water Res. Rsch. Ctr., Univ. Of Ariz., Solutions to Arizona's Water Challenges: What Can We Do? (2024), https://wrrc.arizona.edu/sites/default/files/2024-06/Arroyo-2024-Solutions-AZ-Water-Challenges.pdf.

[24] *Groundwater Decline and Depletion*, U.S. Geological Surv. (June 6, 2018), https://www.usgs.gov/special-topics/water-science-school/science/groundwater-decline-and-depletion.

[25] Stephanie E. Mueller et al., *Climate Relationships with Increasing Wildfire in the Southwestern US from 1984 to 2015*, 460 Forest Ecology & Mgmt. 117861 (2020), https://doi.org/10.1016/j.foreco.2019.117861.

978,519 acres of state, federal, and tribal lands were burned.[26] In 2024, 2,162 wildfires raged throughout Arizona, a 15% increase from the year before.[27] Hotter temperatures, longer dry seasons, and drier soils and vegetation will likely increase the duration of Arizona's fire season, as well as the size and severity of fires.[28]

These large, extreme fires are damaging Arizona's natural resources, including the beloved National and State Parks and Forests located within the state. Climate stress makes forest recovery highly uncertain, and post-fire recovery often leads to forest loss and conversion to alternative ecosystems.[29] Soils become hydrophobic after wildfires and lead to severe erosion, adversely impacting water quality.[30]

Wildfires also have devastating impacts on local communities. Wildfires damage or destroy private land and homes and pose a mortal risk to nearby residents. Firefighters' lives, too, are endangered as the fire season becomes more and more unmanageable. In addition, wildfire smoke contains toxic pollutants that can adversely affect those with breathing conditions like asthma, as well as the elderly and children.[31]

Climate change impacts everyone and every landscape. These impacts are particularly acute in Arizona, where rising global temperatures mean deadly heatwaves, droughts, and wildfires. Without swift action, the climate harms in Arizona will continue to worsen, becoming costlier and deadlier.

California

California is one of the most geographically and ecologically diverse regions in the world. Its landscapes range from chaparral and grasslands to sandy beaches and rugged coastal areas; from redwood rainforests and dense interior forests to snow-covered alpine mountains and dry desert valleys. Each region experiences unique impacts of climate change. From record

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[26] *2020 Wildfire Season one of the Worst in Decade*, Dep't of Forestry & Fire Mgmt. (Jan. 27, 2021), https://dffm.az.gov/2020-wildfire-season-one-worst-decade.

[27] Dep't of Forestry & Fire Mgmt., Wildland Fire Report (2024), https://dffm.az.gov/sites/default/files/media/2024%20Annual%20Report_FINAL.pdf.

[28] John T. Abatzoglou & A. Park Williams, *Impact of Anthropogenic Climate Change on Wildfire Across Western U.S. Forests*, 113 Proc. Nat'l Acad. Scis. 11777 (2016), https://doi.org/10.1073/pnas.1607171113.

[29] Donald A. Falk et al., *Mechanisms of Forest Resilience*, 512 Forest Ecology & Mgmt. 120129 (2022), https://repository.library.noaa.gov/view/noaa/66278.

[30] Anton L. Delgado, *Arizona Wildfires: Bigger, Hotter than Ever. How Will the Land Recover?*, Ariz. Republic (June 28, 2021, updated Dec. 26, 2023), https://www.azcentral.com/in-depth/news/local/arizona-environment/2021/06/28/arizona-wildfires-hotter-bigger-how-land-recover/7212038002/.

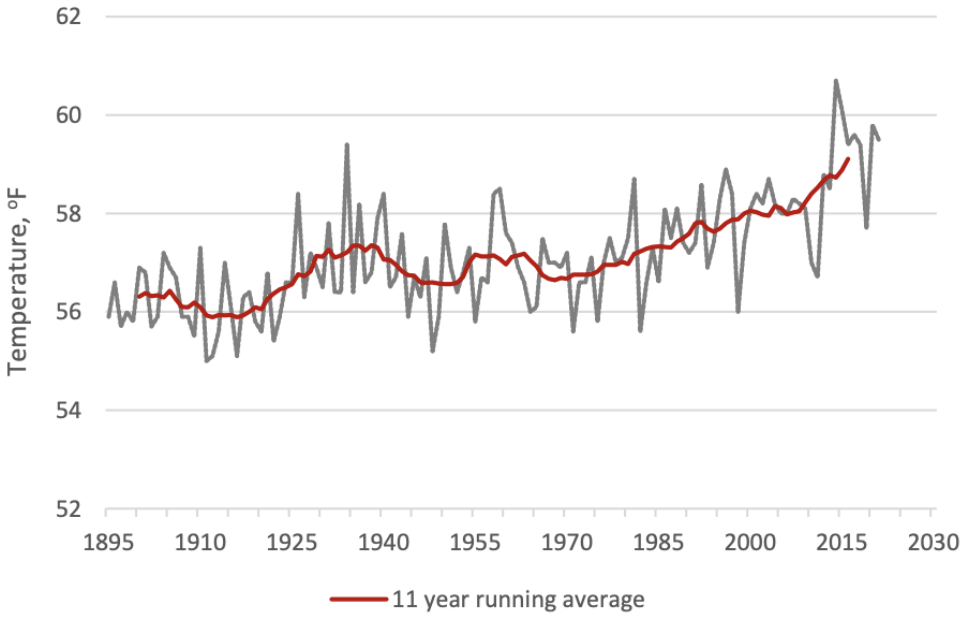
[31] ADHS, Health Effects of Smoke from Wildfires, https://www.azdhs.gov/documents/preparedness/epidemiology-disease-control/extreme-weather/wildfires/health-effects-wildfire-smoke.pdf (last visited Aug. 2, 2025).

temperatures to increasingly intense wildfires, rising sea levels, a less reliable snowpack, and increased megafloods, climate change poses an immediate and escalating threat to California's environment, public health, and economic vitality. Studies show that continued greenhouse gas emissions will cause impacts that are many times worse.

A. Rising Temperatures and Intensifying Heat Waves

Statewide annual mean temperatures have increased by about 2.5°F since 1895. Warming has accelerated; seven of the past eight years have been the warmest on record.[32] In the generally cooler, more moderate coastal areas where many millions of Californians live, heatwaves are becoming stronger and more dangerous.[33]

Figure 1: Statewide Annual Average Temperatures[34]



[32] *Air Temperatures*, Cal. Env't Prot. Agency, Off. of Env't Health Hazard Assessment (July 1, 2024), https://oehha.ca.gov/climate-change/epic-2022/changes-climate/air-temperatures; *Summary of Projected Climate Change Impacts on California*, Cal. Climate Adaption Strategy, https://perma.cc/5LXS-K8TL (last visited Apr. 14, 2025); Cal. Air Res. Bd., 2022 Scoping Plan for Achieving Carbon Neutrality at 172, https://ww2.arb.ca.gov/sites/default/files/2023-04/2022-sp.pdf [hereinafter 2022 CARB Scoping Plan].

[33] *FAQ: Climate Change in California*, U.C. San Diego, Scripps Inst. of Oceanography, https://scripps.ucsd.edu/research/climate-change-resources/faq-climate-change-california (last visited Aug. 2, 2025).

[34] Cal. Env't Prot. Agency, Off. of Env't Health Hazard Assessment, Indicators of Climate Change in California at III–3 (4th ed. 2022), https://oehha.ca.gov/media/downloads/climate-change/document/2022caindicatorsreport.pdf [hereinafter OEHHA Assessment].

As average temperatures have increased, so too have extreme heat events. Extreme heat is a leading cause of climate-related deaths in California, claiming more lives than wildfires.[35] In Northern California, a September 2022 heatwave set record-high temperatures in thousands of places across the state,[36] including in Sacramento, which reached 116°F.[37] Researchers described the 10-day duration of the heatwave as "mind-blowing,"[38] and the heatwave was connected with at least 395 deaths.[39] In September 2024, a heatwave in Southern California "raised daytime temperatures 10–20 degrees above normal for [that] time of year."[40] Downtown Los Angeles registered 111°F, tying a record set just two years prior.[41] In Long Beach, temperatures hit 109°F on September 6—a "new daily record that was 25 degrees hotter than normal for that day of the year."[42] According to some estimates, the number of patients visiting the ER with signs of heat-related illness was twice the number during the heatwave as it was on the day before the heatwave.[43]

Neither of these heatwaves was anomalous. Northern California has six more heatwaves a year than it did in the 1960s, and the duration of the area's heatwave season—the days separating the first and last heatwaves of the calendar year—has increased by upwards of 80 days.[44] In Southern California, heatwave season has increased, as well, by roughly a month.[45]

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[35] Levi Sumagaysay, *Hundreds of Deaths, Thousands of Injuries, Billions of Dollars: The Cost of Extreme Heat in California*, Cal. Matters (July 8, 2024), https://calmatters.org/economy/2024/07/extreme-heat-report-insurance/; *Climate Change Indicators: Heat-Related Deaths*, EPA, https://perma.cc/RT6H-9KV5 (data last updated June 2024) (finding that heat is a leading cause of deaths nationwide).

[36] Cal. Dep't of Pub. Health, Excess Morality During the September 2022 Heat Wave in California 4 (Aug. 2023), https://www.cdph.ca.gov/Programs/OHE/CDPH%20Document%20Library/Climate-Health-Equity/CDPH-2022-Heat-Wave-Excess-Mortality-Report.pdf.

[37] Jill Cowan, *Historic Heat Pushes California to the Brink*, N.Y. Times (Sept. 7, 2022), https://www.nytimes.com/2022/09/07/us/historic-heat-california-power.html.

[38] *Id.*

[39] Cal. Dep't of Pub. Health, Excess Mortality, *supra* note 36, at 3.

[40] Rebecca Lindsey, *Heat Wave in Southern California and the Southwest in Early September 2024*, Climate.gov (Sept. 13, 2024), https://perma.cc/AG9G-QKBU.

[41] Matthew Rodriguez, *Record-High Temperatures Set Through Los Angeles County Admit Heat Wave*, CBS News (Sept. 6, 2024), https://www.cbsnews.com/losangeles/news/record-high-temperatures-set-throughout-los-angeles-county-amid-heat-wave/.

[42] Lindsey, *supra* note 40.

[43] *Id.* (according to the "Spike in heat-related illness" figure, which concerns ER visits in Nevada, Arizona as well).

[44] *Heat Waves*, U.S. Glob. Change Rsch. Program, https://perma.cc/DV34-72MA (last visited Apr. 14, 2025).

[45] *Id.*

These heat events have presented serious health hazards. Between 2010 and 2019, there were an estimated 3,900 heat-related deaths in California.[46] A separate study found that the risk of death in Los Angeles County increased by 65.5% on days with extreme heat.[47] The September 2022 heatwave killed four times as many people as California's most lethal wildfire.[48] And even when the effects of heatwaves are sublethal, heatwaves exacerbate all manner of health conditions. For every additional day above 80 °F, there is an additional $10,600 in medical/ER costs for each 100,000 80-plus year olds.[49] And, even when the consequences of heat do not require immediate medical care, heatwaves still are a burden on the body; for example, heatwaves have cost the California billions of dollars in lost worker productivity, and other disruptions related to extreme heat events.[50] Seven extreme heat events in the state from 2013 to 2022 had a total economic impact of $7.7 billion in the form of lost wages and productivity, agricultural and manufacturing disruptions, power outages, infrastructure damage, and more.[51]

The effects of heat fall hardest on Californians who already suffer from racial, social, and economic inequities.[52] The urban "heat island" effect means that cities—full of asphalt, concrete and other heat-absorbent materials—have daytime temperatures that are on average 1° to 6°F warmer than rural areas, while nighttime temperatures can be as much as 22°F higher as the heat is gradually released from buildings and pavement.[53]

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[46] Anna M. Phillips et al., *Extreme Heat is One of the Deadliest Consequences of Climate Change*, L.A. Times (Oct. 7, 2021), https://www.latimes.com/projects/california-extreme-heat-deaths-show-climate-change-risks/.

[47] L. Baker & R. Sturm, *Mortality in Extreme Heat Events: An Analysis of Los Angeles County Medical Examiner Data*, 236 Pub. Health 290 (Nov. 2024), https://www.sciencedirect.com/science/article/pii/S0033350624003548?via%3Dihub.

[48] *Compare California Wildfires: Top 20 Deadliest California Wildfires*, Cal. Fire, https://www.fire.ca.gov/our-impact/statistics (last updated June 19, 2025), *with* Cal Dep't of Pub. Health, *Excess Mortality*, *supra* note 36, at 3.

[49] U.S. Glob. Change Rsch. Program, Fifth National Climate Assessment 19–7 (2023), https://repository.library.noaa.gov/view/noaa/61592.

[50] Sumagaysay, *supra* note 35; *see also* Gregory Casey et al., *Impact of U.S. Labor Productivity Losses from Extreme Heat*, Fed. Rsrv. Bank of S.F. (May 28, 2024), https://www.frbsf.org/research-and-insights/publications/economic-letter/2024/05/impact-of-us-labor-productivity-losses-from-extreme-heat/; Patrick Behrer, *The Heat Is On: How High Temperatures Are Impacting Workers and the Global Economy*, World Bank Blogs (July 17, 2023) https://blogs.worldbank.org/en/developmenttalk/heat-how-high-temperatures-are-impacting-workers-and-global-economy.

[51] *See* Sumagaysay, *supra* note 35; *see also* Josué Medellín-Azuara et al., *Economic Analysis of the 2016 California Drought on Agriculture*, Ctr. for Watershed Scis. Univ. of Cal., Davis 20 (2016), https://cawaterlibrary.net/wp-content/uploads/2019/08/DroughtReport_20160812.pdf.

[52] *See* Michelle Roos et al., State of Cal., California's Fourth Climate Change Assessment, Climate Justice Report 6–7 (2018), https://resourceslegacyfund.org/wp-content/uploads/2018/09/Climate-Justice-Report-4CCCA-v.4-00455673xA1C15.pdf.

[53] See *Heat Island Effect*, U.S. Env't Prot. Agency, https://perma.cc/XVU8-9BT6 (last updated April 3, 2025); *Understanding the Urban Heat Island Index*, Cal. Env't Prot. Agency,

Moreover, outdoor workers—in industries such as agriculture, construction, and delivery—suffer the brunt of heat-related fatalities.[54] Since 2005, when California began tracking heat-related fatalities, farmworkers have accounted for 36% of heat-related deaths among workers in California.[55] This is an inequity that is particularly consequential in the state, considering that the vast majority of California's hired crop workers are foreign-born,[56] and that California has roughly 15 times more people (171,620) working as farmworkers and in related roles than any other state.[57] Along the same lines, between 1992 and 2016, construction work accounted for 36% of heat-related deaths nationwide,[58] and California has 89,950 workers in the industry—second-most in the country.[59]

These figures reflect the toll of heat in California thus far. But further emissions of greenhouse gases will make heat events in California many times worse. Under the IPCC high greenhouse gas emissions scenario, referred to as the "business as usual scenario" (representing a future where greenhouse gas emissions continue to increase without significant mitigation efforts), California's average daily maximum temperature would rise 5.8°F by midcentury, and 8.8°F by late century.[60] By midcentury, California would see a 10- to 20-fold increase in the number of extremely hot days, and by end-of-century, a 20- to 30-fold increase.[61] In Los

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https://calepa.ca.gov/climate/urban-heat-island-index-for-california/understanding-the-urban-heat-island-index (last visited Aug. 2, 2025).

[54] *See, e.g.*, Fulcher, *supra* note 7; Union of Concerned Scis., Too Hot to Work: Assessing the Threats Climate Change Poses to Outdoor Workers 3 (2021), https://www.ucsusa.org/sites/default/files/2021-09/Too-Hot-to-Work_9-7.pdf; Ariel Wittenberg, *OSHA Targets Heat Threats Heightened by Climate Change*, E&E News: Greenwire (Oct. 26, 2021), https://www.eenews.net/articles/osha-targets-heath-threats-heightened-by-climate-change/.

[55] Teniope Adewumi-Gunn & Juanita Constible, Nat. Res. Def. Council, Feeling the Heat: How California's Workplace Heat Standards Can Inform Stronger Protections Nationwide (2022), https://www.nrdc.org/sites/default/files/feeling-heat-ca-workplace-heat-standards-report.pdf.

[56] *Findings from the National Agricultural Workers Survey (NAWS) 2015-2019: A Demographic and Employment Profile of California Farmworkers (Research Report No. 15)*, U.S. Dep't of Lab. (June 3, 2022), https://www.dol.gov/agencies/eta/research/publications/findings-national-agricultural-workers-survey-naws-2015-2019.

[57] *Occupational Employment and Wage Statistics*, U.S. Bureau of Lab. Stat., https://www.bls.gov/oes/2023/may/oes452092.htm (last updated Apr. 3, 2024).

[58] Xiuwen Sue Dong et al., *Heat-Related Deaths Among Construction Workers in the United States*, 62 Am. J. Indus. Med. 1047–57 (2019), https://pubmed.ncbi.nlm.nih.gov/31328819/.

[59] *Occupational Employment and Wages, May 2023, Construction Laborers*, U.S. Bureau of Lab. Stat., https://www.bls.gov/oes/2023/may/oes472061.htm (last updated Apr. 3, 2024).

[60] *See* Louise Bedsworth et al., State of Cal., California's Fourth Climate Change Assessment, Statewide Summary Report 23 (2019), https://www.energy.ca.gov/sites/default/files/2019-11/Statewide_Reports-SUM-CCCA4-2018-013_Statewide_Summary_Report_ADA.pdf; *see also id.* at 20 (defining RCP 8.5); Intergovernmental Panel on Climate Change, Summary for Policymakers (2019), https://www.ipcc.ch/site/assets/uploads/sites/3/2019/11/03_SROCC_SPM_FINAL.pdf (defining RCP 8.5).

[61] Dong et al., *supra* note 58.

Angeles, by end-of-century, the hottest day of the year would become 7–10°F warmer.[62] And at Los Angeles International Airport—sited right next to the Pacific Ocean—there would be *50-90* days above 90°F.[63] As for Northern California, the Bay Area's hottest day of the year would warm by 6.3°F on the coast, and by 10°F inland.[64] In Sacramento, which currently experiences four days a year above 103°F, further emissions would bring to the city 22 annual days above 103°F, and 40 days by end-of-century.[65] Coastal regions and central Los Angeles would experience three times more days with temperatures over 95°F, and the San Fernando and San Gabriel Valleys would also have extremely hot weather.

Rising temperatures threaten not only human health, but California's vital agricultural sector. Many of California's most important crops cannot grow absent a baseline number of nighttime hours under 45°F (so-called "chill hours"). Walnuts, for instance, are a crop in California valued at about a billion dollars a year,[66] and they "depend on synchronization between male and female flowering that is regulated by the number of chilling hours."[67] By the end of the century, as much as 90% of the Central Valley could lack enough chill hours for walnuts to grow.[68] On account of insufficient chill hours, California's apricot crop (an industry valued at $44 million in 2024)[69] and peach crop ($589 million)[70] would likewise become non-viable in 90% of the Central Valley by the end of the century.[71] Some crops—cherries, for instance, valued in California at $296 million last year—could become non-viable for lack of chill hours across the entire Central Valley as soon as 2040.[72]

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[62] Alex Hall et al., State of Cal., California's Fourth Climate Change Assessment, Los Angeles Region Report 6, 44 (2019), https://www.energy.ca.gov/sites/default/files/2019-11/Reg%20Report-%20SUM-CCCA4-2018-007%20LosAngeles_ADA.pdf.

[63] *Id.*

[64] *See* David Ackerly et al., State of Cal., California's Fourth Climate Change Assessment, San Francisco Bay Area Region Report 15 (2019), https://www.energy.ca.gov/sites/default/files/2019-11/Reg_Report-SUM-CCCA4-2018-005_SanFranciscoBayArea_ADA.pdf.

[65] *Extreme Heat Days & Warm Nights*, Cal-Adapt, https://cal-adapt.org/tools/extreme-heat/ (last visited Aug. 2, 2025) (set location to Sacramento and select "High RCP 8.5" scenario).

[66] *California, 2024 State Agriculture Overview*, U.S. Dep't of Agric., https://www.nass.usda.gov/Quick_Stats/Ag_Overview/stateOverview.php?state=CALIFORNIA (last visited Aug. 2, 2025) [hereinafter 2024 State Agriculture Overview].

[67] Tapan B. Pathak et al., *Climate Change Trends and Impacts on California Agriculture: A Detailed Review*, 8 Agronomy 1, 12 (2018), https://www.mdpi.com/2073-4395/8/3/25.

[68] *Id.* at 14.

[69] 2024 State Agriculture Overview, *supra* note 66.

[70] *Id.*

[71] Pathak et al., *supra* note 67, at 14.

[72] *Id.*

These problems are magnified in California because the state has, by a significant margin, the largest agricultural industry in the country.[73] Agriculture in California is a "$60 billion annual business."[74] As of 2023, the agricultural sector supported at least 407,000 jobs.[75] California "produces over half of the nation's specialty crops, including fruit, vegetables, nuts, flowers and nursery crops."[76] California produces effectively all of the nation's walnuts.[77]

B. Drought

Climate change has also brought severe and worsening drought to California. Between 2012 and 2015, California experienced its driest four-year stretch on record.[78] Between September 2019 and August 2022, California saw its driest three-year stretch on record.[79] According to UCLA researchers, the latter drought would have been "ordinary" had it not been for elevated levels "evaporative demand"—that is, heat, rather than lack of rain, was the principal reason for the drought's severity.[80] And, researchers have found, these unusually high rates of evaporative demand were attributable to climate change.[81]

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[73] *Farm Income and Wealth Statistics*, U.S. Dep't of Agric., https://data.ers.usda.gov/reports.aspx?ID=4058 (last updated Feb. 6, 2025).

[74] Elisabeth Bumiller, *Trump Fuels Fear, Rage and Hope in California's Central Valley*, N.Y. Times (July 10, 2025), https://www.nytimes.com/2025/07/10/us/politics/trump-farmers-california-central-valley.html.

[75] *Agricultural Employment in California*, Emp. Dev. Dep't of Cal., https://labormarketinfo.edd.ca.gov/data/ca-agriculture.html (last visited Aug. 2, 2025); *see also* Josué Medellín-Azuara et al., *Cultivating Climate Resilience in California Agriculture: Adaptions to an Increasingly Volatile Water Future*, PNAS (2024), https://www.pnas.org/doi/epub/10.1073/pnas.2310079121.

[76] California Climate Assessment, Statewide Summary Report, *supra* note 60, at 59.

[77] Cal. Dep't Food & Agric., 2022–2023 California Agricultural Statistics Review 9 (2024), https://www.cdfa.ca.gov/Statistics/PDFs/2022-2023_california_agricultural_statistics_review.pdf.

[78] Cal. Nat. Res. Agency, Report to the Legislature on the 2012–2016 Drought 3 (Mar. 2021), https://water.ca.gov/-/media/DWR-Website/Web-Pages/Water-Basics/Drought/Files/Publications-And-Reports/CNRA-Drought-Report-final-March-2021.pdf.

[79] *Climate at a Glance Statewide Time Series: California Precipitation*, NOAA: Nat'l Ctrs. For Env't Info., https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/statewide/time-series/4/pcp/36/8/1895-2022?base_prd=true&begbaseyear-1895&endbaseyear=2022 (last visited Aug. 2, 2025); *see also* Rachel Becker, *Four in a Row: California Drought Likely to Continue*, Cal. Matters (Sept. 28, 2022), https://calmatters.org/environment/2022/09/california-drought-likely-to-continue/; Cal. Env't Prot. Agency, Off. of Env't Health Hazard Assessment, Indicators of Climate Change in California 102 (May 2018), https://oehha.ca.gov/sites/default/files/media/downloads/climate-change/report/2018caindicatorsreportmay2018.pdf [hereinafter Indicators of Climate Change in California].

[80] Holly Ober, *Climate Change Parching the American West Even Without Rainfall Deficits*, UCLA Newsroom (Nov. 6, 2024), https://perma.cc/QM2Q-FK79.

[81] *Id.*

The magnitude and persistence of droughts are expected to increase,[82] and thus, constrained water resources will be among the most challenging effects of climate change on California agriculture. Indeed, droughts have enormous costs in California, in part because of the state's agricultural sector. The 2012–2016 drought left behind $10 billion of damages.[83] In 2016 alone, and just considering effects on agriculture, the drought cost the state $600 million, and 4,700 jobs.[84] During the subsequent drought, in 2021, farmers opted to fallow 400,000 acres of fields. Crop revenues declined by $962 million, and total economic impacts were on the order of $1.7 billion; the drought resulted in the losses of more than 14,000 full- and part-time jobs.[85]

Droughts also strain supplies of drinking water. During recent droughts, rural frontline communities in the San Joaquin Valley have turned to neighboring communities for bottled water, interim tanks, and buckets and barrels.[86] In 2015, more than 100 small water systems experienced drought-related shortages, and more than 2,000 domestic wells went dry.[87]

When surface water sources like rivers and lakes become scarce, communities, farms, and industries turn to groundwater as an alternative. This increased reliance can lead to pumping groundwater at unsustainable rates. Depleted groundwater reserves are the reason that "land in parts of the San Joaquin Valley [has sunk] by over one foot per year in many years since 2006."[88] Subsiding land destroys infrastructure and triggers the need for "multimillion-dollar repairs" to canals, roads, bridges and other infrastructure.[89] California has already spent hundreds of millions of dollars to mitigate these risks.[90]

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[82] *See, e.g.*, *Overview of Projected Change in the California Central Valley*, Cal. Climate Commons, http://climate.calcommons.org/article/central-valley-change (last visited Aug. 2, 2025).

[83] Jay Lund et al., *Lessons from California's 2012–2016 Drought*, J. of Water Res. Planning & Mgmt. (July 30, 2018), https://ascelibrary.org/doi/10.1061/%28ASCE%29WR.1943-5452.0000984.

[84] Medellín-Azuara et al., *supra* note 51, at 20.

[85] *Id*.

[86] *See* Angel Santiago Fernandez-Bou et al., State of Cal., California's Fourth Climate Change Assessment, San Joaquin Valley Regional Report 27 (2022), https://www.energy.ca.gov/sites/default/files/2022-01/CA4_CCA_SJ_Region_Eng_ada.pdf.

[87] OEHHA Assessment, *supra* note 34, at III-65.

[88] *Groundwater Pumping Drives Rapid Sinking in California*, Stan. Rep. (Nov. 19, 2024), https://news.stanford.edu/stories/2024/11/groundwater-pumping-drives-rapid-sinking-in-california; Alvar Escriva-Bou et al., *Sinking Lands, Damaged Infrastructure: Will Better Groundwater Management End Subsidence*, Pub. Pol'y Inst. of Cal. (May 14, 2020), https://www.ppic.org/blog/sinking-lands-damaged-infrastructure-will-better-groundwater-management-end-subsidence/.

[89] *Id.*

[90] Cal. Dep't of Water Res., Sustainable Groundwater Management Act (SGMA) (Aug. 2023), https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Sustainable-Groundwater-Management/Files/SGMA-Brochure_Online-Version_FINAL_updated.pdf.

Drought's effects are also felt on California's electricity grid. Drought reduces streamflow, depletes reservoirs, and accordingly makes hydropower less effective.[91] One study estimated the cost of lost hydropower generation in California during the 2012–2016 drought at $1.9 billion.[92]

All of these effects stand to worsen if emissions continue. By 2100, "the state and Southern California in particular [could become] 15 to 35% drier."[93] Recent projections show that the snowpack in the Sierra Nevada could decline to less than two-thirds of its historical average by 2050, and less than one-third by 2100.[94] California has already begun to prepare for the loss of 10% of its water supplies by 2040—preparation for which the state anticipates needing to spend upwards of $8 billion.[95]

C. Storms and Flooding

Climate change also puts California at risk of increasingly violent rainstorms. Most of the state's annual rainfall arrives as part of "atmospheric rivers"; these are long, narrow bands of water vapor formed over the Pacific Ocean.[96] California has always seen flooding as a result of atmospheric rivers.[97] But "higher temperatures drive increased atmospheric demand for moisture,"[98] and that means a warmer California would see atmospheric rivers that are 25% more intense,[99] and rates of maximum hourly rainfall that are 30% more intense.[100] At the same time, more precipitation will fall as rain, instead of snow—and that creates a "double whammy" of

[91] Jordan D. Kern et al., *A Retrospective Study of the 2012–2016 California Drought and Its Impacts on the Power Sector*, Env't Rsch. Letters (Aug. 18, 2020), https://iopscience.iop.org/article/10.1088/1748-9326/ab9db1.

[92] *Id.*

[93] Pathak et al., *supra* note 67, at 6.

[94] California Climate Assessment, Statewide Summary Report, *supra* note 60, at 27.

[95] Cal. Dep't of Water Res., California's Water Supply Strategy (2022), https://resources.ca.gov/-/media/CNRA-Website/Files/Initiatives/Water-Resilience/CA-Water-Supply-Strategy.pdf.

[96] California Climate Assessment, Statewide Summary Report, *supra* note 60, at 24.

[97] *Id.*; Xingying Huang et al., *Future Precipitation Increase from Very High Resolution Ensemble Downscaling of Extreme Atmospheric River Storms in California*, Sci. Advances (2020), https://www.science.org/doi/10.1126/sciadv.aba1323.

[98] U.S. Glob. Change Rsch. Program, Fifth National Climate Assessment, 4-18 (2023), https://repository.library.noaa.gov/view/noaa/61592.

[99] Huang et al., *Future Precipitation Increase*, *supra* note 97; California Climate Assessment, Statewide Summary Report, *supra* note 60, at 24.

[100] Xingying Huang et al., UCLA Inst. of Env't & Sustainability, The Future of Extreme Precipitation in California, (2020), https://www.ioes.ucla.edu/project/future-extreme-precipitation-california/.

heightened flood risk.[101] Researchers estimate that melting due to rain on snow produced extreme runoff, with snowmelt contributing between 25% and 50% of the total runoff.[102]

Reflecting these trends, studies show that California faces a sharply increasing risk of a "megaflood"—one on the scale of the Great Flood of 1861–1862. That flood was the product of a "multiweek sequence of consecutive severe winter storm events."[103] It left Los Angeles and Orange Counties underwater, and filled the Sacramento and San Joaquin Valleys with a "temporary but vast inland sea nearly 300 miles in length."[104] A flood on this scale—if one were to happen again today—would cause upwards of $1 trillion in damages.[105] And, strikingly, as a result of climate change, the odds of a megaflood in California have already at least "*doubled*."[106] If emissions increase in a "business-as-usual" scenario, the odds of a megaflood could increase more than seven-fold before the end of the century.[107]

These findings are consistent with prior work reporting progressively larger increases in projected extreme precipitation events for increasing event magnitudes. These studies represent notably large increases in the risk of California megastorm events due to climate change, as they transform an event that previously would have occurred once every two centuries into one that may occur approximately three times per century. Warmer air temperatures alter precipitation and runoff patterns, affecting the availability of freshwater supplies and increasing the risk of severe weather events. In addition to aggravating drought conditions, climate change increases the risk of a California megaflood. California's intense rainfall in early 2023 caused landslides and floods, leading to billions of dollars in damage and at least 20 deaths. Similarly, in early 2024, a powerful atmospheric river—a narrow but intense jet of Pacific Ocean moisture—resulted in landslides that destroyed homes and blocked roads, powerful winds, and power outages.[108]

Intensifying rainstorms do not offer a straightforward solution to California's droughts. Water managers must "deliberately leave some headroom in reservoirs, sometimes up to half

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[101] Xingying Huang et al., *Future Warming and Intensification of Precipitation Extremes: A "Double Whammy" Leading to Increasing Flood Risk in California*, Geophysical Rsch. Letters 47 (2020), https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2020GL088679.

[102] *Id.*

[103] Brian Henn et al., *Extreme Runoff Generation from Atmospheric River Driven Snowmelt During the 2017 Oroville Dam Spillways Incident*, 47 Geophysical Rsch. Letters (2020), https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2020GL088189.

[104] Xingying Huang & Daniel L. Swain, *Climate Change is Increasing the Risk of a California Megaflood*, Sci. Advances 1 (Aug. 2022), https://www.science.org/doi/10.1126/sciadv.abq0995.

[105] *Id.* at 10.

[106] *Id.*

[107] *Id.* at 8, 10; *see also* Huang et al., *Future of Extreme Precipitation in California*, *supra* note 100.

[108] *Climate Change Doubles Megaflood Risk in California*, Climate Adaptation Platform (Feb. 22, 2024), https://climateadaptationplatform.com/climate-change-doubles-megaflood-risk-in-california/.

their capacity" in order to account for increasing flood risks.[109] And the cost of building additional reservoir capacity runs in the billions.[110] For instance, in the Central Valley, the costs of infrastructure upgrades for flood control just through 2027 are estimated to be between $1.8 and $2.8 billion.[111] Separately, groundwater reserves can remain low even after serious rainstorms, on account of the fact that drought leads "soil deposits to dry out and compact . . . making it harder for them to absorb water."[112]

D. Wildfires

The effects of increasing drought, rising temperatures, and unusually powerful storms coincide in perhaps the most visible effect of climate change in California: devastating wildfire seasons. As temperatures rise, California will see extreme fires roughly 50% more often, and the average acreage that burns statewide can be expected to increase by 77%.[113] A recent study determined that the acres of California forest burned each summer between 1996 to 2021 was fivefold greater than the acres burned between 1971 to 1995, and researchers have also concluded that nearly all of the increase in burned area is due to anthropogenic climate change.[114]

These studies confirm what has been visible in the hills around many California communities for more than a decade: the state has experienced one record-breaking fire season after the next. The 2018 Camp Fire remains the deadliest and most destructive wildfire (in terms of lives lost, and structures destroyed) in California history.[115] In 2020, five of the top ten largest-ever California wildfires occurred; as a collective, they burned almost 2.5 million acres combined, contributing to the worst fire season in state history.[116] Then in 2021, a record number

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[109] Umair Irfan, *Why All that Rain in California Won't Solve Its Drought*, Vox (Mar. 10, 2023), https://www.vox.com/science-and-health/23553924/california-rain-atmospheric-river-drought-aquifer-reservoir.

[110] Jeffrey Mount, *Floods in California*, Pub. Pol'y Inst. of Cal. (Feb. 2024), https://www.ppic.org/publication/floods-in-california/.

[111] Cal. Nat. Res. Agency, Central Valley Flood Protection Plan: Update 2022 (Nov. 2022), https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Flood-Management/Flood-Planning-and-Studies/Central-Valley-Flood-Protection-Plan/Files/CVFPP-Updates/2022/Central_Valley_Flood_Protection_Plan_Update_2022_ADOPTED.pdf.

[112] Irfan, *supra* note 109.

[113] California Climate Assessment, Statewide Summary Report, *supra* note 60, at 9.

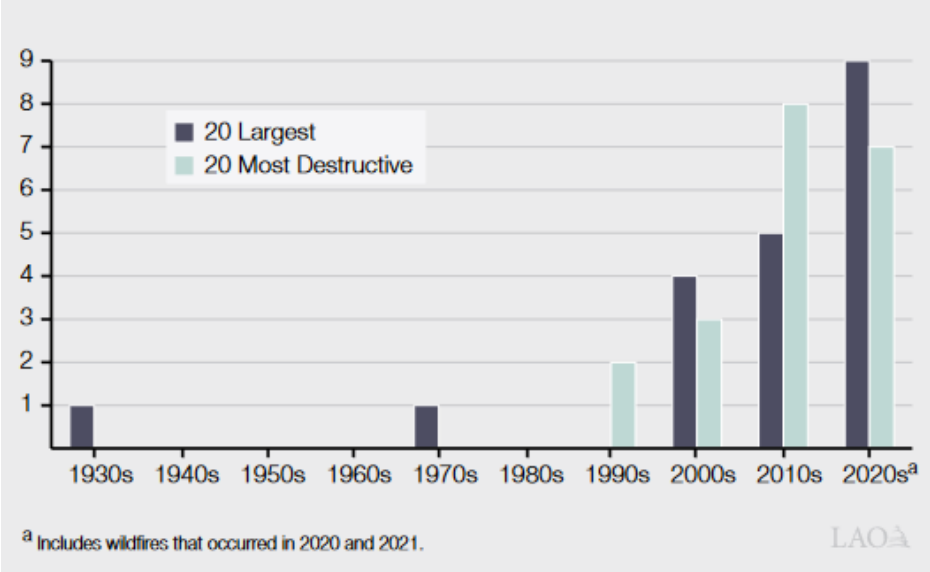
[114] Marco Turco et al., *Anthropogenic Climate Change Impacts Exacerbate Summer Forest Fires in California*, 120 Proc. of the Nat'l Acad. of Scis. 25 (2023), https://www.pnas.org/doi/10.1073/pnas.2213815120.

[115] *Remembering the Camp Fire*, Cal. Fire, https://www.fire.ca.gov/our-impact/remembering-the-camp-fire (last visited Aug. 2, 2025); 2022 CARB Scoping Plan, *supra* note 32, at 16.

[116] *Top 20 Largest Wildfires*, Cal. Fire, https://www.fire.ca.gov/our-impact/statistics (last visited Aug. 2, 2025).

of acres burned in the Sierra Nevada,[117] and the Dixie Fire became the second-largest wildfire in California history.[118]

Figure 2: Largest and Most Destructive Wildfires in California[119]



In dollar terms, the Palisades and Eaton Fires of 2025 inflicted more damage than the five previous fire seasons combined.[120] During several days in early January, Los Angeles County—with a population approaching 10 million people—was "encircled by fire,"[121] a "monster inferno."[122] Eyewitnesses described "neighbourhood after neighbourhood of just sheer gutting: houses upon houses, cars upon cars, businesses upon businesses [destroyed]. Not even Katrina,

[117] *2021: Another Historic Sierra Nevada Fire Season*, Sierra Nevada Conservancy (Jan. 24, 2022), https://sierranevada.ca.gov/2021-another-historic-sierra-nevada-fire-season/.

[118] *Id.*

[119] Cal. Legislative Analyst's Off., The 2022-23 Budget: Wildfire and Forest Resilience Package 2 (2022), https://www.lao.ca.gov/reports/2022/4495/wildfire-forest-resilience-012622.pdf.

[120] *California Summary: Billion-Dollar Weather and Climate Disasters*, NOAA: Nat'l Ctrs. for Env't Info., https://perma.cc/K5EM-4AUV (last visited Apr. 14, 2025).

[121] Carol Mimbs Nyce, *Waking Up to Fire in Los Angeles*, New Yorker (Jan. 8, 2025), https://www.newyorker.com/newsletter/the-daily/waking-up-to-los-angeles-on-fire?_sp=6a9f4a18-30fc-468d-8728-a04c0cb6b758.1744655221942.

[122] Jude Sheerin & John Sudworth, *LA Firefighters Battle to Contain Monster Inferno as Death Toll Rises*, BBC News (Jan. 11, 2025), https://www.bbc.com/news/articles/c897l7wyzj5o.

to me, looked like this."[123] The fires killed at least 30 people.[124] They destroyed at least 16,251 structures,[125] and caused "between $76 billion and $131 billion" in capital losses and property damages.[126] Los Angeles County's GDP is expected to contract by 0.48%,[127] or $4.6 billion. The fires have left behind a "toxic soup" of carcinogens in surrounding soil and air.[128]

The conditions in Southern California making these fires possible bore the hallmarks of climate change. In the two years prior to the 2024–2025 fire season, Southern California experienced "very wet" rainy seasons, which led to significantly increased plant growth.[129] Then, in the summer-fall immediately before the Palisades and Eaton fires, the region's climate turned unusually hot and dry; the area saw the hottest summer-fall since 1895, and a subsequent rainy season that was the second driest.[130] On January 7, 2025, the day the fires started, the sequence of heavy rains and scorching, dry heat had left hills full of vegetation that, according to the "dead-fuel moisture" index, was the sixth driest on record.[131]

Fires in the state place enormous numbers of lives and individual properties at risk. California has more residents in census tracts labelled by FEMA as "Very High" risk for wildfire (4.2 million) than do the next two states combined.[132] But California's wildfires have other devastating effects as well; also at risk are electrical transmission and distribution assets in Northern California, where critical power lines cross highly fire-prone areas.[133] The most severe

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[123] Greg Cochrane, *Reporting from Inside the Inferno*, Reuters Inst. (Feb. 7, 2025), https://reutersinstitute.politics.ox.ac.uk/news/reporting-inside-inferno-three-journalists-reflect-how-they-covered-los-angeles-deadly.

[124] Dani Anguiano, *LA Wildfires Death Toll Climbs to 30 After Officials Find More Human Remains*, Guardian (Apr. 3, 2025), https://www.theguardian.com/us-news/2025/apr/03/los-angeles-wildfires-death-toll.

[125] *Top 20 Most Destructive California Wildfires*, Cal. Fire, https://34c031f8-c9fd-4018-8c5a-4159cdff6b0d-cdn-endpoint.azureedge.net/-/media/calfire-website/our-impact/fire-statistics/top20_destruction.pdf?rev=adaea8332a014a7ebf11dc6fdb3f8e98&hash=EA9A8C492BD9FBAA0FB67C2FEA3FF52E (last visited Aug. 2, 2025).

[126] Zhiyun Li, *Economic Impact of the Los Angeles Wildfires*, UCLA Anderson Sch. of Mgmt. (March 3, 2025), https://www.anderson.ucla.edu/about/centers/ucla-anderson-forecast/economic-impact-los-angeles-wildfires.

[127] *Id.*

[128] Brendan Borrell, *After Wildfires, L.A.'s Clear Skies Conceal a 'Toxic Soup,'* N.Y. Times (March 12, 2025), https://www.nytimes.com/2025/03/12/well/los-angeles-fires-health.html.

[129] Gavin Madakumbura et al., *Climate Change a Factor in Unprecedented LA Fires*, UCLA Sustainability (Jan. 13, 2025), https://sustainablela.ucla.edu/2025lawildfires.

[130] *Id.*

[131] *Id.*

[132] *National Risk Index*, Fed. Emergency Mgmt. Agency, https://hazards.fema.gov/nri/data-resources#csvDownload (last visited Aug. 2, 2025),

[133] Larry Dale et al., Assessing the Impact of Wildfires on the California Electricity Grid iv (2018), https://www.energy.ca.gov/sites/default/files/2019-11/Energy_CCCA4-CEC-2018-002_ADA.pdf.

air pollution events in recent California history have all been associated with extreme wildfires, exposing millions of residents to unhealthy levels of combustion gases, primary particulate matter (PM) and secondary reaction products. Particulate matter produced by wildfires is hazardous to human health (primarily through smoke inhalation, which can cause respiratory and cardiovascular issues, and increase the risk of premature death),[134] and it is disruptive to daily activities.[135] In 2018, air-quality impacts caused by wildfires forced the cancelation of classes for 1.1 million students across California.[136] Cumulative exposure to such polluted air has been shown to reduce test scores, which in turn leads to reduced future earnings.[137] Researchers from Stanford University estimated California wildfire smoke likely led to at least 1,200 and as many as 3,000 excess deaths in California between August 1 and September 10, 2020.[138]

Community health impacts and resilience to increased wildfire risk are an important concern for the state. This concern is elevated for people living in the wildland-urban interface (WUI)—the transitional zone between unoccupied/undeveloped land and human development. In the WUI, human-made structures and objects are often destroyed, releasing diverse and understudied air toxics and reactive chemicals into the atmosphere. Wildfire smoke is often transported to local and regional population centers, degrading air quality and exacerbating exposure to harmful air pollutants.[139]

The threat and actual damage brought about by fires imposes enormous direct financial costs on the state itself as well. California has wildfire-protection responsibilities for about 40% (over 31 million acres) of California's wildlands (approximately 79 million acres).[140] The state is having to spend billions of dollars annually for wildfire prevention.[141] In the 2020–2021 fiscal year, the state budgeted $373 million for the emergency fire fund, but spent over $1.3 billion

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[134] Michael B. Hadley et al., *Protecting Cardiovascular Health from Wildfire Smoke*, 146 Circulation 788 (2022), https://www.ahajournals.org/doi/10.1161/CIRCULATIONAHA.121.058058.

[135] Daniel J. Jacob & Darrel A Winner, *Effect of Climate Change on Air Quality*, 43 Atmospheric Env't 51, 60 (2009), https://www.sciencedirect.com/science/article/abs/pii/S1352231008008571.

[136] Ricardo Cano, *School Closures from California Wildfires This Week Have Kept More than a Million Kids Home*, Cal. Matters (Nov. 15, 2018), https://calmatters.org/environment/2018/11/school-closures-california-wildfires-1-million-students/.

[137] Jeff Wen & Marshall Burke, *Lower Test Scores from Wildfire Smoke Exposure*, 5 Nature Sustainability 947, 951–52 (2022), https://www.nature.com/articles/s41893-022-00956-y.

[138] Alan Buis, *The Climate Connections of a Record Fire Year in the U.S. West*, NASA (Feb. 22, 2021), https://climate.nasa.gov/explore/ask-nasa-climate/3066/the-climate-connections-of-a-record-fire-year-in-the-us-west/.

[139] Minghao Qiu et al., *The Rising Threats of Wildland-Urban Interface Fires in the Era of Climate Change: The Los Angeles 2025 Fires*, 6 Innovation 100835 (2025), https://www.sciencedirect.com/science/article/pii/S2666675825000384.

[140] *California Department of Forestry and Fire Protection*, Cal. Fire., https://www.fire.ca.gov/#:~:text=Preventing%20wildfires%20in%20the%20State,planning%2C%20education%20and%20law%20enforcement (last visited Aug. 2, 2025).

[141] *State Wildfire Response Costs Estimated to Be Higher than Budgeted*, Cal. Legislative Analyst's Off. (Oct. 19, 2020), https://lao.ca.gov/publications/report/4285.

from the emergency fund during the 2020 Fire Siege.[142] And the Governor's Wildfire and Forest Resilience Action Plan has committed more than $2.8 billion to its work.[143]

E. Sea Level Rise and Coastlines

Rising sea levels due to global warming are a major threat to California's coastal areas, leading to increased flooding, inundation, and erosion of cliffs, bluffs, dunes, and beaches. This phenomenon significantly impacts coastal land, infrastructure, and development along the state's coastline. In an "intermediate" emissions scenario, California can expect more than 3 feet of sea level rise.[144] And in a more severe emissions scenario, California can expect as much as 6 feet of sea level rise.[145] Absent mitigation, California could lose "approximately 24 to 75% of [its] sandy beaches,"[146] much of which land is held by the state in the public trust.[147] Even land that remains above the new median sea level could become uninhabitable. As sea levels rise, there is "an exponential increase in the frequency of coastal flooding events"; the frequency "doubl[es] with approximately every 2–4 inches of sea level rise."[148] Accordingly, "[t]oday's once-in-a-lifetime coastal flood could occur annually by 2050 and daily by 2100."[149]

The impacts on the state would be severe: "700,000 California residents and $250 billion in property" would be at risk in these storms.[150] California has approximately 1,100 miles of coastline; California's 19 coastal counties are home to 68% of its people, 80% of its wages, and

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[142] *Id.*

[143] *Governor Newsom Signs State Budget Bill*, Cal. Wildfire & Forest Resilience Task Force, https://wildfiretaskforce.org/governor-newsom-signs-state-budget-bill/ (last visited Aug. 2, 2025).

[144] Cal. Ocean Prot. Council & Cal. Ocean Sci. Trust, State of California Sea Level Rise Guidance: 2024 Science and Policy Update 6, 36 (2024), https://opc.ca.gov/wp-content/uploads/2024/05/California-Sea-Level-Rise-Guidance-2024-508.pdf [hereinafter Sea Level Rise Guidance: 2024 Science and Policy Update].

[145] *Id.* at 6.

[146] *Id.* at 38; *Summary of Projected Climate Change Impacts on California*, Cal. Climate Adaption Strategy, https://perma.cc/5LXS-K8TL (last visited Apr. 14 2025); Sean Vitousek et al., *Can Beaches Survive Climate Change?*, 122 J. Geophysical Rsch: Earth Surface 1060 (2017), https://agupubs.onlinelibrary.wiley.com/doi/full/10.1002/2017JF004308.

[147] *See, e.g.*, *People ex inf. Webb v. Cal. Fish Co.*, 166 Cal. 576, 584 (1913).

[148] Sea Level Rise Guidance: 2024 Science and Policy Update, *supra* note 144, at 40; *see also* Sean Vitousek et al., *Doubling of Coastal Flooding Frequency within Decades Due to Sea-Level Rise*, 7 Sci. Reps. 1399 (2017), https://www.nature.com/articles/s41598-017-01362-7.

[149] Sea Level Rise Guidance: 2024 Science and Policy Update, *supra* note 144, at 40.

[150] *Id.* at 53; Gary Griggs et al., Cal. Ocean Prot. Council, Sci. Advisory Team Working Grp., Rising Seas in California: An Update on Sea-Level Rise Science 12 (Apr. 2017), https://www.opc.ca.gov/webmaster/ftp/pdf/docs/rising-seas-in-california-an-update-on-sea-level-rise-science.pdf.

80% of its GDP.[151] 77% of surveyed Californians visit the coast at least once a year.[152] California has millions more people living in coastal counties than any other state.[153]

Moreover, the state parks system manages 340 miles of Pacific Ocean shoreline.[154] In the event of six feet of sea level rise, and a 100-year storm, the California Department of Parks and Recreation expects to lose "593 structures, 150 acres of parking lots, 93 campgrounds and day-use areas, and 65 miles of access roads."[155]

Rising sea levels also compound the effects of drought. As oceans rise, saltwater intrudes in groundwater reserves, leading groundwater to become "unusable for drinking and agriculture."[156] Saltwater has already intruded "as far as eight miles inland into the Salinas Valley, America's salad bowl."[157]

F. Natural Ecosystems

Climate change is significantly impacting California's natural ecosystems, leading to disruptions in temperature, precipitation patterns, and water availability, which in turn affects biodiversity, habitats, and the state's overall ecological balance. California's ecosystems—in addition to providing "ecosystems services" equivalent to hundreds of millions of dollars[158]—are globally exceptional. "Of the estimated 5,500 plant species found in California, 40 percent are found nowhere else on Earth."[159] But California ranks as one of 25 global diversity hotspots,

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[151] Jennifer Phillips et al., State of Cal., California's Fourth Climate Change Assessment, Coast and Ocean Summary Rep. 12 (2018), https://www.energy.ca.gov/sites/default/files/2019-11/Statewide_Reports-SUM-CCCA4-2018-011_OceanCoastSummary_ADA.pdf [hereinafter California Climate Assessment: Oceans]; *see also Gross State Product*, Cal. Dep't of Fin., https://dof.ca.gov/forecasting/economics/economic-indicators/gross-state-product/ (defining "gross state product" as the value of all goods and services produced in California) (last visited Aug. 2, 2025).

[152] California Climate Assessment: Oceans, *supra* note 151, at 13.

[153] *Economics and Demographics*, NOAA: Off. for Coastal Mgmt., https://coast.noaa.gov/states/fastfacts/economics-and-demographics.html (last updated July 15, 2025).

[154] California Climate Assessment: Oceans, *supra* note 151, at 13.

[155] Cal. State Parks, *Sea Level Rise Adaption Strategy* (2020), https://www.parks.ca.gov/pages/734/files/StateParks_SLR_Strategy.pdf.

[156] Sea Level Rise Guidance: 2024 Science and Policy Update, *supra* note 144, at 44.

[157] California Climate Assessment: Oceans, *supra* note 151, at 13, 46.

[158] Cal. Air. Res. Bd., Ecosystem Service Benefits of Projects Funded by California Climate Investments 11–12 (June 2023), https://ww2.arb.ca.gov/sites/default/files/auction-proceeds/ccidoc/IEc%20Final%20Report_CCI%20ES%20Benefits_2023Sept27.pdf.

[159] *Protecting Biodiversity*, Cal Nat. Res. Agency, https://resources.ca.gov/Initiatives/Protecting-Biodiversity (last visited Aug. 2, 2025).

reflecting the unique threat climate change poses to the state.[160] California has "the most imperiled biodiversity of any state in the contiguous United States."[161]

As temperatures warm, many species in California may not adapt, or may adapt out of sync with the other species on which they have evolved to depend.[162] Butterflies in California, for instance, have evolved to emerge each spring at the same time as their host plants flower.[163] But butterflies are now emerging earlier in the spring, and if host plants do not "adapt at the same rate," butterfly populations will suffer.[164] Similar dynamics are playing out across California's ecosystems.

In California's forests, "as winter temperatures rise," bark beetle "populations have burgeoned to create unprecedented tree die offs." [165] In some parts of the Sierra Nevada, "tree mortality is nearly 100 percent."[166] California is at risk of losing 12%—over 5.7 million acres—of the total area of forests and woodlands in the state due to insects and disease thriving in a hotter climate.[167] California's forests also face the risk of climate-change fueled fires. The CZU Lightning Complex Fire effectively destroyed the state's oldest state park and the surrounding forest of coastal redwoods.[168]

Warming temperatures facilitate the spread of other pests and diseases. California has seen "record-breaking" incidence of Valley fever, a dust-borne fungal disease that benefits from longer dry spells.[169] In 2024, Southern California saw an unprecedented number of cases of the

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[160] Norman Myers et al., *Biodiversity Hotspots for Conservation Priorities*, 403 Nature 853 (2000), https://www.nature.com/articles/35002501; *see also Science: California Biodiversity*, Cal. Dep't Fish & Wildlife, https://wildlife.ca.gov/Science-Institute/Biodiversity (last visited Aug. 2, 2025) (California has "more species of plants and animals than any other state in the nation.").

[161] Catrin Einhorn & Nadja Popovich, *This Map Shows Where Biodiversity is Most at Risk in America*, N.Y. Times (Mar. 3, 2022), https://www.nytimes.com/interactive/2022/03/03/climate/biodiversity-map.html?fbclid=IwAR1WKpKHabydsk0Uj7o7_qVL_b6qnovKlh3hqxHYWUrzZSW9w3rhhRBzg_k.

[162] California Climate Assessment, Statewide Summary Report, *supra* note 60, at 61.

[163] *Id.*

[164] *Id.*

[165] *Id.*

[166] *Id.*

[167] *See* Cal. Air Res. Bd., California's 2017 Climate Change Scoping Plan Update: The Strategy for Achieving California's 2030 Greenhouse Gas Target 7 (Nov. 2017), https://www.arb.ca.gov/cc/scopingplan/scoping_plan_2017.pdf.

[168] *See* Christopher Potter, *Impacts of the CZU Lightning Complex Fire of August 2020 on the Forests of Big Basin Redwoods State Park*, Cal. Fish & Wildlife Sci. J. (Apr. 12, 2023), https://journal.wildlife.ca.gov/2023/04/12/impacts-of-the-czu-lightning-complex-fire-of-august-2020-on-the-forests-of-big-basin-redwoods-state-park/.

[169] Press Release, Berkeley Pub. Health, Study: Longer, Drier Summers Extend Valley Fever Transmission in California (Mar. 3, 2025),

tropical disease, Dengue, a trend driven in part by the lessening of "chillier temperatures that [once] quelled" mosquito populations.[170] And, according to a recent study, the risk of emergency visits for hand, foot and mouth disease has increased in California by an estimated 2% for every 1 °F increase in weekly mean temperature.[171]

In California's oceans, rising temperatures have spurred harmful algal blooms.[172] A common byproduct of these blooms is domoic acid, which can be fatal to mammals ingesting it. In August 2022, elevated levels of this acid spread along the coast of Southern California.[173] Over 400 sea lions and seals were found stranded with apparent poisoning.[174] Increasing concentrations of carbon dioxide in the atmosphere also causes ocean acidification—a trend that is "predicted to occur especially rapidly along the West Coast"[175]—and that, in turn, changes behavior and physiology of marine life. For instance, the Dungeness crab—a species supporting one of California's most valuable fisheries, assessed at $45.3 million per year—is "[h]ighly [v]ulnerable" to climate change, and especially the effects of ocean acidification.[176]

Changes in the ocean also can have cascading indirect effects on land. Traditional wind patterns off California's coasts have begun to shift course, such that northern areas no longer see as regular "coastal fog" during the spring and summer.[177] These changes harm coastal redwoods, which have evolved to "depend on coastal fog."[178]

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https://publichealth.berkeley.edu/articles/spotlight/research/longer-drier-summers-extend-valley-fever-transmission.

[170] Alejandra Borunda, *Dengue Fever is Rare in L.A. That Could Start to Change Because of Climate Change*, Nat'l Pub. Radio (Oct. 22, 2024), https://www.npr.org/2024/10/22/nx-s1-5155035/climate-change-dengue-fever-los-angeles-mosquitos.

[171] Dharshani Pearson et al., *Temperature and Hand, Foot, and Mouth Disease in California*, 185 Env't Rsch. 109461 (2023), https://pubmed.ncbi.nlm.nih.gov/32278924/.

[172] California Climate Assessment, Statewide Summary Report, *supra* note 60, at 66; S. Morgaine McKibben et al., *Climatic Regulation of the Neurotoxin Domoic Acid*, 114 PNAS 239, 240 (2007), https://www.pnas.org/doi/10.1073/pnas.1606798114.

[173] *See C-Harm: Predicting Harmful Algal Blooms with Satellite Data*, NOAA: Coast Watch https://perma.cc/M77Q-T49R (last visited Aug. 2, 2025).

[174] *Id.*

[175] California Climate Assessment, Statewide Summary Report, *supra* note 60, at 66.

[176] Timothy Frawley et al., *A Collaborative Climate Vulnerability Assessment of California Marine Fishery Species*, PLOS Climate 1, 18 (Feb. 12, 2025), https://journals.plos.org/climate/article?id=10.1371/journal.pclm.0000574.

[177] California Climate Assessment, Statewide Summary Report, *supra* note 60, at 67

[178] *Id.*

And, on land, a vast majority (82%) of California's native freshwater fish are "highly vulnerable" to the effects of climate change.[179] Among threatened and endangered birds in California, the "majority (72%) . . . are vulnerable to climate change."[180] 45–56% of California's vegetation become climatically at risk by 2100 if emissions continue in the business-as-usual scenario.[181]

Climate change significantly impacts California's ecosystems, affecting biodiversity and potentially reducing the state's capacity to mitigate global warming. Changes in temperature and precipitation patterns are altering habitats, increasing the risk of wildfires, and leading to species shifts and extinctions. These impacts can also reduce the ability of ecosystems to store carbon, hindering efforts to reduce greenhouse gas emissions. Hence, California's ecosystems, with their rich biodiversity, play a crucial role in mitigating climate change by naturally sequestering carbon dioxide. Diverse habitats, including forests, shrublands, grasslands, and deserts, act as significant carbon sinks, absorbing more carbon than they release. California's efforts to protect and restore these ecosystems, alongside other nature-based solutions, are vital for achieving the state's climate goals.

G. Harms to Vulnerable Communities

Climate change disproportionately impacts vulnerable communities in California, exacerbating existing environmental injustices. Environmental injustice refers to the inequitable exposure of marginalized populations to environmental hazards and associated health risks. These communities often face higher exposure to pollution, extreme heat, and other climate-related hazards due to historical and ongoing discriminatory land use and development practices. Evidence is emerging that some of the projected impacts of climate change on human health and well-being are already occurring. Higher temperatures associated with climate change contribute to increased smog and fine particulate matter, exacerbating respiratory illnesses like asthma, already prevalent in environmentally burdened areas. Vulnerable populations also experience greater risks from extreme heat, wildfires and smoke, vector-borne diseases, and mental health challenges related to climate events.

Climate change exacerbates environmental injustice. As discussed above, frontline communities tend to hold jobs that force more exposure to extreme heat—such as agriculture.[182]

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[179] Peter B. Moyle et al., *Climate Change Vulnerability of Native and Alien Freshwater Fishes of California: A Systematic Assessment Approach*, PLOS One 1 (2013), https://doi.org/10.1371/journal.pone.0063883.

[180] Thomas Gardali, *A Climate Change Vulnerability Assessment of California's At-Risk Birds*, PLOS One 11 (Mar. 2, 2012), https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0029507.

[181] California Climate Assessment, Statewide Summary Report, *supra* note 60, at 61.

[182] *See, e.g.*, Fulcher, *supra* note 7; Union of Concerned Scis., *supra* note 54, at 3; Wittenberg, *supra* note 54.

Tribes also face the threat of losing cultural resources of immeasurable value.[183] These cultural resources are critical to tribal community identity and group cohesion, which translates into direct health benefits.[184] Moreover, degradation of these cultural resources threatens traditional ecological knowledge, such as particularized understanding of local ecosystems, agriculture, and sustainable practices, that can help limit the impacts of climate change.[185]

Climate change is an environmental justice problem as well in that it inflicts harms that are harder for already disadvantaged communities to redress. Environmental justice communities have less access to wealth and capital.[186] That makes it harder to move, if necessary, and to foot many bills associated with climate change, including: buying air conditioning, buying insurance, paying higher energy prices, and paying for medical care.[187] These communities may also have reduced access to important resources offered by state or local governments, due to language barriers, for instance.[188] Social capital in the political process is critical to ensure environmental justice communities receive resources to increase climate resilience and to prevent further entrenching existing inequities.

California has enacted laws and programs to address environmental justice and climate change. These include laws directing funding to environmental justice communities, creating community air quality protection programs, and incorporating environmental justice into local land use planning. Additionally, the state is implementing climate action plans that aim to reduce greenhouse gas emissions and promote adaptation strategies. However, the effectiveness of these efforts in mitigating the disproportionate impacts on vulnerable communities remains a key concern.

Colorado

Climate change is already having dire effects on the State of Colorado and its residents. Extreme heat, droughts, wildfires, and flooding have dramatically impacted Colorado's public

[183] Ron Goode et al., State of Cal., California's Fourth Climate Change Assessment, Summary Report from Tribal and Indigenous Communities within California 19 (2018), https://www.energy.ca.gov/sites/default/files/2019-11/Statewide_Reports-SUM-CCCA4-2018-010_TribalCommunitySummary_ADA.pdf.

[184] *Id.*

[185] *Id.* at 13–16.

[186] *See, e.g.*, California Climate Assessment, Statewide Summary Report, *supra* note 60, at 35–36.

[187] *See id.* at 37.

[188] Cami Ferrell, *How Language Barriers Worsen Environmental Justice*, Env't Health News (Nov. 8, 2023), https://www.ehn.org/language-justice.

health and economy.[189] These effects are disproportionately harming vulnerable populations, including rural communities, youth and the elderly, and low-income individuals.[190]

The frequency of extreme climate events has drastically increased over the past few decades. The National Centers for Environmental Information at the National Oceanic and Atmospheric Administration has published statistics on natural disasters and climate disaster events that have occurred in the State of Colorado.[191] From 1980–2024, there have been 76 confirmed weather and climate disaster events in Colorado that each caused losses exceeding $1 billion.[192] These events include severe storms, droughts, wildfires, flooding, winter storms, and freeze events.[193] During the period between 1980 and 2024 these events occurred on average 1.7 times per year.[194] In the most recent 3 years (2022–2024), the annual average has increased to 5.0 events per year.[195]

Climate change is causing unprecedented heat waves in Colorado. The average temperatures in August in 2020, 2021, 2022, and 2024 were all within the 10 hottest on record in the state.[196] Additionally, in most regions of Colorado, the median number of projected heat waves is expected to increase from 1 per year between 1971–2000, to approximately 10 per year by the 2060s.[197] Colorado residents, particularly low-income communities, are acutely vulnerable to extreme heat impacts. For instance, 30% of Denver's housing stock lacks air conditioning.[198] Of that 30%, a majority are concentrated in mostly low-income neighborhoods, placing a disproportionate risk on already vulnerable populations.[199] Extreme heat poses further risks because "[r]ising temperatures also increase the formation of ground-level ozone," a serious

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[189] *See* HB 19-1261, 19-1261, 62nd Gen. Assemb., 1st Reg. Sess. (Colo. 2019), https://leg.colorado.gov/bills/hb19-1261.

[190] *Climate Change and Human Health: Who's Most at Risk?*, U.S. Env't Prot. Agency (EPA), https://www.epa.gov/climateimpacts/climate-change-and-human-health-whos-most-risk (last updated Mar. 25, 2025).

[191] *Colorado Summary*, *Billion-Dollar Weather and Climate Disasters,* NOAA: Nat'l Ctrs. for Env't Info., https://www.ncei.noaa.gov/access/billions/state-summary/CO (last updated Feb. 19, 2025).

[192] *Id.*

[193] *Id.*

[194] *Id.*

[195] *Id.*

[196] Nat'l Oceanic & Atmospheric Admin. (NOAA), Denver Monthly Climate Summary: August 2024 (Sept. 3, 2024), https://www.weather.gov/media/bou/Climate_Summary_August2024.pdf.

[197] Rebecca Bolinger et al., Climate Change in Colorado at 63 (3d ed. 2023), https://doi.org/10.25675/10217/237323.

[198] Denver Off. of Climate Action, Sustainability & Resiliency, The Energize Denver Renewable Heating and Cooling Plan: Resilient Existing Building and Homes at ES1, 18 (2021), https://www.denvergov.org/files/assets/public/v/1/climate-action/documents/hpbh/renewable-hampc/denver-renewable-heating-and-cooling-plan_june-2021.pdf.

[199] *Id.*

problem in Colorado, especially in the Front Range.[200] In fact, the "Front Range has one of the worst ozone problems in the county," with ozone action day alerts being issued on 65 days in 2021, which was the highest number at that time since record-keeping began in 2011.[201] Ozone pollution can cause asthma attacks, pulmonary inflammation, and coronary damage and results in more than 1 million premature deaths each year.[202]

Further, areas in Colorado and much of the Western United States have been in a state of drought since the year 2000. This drought has "drastically shrunk the Colorado River, which provides water for drinking and irrigation" for over 40 million people in Colorado, six other states, 30 tribes, and Mexico.[203] Precipitation in Colorado was 4% lower in 2001–2022 compared to the 1951–2000 average.[204] Rising temperatures increase the rate of water evaporation, worsening droughts.[205] For instance, snowpack has decreased by 20% to 60% throughout Colorado since the 1950s.[206] Much of the water in Colorado, including water used for everything from daily consumption to agriculture, comes from melting snowpack.[207]

In recent years, Colorado has also been plagued by severe wildfires, which have been exacerbated by the worsening drought and rising temperatures.[208] The annual area burned by wildfires in Colorado, and adjacent areas of New Mexico and Wyoming, increased by over 300% from the 1984–2000 period to the 2001–2017 period.[209] The 20 most destructive fires in

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[200] U.S. Env't Prot. Agency, EPA 430-F-16-008, What Climate Change Means for Colorado 2 (Aug. 2016), https://19january2017snapshot.epa.gov/sites/production/files/2016-09/documents/climate-change-co.pdf; *see also* Jim Robbins, Colorado's Efforts Are Not Enough to Solve Its Ozone Problems, PBS: Rocky Mountain (July 14, 2022), https://www.rmpbs.org/blogs/news/colorado-ozone-pollution-legislation.

[201] *Id.*

[202] *See* Christopher S. Malley et al., *Updated Global Estimates of Respiratory Mortality in Adults ≥ 30 Years of Age Attributable to Long-Term Ozone Exposure*, 125 Env't Health 1 (2017), https://ehp.niehs.nih.gov/doi/10.1289/ehp1390.

[203] Jennifer Weeks, *The Colorado River Drought Crisis: 5 Essential Reads,* Conversation (Apr. 13, 2023), https://theconversation.com/the-colorado-river-drought-crisis-5-essential-reads-203651; *"Mega-drought" Takes Dramatic Toll on Colorado River System that Provides Water to 40 Million*, CBS News (June 9, 2021); *Colorado*, NOAA & Nat'l Drought Mitigation Ctr., https://www.drought.gov/states/colorado (last visited Aug. 2, 2025).

[204] Bolinger et al., *supra* note 197, at 31.

[205] U.S. Env't Prot. Agency, What Climate Change Means for Colorado, *supra* note 200, at 1–2.

[206] *Id*. at 1.

[207] *Id*. at 2.

[208] Carly Phillips, *The Vicious Climate-Wildfire Cycle*, Union of Concerned Scis: The Equation (Apr. 30, 2019), https://blog.ucs.org/carly-phillips/the-vicious-climate-wildfire-cycle/.

[209] Bolinger et al., *supra* note 197, at 67.

Colorado history have taken place since 2001, and 11 of those have occurred since 2016.[210] Recently, the 2021 Marshall Fire in Boulder County destroyed over 1,000 homes,[211] causing over $2 billion in damages, making it the 10th costliest wildfire in U.S. history at the time.[212]

Climate change has also caused unprecedented flooding throughout Colorado. Rising temperatures and shorter winters are causing snowpack to melt earlier and quicker, which, combined with wildfire damages, are causing increasingly intense flooding.[213] Colorado has experienced, and is likely to continue to experience, floods similar to the catastrophic 2013 floods throughout the Front Range, when Boulder County, in a matter of days, received nearly as much rain as the area typically receives in an entire year.[214] The flood caused extensive damage, "with an estimated 19,000 homes damaged or destroyed, and at least 30 highway bridges destroyed by floodwaters."[215]

These impacts from climate change severely harm Colorado's economy. Infrastructure damage from climate change-influenced floods, wildfires, and other natural disasters has already and will likely continue to cost Colorado billions.[216] Wildfires and droughts in Colorado caused over $1 billion in damages in 2020 alone.[217]

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[210] *Historical Wildfire Information*, Colo. Div. of Fire Prevention & Control, https://dfpc.colorado.gov/sections/wildfire-information-center/historical-wildfire-information (last visited Aug. 2, 2025).

[211] *Marshall Fire Recovery Dashboard*, Boulder Cnty, Colo., https://bouldercounty.gov/marshall-fire-recovery-dashboard/ (last visited Aug. 2, 2025).

[212] *Official: 2021 Colorado Wildfire Losses Surpass $2 Billion*, Assoc. Press (Oct. 27, 2022), https://apnews.com/article/wildfires-business-fires-colorado-denver-20501c246da58c1a8da04500656f3ab5.

[213] Shannon Mullane, *Snowmelt Is Swelling Colorado's Rivers, But Much More Snow Is Still Waiting in the High Country*, Colo. Sun (May 23, 2023), https://coloradosun.com/2023/05/23/snowpack-spring-runoff-colorado-2023-river-update/; Chrissy Esposito, *Climate Change Forces Local Leaders to Brace for Flooding*, Colo. Health Inst. (Sept. 20, 2021), https://www.coloradohealthinstitute.org/blog/climate-change-forces-local-leaders-brace-flooding.

[214] Andrew Freedman, *Flood-Ravaged Boulder, Colo., Sets Annual Rainfall Record*, Climate Cent. (Sept. 16, 2013), https://www.climatecentral.org/news/flood-ravaged-boulder-colorado-sets-annual-rainfall-record-16481.

[215] *Id*.

[216] *See* State of Colo., Colorado Climate Plan: State Level Policies and Strategies to Mitigate and Adapt at 48–49 (2015), https://uccrnna.org/wp-content/uploads/2017/06/Colorado_2015_Climate-Action-Plan-Updated.pdf; *see also* Scott Weiser, *Glenwood Canyon I-70 Closure Wreaks Havoc on Travel and the Economy*, Denver Gazette (Aug. 11, 2021), https://denvergazette.com/news/glenwood-canyon-i-70-closure-wreaks-havoc-on-travel-and-the-economy/article_46f10050-f896-11eb-b05a-03c4947b5863.html.

[217] Justin S. Mankin et al., NOAA Drought Task Force Report on the 2020–2021 Southwestern U.S. Drought tbl. 1 (2021), https://repository.library.noaa.gov/view/noaa/46463.

Additionally, studies predict that, by the century's end, ski mountains will experience a majority of days in winter with above-freezing temperatures,[218] which will drastically impact Colorado's tourism industry and economy. Many Colorado mountains are already seeing historic lows for snowfall and ski days,[219] and future snow levels are projected to decrease by 20–30% by the 2040s and 40–60% by the 2100s throughout the Western United States.[220] Studies predict that, even with some large-scale emissions reductions, Colorado ski resorts "could lose two to four weeks in the ski season, as well as $650 million annually, by 2050."[221] Other tourist attractions like the Denver Zoo have already been impacted by climate change. During the summer of 2024, the Denver Zoo started to see numbers of visitors drop by around 1,100 people a day.[222] The decrease in visitors to the Denver Zoo has been directly linked to increased heat in recent years.[223]

Colorado's wildlife is also feeling the dire effects of climate change. For instance, climate change has forced certain ant species, unable to tolerate higher temperatures, out of their original habitats, leading to other ant species dominating the areas, resulting in less biodiversity.[224] Some bird species in Colorado including the yellow warbler, spotted towhee, and ducky flycatcher, have become scarcer due to water deficits and vulnerabilities due to the effects of climate change.[225]

Because of the myriad harms caused by climate change, Colorado requires the use of the social cost of carbon dioxide emissions and methane emissions in several circumstances. For instance, the Colorado Public Utilities Commission must annually set a value for the social cost of carbon dioxide and methane, and any electric or gas public utility subject to its jurisdiction must consider the social cost of carbon dioxide and methane when determining the cost, benefit,

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[218] Stephen Saunders et al., Climate Projections in Summit County, Colorado (2021), https://cms3.revize.com/revize/summitcoco/Documents/Services/Sustainability/55%20Page%20Report_Climate%20Projections%20in%20Summit%20County%20Co.pdf.

[219] *See*, *e.g.*, Olivia Prentzel, *Yes, It Hasn't Snowed yet in Denver. But It's Colorado's Meager Snowpack that Should Worry You*, Colo. Sun (Dec. 2, 2021), https://coloradosun.com/2021/12/02/no-snow-denver-bad-mountain-snowpack.

[220] Erica Siirila-Woodburn et al., *What a Low-to-No-Snow Future Could Mean for the Western U.S.*, 2 Nature Revs. 800 (2021).

[221] Emma VandenEinde, *Colorado's Ski Resorts Helped by Elevation, But Climate Change Hurts Overall Industry, Study Shows*, NPR: Colo. (Mar. 12, 2024), https://www.kunc.org/news/2024-03-12/colorados-ski-resorts-helped-by-elevation-but-climate-change-hurts-overall-industry-study-shows.

[222] Anusha Roy, *Climate Change Impacts Some Colorado Businesses that Are Now Changing Operations After Revenue Loss*, Denver 7 News (Oct. 25, 2024), https://www.denver7.com/news/local-news/climate-change-impacts-some-colorado-businesses-that-are-now-changing-operations-after-revenue-loss.

[223] *Id.*

[224] Yvaine Ye, *Ants in Colorado Are on the Move due to Climate Change*, CU Boulder Today (Apr. 10, 2024), https://www.colorado.edu/today/2024/04/10/ants-colorado-are-move-due-climate-change.

[225] *Localized Drought Impacts on Northern Colorado Plateau Landbirds*, Nat'l Park Serv. (May 9, 2024), https://www.nps.gov/articles/000/ncpn_birds-and-drought.htm.

or net present value of various plans the utility is required to file for Commission approval.[226] This includes clean heat plans,[227] electric resource plans/clean energy plans, transportation electrification plans, beneficial electrification plans, renewable energy standards plans, and demand-side management plans.[228] Relatedly, when estimating the social cost of carbon dioxide or methane, the Colorado Energy Office, Department of Transportation, and Department of Public Health and Environment must base their cost estimate on the most recent assessment of the federal government using a discount rate that is 2.5% or less and does not yield a lower estimate of costs.[229]

Colorado, along with the rest of the world, has already experienced the devastating effects of climate change that will continue to worsen. These effects can be halted and/or mitigated by local, national, and global policies addressing greenhouse gas emissions.

Connecticut

Climate Planning and Policies

In April 2010, the Governor's Steering Committee on Climate Change produced a report that predicted the impact of climate change on Connecticut's agriculture, infrastructure, natural resources, and public health.[230] The report concluded that the impact of climate change on these four areas would be largely negative. Connecticut's agriculture and food production—including maple syrup, apples, pears, and shellfish—will decrease and these industries will suffer. Critical infrastructure that controls coastal flooding and storm water could be substantially damaged. Rare habitats and critical species face elimination. And Connecticut's public health, particularly the health of the most vulnerable communities, is threatened by a decrease in air quality and an increase in extreme heat, which create favorable conditions for increased incidents of disease.

The Connecticut Institute for Resilience and Climate Adaptation (CIRCA), an institute housed at the University of Connecticut, has projected a rise in sea level of approximately twenty inches by 2050. In response to this analysis, then-Governor Malloy signed into law Public Act 18-82, *An Act Concerning Climate Change Planning and Resiliency*. That statute requires state and federally funded projects to plan for a scenario of 50 centimeters of sea level rise by 2050, ensuring the success of future projects undertaken in the state, the prudence of state investments, and the safety of those residing on or near the shoreline. In addition to preparations for the imminent rise in sea level, Public Act 18-82 set an interim target of a 45% reduction in greenhouse gas emissions by 2030 from a 2001 baseline, ensuring Connecticut remains on a path

[226] Colo. Rev. Stat. § 40-3.2-106(1), (4).

[227] *Id.* § 40-3.2-108(6)(c)(I).

[228] *Id.* §§ 40-3.2-106(1)(a)–(d) & 40-3.2-107(2).

[229] *Id.* § 24-38.5-111.

[230] Adaptation Subcomm. to the Governor's Steering Comm. on Climate Change, The Impacts of Climate Change on Connecticut Agriculture, Infrastructure, Natural Resources and Public Health (2010), https://portal.ct.gov/-/media/DEEP/climatechange/ImpactsofClimateChangepdf.pdf.

to achieve an 80% reduction in emissions by 2050 as mandated under the state's Global Warming Solutions Act.

The Governor's Council on Climate Change January 2021 report included 61 recommendations to reduce emissions in the buildings, transportation, and electric sectors and address climate impacts to the state in the areas of natural and working lands, infrastructure and land use, and public health and safety.[231] All of the recommendations were viewed through an equity lens, recognizing that low-income and black, indigenous, and people of color (BIPOC) communities are disproportionately impacted by climate change. The recommendations from this report have been implemented through actions under Executive Order 21-3[232] and the passage of multiple laws.[233] Those actions included adopting a goal of a zero-carbon energy supply by 2040 (see Public Act 22-5, *An Act Concerning Climate Change Mitigation*), and enhancing municipalities' tools to address climate impacts through the formation and expansion of stormwater authorities, climate resilience boards, and funding options for environmental infrastructure (see Public Act 21-115, *An Act Concerning Climate Change Adaptation*).

In June 2025, the legislature passed Public Act 25-125, *An Act Concerning the Protection of the Environment and the Development of Renewable Energy Sources and Associated Job Sectors,* which targets net zero greenhouse gas emissions by 2050; codifies the GreenerGov initiative by setting emissions reductions targets for state agencies; enables significant investments in environmentally sustainable practices; codifies the Connecticut Clean Economy Council, which advises on economic development strategies and supports clean energy jobs and businesses; charges the state to identify actions that can improve energy affordability, increase community resilience, and reduce emissions; focuses the state's incentive programs for heat pumps towards those individuals who will benefit the most; and advances nature-based solutions for climate change mitigation and adaptation, ecosystem resilience and biodiversity. Public Act 25-125 was signed into law on July 1, 2025.

Observed Climate Impacts

Connecticut has begun to experience the severe consequences of climate change caused by increasing GHG emissions. Between 1895 and 2011, temperatures in Connecticut increased by almost 2°F (0.16°F per decade), and precipitation increased by approximately five inches, or

[231] Conn. Governor's Council on Climate Change, Taking Action on Climate Change and Building a More Resilient Connecticut for All, Phase 1 Report: Near-Term Actions (Jan. 2021), https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3_Phase1_Report_Jan2021.pdf.

[232] Conn. Exec. Order No. 21-3 (Dec. 16, 2021), https://portal.ct.gov/ConnecticutClimateAction/Executive-Order/Executive-Order-No-21-3.

[233] Conn. Governor's Council on Climate Change, Council Meeting, GC3 Progress Report Highlights of GC3 Recommendation Implementation (June 8, 2022), https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3-2022-agendas-and-minutes/GC3-Annual-Progress-Report-060822.pdf.

more than 10% (0.4 inches per decade).[234] Between 1980 and 2018, the average annual temperature in Connecticut has risen by over 2°F. Over the same period, winter temperatures warmed by 3°F.

This temperature increase has already impacted Connecticut through associated sea level rise. Direct and remotely sensed measurements of sea level have shown that the annual mean level of the ocean surface is rising. In the Northeast, coastal flooding has increased due to approximately one foot rise in sea level since 1900.[235] This rate of sea level rise exceeds the global average of approximately eight inches, due primarily to land subsidence and thermal expansion of ocean water along the Northeastern coast.

The Northeast has experienced a greater increase in extreme precipitation than any other region in the United States. Between 1958 and 2010, Connecticut saw more than a 70% increase in the amount of precipitation in very heavy events.[236] In 2011, Hurricane Irene caused power outages affecting 754,000 customers and over $200 million in damage.[237] In 2012, Hurricane Sandy caused power outages affecting more than 600,000 customers and over $360 million in damage. The latter forced thousands of Connecticut residents to evacuate, caused thousands to apply for FEMA assistance, and damaged roads and infrastructure; it took nine days for utilities to restore power.[238] Many of Connecticut's coastal communities and assets remain at risk of more frequent future storm events exacerbated by climate change.

Since 2020, Connecticut has been impacted by several storms resulting in high costs to the government, businesses, and residents. In August of 2020, Tropical Storm Isaias caused over $40 million[239] in damage to public assets, resulted in widespread power outages, and closed more than 90 state roads.[240] Hurricane Ida, in September of 2021, caused widespread damage to homes

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[234] Radley Horton et al., U.S. Glob. Change Rsch. Prog., Climate Change Impacts in the United States: The Third National Climate Assessment, Ch. 16: Northeast (2014), https://www.giss.nasa.gov/pubs/docs/2014/2014_Horton_ho06500e.pdf.

[235] *Climate Change Connections: Connecticut (The Coastline)*, EPA, https://www.epa.gov/climateimpacts/climate-change-connections-connecticut-coastline (last updated Jan. 16, 2025).

[236] Horton et al., *supra* note 234.

[237] Mary-Beth Hart, *Tropical Storm Irene Delivered a Sunday Punch to Connecticut*, Univ. of Conn. Sea Grant: Wrack Lines (Winter 2011), https://digitalcommons.lib.uconn.edu/cgi/viewcontent.cgi?article=1067&context=wracklines.

[238] John Burgeson & Genevieve Reilly, *Rising Above the Tide: 5 Years Since Sandy*, CTPost (Oct. 28, 2017), https://www.ctpost.com/local/article/Rising-above-the-tide-5-years-since-Sandy-12313727.php.

[239] *Connecticut Tropical Storm Isaias 4580-DR-CT*, Fed. Emergency Mgmt. Agency, https://www.fema.gov/disaster/4580#funding-obligations (last visited Aug. 2, 2025).

[240] *One Year Later: The Lasting Impacts of Tropical Storm Isaias*, NBC News: CT (Aug. 4, 2021), https://www.nbcconnecticut.com/news/local/one-year-later-the-lasting-impacts-of-tropical-storm-isaias/2552629/.

and roads due to flooding.[241] The floodwaters were so overwhelming that they killed a responding state trooper. On August 18, 2024, portions of Fairfield, New Haven, and Litchfield counties experienced an unprecedented rain event that dropped more than 14 inches of rain in a few hours. The rain far exceeded the capacity of stormwater systems and caused riverine flooding, resulting several civilian fatalities and a disaster declaration to FEMA that initially estimated at least $206 million in damages.[242]

Wildfire is a growing area of concern in Connecticut as the state experiences hot and dry conditions during certain times of the year. As of April 2025, Connecticut had experienced 155 fires that impacted 385 acres since the start of 2025, compared to 77 fires in the same time period in 2024.[243] These local fires are in addition to the state being impacted by wildfire smoke from wildfires across the country and in Canada[244] that harms air quality.

Projections for Climate Change Impacts

Weather and climate extremes will impact the natural environment and all socioeconomic sectors. Connecticut is highly vulnerable to changes in mean climate and extreme climate-driven weather events due to regional characteristics like a dense population and aging infrastructure.[245] As discussed, Connecticut has already seen the devastating and deadly impacts of climate change in the form of damaging storms, extensive flooding, drought, extreme heat, and wildfire. The Governor's Council on Climate Change January 2021 report, which summarized the projected impacts of climate change for Connecticut, focused on the anticipated harms from three climate change consequences—sea level rise, storms and precipitation, and heat and drought.

Sea Level Rise: Communities in Connecticut should expect that coastal flooding intensity and frequency will increase in the coming decades due to sea level rise. Connecticut is planning for sea level rise along the Connecticut coast to be a projected 20 inches higher than the national tidal datum in Long Island Sound by 2050.[246] With this increase of sea level rise along Connecticut's coast by 2050, there will be an increased frequency of coastal flooding, causing

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[241] Letter from Gov. Ned Lamont, to Pres. Joseph R. Biden, Presidential Major Disaster Declaration for Remnants of Hurricane Ida (Oct. 22, 2021), https://portal.ct.gov/-/media/office-of-the-governor/news/2021/20211022-gov-lamont-request-for-presidential-major-disaster-declaration.pdf.

[242] Letter from Gov. Ned Lamont, to Pres. Joseph R. Biden, Requesting Major Disaster Declaration for August 18, 2024 Flash Flooding (Sept. 9, 2024), https://portal.ct.gov/governor/-/media/office-of-the-governor/news/2024/20240909-request-for-major-disaster-declaration.pdf.

[243] *CT Has Had 155 Fires that Impacted 385 Acres This Year; DEEP Warns All Residents to Use Caution*, Hartford, Conn. Courant (Apr. 24, 2025), https://www.courant.com/2025/04/24/ct-has-had-155-fires-that-impacted-385-acres-this-year-deep-warns-all-residents-to-use-caution/.

[244] Matt Simon, *The Smoke from Canada's Wildfires May Be Even More Toxic than Usual*, Grist (June 5, 2025), https://grist.org/wildfires/canada-wildfire-smoke-toxic-arsenic/.

[245] Horton et al., *supra* note 234.

[246] James O'Donnell, Dep't of Marine Scis. & Conn. Inst. for Resilience & Climate Adaptation, Sea Level Rise in Connecticut (2019), https://circa.uconn.edu/wp-content/uploads/sites/1618/2019/02/SeaLevelRiseConnecticut-Final-Report-1.pdf.

flooding levels like those seen in Superstorm Sandy every 5-10 years.[247] Sea level rise will continue after 2050. Recent simulations indicate that the mean sea level could be up to 80 inches higher by 2100 if greenhouse gas emissions are not reduced soon.[248]

Storms and Precipitation: Projections of changes in the frequency of tropical cyclones in a warmer climate is uncertain, but it is expected that they will bring stronger winds and more precipitation. Since 1980, there has been an increase in the frequency of hurricanes in category 3 or greater in the Western Atlantic Basin.[249] Though it is unclear whether the frequency or intensity of extratropical storms in Connecticut will change, they will likely bring more precipitation. In general, warmer temperatures will result in less snow and more rain, but increased humidity will yield high snowfall events when temperatures permit.[250] Increased annual precipitation, coming from higher intensity rain events, will contribute to increased flooding risk throughout the region because existing built infrastructure cannot handle the more extreme events.[251]

Heat and Drought: Climate change increases the risk of dangerously hot days and drought. An increase in the average temperature of the state of 5ºF by 2050 will mean an increased frequency of 90°F days, from an average of 5 per year in the late 1990s to 25 per year by mid-century.[252] As temperatures increase along the coast, humidity will also rise, resulting in amplified heat stress during summer months.[253] Drought risk will also increase. The probability of unusual events (such as extremely low annual and summer water availability, and extremely high 1-day and 5-day precipitation events) are projected to increase by a factor of between 2 and 4 by mid-century.[254]

Delaware

The combustion of fossil fuels has contributed to climate change and consequent sea level rise, with attendant flooding, erosion, and loss of farmland, wetlands, and beaches in Delaware. Climate change has also increased the frequency and intensity of extreme weather events in Delaware, including coastal storms, flooding, drought, extreme heat, wildfires, extreme precipitation events, and ocean warming and acidification; and the cascading social, economic,

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[247] Conn. Governor's Council on Climate Change, *supra* note 231.

[248] O'Donnell, *supra* note 246.

[249] Conn. Governor's Council on Climate Change, *supra* note 231.

[250] *Id.*

[251] *Climate Adaptation and Stormwater Runoff*, EPA, https://www.epa.gov/arc-x/climate-adaptation-and-stormwater-runoff (last updated Jan. 10, 2025).

[252] Conn. Inst. for Resilience & Climate Adaptation, Connecticut Climate Fact Sheets (2020) https://circa.uconn.edu/2020/10/08/ct-climate-fact-sheets/.

[253] Anji Seth et al., Connecticut Physical Climate Science Assessment Report (PCSAR): Observed Trends and Projections of Temperature and Precipitation (2019), https://circa.uconn.edu/wp-content/uploads/sites/1618/2019/11/CTPCSAR-Aug2019.pdf.

[254] Conn. Governor's Council on Climate Change, *supra* note 231.

and other consequences of these environmental changes. These adverse impacts will continue to increase in frequency and severity in Delaware.[255]

Sea Level Rise

Since 1900, Delaware has already experienced over one foot of sea level rise and associated coastal impacts.[256] Delaware will continue to experience significant additional and accelerating sea level rise over the coming decades, which would cause severe harm to the state. Delaware is the state with the lowest mean elevation in the nation, with a mean elevation of just 60 feet above sea level.[257] More than 331 square miles, or 17% of Delaware's land area lies within the 100-year coastal floodplain.[258] Indeed, 39,700 properties in Delaware currently have a substantial risk of flooding, and many thousands more will face flooding risk in the coming decades.[259] For instance, over 70,000 residents live in Wilmington, Delaware's largest city, and a significant portion of the city already resides within the 100-year floodplain.[260] Low-lying topography and land subsidence make Delaware more vulnerable to sea level rise; and flooding exacerbated by sea level rise had the potential to inundate homes in businesses in Wilmington more frequently over time, particularly in low-lying neighborhoods.[261] Substantial flooding from climate change is expected in east and south Wilmington, with potential environmental justice implications for the city, which has a 23% poverty rate.[262]

Saltwater Intrusion

Saltwater intrusion into groundwater will also contaminate the state's drinking water supply, with thousands of domestic wells and thousands of septic systems potentially inundated

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[255] Del. Dep't of Nat. Res. & Env't Control, An Economic Analysis of the Impacts of Climate Change in the State of Delaware, Final Report, Ch. 3 Natural Resource Impacts 17–46 (July 2022), https://documents.dnrec.delaware.gov/energy/Documents/Climate/Plan/Economic-Analysis-of-the-Impacts-of-Climate-Change-in-the-State-of-Delaware.pdf.

[256] *Determination of Future Sea-Level Rise Planning Scenarios for Delaware*, Del. Geological Sur, Univ. of Del., https://www.dgs.udel.edu/projects/determination-future-sea-level-rise-planning-scenarios-delaware (last visited Aug. 2, 2025).

[257] Univ. of Del., The Delaware Floodplain, Final Draft Report 1 (Sept. 2011), https://www.wrc.udel.edu/wp-content/publications/DelawareFloodplain.pdf.

[258] *Id.*

[259] First St. Found., The First National Flood Risk Assessment: Defining America's Growing Risk 36 (2020), https://assets.firststreet.org/uploads/2020/06/first_street_foundation__first_national_flood_risk_assessment.pdf.

[260] Del. Dep't of Nat. Res. & Env't Control & Wilmington Dep't of Pub. Works, Resilient Wilmington, Preparing Today for Tomorrow's Climate Risks, https://www.wilmingtonde.gov/home/showpublisheddocument/10643/637846654834170000.

[261] *Id*. at 13.

[262] *Quick Facts: Wilmington City, Delaware*, U.S. Census (July 1, 2024), https://www.census.gov/quickfacts/fact/table/wilmingtoncitydelaware/PST045224.

by a 1.5-meter sea level rise.[263] Large areas of Delaware's agricultural industry, which contributes more than $2 billion dollars in annual economic impact to the state,[264] could also be impacted by saltwater intrusion from sea level rise and suffer the resulting loss of productivity of those areas by shifting growing seasons and increasing plant and crop susceptibility to pests and invasive species.[265]

Agricultural Impacts

Agriculture is an essential driving force behind Delaware's economy. Almost 40% of Delaware's land is dedicated to agricultural production, and sole or family proprietorship account for the vast majority of the state's farms.[266] By exacerbating extreme weather and rising seas, climate change has already impacted, and will continue to impact, agriculture in Delaware.

Delaware's agricultural industry has suffered significantly because of extreme weather. In Delaware's low-lying areas, saltwater intrusion associated with sea level rise could make soil too salty for crops.[267] In addition, higher temperatures and changing rainfall patterns are likely to have negative effects on crops and livestock, such as crop losses; reduced yield from heavy precipitation, heat, or drought; heat stress on livestock; increased difficulty of nutrient management; and higher infrastructure, irrigation, and energy costs. Warmer winters may also harm crops by promoting weeds and insect pests.[268] Severe rainstorms, expected to increase in frequency, can also have serious consequences for crop production, delaying planting or washing out planted crops and increasing disease.[269] In terms of livestock, increased heat stress, extreme weather, and drought are likely to affect animal health and reduce feed and growth efficiency for poultry and dairy cows.[270]

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[263] Del. Dep't of Nat. Res. & Env't Control, Delaware's Climate Action Plan 6–7 (Nov. 2021), https://documents.dnrec.delaware.gov/energy/Documents/Climate/Plan/Delaware-Climate-Action-Plan-2021.pdf [hereinafter Delaware's Climate Action Plan].

[264] *Delaware*, Univ. of Ark. Div. of Agric., https://economic-impact-of-ag.uada.edu/delaware/ (last visited Aug. 2, 2025).

[265] Delaware's Climate Action Plan, *supra* note 263, at ix–xviii, 8.

[266] *Delaware Agricultural History*, Del. Dep't of Agric., https://agriculture.delaware.gov/agricultural-history (last visited Aug. 2, 2025).

[267] U.S. Env't Prot. Agency, What Climate Change Means for Delaware (Jan. 2017), https://19january2017snapshot.epa.gov/sites/production/files/2016-09/documents/climate-change-de.pdf.

[268] Del. Dep't of Nat. Res. & Env't Control, Delaware Climate Change Impact Assessment 7-16 (Feb. 2014), https://documents.dnrec.delaware.gov/energy/Documents/Climate%20Change%202013-2014/DCCIA%20interior_full_dated.pdf [hereinafter Delaware Climate Change Impact Assessment].

[269] *Id*. at 7-2.

[270] *Id*. at 7-14.

Wetlands and Coastal Areas

Climate change is stressing important natural and cultural resources in Delaware.[271] Nearly a quarter of Delaware's land consists of wetlands,[272] which will face significant damage due to climate change by the end of the century.[273] Delaware's beaches and marshes provide habitat for fish, reptiles, and birds, such as horseshoe crabs, Atlantic sturgeon, and red knots.[274] Delaware's marshes also provide valuable ecosystem services to the state, including by filtering water contaminants, mitigating storm damage, and supporting the state's fishing and hunting industries.[275] Delaware is an important area in the Western Hemisphere for migratory birds, so harm to Delaware wetlands and coastal areas would impact the reproductive success of many migratory birds, such as red knots.[276] Delaware is likewise a center for horseshoe crab spawning, so harm to their habitat will impact food chains, including for numerous migratory bird species, and potentially impact human health, given the role of horseshoe crabs in medical and biomedical research.[277]

Threats to Property and Infrastructure

Sea level rise is also threatening over $1 billion in coastal property value,[278] and is contributing to the loss of Delaware's beaches. This, combined with the risk to coastal transportation and other infrastructure, will harm the state's $3.5 billion tourism industry and the 44,000 people who work in tourism.[279] Indeed, many publicly owned roads and highways in the state are already prone to flooding, including Delaware Route 9, which is designated as a hurricane evacuation route. In the coming decades, sea level rise will threaten over 400 miles of

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[271] Del. Dep't of Nat. Res. & Env't Control, Preparing for Tomorrow's High Tide: Sea Level Rise Vulnerability Assessment for the State of Delaware 89–90 (July 2012), https://documents.dnrec.delaware.gov/coastal/Documents/SeaLevelRise/AssesmentForWeb.pdf.

[272] Erin Dorset, *Wetland Acreage Status in Delaware*, Wetland Monitoring & Assessment Program (Mar. 22, 2021), https://wmap.blogs.delaware.gov/2021/03/22/wetland-acreage-status-in-delaware/.

[273] Del. Dep't of Nat. Res. & Env't Control, Preparing for Tomorrow's High Tide, *supra* note 271, at 19.

[274] *Dolphins, Horseshoe Crabs and Piping Plovers, Oh My! Discovery Delaware's Diverse Coastal Wildlife this Summer*, Del. Dep't of Nat. Res. & Env't Control, https://dnrec.delaware.gov/outdoor-delaware/dolphins-horseshoe-crabs-and-piping-plovers-oh-my-discover-delawares-diverse-coastal-wildlife-this-summer/ (last visited Aug. 2, 2025).

[275] Del. Dep't of Nat. Res. & Env't Control, Preparing for Tomorrow's High Tide, *supra* note 271, at 37.

[276] *Id*. at 26–27, 33, 42–43, 53.

[277] *Climate Change Connections: Delaware (Horseshoe Crabs)*, U.S. Env't Prot. Agency, https://www.epa.gov/climateimpacts/climate-change-connections-delaware-horseshoe-crabs (last visited Aug. 2, 2025).

[278] *Delaware, USA*, Climate Cent.: Surging Seas Risk Finder, https://riskfinder.climatecentral.org/state/delaware.us (last visited Aug. 2, 2025).

[279] *See id*.; *see also* Del. Tourism Off., 2018 Value of Tourism Report 3, https://www.visitdelaware.com/industry/tourism-statistics.

roadway, including 62 miles of state roads, and many miles of evacuation routes.[280] Higher sea levels are already submerging lowlands, exacerbating coastal flooding, and inundating natural resources and the state's property and infrastructure, causing damage and preventing its normal use.

Harm to Industry

In addition, sea level rise is harming Delaware's industrial sector and threatening its environment. The state-owned Port of Wilmington, an economic driver, faces severe structural damage due to sea level rise. Much of the land currently used in the state for heavy industry will likely also be inundated, potentially releasing contaminated material. Sea level rise will likely affect 89 EPA-listed contamination sites, including 10 brownfields, three oil facilities, one sewage plant, four extreme hazmat facilities, and 54 hazardous waste sites.[281]

Costs Incurred by the State

The destructive force and flooding potential from storm surges during coastal storms and other weather events have worsened as the mean sea level along the coast of Delaware has increased, and the combined effects of storm surge and sea level rise will continue to exacerbate flooding impacts on the state.[282] Even if all carbon emissions were to cease immediately, Delaware would continue to experience the consequences of sea level rise due to the "locked in" greenhouse gases already emitted, and the lag time between emissions and sea level rise.[283]

The state has already incurred significant costs on projects to address sea level rise, including by conducting comprehensive surveys of sea level rise threats to the state, and by conducting sea level rise analysis in certain transportation infrastructure projects. The state has spent capital funds to protect roads and highways such as State Route 1, a section of which was raised to reduce coastal flooding, and for reconstructing and reinforcing levees and dikes, and restoring dams. Sea level rise and coastal storms have also exacerbated erosion. Delaware frequently spends significant resources on beach nourishment and other projects to combat erosion and protect natural, economic, and cultural resources. For example, in 2019 alone, Delaware announced beach nourishment projects for the communities of Pickering Beach, Kitts Hummock, Bowers Beach, and the City of Rehoboth, costing the state millions of dollars. The State of Delaware All-Hazard Mitigation Plan estimates shoreline management beach replenishment projects and protection measures, including inlet stabilization, beach nourishment

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[280] *Id.*

[281] *Delaware, USA,* Climate Cent.: Surging Seas Risk Finder, *supra* note 278.

[282] Climate Cent., Delaware and the Surging Sea 10 (Sept. 2014), https://sealevel.climatecentral.org/uploads/ssrf/DE-Report.pdf.

[283] Zita Sebesvari, *Sea Level Rise Is Inevitable—But What We Do Today Can Still Prevent Catastrophe for Coastal Regions,* Conversation (Sept. 26, 2019), https://theconversation.com/sea-level-rise-is-inevitable-but-what-we-do-today-can-still-prevent-catastrophe-for-coastal-regions-124129.

and dune restoration to address coastal riverine and storm surge flooding to cost $10 million to $20 million annually.[284]

The state has planned and is planning, at significant expense, adaptation and mitigation strategies to address climate change-related impacts to lessen or prevent injuries to itself and its citizens. These efforts include, but are not limited to, capital projects, such as improving its drainage system and raising roadways, reconstructing and reinforcing levees and dikes, and restoring dams; partnership initiatives to prepare cities and towns across Delaware for the effects of climate change; and planning efforts, such as the development of the DelDOT Strategic Implementation Plan for Climate Change[285] and the creation of a flood avoidance guide for state agencies[286] pursuant to Executive Order 41, which former-Governor Markell implemented to help Delaware prepare for emerging climate impacts.[287]

Finally, the state has incurred and will incur significant expense in implementing policies to mitigate and adapt to climate change impacts, including through clean transportation programs, electric vehicle incentive programs, assisting Delaware residents with home weatherization, providing incentives for building energy efficiency, restoring plant life to lessen heat impacts and reduce tidal flooding, and mapping vulnerable populations and disease patterns. Delaware has already allocated funds to climate adaptation through the Strategic Opportunity Fund for Adaptation among other sources, and future climate adaptation will come at a substantial cost to the state.[288]

Extreme Weather Events

Climate change is causing more extreme weather events in Delaware, with attendant physical and environmental consequences, including coastal flooding, coastal erosion, inland flooding, extreme heat events, wildfires, dam and levee failures, and drought.[289] Coastal storms have already caused tens of millions of dollars in damages in Delaware, along with floods, power outages, sewage spills, and other disasters. Low-income Delawareans who depend on public transportation to access their employment are particularly vulnerable to flooding that accompanies coastal storms and other extreme weather events, as such flooding often disrupts delivery of public transportation services. In the coming decades, increased rainfall and

[284] State of Del., All-Hazard Mitigation Plan 20 (2023), https://www.epa.gov/system/files/documents/2023-12/state-of-deleware-all-hazard-mitigation-plan.pdf.

[285] Del. Dep't of Transp., Strategic Implementation Plan for Climate Change, Sustainability & Resilience for Transportation (2017), https://deldot.gov/Publications/reports/SIP/pdfs/SIP_FINAL_2017-07-28.pdf.

[286] Del. Dep't of Nat. Res. & Env't Control, Avoiding and Minimizing Risk of Flood Damage to State Assets: A Guide for Delaware State Agencies (Mar. 2016), https://documents.dnrec.delaware.gov/energy/Documents/DE%20Flood%20Avoidance%20Guide%20For%20State%20Agencies.pdf.

[287] Del. Exec. Order No. 41 (2013), https://archivesfiles.delaware.gov/Executive-Orders/Markell/Markell_EO41.pdf.

[288] Delaware's Climate Action Plan, *supra* note 263, at 11, 19.

[289] *Id*. at 61–62.

windspeed during already-destructive coastal storms will cause even more severe damage to public and private property and infrastructure in Delaware.

In addition, the Atlantic Ocean is acidifying at an alarming rate because of greenhouse gas emissions, endangering Delaware's coastal ecosystems and economy. Acidity levels have already increased by roughly 30% since the Industrial Revolution, and they are expected to rise at a faster rate over time.[290] This radical change in ocean chemistry has serious and far-reaching consequences. For example, the accumulation of carbonic acid in coastal waters threatens the survival of organisms that build shells and skeletons from calcium carbonate—such as coral, crabs, oysters, and shrimp.[291] It also risks destabilizing whole marine ecosystems by altering the behavior, growth, reproduction, and migration patterns of critical aquatic organisms.[292] Delaware is particularly vulnerable to the effects of human-caused ocean acidification, as its identity, industries, and economy are closely intertwined with its coastal waters, saltwater wetlands, bays, and estuaries. Indeed, the Chesapeake Bay alone is responsible for nearly 13,000 Delawarean jobs, and the economic value of commercial and recreational fishing in the state totals to more than $100 million each year.[293]

Heat Effects

The average air temperature has increased and will continue to increase in Delaware due to climate change. By 2050, parts of Delaware are expected to endure up to 40 days per year of temperatures with a heat index above 105°F.[294] Warming air temperatures have led and will continue to lead to poorer air quality, more heat waves, expanded pathogen and pest ranges, impacts on agricultural production, greater need for irrigation of agricultural production, increased costs of cooling and other expenses to poultry industry, thermal stress for native flora and fauna, increased electricity demand, and threats to human health such as from heat stroke and dehydration, and increased allergen exposure.[295] Higher average and more frequent extreme temperatures are expected to drive up energy use due to increased air-conditioning use. By 2060, Delaware is projected to see up to a 70% increase in demand for cooling.[296]

Due to systemic inequities, communities of color and low-income communities are particularly vulnerable to extreme heat events. Pregnant women exposed to high temperatures or air pollution are more likely to have children who are premature, underweight or stillborn, and

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[290] Jean Brodeur, Univ. of Del. & Del. Dep't of Nat. Res. & Env't Control, Delaware and Ocean Acidification: Preparing for a Changing Ocean 12 (2015), https://oceanconservancy.org/wp-content/uploads/2016/04/OceanAcidification-1.pdf.

[291] *Id.* at 4.

[292] *Id.* at 14–15.

[293] *Id.* at 24–25.

[294] *See* Climate Change Risk Ratings for Delaware, Climate Check, https://climatecheck.com/delaware (last visited Aug. 2, 2025).

[295] Delaware Climate Change Impact Assessment, *supra* note 268, at 4–6.

[296] *Id*. at 4–21.

Black mothers and babies are harmed at a much higher rate than the population at large.[297] The urban heat island effect, which affects cities including Wilmington, exacerbates the health impacts of extreme heat on communities of color and low-income communities in urban areas.[298] Delawareans who face housing insecurity are also more vulnerable to the extreme temperatures and air pollution exacerbated by climate change.[299]

Public Health Impacts

Climate change has caused and will continue to cause significant public health-related injuries to Delaware and its residents.[300] For instance, climate change is causing more frequent extreme heat events in Delaware, resulting in an increased risk of heat-related illnesses (from mild heat stress to fatal heat stroke) and the exacerbation of pre-existing conditions in the medically fragile, chronically ill, and vulnerable.[301] Increased extreme temperatures and heat waves has and will contribute to and exacerbate, allergies, respiratory disease, and other health issues in children and adults.[302] Climate-change induced increases in air temperature, rain, and carbon dioxide concentrations in air can lead to more ozone, pollen, mold spores, fine particles and chemicals that can irritate and damage the lungs and airways, particularly of those with pre-existing respiratory problems and conditions.[303] Vulnerable populations such as the disabled, the elderly, those with prior health issues, children, people who live alone, people of color, and less-resourced communities are more likely to suffer health effects from higher air temperatures, flooding, and air pollution.[304] As pest seasons and ranges expand, vector-borne illnesses will increase in Delaware's population.[305] Delaware has borne and will continue to bear costs associated with mitigating and responding to these public health threats.

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[297] Christopher Flavelle, *Climate Change Tied to Pregnancy Risks, Affecting Black Mothers Most*, N.Y. Times (June 18, 2020), https://www.nytimes.com/2020/06/18/climate/climate-change-pregnancy-study.html.

[298] Resilient Wilmington, Preparing Today for Tomorrow's Climate Risks, *supra* note 260.

[299] Victor W. Perez & William Swiatek, *The Perilous Intersection of Housing Precarity and Climate Change in Delaware*, 9 Del. J. Pub. Health 60 (2023), https://pmc.ncbi.nlm.nih.gov/articles/PMC10445608/.

[300] *See, e.g.*, Del. Dep't of Nat. Res. & Env't Control, Div. of Energy & Climate, Delaware Climate Health Conference: Summary Report (2017), https://documents.dnrec.delaware.gov/energy/Documents/Climate%20Health%20Conference/DE%20Climate%20+%20Health%20Report.pdf.

[301] Delaware Climate Change Impact Assessment, *supra* note 268, at 5-13.

[302] *Id*.

[303] *Id*. at 5-7–5-10.

[304] *Id*. at 5-13.

[305] *Id*. at 5-10–5-11.

Environmental Justice

Compounding these physical and environmental harms, climate change is causing cascading social and economic impacts that cause injuries to the state. Delaware's low-income communities and communities of color are particularly at risk to the impacts of climate change. For instance, climate change is exacerbating, and will continue to exacerbate, underlying inequities faced by low-income communities and communities of color that are disproportionately exposed to environmental hazards and face a greater risk of adverse health effects. The racial and ethnic disparities in Delaware's poverty rate[306] further compound the increased risk that Black and brown Delawareans face from climate change, because low-income communities and communities of color are often unable to prepare in advance for events caused or exacerbated by climate change, and are forced to use a bigger proportion of their resources to rebuild in the aftermath—or are unable to rebuild at all. The impact of climate change on agricultural yield may impact food insecurity in Delaware, which more than 12% of Delawareans already experience.[307]

Hawai‘i

Hawai‘i experiences the harmful effects of climate change in unique and region-specific ways.[308] As the planet warms, Hawai‘i and the Pacific region will experience rising sea level, ocean acidification, and changing rainfall, wind, and storm patterns.[309] These changes will impact temperatures, water, agriculture including fisheries, and species distribution, which in turn will affect the quality of life, food security, and overall health of the population in the region.[310]

In Hawai‘i, the average air temperature has risen by 1.1˚C (2˚F) statewide since 1950, with a sharp increase in warming over the last decade.[311] Statewide, the number of hot days and very warm nights between 2015 and 2020 were more than double the respective long-term

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[306] Black Delawareans are more than twice as likely to experience poverty than white Delawareans, and Hispanics are approximately three times as likely to live in poverty than non-Hispanic whites. Steve Peuquet et al., Ctr. for Cmty. Rsch. & Serv., Univ. of Del., An Overview of Poverty in Delaware 2 (2018), http://udspace.udel.edu/handle/19716/23128.

[307] Cecelia Harrison et al., Food Insecurity in Delaware: A Triangulation of Spatial Data Sources, 18 CDC: GIS Snapshots (Aug. 19, 2021), https://www.cdc.gov/pcd/issues/2021/20_0555.htm.

[308] Haw. Dep't of Health, 2016 Climate Change and Health Report to the Twenty-Eighth Legislature Pursuant to House Concurrent Resolution 108, SD1 at 10 (Dec. 2015), https://health.hawaii.gov/heer/files/2021/06/Hawaii-2016-Climate-Change-Health-Report-to-the-Legislature.pdf.

[309] *Id*. at 7.

[310] *Id*.

[311] City & Cnty. of Honolulu Climate Change Comm'n, Climate Change Brief 2023 at 8, https://static1.squarespace.com/static/5e3885654a153a6ef84e6c9c/t/64374370c0631e3ac922692a/1681343347345/Climate+Change+Brief+2023.pdf.

averages.[312] In addition to effects on human health, warming air temperatures bring mosquito borne diseases to upland forests driving several native bird species towards extinction.[313]

Over 90% of Hawai‘i experienced a decline in rainfall from 1920–2012, with changes in precipitation varying on each island.[314] Drought frequency, duration, and magnitude have increased statewide from 1920–2019, with rainfall declining in both wet and dry seasons.[315] These drought conditions increase the risk of wildfires and threatens the state's water supplies. The 2023 Maui wildfires were the deadliest in modern U.S. history and the worst natural disaster in the history of the state. In the historic district of Lahaina, more than 100 lives were lost.[316] The fire destroyed more than 2,200 structures and caused roughly $5.5 billion in damage.[317] The number of wildfires in Hawaii has increased four-fold in recent decades.[318] Wildfire probability is expected to increase by as much as 375% by late century under a high emissions scenario.[319] Wildfires have caused, and are likely to continue to cause, substantial loss to Hawaii communities.

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[312] *Id*.

[313] *Id*. at 33.

[314] *Id*. at 11

[315] *Id*.

[316] *Preliminary After-Action Report: 2023 Maui Wildfire*, U.S. Fire Admin. (Feb. 8, 2024). https://www.usfa.fema.gov/blog/preliminary-after-action-report-2023-maui-wildfire/.

[317] *Id.*

[318] Haw. Dep't of Transp., Hawaii Highways Climate Adaptation Action Plan: Exposure Assessments 61 (Apr. 2021), https://hidot.hawaii.gov/wp-content/uploads/2021/07/HDOT-Climate-Resilience-Action-Plan-Exposure-Assessments-April-2021.pdf.

[319] *Id*.

Image from NBC News[320]

Sea level rise and the frequency of high tide flooding has resulted in over 70% of Hawai‘i’s beaches in a state of chronic erosion.[321] Sea level rise may also contaminate Hawai‘i’s groundwater.[322] Sea level rise and coastal flooding may amount to over $19 billion in property damage across the state.[323] In addition, sea level rise may overwhelm sewer systems and threaten public sanitation.[324]

In Hawai‘i, tourism comprises a large portion of the state’s economy and damage to infrastructure and ecosystems, like coral reefs, could have large economic impacts.[325] The loss of

[320] Assoc. Press, *A $4B Settlement for Hawaii Wildfire Victims Is in Legal Limbo as an Unusual Trial Starts*, NBC News (Jan. 29, 2025), https://www.nbcnews.com/news/us-news/4b-settlement-hawaii-wildfire-victims-legal-limbo-unusual-trial-starts-rcna189752.

[321] City & Cnty. of Honolulu Climate Change Comm’n, *supra* note 311, at 14.

[322] Diana Felton et al., State of Haw., Dep’t of Health, Risk of Sea Level Rise and Increased Flooding on Known Chemical Contamination in Hawaii (June 21, 2021), https://health.hawaii.gov/heer/files/2021/06/Climate-Change-and-Chemical-Contamination-memo-updated-June-2021.pdf.

[323] Hawai‘i Climate Change Mitigation & Adaptation Comm’n, Hawai‘i Sea Level Rise Vulnerability and Adaptation Report ix (2017), https://climateadaptation.hawaii.gov/wp-content/uploads/2017/12/SLR-Report_Dec2017.pdf.

[324] *Id.* at 225.

[325] Haw. Dep’t of Health, 2016 Climate Change and Health Report, *supra* note 308, at 11.

Waikiki Beach could lead to an annual loss of $2 billion in visitor expenditures, which would adversely affect workers' ability to support themselves.[326]

Hawai‘i is 80–90% dependent on imported food, fuel, and material.[327] Because of this dependency, the vulnerability of ports and airports to extreme events such as sea level rise and increased wave height is of great concern. The Hawai‘i Emergency Management Agency reports that, at any given time, there is only a 5-to-7-day supply of food in the state.[328] This leaves Hawai‘i especially vulnerable to climate-related disasters, as well as other disaster events.

Environmental Justice communities including indigenous populations will be disproportionately impacted by climate change in Hawai‘i.[329] Native Hawaiian culture is inextricably bound to Hawaii's natural environment.[330] As a result, climate change threatens Native Hawaiian culture, identity, social welfare, and self-determination.[331] Climate change directly impacts Native Hawaiian traditional and customary practices. For instance, sea level rise impacts fishing and gathering.[332] Flooding and saltwater intrusion negatively impact cultivation of taro and other traditional crops.[333]

In Hawai‘i, coral reefs are ecologically, culturally, and economically significant.[334] Carbon dioxide reacts with sea water to produce carbonic acid.[335] As the oceans absorb larger amounts of carbon dioxide, the pH levels of the oceans are impacted and become more acidic.[336] Ocean acidification and warming temperatures pose a major threat to coral reefs and interfere with the corals' ability to produce skeletal shells.[337] Severe storms and changing precipitation patterns increase runoff and physically damage coral.[338]

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[326] *Id*.

[327] *Id*. at 12.

[328] City & Cnty. of Honolulu Climate Change Comm'n, *supra* note 311, at 24.

[329] *Id*. at 30–31.

[330] D. Kapua‘ala Sproat, *An Indigenous People's Right to Environmental Self-Determination: Native Hawaiians and the Struggle Against Climate Change Devastation*, 35 Stan. Env't. L.J. 157, 171 (2016), https://law.stanford.edu/wp-content/uploads/2017/01/sproat.pdf.

[331] *Id*.

[332] City & Cnty. of Honolulu Climate Change Comm'n, *supra* note 311, at 30–31.

[333] *Id*.

[334] *Climate Change Connections: Hawai‘i (Coral Reefs)*, U.S. Env't Prot. Agency, https://www.epa.gov/climateimpacts/climate-change-connections-hawaii-coral-reefs (last updated Jan. 16, 2025).

[335] *Id*.

[336] *Id*.

[337] *Id*.

[338] *Id*.

Illinois

Climate change is affecting Illinois in a number of ways—both by fundamentally altering the state's environment in manners never seen before and by intensifying well-recognized weather hazards. The fundamental changes can be seen in Illinois' farming industry and in the state's greatest environmental asset, Lake Michigan. At the same time, storms in Illinois are becoming more numerous and more ferocious, leading to widespread destruction from tornadoes and flooding.

Illinois' farming industry is vulnerable to cycles of extreme drought and extreme precipitation caused by climate change. In 2023, a severe drought dried up soil throughout the state, with extreme dryness extending down to 20 inches below the surface in some areas.[339] This drought led to visible stunting and stress on growing corn and beans, exacerbated spider mite damage to crops, and poor pasture conditions leading to hay supply issues.[340] In other years, extreme precipitation has threatened Illinois' agriculture. For instance, January to June of 2013 was the wettest period ever recorded in Illinois, causing widespread flooding in farmland that forced farmers to delay planting and lose revenue.[341]

In addition to extreme precipitation, increased temperatures also cause Illinois' agriculture to suffer. Heat waves during the pollination season may reduce future crop yield—expected to cause up to a 73% average crop loss by the end of the century.[342] And milder winters in Illinois will lead to more weeds, insects, and diseases surviving through the coldest months of the year, also hurting yield and quality of crops.[343] Another key indicator of the effect of climate change on Illinois' agriculture is marked by the changes to the U.S. Department of Agriculture's Plant Hardiness Zone map.[344] The latest map shows a significant northward progression of warm-weather zones as well as the appearance of new warm-weather zones never before found in Illinois.

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[339] *Drought Worsens in a Very Dry June*, Ill. State Climatologist (June 30, 2023), https://stateclimatologist.web.illinois.edu/2023/06/30/drought-worsens-in-a-very-dry-june/.

[340] *Id.*

[341] Univ. of Ill., Inst. of Gov't & Pub. Affairs, Preparing for Climate Change in Illinois: An Overview of Anticipated Impacts (2015), https://indigo.uic.edu/articles/report/Preparing_for_Climate_Change_in_Illinois_An_Overview_of_Anticipated_Impacts/15078939/1; *see also* Kristen Giesting et al., U.S. Dep't of Agric., Climate Hubs & Great Lakes Rsch. Integrated Sci. Assessment, Climate Change Impacts on Illinois Agriculture (2022), https://www.climatehubs.usda.gov/sites/default/files/2022_ClimateChangeImpactsOnIllinoisAgriculture.pdf.

[342] *Id.*

[343] *Id.*

[344] *2023 USDA Plant Hardiness Zone Map*, U.S. Dep't of Agric., https://planthardiness.ars.usda.gov/ (last visited Aug. 2, 2025); *see also New USDA Plant Hardiness Zones Map*, Ill. State Climatologist (Nov. 16, 2023), https://stateclimatologist.web.illinois.edu/2023/11/16/new-usda-plant-hardiness-zones-map/.

Climate disruption also contributes to whipsawing water levels on Lake Michigan. In 2024, Lake Michigan's water levels fell below its long-term average for the first time in over a decade, after reaching historic high levels in 2019 and 2020.[345] This pattern of extreme highs and lows in water levels repeats what happened in January 2013, as Lake Michigan fell to an all-time low water level, followed by a 17-year high in 2015—the second-largest recorded gain over a 24-month span.[346] Rapidly swinging water levels hurt the commercial shipping industry, recreational boaters, wildlife, and beach-goers. For example, for every inch the lake loses, a freighter must forgo 270 tons of cargo. High water erodes beaches and damages property.[347]

In addition to posing novel threats to agriculture and Lake Michigan, climate change is also intensifying catastrophic extreme weather events. Illinois commonly sees strong thunderstorms and tornadoes, but climate change is making these storms occur more frequently and become more damaging.

In 2024, Illinois experienced storms of unprecedented ferocity. The Illinois State Climatologist recorded strong wind, hail, and tornadoes across all of Illinois' 102 counties and the state logged 142 tornadoes—a new annual record.[348] According to NOAA, Illinois experienced twelve weather and climate disasters in 2024 that caused over a billion dollars of damage each—the most in Illinois since NOAA's record keeping began in 1980.[349] Nine of these disasters were severe storm events, also the most since 1980. These storms included a July 15, 2024 "derecho" that produced 100 mile-per-hour winds and 48 separate tornados.[350] In the Chicago area alone, the derecho produced 32 tornados, breaking the previous records set by the July 2014 "double derecho" and March 2023 storm.[351] Illinois even experienced flooding from

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[345] Vivian La, *Lake Michigan Water Levels Drop to Lowest in Years Amid Warmth and Lack of Rain*, Chi. Trib. (Nov. 20, 2024), https://www.chicagotribune.com/2024/11/20/lake-michigan-water-levels/.

[346] Tony Briscoe, *Lake Michigan Water Levels Rising at Near Record Rate*, Chi. Trib. (July 12, 2015), https://www.chicagotribune.com/2015/07/12/lake-michigan-water-levels-rising-at-near-record-rate/; *see also* D. Wuebbels et al., An Assessment of the Impacts of Climate Change in Illinois, Univ. of Ill. Urbana-Champaign (2021), https://databank.illinois.edu/datasets/IDB-1260194 (full study), https://www.nature.org/content/dam/tnc/nature/en/documents/IL_Climate_Assessment_2020_Executive_Summary.pdf (executive summary).

[347] *Id.*

[348] *Id.*

[349] *Illinois Summary*, *Billion-Dollar Weather and Climate Disasters*, Nat'l Ctrs. for Env't Info., https://www.ncei.noaa.gov/access/billions/state-summary/IL (last visited Aug. 2, 2025). Notably, the current administration will cease recording billion-dollar weather incidents.

[350] *July 15, 2024 Derecho Produces Widespread Wind Damage and Numerous Tornadoes*, Nat'l Weather Serv., https://www.weather.gov/lot/2024_07_15_Derecho (last visited May 25, 2025); *see also* David Struett, *Tornado Record Broken with 27 Chicago Area Twisters July 15—Spawned by 'Ring of Fire'*, WBEZ: Chi. (July 24, 2024), https://www.wbez.org/weather/2024/07/24/chicago-weather-tornado-record-derecho-july-15.

[351] *Id.*

the remnants of Hurricane Beryl in July 2024, a very rare instance of a tropical cyclone in the state.[352]

Illinois also suffers from frequent flooding, and climate change has and will also cause the frequency and strength of these floods to increase.[353] Flooding caused by increased precipitation causes dramatic damage to the lives and property of Illinois residents; this toll will increase as climate change intensifies.

For example, flooding from Illinois' 2024 storms compounded pre-existing problems in Cahokia Heights, a low-lying city in St. Clair County in southern Illinois near St. Louis, Missouri. The stormwater management system in Cahokia Heights—portions of which are 70 years old—often are unable to keep up in during large storms.[354] When stormwater floods the area and accumulates on streets, it infiltrates Cahokia Heights' sewer system through manhole covers. If the sewer system is overwhelmed, sewage reverses flow back up citizens' toilets, bathtubs, and kitchen sinks. In response to the 2024 flood, federal agencies sent $120 million to St. Clair County and surrounding areas to assist recovery.[355] As climate change intensifies, these sewage overflows are happening more frequently in municipalities across Illinois with combined sewage and stormwater systems.[356]

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[352] Deanese Williams-Harris, *Weather Officials Call a Flood Watch as Remnants of Beryl Track Across Lower Great Lakes Region,* Chi. Trib. (July 9, 2024), https://www.chicagotribune.com/2024/07/09/weather-officials-call-a-flood-watch-as-remnants-of-tropical-storm-beryl-track-across-the-area/.

[353] Ill. Dep't of Pub. Health, Climate and Health in Illinois (2016), https://dph.illinois.gov/content/dam/soi/en/web/idph/files/publications/publicationsoprclimatehealthreport.pdf.

[354] Shahla Farzan, *Raw Sewage Has Plagued Cahokia Heights for Years. Aging Water Systems Are to Blame*, St. Louis Pub. Radio (Oct. 25, 2024), https://www.stlpr.org/health-science-environment/2024-10-25/raw-sewage-illinois-cahokia-heights-aging-water-systems.

[355] Mike Koziatek, *Feds Send $120M to Help in Metro-East Recovery from July Flooding*, Belleville News-Democrat (Jan. 8, 2025), https://www.bnd.com/news/local/article298142073.html.

[356] *Where Combined Sewer Overflow Outfalls Are Located*, EPA, https://www.epa.gov/npdes/where-combined-sewer-overflow-outfalls-are-located (last updated May 23, 2025).

CAHOKIA HEIGHTS FLOOD AND COMBINED SEWER OVERFLOW

Image from Belleville News-Democrat

In another example from 2009, a freight train carrying ethanol derailed in Cherry Valley, Illinois due to washout of train tracks following heavy rains.[357] Fourteen of the tanker cars carrying ethanol caught fire, killing a woman in her car waiting for the train to pass. Seven other people were injured and about 600 nearby homes were evacuated.[358] A few days later, a 54-mile-long fish kill occurred on the Rock River when ethanol that was not consumed by the fire flowed downstream, killing over 70,000 fish.[359]

[357] Nat'l Transp. Safety Bd., Derailment of CN Freight Train U70691-18 with Subsequent Hazardous Materials Release and Fire: Accident Report (2012), https://www.ntsb.gov/investigations/Accidentreports/Reports/RAR1201.pdf.

[358] *CN Blamed for Fatal Train Derailment in Illinois*, CBC (Feb. 14, 2012), https://www.cbc.ca/news/canada/cn-blamed-for-fatal-train-derailment-in-illinois-1.1139430.

[359] Press Release, Ill. Att'y Gen., Attorney General Madigan Reaches Settlement to Recover Costs of Rockford Train Derailment, Ethanol Leak (Mar. 5, 2015), https://illinoisattorneygeneral.gov/News-Room/2006-2018-Press-Archive/201503-05%20ATTORNEY%20GENERAL%20MADIGAN%20REACHES%20SETTLEMENT%20TO%20RECOVER%20COSTS%20OF%20ROCKFORD%20TRAIN%20DERAILMENT%20ETHANOL%20LEAK.pdf.

CHERRY VALLEY TRAIN DERAILMENT

Image from Rockford Register Star

A major flood also struck Jo Daviess County in northwestern Illinois in 2011 after 15 inches of rain fell during a 12-hour time period. The flood waters caused extensive damage to roads and train tracks and at least one fatality.[360] Illinois has also struggled with urban flooding caused by heavy rains falling on impervious surfaces.[361]

JO DAVIESS COUNTY FLOOD

Images from Rockford Register Star

Furthermore, rising average temperatures injure Illinois residents. Hotter weather will inevitably harm public health and lead to heat-related deaths. For instance, over 700 Illinois

[360] *Crews Find Body of Woman Swept Away by Flood in Galena*, Rockford, Ill. Register Star (July 30, 2011), https://www.rrstar.com/story/lifestyle/public-safety/2011/07/30/crews-find-body-woman-swept/44585321007/.

[361] *State Climate Summaries 2022: Illinois*, NOAA: Nat'l Ctrs. for Env't Info., https://statesummaries.ncics.org/chapter/il/ (last visited Aug. 2, 2025).

residents died due to the historically intense heat wave in July 1995.[362] Intensified drought conditions strengthen these impacts—the inverse of heavy precipitation. And the heat is continuing to increase. According to the Illinois State Climatologist, 2024 was Illinois' second hottest year on record—dating back to the 1870s—averaging 2.9 degrees above normal.[363]

Though catastrophes such as these have occurred from time to time throughout Illinois' history, climate change will cause them to happen more frequently and with more ferocity than ever before, at the cost of the lives and health of Illinois residents.

Maine

Maine's coast is experiencing significant negative effects of climate change in the form of rising sea levels, ocean acidification, and the encroachment of invasive species that are expanding their range northward as the environment warms. For example, surface temperatures in the Gulf of Maine have been warming at a rate nearly triple that of the world's oceans.[364] These warmer waters have brought with them an invasion of non-native green crabs that are devastating economically important soft-shell clam flats throughout southern and mid-coast Maine.[365] Maine's lobster populations are expected to decline as ocean waters warm and surviving lobster populations are likely to move farther offshore and northward outside the state's waters.[366] At the same time, ocean waters globally have become approximately 30% more acidic over the last century, and features of the Gulf of Maine, including its extensive freshwater inputs, make it particularly vulnerable to acidification.[367] The increasing acidity inhibits shell formation in all shellfish, including lobsters, which have an estimated economic impact in Maine

[362] Jan C. Semenza et al., *Heat Related Deaths During the 1995 Heat Wave in Chicago*, 335 New Eng. J. Med. 84 (1996), https://www.nejm.org/doi/full/10.1056/NEJM199607113350203.

[363] *2024 Weather Was Very Warm and Wild*, Ill. State Climatologist (Jan. 15, 2025), https://stateclimatologist.web.illinois.edu/2025/01/15/2024-weather-was-very-warm-and-wild/.

[364] *2024 Gulf of Maine Warming Update*, Gulf of Me. Rsch. Inst. (Feb. 14, 2025), https://gmri.org/stories/2024-gulf-of-maine-warming-update; Colin Woodard, *Mayday: Gulf of Maine in Distress*, Portland Press Herald (Oct. 25, 2015), http://www.pressherald.com/2015/10/25/climate-change-imperils-gulf-maine-people-plants-species-rely/.

[365] Woodard, *supra* note 364; Ivan Fernandez et al., Me. Climate Council Sci. & Tech. Subcomm., Scientific Assessment of Climate Change and Its Effects in Maine 175, App'x 2 (Aug. 2020), https://climatecouncil.maine.gov/future/sites/maine.gov.future/files/inline-files/GOPIF_STS_REPORT_092320.pdf.

[366] Susie Arnold et al., Me. Climate Council Sci. & Tech. Subcomm., Scientific Assessment of Climate Change and Its Effects in Maine: 2024 Update 118 (2024), https://www.maine.gov/future/sites/maine.gov.future/files/inline-files/STS_2024_digital.pdf.

[367] Dwight K. Gledhill et al., *Ocean and Coastal Acidification off New England and Nova Scotia*, 28 Oceanography 182–97 (2015), http://dx.doi.org/10.5670/oceanog.2015.41.

of $1.7 billion annually.[368] These impacts of climate change threaten both the health of the state's marine ecosystem and a coastal economy that depends on it.

Similar changes are occurring in Maine's interior. Iconic species that drive the state's tourist economy are suffering from the effects of climate change. Longer, hotter summers, decreased snowpack, and more frequent droughts and flooding are shrinking brook trout habitat[369] and undermining efforts to restore sea-run salmon in Maine's downeast rivers.[370] A plague of winter ticks brought on by decreased snowpack and warmer winters has taken a significant toll on Maine's moose population.[371] Milder winters have also hurt the ski industry,[372] while shorter and earlier springs are interfering with maple sugaring operations.[373] In addition to environmental impacts, human health incidents such as heat-related illnesses from more extreme summers and tick-borne diseases from shorter, warmer winters are increasing as the climate warms.[374]

Maryland

With 3,100 miles of shoreline, Maryland is particularly vulnerable to rising sea levels and the more extreme weather events associated with climate change: shoreline erosion, coastal flooding, storm surges, inundation, saltwater intrusion, and contamination of groundwater supplies. Rising sea levels and increased storm duration and intensity could have devastating and far-reaching impacts on the Atlantic coast and the Chesapeake Bay ecosystem affecting

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[368] *Id.*; Emily Greenhalgh, *Climate & Lobsters*, Nat'l Oceanic & Atmospheric Admin. (Oct. 6, 2016), https://www.climate.gov/news-features/climate-and/climate-lobsters; Jessica Hall, *From Bought to Caught, Lobsters All About Economics*, Portland Press Herald (Aug, 11, 2012), http://www.pressherald.com/2012/08/11/market-forces-make-everyone-feel-the-pinch_2012-08-12/.

[369] Penn. State Univ., *For Trout Fishermen, Climate Change Will Mean More Driving Time, Less Angling*., ScienceDaily (Aug. 20, 2015), www.sciencedaily.com/releases/2015/08/150820123648.htm.

[370] Nat'l Rsch. Council, Atlantic Salmon in Maine 50–53 (2004) https://www.nap.edu/read/10892/chapter/5; Me. Climate Council Sci. and Tech. Subcomm., *supra* note 365, at 210–11.

[371] Deirdre Fleming, *Winter Ticks Raise Concerns About the Future of Maine's Moose Herd*, Portland Press Herald (June 14, 2014), http://www.pressherald.com/2014/06/14/winter-ticks-raise-concerns-about-future-of-maines-moose-herd/; Kevin Miller & Esta Pratt-Kielley, *Winter Ticks Wiped Out Nearly 90% of the Moose Calves Scientists Tracked in Part of Maine Last Year*, Me. Pub. (May 18, 2022), https://www.mainepublic.org/environment-and-outdoors/2022-05-18/most-moose-calves-in-part-of-maine-died-this-year-as-a-tiny-predator-benefits-from-warmer-weather.

[372] Katharine Q. Seelye, *Rising Temperatures Threaten Fundamental Change for Ski Slopes*, N.Y. Times (Dec. 12, 2012), http://www.nytimes.com/2012/12/13/us/climate-change-threatens-ski-industrys-livelihood.html.

[373] Abigail Curtis, *How Climate Change Is Affecting The Maine Maple Syrup Industry*, Me. Pub. (Mar, 26, 2018), https://www.mainepublic.org/environment-and-outdoors/2018-03-26/how-climate-change-is-affecting-the-maine-maple-syrup-industry; Christie Taylor, *How Climate Change Threatens Your Breakfast*, Sci. Friday (Mar. 17, 2017), https://www.sciencefriday.com/segments/how-climate-change-threatens-your-breakfast/.

[374] Me. Climate Council Sci. and Tech. Subcomm., *supra* note 365, at 16–17.

recreational and economic benefits enjoyed by Maryland and its visitors. Although Maryland's coastal areas are particularly vulnerable, all areas of the state are at risk.

Maryland is the seventh most densely populated state in the nation with 636 people per square mile.[375] The state's population is concentrated in the center of the state in an area that stretches from the northeastern Baltimore suburbs southwest to the suburbs of Washington D.C.[376] A heavy concentration of environmental justice communities, disproportionately vulnerable to public health risks from pollution and the impacts of climate change, are within that corridor. There is a higher probability of negative outcomes due to climate change for environmental justice communities because of historic disinvestment that limits their adaptive capacity to respond to climate-related events and, therefore, exacerbating existing disparities.[377] Low-income communities and communities of color often face a greater burden from climate-related events due to inadequate infrastructure, lack of access to resources, and historical patterns of environmental injustice. Environmental justice communities are more likely to experience the brunt of flooding, heatwaves, and poor air quality, leading to disproportionate health risks and economic hardships. Under Governor Moore's leadership, climate change and environmental justice are inextricably linked and priorities for executive action. As such, Maryland must ensure that residents and businesses across all communities have ample opportunity to shape climate policy, direct resources from climate programs to help disadvantaged communities benefit from the clean energy transition which will create opportunities through job creation, new technologies, and increased economic growth.

Climate change also impacts coastal, bay, and inland water quality parameters that may change the viable uses of surface water for irrigation, recreation, and human consumption. This is especially true for the Chesapeake Bay, the largest estuary in the United States.[378] Human development and pollution have made the Bay and its ecosystems more vulnerable to extreme weather events.[379] Climate change will likely exacerbate the problem creating a greater threat to the ecosystem.[380] Already, the Bay is warming and further temperature increases could change the composition of commercial fisheries and increase anoxia, the absence of oxygen needed for

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[375] *Maryland State Energy Profile*, U.S. Energy Info. Admin., https://www.eia.gov/state/print.php?sid=MD (last updated June 20, 2025).

[376] *Id.*

[377] Md. Comm'n on Climate Change, 2020 Annual Report 17, https://mde.maryland.gov/programs/air/ClimateChange/MCCC/Documents/MCCCAnnualReport2020.pdf [hereinafter MCCC 2020 Annual Report].

[378] Md. Comm'n on Climate Change, 2024 Annual Report 27, https://mde.maryland.gov/programs/air/ClimateChange/MCCC/Documents/MCCC%20Annual%20Report%202024/MCCC_Annual_Report_2024_508.pdf [hereinafter MCCC 2024 Annual Report].

[379] *Id.* at 16; Chesapeake Bay Program, Achieving Water Quality Goals in the Chesapeake Bay: Comprehensive Evaluation of System Response (CESR) (May 2023), https://www.chesapeakebay.net/what/publications/achieving-water-quality-goals-in-the-chesapeake-bay-a-comprehensive-evaluation-of-system-response-cesr.

[380] *Id.*

aquatic life to survive in the Bay.[381] Weeds, invasive pests, and diseases will flourish in the Bay's newly-warmed waters disrupting the ecosystem.

Maryland is projected to experience between 2.1 and 5.7 feet of sea level rise over the next century.[382] In fact, the sea level could be as much as 2.1 feet higher in 2050 along Maryland's shorelines than it was in 2000.[383] Sea level rise could inundate some facilities of the Port of Baltimore, placing one of the most important ports along the East Coast, and one of the 20 large ports in the nation, at risk. In 2023, for instance, the Port's cargo and cruise activity at the state-owned and private marine terminals generated 51,365 jobs, and $5,331 million in personal wage and salary income for Maryland residents.[384]

The state's tourism sector is also likely to feel the impact of climate change. In 2021, tourism resulted in $11.6 billion in tax revenue, and tourism ranked as the 12th largest private industry employer in Maryland.[385] East of the Chesapeake Bay, in an area known as the Eastern Shore, the land is flat with many wetlands, and the nearby Atlantic Ocean adds humidity and moderates the weather year-round. Rising sea levels, flooding, and heightened storm surges will place further strain on Maryland's low-lying urban and coastal lands, making tourism less feasible in areas like the Eastern Shore.

Maryland's forests are also vulnerable to the effects of climate change. Forest ecosystems not only sequester carbon, but they also play a major role in adaptation efforts by reducing the impacts of urban heat, enhancing migration corridors, mitigating flooding, protecting drinking water supplies, and reducing nutrient and sediment runoff.[386] Climate change will have a direct effect on forestry and the protections they provide.[387] Climate change will also alter the distributions of species and habitats and exacerbate existing stressors at a rate and degree that cannot be fully predicted.[388] Native species populations are likely to decline or migrate from the state.[389]

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[381] *Id.* at 15.

[382] *Id.* at 13; Univ. of Md. Ctr. for Env't Sci., Sea-Level Rise Projections for Maryland (2023), https://www.umces.edu/sea-level-rise-projections.

[383] *Id.*

[384] Md. Port Admin., The 2023 Economic Impact of the Port of Baltimore in Maryland (2024), https://mpa.maryland.gov/Documents/MarylandEconomicimpactofPOB2023.pdf.

[385] Md. Off. of Tourism Development, Fiscal Year 2021 Tourism Development Annual Report 2, https://www.visitmaryland.org/sites/default/files/2021-12/MD_FY21_Annual%20Report_V9.pdf.

[386] Chesapeake Bay Program, *supra* note 379, at 15.

[387] *Id.*

[388] *Id.* at 15–16.

[389] *Id.* at 16.

Climate change may also adversely impact Maryland's agricultural industry, which employs more than 350,000 people.[390] In 2015, the market value of Maryland's agricultural products was $2.2 billion, with net farm income exceeding $500 million.[391] By 2050, absent additional action, rising summer temperatures could result in nearly $150 million in median annual losses for corn, soy, and wheat.[392] Increased flooding could adversely affect the stability, salinity, drainage, and nutrient balance of soil in low-lying areas, causing declines in crop production and making farming less viable.

For more than a decade, farmers along Maryland's Eastern Shore have faced the growing challenge of saltwater intrusion, which decreases crop yields on salt-impacted land.[393] With rising sea levels, severe storms, and higher tides, the consequences of saltwater intrusion are being felt more intensely and farther inland than in previous years. Most crops struggle to grow when salinity levels are consistently above two parts per thousand (ppt). In numerous areas along the Eastern Shore, salinity levels as high as 3.8 ppt have been recorded, resulting in severe damage to common cash crops like corn and soybeans and rendering previously productive agricultural land less viable.[394]

Climate change harms Maryland's agricultural sector beyond saltwater intrusion. For instance, higher temperatures could impact livestock, requiring greater access to cooler areas. In addition, increased rainfall causes soil erosion and nutrient runoff, which could adversely affect water quality, including in the Chesapeake Bay.[395]

In terms of health impacts, like other states around the country, Maryland is experiencing increasing numbers of 90-degree days, markedly exacerbating heat-related illnesses and mortality, particularly among children, the elderly, and more vulnerable segments of the population. Additionally, more pavement and less tree coverage make environmental justice communities particularly vulnerable to heat-related illness. In 2024, Maryland experienced a significant increase in heat-related deaths, with 25 reported fatalities during the May–September

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[390] Md. Comm'n on Climate Change, 2017 Annual Report 13, https://mde.maryland.gov/programs/Air/ClimateChange/MCCC/Documents/MCCC_2017_final.pdf; Md. Dep't of Env't et al., Maryland Joint Chairmen's Report, Study in Preparation for Maryland Agriculture Climate Vulnerability Assessment 88–89 (2021), https://agnr.umd.edu/sites/agnr.umd.edu/files/files/documents/Hughes%20Center/CVAMA/CVAMA_Report_forweb.pdf.

[391] *Id.*

[392] Md. Comm'n on Climate Change, 2015 Annual Report 15, https://mde.maryland.gov/programs/air/ClimateChange/MCCC/Publications/MCCC2015Report.pdf [hereinafter MCCC 2015 Annual Report].

[393] Md. Dep't of Planning, Maryland's Plan to Adapt to Saltwater Intrusion and Salinization (Dec. 2024), https://planning.maryland.gov/Documents/OurWork/RRP/envr-planning/Marylands-plan-to-adapt-to-saltwater-intrusion-and-salinization.pdf.

[394] Kate Tully et al., *The Invisible Flood: The Chemistry, Ecology, and Social Implications of Coastal Saltwater Intrusion*, 69 BioSci. 368, 378 (2019).

[395] *Id.*

monitoring period. This marks the highest number since at least 2019, surpassing the totals of 21 in both 2019 and 2020, 16 in 2021, 5 in 2022, and 9 in 2023.[396] By mid-century, rising temperatures could cause 27 additional deaths each summer in Baltimore alone.[397]

Maryland has experienced an increase in the frequency and intensity of extreme weather events, such as hurricanes, tornadoes, heavy rainfall, and heatwaves. These events have caused severe damage to homes, infrastructure, and natural habitats. Flooding resulting from heavy rainfall has affected low-lying areas and urban centers, leading to property damage and disruption of daily life for residents and a negative impact on the state's tourism industry. More frequent and severe storms cause significant financial damage to communities throughout the state. Indeed, Maryland experienced 85 extreme weather events between 1980 and 2024, and according to the National Oceanic Atmospheric Administration, the total recovery costs for Maryland during this time period were between $10 billion to $20 billion dollars. Some of these costs included property and infrastructure damage, crop loss, and loss of revenue to businesses. Maryland will not be immune from more disasters in the coming decades; the costs of recovery will grow in tandem.[398]

Climate change harms Maryland's economy, too. Climate-related harms lead to higher costs for basic goods, reduced productivity, strained public health systems, depleted natural resources, inflated housing prices, and increased insurance costs—all of which pose significant obstacles to economic growth. Specific economic impacts occur from supply chain disruptions and rising resource costs. Loss of essential services threaten basic services and economic continuity. Climate impacts increase the costs of our water, land, and raw materials, complicating supply chains across Maryland's industrial sector.

Finally, Maryland has started to incorporate the social cost of greenhouse gases into its regulatory programs. The Climate Solutions Now Act of 2022 requires the Maryland Department of the Environment to adopt regulations for Building Energy Performance Standards including an option for covered building owners to make an alternative compliance payment greater than or equal to the social cost of greenhouse gases adopted by the U.S. EPA for emissions above target levels.[399]

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[396] Md. Dep't of Health, Maryland 2024 Heat-Related Illness Surveillance Summary Report (2024), https://health.maryland.gov/preparedness/Documents/2024%20Heat-Related%20Illness%20Surveillance%20Summary%20Report.pdf.

[397] MCCC 2015 Annual Report, *supra* note 392, at 17–18.

[398] Md. Off. of the Comptroller, State Spending Series: Climate Change Costs (Apr. 2025), https://www.marylandcomptroller.gov/content/dam/mdcomp/md/reports/research/state-spending-series-climate-change-costs-april-2025.pdf.

[399] Md. Code Ann., Env't § 2-1602.

Massachusetts

In Massachusetts, temperatures have increased over the years and will continue to rise; there could be both fewer rainy days and more intense rainstorms; and sea levels will rise and combine with more powerful coastal storms.[400]

Since the beginning of the 20th century, statewide annual average temperatures have risen by almost 3.5°F.[401] According to the Fifth National Climate Assessment, the U.S. Northeast, including Massachusetts, is projected to experience one of the largest temperature increases in the contiguous United States compared to the 1851–1900 baseline.[402] The available climate model projections for Massachusetts all show a warming trend throughout the 21st century, with inland areas warming faster than coastal areas. By the mid-21st century, the median projection estimates that, as compared to a 1950–2013 baseline, inland areas will have about 25 more days above 90°F and coastal areas will have about 19 more days above 90°F.[403]

The consequences of more frequent extreme heat days include an increase in heat-related illnesses and deaths. As of 2022, 19 annual premature deaths could be attributed to extreme temperatures in Massachusetts.[404] If no actions are taken, an additional 400 annual premature deaths due to extreme heat could occur by the end of the century.[405] Increased temperatures also will cause damage to public infrastructure, including electric transmission, utility distribution, and rail infrastructure.[406] In Massachusetts, annual rail infrastructure repair costs are projected to increase by $6 million by 2050 and $35 million by 2100.[407]

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[400] Mass. Off. of Energy & Env't Affairs, 2022 Massachusetts Climate Change Assessment: Volume 1 – Executive Summary at ES3 (Dec. 2022), https://www.mass.gov/doc/2022-massachusetts-climate-change-assessment-december-2022-volume-i-executive-summary/download [hereinafter 2022 Massachusetts Climate Change Assessment Vol. 1].

[401] *Massachusetts State Climate Summary*, NOAA Nat'l Ctrs. for Env't Info. (2022), https://statesummaries.ncics.org/downloads/Massachusetts-StateClimateSummary2022.pdf.

[402] Kate Marvel et al., U.S. Glob. Change Rsch. Program, Ch. 2: Climate Trends, in Fifth National Climate Assessment (2023), https://repository.library.noaa.gov/view/noaa/61592.

[403] Mass. Off. of Energy & Env't Affairs, 2022 Massachusetts Climate Change Assessment: Volume II – Statewide Report at 18–19 (Dec. 2022), https://www.mass.gov/doc/2022-massachusetts-climate-change-assessment-december-2022-volume-ii-statewide-report/download [hereinafter 2022 Massachusetts Climate Change Assessment Vol. 2].

[404] *Id.* at 33.

[405] *Id.*

[406] 2022 Massachusetts Climate Change Assessment Vol. 1, *supra* note 400, at ES7.

[407] Mass. Off. of Energy & Env't Affairs, 2023 ResilientMass Plan, Massachusetts State Hazard Mitigation and Climate Adaptation Plan, Executive Summary 7 (Sept. 2023), https://www.mass.gov/doc/resilientmass-plan-2023-executive-summary/download.

Summers will be hotter, which will increase the number, intensity, and duration of heat waves and lead to poorer air quality.[408] Degraded air quality and its related health effects, including new childhood asthma diagnoses and premature death among adults aged 65 and over, are an urgent impact of climate change.[409] Currently, Massachusetts has the third highest prevalence of pediatric asthma in the nation, with nearly 10% of children under the age of 17 affected by asthma.[410] In addition, approximately 12% of the adult population suffers from asthma.[411] Warmer temperatures accelerate the production of ground-level ozone, which impairs lung function and can result in increased hospital admissions and emergency room visits for people suffering from asthma, particularly children.[412] Higher temperatures and carbon dioxide levels also will cause plants to produce more pollen, which exacerbates asthma and other respiratory illnesses.[413] In Massachusetts, the asthma incidence rates are predicted to increase from 7 in 100,000 in 2030 to 53 in 100,000 by 2090.[414] Further, the consequences of degraded air quality disproportionately impact vulnerable populations in Massachusetts.[415] For instance, the incidence rates of both childhood asthma and premature mortality among elderly individuals are more than 20% higher in minority and language-isolated populations.[416]

Massachusetts is already experiencing the effects of climate change on our natural resources. The most urgent impacts include degradation of freshwater and marine ecosystems, coastal wetlands, and forest health.[417] The signs of spring—including the arrival of migratory birds and the blooming of wildflowers and other plants—are arriving earlier. Warmer temperatures are also contributing to a rise in deer populations in Massachusetts, resulting in loss of underbrush habitat for forest species and the spread of tick-borne diseases such as Lyme disease.[418] In part because the Gulf of Maine is warming much faster than other water bodies,

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[408] 2022 Massachusetts Climate Change Assessment Vol. 1, *supra* note 400, at ES3, ES7.

[409] 2022 Massachusetts Climate Change Assessment Vol. 2, *supra* note 403, at 39–40.

[410] *Adult Current Asthma Prevalence and Number by State or Territory, BRFSS 2021, tbl. C1*, Ctrs. for Disease Control & Prevention, https://www.cdc.gov/asthma/brfss/2021/tableC1.html (last updated Mar. 23, 2023); Child Current Asthma Prevalence and Weighted Number by State or Territory, BRFSS 2021, tbl. C1, https://www.cdc.gov/asthma/brfss/2021/child/tableC1.html (last updated July 14, 2023).

[411] *Id.*

[412] 2022 Massachusetts Climate Change Assessment Vol. 2, *supra* note 403, at 32 (linking "health and cognitive effects" to extreme heat), 39 (linking climate-induced temperature increases to degraded air quality).

[413] *Id.* at 51 (linking higher temperatures and carbon dioxide to increases in pollen that exacerbate respiratory illnesses).

[414] *Id.* at 40.

[415] *Id.* at 42.

[416] *Id.*

[417] 2022 Massachusetts Climate Change Assessment Vol. 1, *supra* note 400, at ES7.

[418] Mass. Off. of Energy & Env't Affairs, 2022 Massachusetts Climate Change Assessment: Volume II – Statewide Report, Appendix A at A36 (Dec. 2022), https://www.mass.gov/doc/2022-massachusetts-climate-change-assessment-december-2022-volume-ii-appendix-a/download.

key cold-water ocean fisheries, including cod and lobster, are in decline.[419] The timing of the migration of anadromous fish species, such as Atlantic salmon and alewives, has advanced in the last few decades, and they are migrating earlier in the season.[420]

A future with more intense and frequent precipitation events is expected due to climate change, since higher temperatures mean the moisture-holding capacity of the atmosphere increases.[421] Since 1970, the total annual precipitation in Massachusetts has averaged about 4.7 inches more than during 1895–1969, and a record-setting number of extreme precipitation events occurred during 2005–2014.[422] The U.S. Northeast, including Massachusetts, has seen the country's largest increases in rainfall intensity, with a 55% increase in heavy precipitation events.[423] And rainfall intensity and duration are expected to increase over the coming decades as more moisture will be available to fuel storms.[424] Currently, the 24-hour, 10% annual probability rainstorm for Massachusetts is roughly 3 inches statewide, but the intensity of a 10-year rainstorm may increase to 4 inches in a day by 2090.[425] Finally, higher temperatures will also result in milder winters with more freeze-thaw cycles and more precipitation falling as rain than snow.[426]

While an overall increase in precipitation is expected in Massachusetts, the number of days with rainfall could be more variable and decline.[427] A future with fewer days with rainfall has implications for air quality, generally reducing the "washout" effects that a rainy day has in reducing concentrations of soot, particulate matter, and pollen in the atmosphere, as well as water quality and volume.[428] Higher temperatures coupled with fewer days with rainfall decreases available moisture in the air, increases overall dryness, fire danger and drought conditions. Projections for Massachusetts suggest an increase of about 3% in both the number of consecutive dry day events and the total number of days without rain statewide by 2090. The greater intensity

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[419] *Climate Change in the Northeast U.S. Shelf Ecosystem*, NOAA Fisheries, https://www.fisheries.noaa.gov/new-england-mid-atlantic/climate/climate-change-northeast-us-shelf-ecosystem (last updated June 17, 2025).

[420] *Massachusetts Wildlife Climate Action Tool*, Mass. Climate Adaptation Partnership, https://climateactiontool.org/ (last visited Aug. 2, 2025); U.S. Env't Prot. Agency, Fact Sheet: What Climate Change Means for Massachusetts (Aug. 2016), https://19january2017snapshot.epa.gov/sites/production/files/2016-09/documents/climate-change-ma.pdf.

[421] 2022 Massachusetts Climate Change Assessment Vol. 2, *supra* note 403, at 20, 23.

[422] Jennifer Runkle et al., NOAA Nat'l Ctrs. for Env't Info., *Massachusetts State Climate Summary* (2022), https://statesummaries.ncics.org/downloads/Massachusetts-StateClimateSummary2022.pdf.

[423] Marvel et al., *supra* note 402; Mass. Off. of Energy & Env't Affairs, 2023 ResilientMass Plan, *supra* note 407, at 5.

[424] 2022 Massachusetts Climate Change Assessment Vol. 2, *supra* note 403, at 20, 23.

[425] *Id.*

[426] *Id*. at 123; Marvel et al., *supra* note 402.

[427] 2022 Massachusetts Climate Change Assessment Vol. 2, *supra* note 403, at 23.

[428] *Id.* at 20.

and duration of rainfall on rainy days, on the other hand, can lead to more river and stream flooding, and more stormwater flooding where rainfall intensity hits more impervious areas and overwhelms the ability of the landscape and drainage systems to channel water away. The greater intensity and duration of rainfall also leads to stress on built infrastructure and natural ecosystems, and consequent impacts on human health.[429]

Since 1990, Massachusetts has been affected by numerous major weather disasters, including Superstorm Sandy and Tropical Storm Irene.[430] Superstorm Sandy, a post-tropical storm in 2012, was the most extreme and destructive event to affect the northeastern United States in over 40 years and the fifth costliest in the Nation's history.[431] Impacts of Superstorm Sandy in Massachusetts included strong winds, record storm tide levels, flooding of some coastal areas, and loss of power for 385,000 residents.[432] Massachusetts suffered an estimated $300 million in property losses alone.[433] In January 2018, the storm surge from a powerful winter storm caused major coastal flooding and resulted in a high tide in Boston of 15.16 feet, the highest tide since records began in 1921, even surpassing the infamous Blizzard of 1978.[434] Two months later, a March 2018 coastal storm resulted in a 14.67 foot tide in Boston, the third-highest on record.[435] That March 2018 coastal storm damaged 2,113 homes, including destroying 147 homes, and caused more than $24 million in flood damage across six Massachusetts coastal counties.[436] More recently, a series of heavy rain and flooding events occurred over New England in July 2023, which significantly impacted farms in Massachusetts.[437] The Massachusetts Department of Agricultural Resources estimated that at least 75 farms were damaged, with about

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[429] *Id.* at 22–23.

[430] Runkle et al., *supra* note 422, at 4.

[431] *Massachusetts Summary: Billion-Dollar Weather and Climate Disasters*, NOAA Nat'l Ctrs. for Env't Info., https://www.ncei.noaa.gov/access/billions/events/MA/1980-2024/?disasters%5b%5d=all-disasters (last visited Aug. 2, 2025).

[432] Runkle et al., *supra* note 422, at 4.

[433] *Id.*

[434] Martin Finucane, *It's Official: Boston Breaks Tide Record*, Boston Globe (Jan. 5, 2017), https://www.bostonglobe.com/metro/2018/01/05/official-boston-breaks-tide-record/UPbwDxgF0QXNOWvB9bcQ7L/story.html.

[435] Christina Prignano*, The Noon High Tide Was Bad, but the Midnight High Tide Could Be Worse,* Boston Globe (Mar. 2, 2018), https://www.bostonglobe.com/metro/2018/03/02/the-noon-high-tide-was-bad-but-midnight-high-tide-will-worse/m4O1PR8HRIoLsmx3mp2YvO/story.html.

[436] Christian M. Wade, *Baker Seeks Federal Disaster Funds for Storm Damages*, Lawrence Eagle-Trib. (May 1, 2018), https://www.eagletribune.com/news/merrimack_valley/baker-seeks-federal-disaster-funds-for-storm-damages/article_d2f0c7b4-bd75-5a8b-8a0c-4dedbe44a7b4.html.

[437] *Intense Storms in the Northeast Cause Catastrophic Flooding*, NOAA Nat'l Env't Satellite Data & Info. Serv. (July 14, 2023), https://www.nesdis.noaa.gov/news/intense-storms-the-northeast-cause-catastrophic-flooding; *WPC Met Watch*, Nat'l Weather Serv., Weather Prediction Ctr., https://www.wpc.ncep.noaa.gov/metwatch/metwatch_mpd_multi.php?md=0751&yr=2023 (last updated July 16, 2023).

2,000 acres in crop losses at a minimum value of $15 million.[438] The U.S. Department of Agriculture designated 7 Massachusetts counties as "primary natural disasters area" following the event.[439] In September 2023, torrential rain totaling almost 10 inches in 6 hours caused flash flooding, road washouts, sinkholes, and extensive property damages in the City of Leominster.[440] This event resulted in over $30 million in damages and was declared a federal disaster in May 2024.[441] The September 2023 flooding event represents a 200-year event under return period estimates based on historical data that do not account for climate change, but could become 8 times more likely by the end of the century. The damages from such major weather disasters are expected to worsen with climate change, with a projected statewide annual increase of $9.3 million in economic flood damage by 2030.[442]

Beyond the damage that more intense storms can cause homes, businesses, and private and public infrastructure generally, such events also threaten the aging combined sewer and stormwater systems serving many Massachusetts cities, such as Boston and Lowell. Heavy precipitation and coastal flooding can overwhelm these systems and release untreated sewage to our rivers and coastal waters, threatening public health and water quality.[443] As assessed in the 2022 MA Climate Change Assessment, there is a high level of disproportionate impact for both coastal storm surge events and inland flooding on minority, low-income, and language-isolated communities.[444]

Massachusetts's entire coastline is at risk from coastal flooding and storm surge, including tidal flooding and flooding caused by storm events. As a coastal state, Massachusetts is

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[438] Press Release, Mass. Off. of the Governor, Healey-Driscoll Administration, United Way Announce Farm Resiliency Fund to Support Flood Relief Efforts (July 20, 2023), https://www.mass.gov/news/healey-driscoll-administration-united-way-announce-farm-resiliency-fund-to-support-flood-relief-efforts.

[439] Press Release, U.S. Dep't of Agric. Farm Serv. Agency, USDA Designates 7 Massachusetts Counties Primary Natural Disaster Areas (July 31, 2023), https://www.fsa.usda.gov/news-events/news/07-31-2023/usda-designates-7-massachusetts-counties-primary-natural-disaster-areas.

[440] Heather Brinkmann & Scott Sistek, *Flash Flooding Emergency Leaves Widespread Water Damage in Massachusetts Town*, Fox Weather (Sept. 11, 2023), https://www.foxweather.com/weather-news/flash-flood-leominster-mass-northeast; *Storm Events Database*, NOAA Nat'l Ctrs. for Env't Info., https://www.ncdc.noaa.gov/stormevents/ (last visited Aug. 2, 2025).

[441] Russ Reed, *Massachusetts Governor Files Federal Disaster Declaration Request 3 Months After Leominster Flood*, WCVB: Boston (Dec. 12, 2023), https://www.wcvb.com/article/leominster-flood-disaster-request-massachusetts-governor/46107881; Colin A. Young, *White House Overrules FEMA on Storm Aid for September Floods*, WBUR: Boston (May 16, 2024), https://www.wbur.org/news/2024/05/16/biden-fema-dister-aid-leominster-floods.

[442] Mass. Off. of Energy & Env't Affairs, 2023 ResilientMass Plan, *supra* note 407, at 5.

[443] City of Boston, Climate Ready Boston, Final Report 290 (Dec. 2016), https://bostoncan.org/wp-content/uploads/2017/01/climate-ready-boston-12-2016.pdf; Miriam Wasser, *Sewage Can Overflow into Mass. Waterways When It Rains. Fixing the Problem Isn't Cheap*, WBUR: Boston (Oct. 23, 2023), https://www.wbur.org/news/2023/10/23/massachusetts-combined-sewer-overflow-cso-climate-change.

[444] 2022 Massachusetts Climate Change Assessment Vol. 2, *supra* note 403, at 45.

especially vulnerable to sea level rise caused by climate change, which is already exacerbating coastal flooding and erosion from storm events. The state is planning for projected sea level rise of up to two and a half feet by 2050 and four and a half feet by 2070, compared to 2008 levels, if global emissions are not significantly reduced. As a consequence, coastal communities are facing increasing flooding risks to homes and businesses, infrastructure, and natural resources.[445] According to the 2022 Massachusetts Climate Change Assessment, nearly 43% (3 million out of 7 million) of the Commonwealth's total population resides on or near the coast, including the region's major economic hub, the City of Boston.[446] Estimates of the projected direct flood damage to commercial and industrial structures in the Commonwealth's coastal areas are expected to more than double by 2030 (up to $56 million) and the incremental cost could reach as high as $270 million annually by 2090, more than ten times higher than current levels.[447] These direct impacts of flooding are largest and grow most rapidly in the Boston Harbor region, where a large portion of the Commonwealth's commercial economic base is located. For example, more disruptions to emergency response services due to traffic delays are expected with sea level rise and greater storm surge.[448] The associated annual economic cost can rise to $1.3 million by 2070, more than five times the current expected annual cost.[449] Further, by 2070, coastal flooding is projected to cause over $52 million in damage annually to state-owned coastal properties, a 550% increase from 2023.[450]

Increased sea level, combined with coastal erosion, is also predicted to threaten Massachusetts's coastal landforms, such as beaches, dunes, banks, and salt marshes. Development on or adjacent to the beaches themselves will continue to face challenges associated with erosion and storm damage. Barrier beaches are susceptible to erosion, overwash, and, in some cases, breaching.[451] Such breaching will threaten extensive areas of developed shoreline located behind these barrier spits and islands, such as the shorelines of Plymouth,

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[445] Mass. Off. of Energy & Env't Affairs, 2022 Massachusetts Climate Change Assessment: Volume II – Statewide Report, Appendix B: Additional Information on Climate Inputs and Assessment Methods at B9, tbl. B-1, panel B, https://www.mass.gov/doc/2022-massachusetts-climate-change-assessment-december-2022-volume-ii-appendix-b/download.

[446] 2022 Massachusetts Climate Change Assessment Vol. 2, *supra* note 403, at 7. Forty-three percent value is the share of Massachusetts's population living in the Boston Harbor, North & South Shores, and Cape, Islands, & South Coast Assessment Regions.

[447] 2022 Massachusetts Climate Change Assessment: Volume II, Appendix A, *supra* note 418, at A124–25, tbl. A40. 2030 damages ($56 million) are equal to the sum of the increase in damages from 2008 to "Current" ($22 million) and the increase in damages from "Current" to 2030 ($34 million).

[448] City of Boston, Climate Ready Boston, *supra* note 443, at 291.

[449] 2022 Massachusetts Climate Change Assessment Vol. 2, *supra* note 403, at 124.

[450] Mass. Off. of Energy & Env't Affairs, 2023 ResilientMass Plan, *supra* note 407, at 5.

[451] Trustees of Reservations, State of the Coast: Future Climate-Driven Risks—and Their Solutions—on Massachusetts' North Shore 8 (2020), https://static1.squarespace.com/static/5ce308a7514487000112e19b/t/5f3d5582527cfe3b6a26f282/1597855119256/SOC_2020_NorthShore_.pdf.

Duxbury, and Kingston.[452] Some approaches to addressing coastal erosion can exacerbate the problem. For example, efforts to maintain the shoreline via hardening and armoring (e.g., shore-parallel coastal engineering structures) can damage the natural environment, including lowering of beaches (natural buffers) that protect upland infrastructure and provide essential habitat. Human activity upland and on the shore can result in increased rates of erosion, with certain types of shoreline protection infrastructure like seawalls changing erosion rates in adjacent shorelines.[453] Land uses that impact natural sedimentation processes and increased development and infrastructure in upland areas can also contribute to increased coastal erosion.[454] Further, the cost of maintaining and upgrading these engineering structures will increase as sea levels rise, requiring millions of dollars of investments by the state and local governments in Massachusetts.[455] For example, a large scale beach replenishment project in Winthrop required $26 million in state funds for completion.[456]

Large populations of species that rely on areas of critical coastal and estuarine habitat, including the North Shore's Great Marsh—the largest continuous stretch of salt marsh in New England, extending from Cape Ann to New Hampshire—are also at risk as they may be unable to keep pace or migrate landward as sea level rises.[457] Coastal wetland degradation was one of the most urgent impacts for the natural environment sector noted in the 2022 Massachusetts Climate Change Assessment. Sea level rise is cited as affecting the highest degree of habitat shifts and contributing to possible loss of salt marshes at the regional scale, while other impacts from climate change, such as rising temperatures, increased runoff during precipitation events, invasive species, drought, and coastal development also stress coastal wetlands.[458] In addition to providing essential habitat and recreational opportunities, coastal wetlands absorb wave action, buffering developed areas upland during storms. The Commonwealth is projected to lose over 24,000 acres of coastal wetlands by the end of the century.[459]

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[452] *See* Plymouth: Nourishment of Eroded Overwash Areas at Long Beach, Mass. Off. of Coastal Zone Mgmt. (CZM), https://www.mass.gov/info-details/plymouth-nourishment-of-eroded-overwash-areas-at-long-beach (last visited Aug. 2, 2025) (one of CZM's Coastal Resilience Grant Program's Feature Projects); *see also Coastal Resilience Program*, Duxbury Beach Reservation, Inc., https://www.duxburybeachreservation.org/coastalresilience (last visited Aug. 2, 2025).

[453] Mass. CZM, StormSmart Properties Fact Sheet 7: Repair and Reconstruction of Seawalls and Revetments (2018), https://www.mass.gov/files/documents/2018/05/29/ssp-factsheet-7-revetments-new.pdf.

[454] Mass. CZM, StormSmart Properties Fact Sheet 2: Controlling Overland Runoff to Reduce Coastal Erosion (2018), https://www.mass.gov/files/documents/2018/05/29/ssp-factsheet-7-revetments-new.pdf.

[455] *See* Beth Daley, '*Sand Wars' Come to New England Coast*, Boston Globe (Dec. 15, 2013), https://www.bostonglobe.com/lifestyle/health-wellness/2013/12/15/sand-wars-come-new-england-coast/F2ClK6e20wtcZeCoUQC9AM/story.html.

[456] *Id.*

[457] City of Boston, Climate Ready Boston, *supra* note 443, at 60.

[458] 2022 Massachusetts Climate Change Assessment Vol. 2, *supra* note 403, at 94.

[459] Mass. Off. of Energy & Env't Affairs, 2023 ResilientMass Plan, *supra* note 407, at ES6.

Finally, Massachusetts is also experiencing more extreme droughts, with drought conditions lasting at least six months in multiple regions across the state for 8 of the last 10 years. Most recently, the Commonwealth experienced drought conditions beginning in June 2024 with more rapidly intensifying conditions from September through November 2024, and the drought extended through May 2025. In the fall of 2024, a severe deficit in rainfall coupled with above normal temperatures resulted in drying out vegetation and the top several inches of soil layer, which became fuels for ignition and caused fires to burn deeper and longer. Fire weather-related indices, including drought, temperatures, winds, and relative humidity, repeatedly reached critical levels and increased wildfire occurrence, with dangerous intense, deep burning fire behavior.[460] In 2024, there were 227 fires in October and 461 fires in November, months which typically have 15 and 21 fires, respectively.[461] Increased temperatures, drought, and changes in precipitation patterns, similar to those experienced in 2024, will increasingly contribute to drier conditions that create a greater risk of wildfires.[462]

Michigan

The realities of the climate crisis are already directly impacting Michigan and pose a serious threat to our communities' health and well-being, infrastructure, businesses, and natural resources. Increased temperatures and precipitation—the main two drivers of climate impacts in the state—have drastically disrupted historically stable weather patterns and have led to more extreme weather events and statewide emergencies.[463] Compared to 1900, Michigan is nearly three degrees warmer on average and receives around five more inches of rain per year.[464] More frequent storms and record flooding have overwhelmed our public infrastructure.[465] Hotter summers are contributing to higher rates of heat-related emergency room visits.[466] And these warmer, wetter summers combined with milder winters have increased instances of disease-carrying ticks and mosquitos and amplified rates of Lyme disease and West Nile virus throughout

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[460] Mass. Drought Mgmt. Task Force, Wildland Fire Management Current Drought Impacts (Nov. 2024), https://www.mass.gov/doc/november-18-2024-dmtf-attachment-dcr-fire-summary/download.

[461] Mass. Drought Mgmt. Task Force, November Meeting Minutes (Nov. 2024), https://www.mass.gov/doc/november-18-2024-dmtf-meeting-notes/download; Mass. Drought Mgmt. Task Force, December Meeting Minutes (Dec. 2024), https://www.mass.gov/doc/december-5-2024-dmtf-meeting-notes/download.

[462] 2022 Massachusetts Climate Change Assessment Vol. 2, *supra* note 403, at 106.

[463] Mich. Dep't of Env't, Great Lakes, & Energy, Michigan Healthy Climate Plan 10–11 (2022) https://www.michigan.gov/egle/-/media/Project/Websites/egle/Documents/Offices/OCE/MI-Healthy-Climate-Plan.pdf?rev=d13f4adc2b1d45909bd708cafccbfffa [hereinafter Michigan Healthy Climate Plan].

[464] *Id*. at 10.

[465] *Id*. at 3, 10.

[466] Mich. Dep't of Health & Human Servs., Climate Effects On Health, Extreme Heat and Heat-Related Illness (2020), https://www.michigan.gov/mdhhs/-/media/Project/Websites/mdhhs/Safety-and-Injury-Prevention/Environmental-Health/Climate/Documents/Climate_effects_on_health_extreme_heat_and_HRI.pdf?rev=12dc48b8e1a742c3a95da9822fe72f9e&hash=C2E258903C7CC5A72CE25F59D7A2C9A7; Michigan Healthy Climate Plan, *supra* note 463, at 11.

the state.[467] Most recently, a once-in-a-hundred-year ice storm overwhelmed northern Michigan, leaving thousands without power and straining fuel, food, and other resources.[468]

John L. Russell, Wilkinson Road Blocked by Downed Power Lines, Monday, March 31, 2025; Source: Associated Press News[469]

[467] Mich. Dep't of Health & Human Servs., Climate Changes MI Health: Michigan Ticks (2024), https://www.michigan.gov/mdhhs/-/media/Project/Websites/mdhhs/Safety-and-Injury-Prevention/Environmental-Health/MiTracking/Documents/MiTracking-Climate-Changes-MI-Health-Series-Ticks.pdf?rev=70f28e6c813e4bd48eca49bd1506df68&hash=8C65E3B02E240BC84AC2F063C37B1448; Michigan Healthy Climate Plan, *supra* note 463, at 11.

[468] Annie Doyle, *National Weather Service: Northern Michigan Ice Storm worst in over 100 Years*, Petoskey News-Review (Apr. 3, 2025), https://www.petoskeynews.com/story/weather/2025/04/03/a-generational-storm-national-weather-senorthern-michigan-ice-storm-2025-was-worst-in-over-100-years/82779670007/; Marc Schollett, *Northern Michigan Power Restoration Continues After Devastating Ice Storm*, UpNorthLive (Apr. 7, 2025), https://upnorthlive.com/news/local/northern-michigan-power-restoration-continues-after-devastating-ice-storm; Ken Haddad, *Whitmer Deploys National Guard, Boosts Fuel Delivery in Response to Northern Michigan Ice Storm*, Click on Detroit (Apr. 1, 2025), https://www.clickondetroit.com/news/local/2025/04/01/whitmer-deploys-national-guard-boosts-fuel-delivery-in-response-to-northern-michigan-ice-storm/.

[469] Ed White, *Northern Michigan —No Stranger to Wild Weather—Tries to Cope with Days of No Power*, Associated Press (Apr. 1, 2025), https://apnews.com/article/michigan-ice-storm-power-outages-4807b995fd4f9acbe1cdc7715e2bbaef.

These events are not "one-off" accidents. From 1980 to 2009, Michigan experienced 21 confirmed climate disaster events with losses exceeding $1 billion each.[470] From 2010 to 2024, the number of billion-dollar disasters impacting Michigan rose to 39 events, a nearly 50% increase in half the amount of time.[471] Over the course of these 45 years, Michigan experienced an estimated total of $10 to $20 billion worth of damages, adjusted for inflation, with events from the last 15 years contributing to over 60% of the total costs.[472]

Irregular weather conditions from climate change are also disrupting some of Michigan's most important industries. For instance, the state experienced a record-breaking crop loss event when temperatures hit over 80 degrees in March 2012, which caused Michigan cherry trees to bloom, only for the crop to be almost entirely lost when temperatures dropped below freezing later in April.[473] Numerous seasonal winter businesses and cultural practices that rely on predictable snow and ice formation have struggled to survive warming winters, with tangible economic implications for the greater Michigan economy, where winter recreation generates over $3 billion annually.[474]

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[470] *Michigan Summary*, *Billion-Dollar Weather and Climate Disasters*, Nat'l Ctrs. for Env't Info., https://www.ncei.noaa.gov/access/billions/state-summary/MI#:~:text=Tornado%20Alley,Michigan%20Summary,and%207%20winter%20storm%20events (last visited Aug. 2, 2025).

[471] *Id*.

[472] *Id.*

[473] Michigan Healthy Climate Plan, *supra* note 463, at 11.

[474] Kelly House, *Climate Change Is Erasing Michigan Winters, Taking Our Heritage with Them*, Bridge Mich. (Feb. 26, 2024), https://www.bridgemi.com/michigan-environment-watch/climate-change-erasing-michigan-winters-taking-our-heritage-them; Izzy Ross, *Should a Lack of Snow Become its Own Economic Disaster?*, Planet Detroit (Dec. 20, 2024), https://planetdetroit.org/2024/12/ski-hill-drought-relief; Great Lakes Business Network, *The Costs of Climate Change for Michigan: Great Lakes State at Risk* 3, https://glbusinessnetwork.com/wp-content/uploads/2020/11/GLBN-Costs-of-Climate-Change-for-Michigan-Fact-Sheet-5-002.pdf.

Source: Michigan Department of Environment, Great Lakes, and Energy, Michigan Healthy Climate Plan 11 (2022).

The effects of climate change also have disastrous implications for one of Michigan's most treasured resources: the Great Lakes. Warming winter temperatures have contributed to the historic decline of ice cover on all five Great Lakes.[475] This loss of ice cover, in combination with increased precipitation, increased air and water temperatures, and higher rates of evaporation, have led to greater variability in water levels, highlighted by abnormally low water levels from 1998 to 2013 to unusually high-water levels from 2015 to 2021.[476] Varying water levels negatively affect Michigan's shipping industry, and contribute to coastal erosion, the spread of invasive species, and the decline of overall ecosystem health.[477] Higher levels of precipitation also increase the amount of agricultural runoff flowing into the Great Lakes, which

[475] *Climate Change Connections: Michigan (The Great Lakes)*, U.S. Env't Prot. Agency, https://www.epa.gov/climateimpacts/climate-change-connections-michigan-great-lakes (last updated Jan. 17, 2025).

[476] Mich. Dep't of State Police, Emergency Mgmt. Homeland Security Div., Michigan Hazard Mitigation Plan 76 (Apr. 2024), https://www.michigan.gov/-/media/Project/Websites/msp/EMHSD/Publications/MHMP.pdf?rev=c70dec864e0146efad1d42ebc90a572e.

[477] *Id.*

undermines water quality and promotes the growth of harmful algal blooms, which can produce toxins that are hazardous to human health.[478]

As climate change continues to affect Michigan, we will see more property loss, infrastructure failures, and a greater likelihood of contamination, bacteria, and hazardous toxins in our water supplies from increased precipitation.[479] Higher temperatures will put our residents at greater risk of heat-related illnesses and warmer winters will require Michigan's small winter businesses to adapt or face closure.[480] Moreover, extreme weather events and power outages will continue to harm Michigan's most vulnerable families and strain our resources.[481] Michigan currently spends millions of dollars annually to respond to these climate-related impacts.[482] According to a recent study, for every $1 Michigan commits to climate adaptation, the state will avoid $4 to $11 worth of future damages.[483] Reducing greenhouse gas emissions as rapidly as possible will help Michigan avoid the most dire of these outcomes.[484]

Minnesota

The State of Minnesota is experiencing a rapidly changing climate that will continue to change for the foreseeable future. Temperatures are increasing—especially in winter—and larger, more frequent extreme precipitation events are occurring.[485] Substantial warming during winter and at night, increased precipitation, and heavier downpours already have affected our natural resources, and how we interact with and use them. The decades ahead will bring even warmer winters and nights, and even greater rainfalls, along with the likelihood of increased summer heat and the potential for longer dry spells.[486] Minnesota has warmed by 3.3°F between 1895 and 2024, while annual precipitation increased by an average of 3.5 inches.[487] Although Minnesota has gotten warmer and wetter since 1895, the most dramatic changes have come in the past several decades.[488] Compared to 20th century averages, all but two years since 1970 have been warm, wet, or both.[489] Each of the top-10 combined warmest and wettest years on record (since 2024) occurred since 1998, with 2024 standing as the warmest year on record and 2019 the

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[478] *Climate Change Connections: Michigan (The Great Lakes)*, U.S. Env't Prot. Agency, *supra* note 475.

[479] Michigan Healthy Climate Plan, *supra* note 463, at 10.

[480] *Id*. at 10–11; House, *supra* note 474.

[481] Michigan Healthy Climate Plan, *supra* note 463, at 15.

[482] *Id*. at 22.

[483] *Id*.

[484] *Id*. at 15.

[485] *Climate Trends*, Minn. Dep't of Nat. Res., https://www.dnr.state.mn.us/climate/climate_change_info/climate-trends.html (last visited Aug. 2, 2025).

[486] *Id*.

[487] *Id*.

[488] *Id*.

[489] *Id*.

wettest.[490] Although climate conditions will vary from year to year, these increases are expected to continue through the 21st century.[491]

In the last five years, the frequency of billion-dollar disasters in Minnesota has increased significantly. From 1980 to 2024, the annual average for billion-dollar weather and climate disasters in Minnesota is 1.4 events per year, but the annual average from 2020 to 2024 is 4.6 events.[492] In other words, over the past four decades, Minnesota has averaged about 1.4 billion-dollar weather and climate disasters per year—but in just the last five years, that average has spiked to 4.6 annually.[493]

The "Lost Winter" of 2023–2024 was the warmest on record, with temperatures averaging 10.9°F above 1991–2020 averages.[494] Most areas in the state received less than 50% of their normal snowfall.[495] These conditions had a significant negative impact on Minnesota's winter recreation economy, leading many small businesses to seek support in emergency loans.[496] That "Lost Winter" was followed by a multi-month period of frequent and sometimes heavy precipitation, punctuated by extreme rainfall events between June 18th and 22nd in northeastern and southern Minnesota, leading to extensive flooding and federal emergency declarations for large parts of the state.[497]

Heavy rains are now more common in Minnesota and more intense than at any time on record.[498] Long-term observation sites have seen dramatic increases in 1-inch rains, 3-inch rains, and the size of the heaviest rainfall of the year. Since 2000, Minnesota has seen a significant uptick in devastating, large-area extreme rainstorms as well.[499] Rains that historically would have

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[490] *Id.*

[491] *Id.*

[492] *Minnesota Summary, Billion-Dollar Weather and Climate Disasters*, NOAA Nat'l Ctrs. for Env't Info., https://www.ncei.noaa.gov/access/billions/state-summary/MN (last visited Aug. 2, 2025).

[493] *Id.*

[494] *Id.*

[495] State of Minn., Climate Action Framework Progress Report 4 (2024), https://perma.cc/CV57-T5HM.

[496] *Id.*

[497] *Extreme Rainfall Drenches Northeastern Minnesota*, Minn. Dep't of Nat. Res. (June 20, 2024), https://www.dnr.state.mn.us/climate/journal/extreme-rainfall-northeast-mn-june-18-2024.html; *Extreme Rain and Flooding in Southern Minnesota, June 20-22*, Minn. Dep't of Nat. Res. (Aug. 9, 2024) https://www.dnr.state.mn.us/climate/journal/extreme-rain-flooding-southern-minnesota-june-20-22.html; *Disaster Information*, Minn. Dep't of Pub. Safety, https://dps.mn.gov/divisions/hsem/em-resources/disaster-information (last visited Aug. 2, 2025).

[498] *Climate Trends*, Minn. Dep't of Nat. Res., *supra* note 4855.

[499] *Id.*

been in the 98th percentile annually (the largest 2%) have become more common.[500] Climate projections indicate these big rains will continue increasing into the future.[501]

Most of Minnesota's observed warming has been when it is coolest. Minnesota winters are warming faster than nearly any other state in the contiguous United States.[502] Minnesota's average winter temperature has warmed 5.8°F since 1970, and our lakes have lost an average of 10 to 14 days of ice cover in the past 50 years.[503] Over the entire period of record (back to January of 1895), average daily minimum or low temperatures have risen at more than twice the rate of average daily maximum or high temperatures, and the winter season (December through February) has warmed 2 to 3 times faster than summer (June through August).[504] Winter warming rates in particular have risen even more sharply in recent decades, and from 1970 through 2021, average daily winter low temperatures rose more than 15 times faster than average daily summer high temperatures.[505] The frequencies of -35°F readings in northern Minnesota and -25°F readings in the south have fallen by up to 90%. Minnesota does not get as cold as it once did, and even though Minnesota always will see periodic severe cold spells, the long-term decline in cold extremes is all but guaranteed to continue.[506]

Minnesota's summers are anticipated to get hotter and more humid in the years ahead. This can be especially dangerous for outdoor workers, athletes, pregnant people, children, and older Minnesotans.

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[500] *Id.*

[501] *Id.*

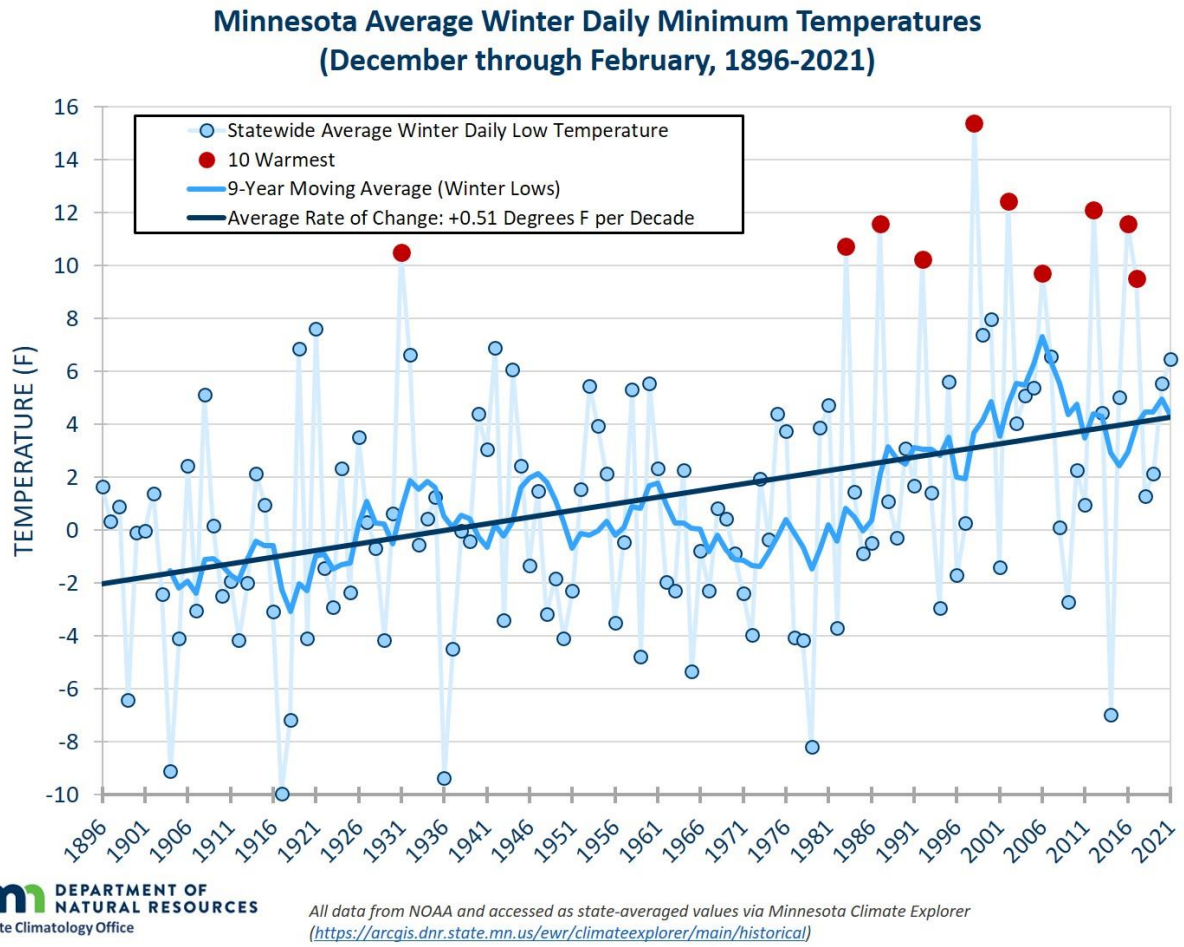
[502] State of Minn., Climate Action Framework Progress Report, *supra* note 495.

[503] *Id.*; *Climate Trends*, Minn. Dep't of Nat. Res., *supra* note 485.

[504] *Climate Trends*, Minn. Dep't of Nat. Res., *supra* note 485.

[505] *Id.*

[506] *Id.*



Climate change is having a profound impact on Minnesota's natural environment. Many of our state's iconic native plants and animals—from birch trees to walleye—are threatened by warming temperatures and shifting weather patterns.[507] This may cause northern tree species to die out or populations to move further north, while warmer-climate tree species take their place. Higher temperatures in concert with increased stormwater runoff and erosion, will cause problematic algae blooms.

Minnesota is an agricultural state, and it has been impacted by significant drought since 2021. The drought in 2021 was the most extreme the state has experienced since 1988.[508] That drought continued through 2022.[509] The state's 2021 Agricultural Drought Relief Program, established by the Minnesota Legislature with $8.1 million in funding, received nearly 3,000 applications totaling close to $19 million in eligible expenses—more than double the available

[507] *Climate Impacts on the Environment*, Minn. Pollution Control Agency, https://www.pca.state.mn.us/air-water-land-climate/climate-impacts-on-the-environment (last visited Aug. 2, 2025).

[508] *Drought in Minnesota*, Minn. Dep't of Nat. Res., https://www.dnr.state.mn.us/climate/drought/index.html (last visited Aug. 2, 2025).

[509] *Id.*

funds. This significant gap between available funding and demonstrated need underscores both the severity of the drought's impact on Minnesota's agricultural producers and the urgent, unmet demand for government support in the face of climate-related disasters. In 2023–2024, drought conditions persisted due to less than half the average winter snowfall and extraordinarily warm winter and fall temperatures.[510] Though there is currently no long-term trend regarding the frequency or intensity of drought occurrence in Minnesota, climate model projections indicate that projected warmer temperatures could cause an increase in future drought intensity, despite further expected increases in precipitation levels.[511]

Climate change is also responsible for flooding.[512] Frequent and intense storms are now occurring more often than any time on record, and the trend is projected to continue.[513] Record-breaking floods damage streets, wastewater facilities, businesses, homes, farms, and natural resources, costing local governments, business owners, and residents millions of dollars in cleanup and repairs.[514] For example, in FY25, $3 million of state funds were allocated to support local jurisdictions, tribal nations, educational institutions, and nonprofits in adapting to extreme weather, improving clean transportation options, and implementing community resilience measures.

Annual precipitation has increased as well, especially in the southern parts of the state.[515] Extreme rains also cause major destruction to infrastructure.[516] In 2023, there were more than 155,000 residential properties, 29,000 miles of roads, 13,000 commercial buildings, and 515 critical infrastructure facilities in Minnesota at risk of severe flooding. These numbers are expected to increase with rain totals across the state.[517] In fiscal year 2025, the Minnesota Pollution Control Agency allocated $500,000 in state-administered funds to support climate adaptation planning in small communities under 10,000 people. This program addresses rising costs and damage from overwhelmed stormwater infrastructure, increased wastewater system stress, and climate-related public health risks. The program illustrates both the state's growing financial responsibility and the wear on public infrastructure requiring proactive investment.

Climate change also disproportionately impacts the most vulnerable in Minnesota, including the very old and very young, people of color, and people with health issues,

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[510] *Id.*

[511] *State Climate Summaries 2022: Minnesota*, NOAA Nat'l Ctrs. for Env't Info., https://statesummaries.ncics.org/chapter/mn/ (last visited Aug. 2, 2025).

[512] *Climate Change Impacts*, Minn. Pollution Control Agency, https://www.pca.state.mn.us/air-water-land-climate/climate-change-impacts (last visited Aug. 2, 2025).

[513] *Id.*

[514] *Id.*

[515] *Id.*

[516] *Climate Impacts on Infrastructure*, Minn. Pollution Control Agency, https://www.pca.state.mn.us/air-water-land-climate/climate-impacts-on-infrastructure (last visited Aug. 2, 2025).

[517] *Id.*

disabilities, economic vulnerability, outdoor occupations, disproportionate exposure to environmental pollution, and cultural/language barriers.[518]

Wildfires are becoming larger and more frequent, in part, due to climate change. In 2023, Minnesota issued a record 21 air quality alerts because of wildfire smoke drifting into the state from far beyond our borders.[519] These conditions make it difficult to enjoy the health and wellness benefits of time spent outdoors. In the spring of 2025, Minnesota experienced more frequent, intense, and destructive wildfires in northern parts of the state (three fires consumed more than 32,000 acres and destroyed an estimated 150 structures), signaling that Minnesota is not immune from the severe effects of a warming planet.[520]

New Jersey

Climate-Change-Related Harms Currently Impacting New Jersey

New Jersey currently is suffering the consequent harms of climate change. These include sea level rise and attendant flooding, erosion, damage to riparian lands and submerged lands, and loss of wetlands and beaches; increased frequency and intensity of extreme weather events, including coastal and inland storms and associated flooding, drought, extreme heat, extreme precipitation events, wildfires, habitat loss, species impacts, and others; ocean warming and acidification; and the resulting social, economic, health and other consequences of climate change.[521]

New Jersey's total coastal zone encompasses 1,792 miles of coastline, and covers a vast portion of the state, including parts of 17 counties and 239 municipalities (42% of total municipalities).[522] Eighty percent of New Jersey residents, approximately seven million people, live year-round in the coastal zone.[523] The New Jersey Department of Environmental Protection (NJDEP) itself owns and manages numerous state-owned coastal and waterfront properties,

[518] *Climate Impacts on Vulnerable Populations*, Minn. Pollution Control Agency, https://www.pca.state.mn.us/air-water-land-climate/climate-vulnerable-populations-and-strategies-to-reduce-risk (last visited Aug. 2, 2025).

[519] State of Minn., Climate Action Framework Progress Report, *supra* note 495.

[520] Soumya Karlamangla & Jeff Ernst, *Minnesota as a Refuge from Climate Change? Three Wildfires Show Otherwise*, N.Y. Times (May 17, 2025), https://www.nytimes.com/2025/05/17/us/minnesota-wildfires-climate-change.html?smid=url-share.

[521] *See generally* N.J. Dep't of Env't Prot., 2020 New Jersey Scientific Report on Climate Change, ch. 4, https://dspace.njstatelib.org/items/07c48e1a-6de6-4458-82d3-5dd70e31de50.

[522] *Coastal Zone*, N.J. Dep't of Env't Prot., https://dep.nj.gov/wlm/lrp/coastal-zone/ (last visited Aug. 2, 2025).

[523] N.J. Dep't of Env't Prot., 2021 New Jersey Climate Change Resilience Strategy 75, 98, https://dep.nj.gov/climatechange/resilience/resilience-strategy/.

including Barnegat Lighthouse State Park, Cape May Point State Park, Island Beach State Park, Liberty State Park, and the North Brigantine Natural Area.[524]

New Jersey's coastal zone is critical to a $50 billion maritime industry, which includes ports and terminals, cargo movement, boat manufacturing and sales, ferry operations, and marine trade, among other things.[525] As part of the coastal zone, New Jersey has about 125 miles of white sand beaches along the Atlantic coastline. The so-called Jersey Shore is a major tourist destination, attracting millions of visitors each year and generating billions of dollars for the state's economy. In 2023, more than 55 million people visited four coastal counties at the Shore (Monmouth, Ocean, Atlantic, and Cape May), spending approximately $24.39 billion.[526]

With its large and economically important coastline, New Jersey is especially vulnerable to harms from rising sea levels. The sea level along the Jersey coast is rising faster than the global average. In Atlantic City, Cape May, and Sandy Hook, sea level rise has averaged 0.2 to 0.5 inches per year since 1900.[527] As the sea level has risen, the occurrence of high-tide floods, which are instances where upland flooding occurs solely due to the high tide levels in the absence of any precipitation, also has increased. In Atlantic City, the frequency of tidal flooding events has increased from an average of one per year in the 1950s to an average of eight per year from 2007 to 2016.[528]

New Jersey's freshwater and coastal wetlands have experienced greater levels of salinity from increased sea levels and flooding during storms. This saltwater inundation has caused New Jersey to experience "ghost forests," or stands of dead trees, surrounded by transitional marshes.[529]

New Jersey's temperature is rising faster than the rest of the Northeastern United States. Since 1895, New Jersey's annual temperature has increased by 3.5°F.[530] June and July 2024 were the second hottest on record in New Jersey since the state began keeping records in 1895. Eight of the 10 warmest Julys, going back to 1895, have occurred since 2010.[531] The urbanization of large parts of New Jersey has resulted in large expanses of asphalt and concrete, and the loss of forests, fields, and other open spaces. These conditions make heat waves especially pronounced

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[524] *New Jersey's State Parks, Forests & Historic Sites*, N.J. Dep't of Env't Prot., https://www.nj.gov/dep/parksandforests/ (last visited Aug. 2, 2025).

[525] 2021 New Jersey Climate Change Resilience Strategy, *supra* note 523, at 77.

[526] Tourism Econ., The New Jersey Visitor Economy 2023 19 (2024), https://visitnj.org/sites/default/files/2024-05/2023_Tourism_Economic_Impact_Study.pdf.

[527] 2020 New Jersey Scientific Report on Climate Change, *supra* note 521, at ix, 44.

[528] *Id.* at 45.

[529] *Id.* at xii–xiii, 106.

[530] *Id.* at vii, 31.

[531] David A. Robinson, *Once Again Hot, and This Time Around, Dry: July 2022 Recap*, Off. of the N.J. State Climatologist (Aug. 6, 2022), https://climate.rutgers.edu/stateclim/?section=menu&%20target=jul22.

and lead to increased impacts in densely populated urban areas, the so-called heat island effect.[532]

Over the last 50 years, storms in New Jersey that resulted in extreme rain increased by 71%, which is a faster rate than anywhere else in the United States.[533] By the end of this century, heavy precipitation events are projected to occur two to five times more often, and with more intensity than in the last century.[534] Total annual precipitation in New Jersey has been about 3.7 inches above the long-term average for the past 16 years.[535] However, small decreases in the amount of precipitation may occur in the summer months, resulting in greater potential for more frequent and prolonged droughts.[536]

These increased precipitation levels and more intense storms have subjected New Jersey residents to more extreme storms, including coastal nor'easters, snowstorms, spring and summer thunderstorms, tropical storms, and, on rare occasions, hurricanes.[537] Extreme storms that resulted in major flooding in the state include storm events in 2000, 2004, 2005, 2006, 2007, 2010, 2011, 2012, and 2016.[538] One major example of a combined hurricane and nor'easter is Superstorm Sandy, which landed in New Jersey in October 2012 causing widespread flooding inundation that damaged or destroyed 346,000 homes, and resulted in the loss of 38 lives, the loss of power to 2 million people for an extended period, and approximately $30 billion in damages.[539]

Tropical Storm Ida in 2021 caused extensive damage to NJ Transit's maintenance facility in Woodbridge Township, which continues to be risk-prone due to destructive weather events. To alleviate this danger, NJ Transit is now building a new facility in another town.[540] Superstorm Sandy damaged more than 300 NJ Transit rail cars and locomotives, and flooding devastated the

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[532] 2020 New Jersey Scientific Report on Climate Change, *supra* note 521, at vii, 30.

[533] *Id.* at ix.

[534] *Id.* at viii.

[535] Jennifer Runkle et al., NOAA Technical Report NESDIS 150-NJ, New Jersey State Climate Summary 2022 at 1-5 (2022), https://statesummaries.ncics.org/chapter/nj/.

[536] 2020 New Jersey Scientific Report on Climate Change, *supra* note 521, at xiii.

[537] *Id.*

[538] *Id*. at 42; *see also New Jersey Summary, Billion-Dollar Weather and Climate Disasters*, Nat'l Ctrs. for Env't Info., https://www.ncei.noaa.gov/access/billions/state-summary/NJ (summarizing numerous extreme weather events that resulted in severe flooding in New Jersey) (last visited Aug. 2, 2025).

[539] *Remembering Superstorm Sandy*, N.J. Dep't of Env't Prot., https://dep.nj.gov/sandy-10/ (last visited Aug. 2, 2025).

[540] Press Release, N.J. Transit, NJ Transit Facility Receives $75 Million Grant from the FTA for New Rail Maintenance of Way Facility (Feb. 6, 2024), https://www.njtransit.com/press-releases/nj-transit-receives-75-million-grant-fta-new-rail-maintenance-way-facility.

Hoboken rail yard and the Meadowlands maintenance complex, resulting in more than $400 million in damage.[541]

In sum, climate change is already causing more extreme weather in New Jersey, with attendant physical and environmental consequences, including coastal flooding, coastal erosion, inland flooding, extreme heat events, and drought.[542] Coastal storms have already caused tens of billions in damages in New Jersey, along with floods, power outages, sewerage spills, and other disasters.

New Jersey Will Continue to Suffer the Harmful Impacts of Climate Change if Mitigating Action Is Not Taken

New Jersey has also studied what impacts it could reasonably expect if anthropogenic greenhouse gas emissions continue at their current rate. The results of these studies are stark.

By 2050—in 25 years—there is a 50% chance that New Jersey will experience sea level rise that meets or exceeds 1.4 feet.[543]

By 2030—five years from now—a one-foot sea level rise is expected to inundate approximately 757 acres of Island State Beach State Park, comprising around 30% of total beach area. Cape May State Park is expected to lose approximately 100 acres due to sea level rise by 2030, which is about 38% of the park's total beach area. Statewide, a one-foot rise in sea level will inundate approximately 97,000 acres of state-owned property.

In Atlantic City, by the year 2100 it is extremely likely (i.e., greater than a 95% chance) that the city will experience high-tide flooding at least 95 days per year, and likely (50% chance) that the city will experience high-tide flooding 355 days per year.[544]

Climate change also is expected to continue to alter the frequency and intensity of precipitation events in New Jersey. The rise in precipitation levels will subject New Jersey residents to more frequent and severe flooding.[545] Additionally, extreme precipitation events will degrade water quality as increased runoff will deposit sediment and contaminants into the state's surface water, thereby causing eutrophic conditions and increasing the potential for harmful algal blooms.[546]

New Mexico

[541] Bill Hartnett, *NJ Transit Breaks Ground on $497 Million Flood-Protected Rail Yard*, Jersey Digs (Dec. 30, 2024), https://jerseydigs.com/nj-transit-storage-yard-breaks-ground/.

[542] 2020 New Jersey Scientific Report on Climate Change, *supra* note 521, at 42.

[543] *Id*. at 46, tbl. 4.3.

[544] *Id*. at 45.

[545] *Id*. at 42.

[546] *Id*.

New Mexico is expected to become hotter and more arid due to human-caused climate change.[547] Warming trends in the southwestern United States have exceeded global averages by nearly 50% since the 1970s, and likewise, average temperatures in New Mexico have been increasing 50% faster than the global average over the past century.[548] Indeed, the average temperature across New Mexico has risen by more than 2°F from 1970 to 2020.[549] Mountains have shown a higher rate of temperature rise when compared to lower elevations.[550] Heat waves lasting longer than four days have also significantly increased since 1960.[551] Global climate models projects an average increase across the state of between 5°F and 7°F over the next 50 years.[552]

Further, since 2000, the Southwest has experienced a "megadrought"—defined as "an episode of intense aridity that persists for multiple decades"—that is recognized as the driest two decades in 1,200 years.[553] Beyond low precipitation, higher temperatures increase the amount of water that evaporates and reduces the amount of moisture held in soil, which reduces the volume of runoff produced from precipitation.[554] Snowpack and streamflow amounts are projected to decline in parts of the Southwest, decreasing surface water supply reliability for cities, agriculture, and ecosystems.[555] This is a critical issue for New Mexico because the state's social, economic, and environmental systems are already water-scarce and thus vulnerable to the supply disruptions that are likely to accompany future climate changes.[556]

Indigenous peoples in the Southwest are especially vulnerable to climate change. There are 182 federally recognized tribes in the Southwest, as well as state-recognized tribes and tribes

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[547] N.M. Bureau of Geology & Mineral Res., Bull. No. 164, Climate Change in New Mexico Over the Next 50 Years: Impact on Water Resources 10 (2022) [hereinafter Climate Change in New Mexico].

[548] N.M. Off. of the State Eng'r, The Impact of Climate Change on New Mexico's Water Supply and Ability to Manage Water Resources 5 (2006), https://www.waterassembly.org/archives/Water-related%20Publications/OSE-Climate_Report.pdf; Robert Repetto, DĒMOS, New Mexico's Rising Economic Risks from Climate Change 1 (2012), https://www.demos.org/sites/default/files/publications/UpdatedNMFullReport.pdf.

[549] Climate Change in New Mexico, *supra* note 547, at 4.

[550] Dagmar Llewellyn & Seshu Vaddey, U.S. Dep't of the Interior, Bureau of Reclamation, West-Wide Climate Risk Assessment: Upper Rio Grande Impact Assessment 1, 37–38, 117 (Dec. 2013), https://www.usbr.gov/watersmart/baseline/docs/urgia/URGIAMainReport.pdf.

[551] Repetto, *supra* note 548.

[552] Climate Change in New Mexico, *supra* note 547, at vi.

[553] Williams et al., *supra* note 19.

[554] Climate Change in New Mexico, *supra* note 547, at vi.

[555] U.S. Global Change Rsch. Program, Fifth National Climate Assessment 1362 (2023), https://repository.library.noaa.gov/view/noaa/61592.

[556] N.M. State Univ., Tech. Rep. No. 4,5 Climate Change and Its Implications for New Mexico's Water Resources and Economic Opportunities 1, 24 (2008).

seeking state or federal recognition.[557] The Navajo Nation—the largest U.S. Indian reservation at 16 million acres—occupies portions of New Mexico, Arizona, and Utah.[558] Impacts of climate change are disproportionately felt by indigenous communities, and include the loss of traditional foods, medicines, and water supplies.[559] Many tribes lack access to water because of the high cost of water infrastructure, as well as the fact that many tribes have not had their water rights adjudicated through settlements or other processes.[560]

Agriculture, including the cultivation of New Mexico's most well-known specialty crops, red and green chile, is directly affected by climate change. Climate change increases the spread of agricultural diseases, limits production of crops, makes weather patterns more unstable, and increases worker risk of heatstroke.[561] Higher temperatures may make it impossible to grow crops in areas where they have been historically grown, due to heat sensitivity or dependence on a winter freeze.[562] Loss of snowpack due to climate change will lead to reductions in spring runoff, which is essential for supplying water to New Mexico's traditional community irrigation systems, known as *acequias*.[563]

Increased warming, drought, and insect outbreaks caused by or linked to climate change have increased the frequency of catastrophic wildfires impacting people and ecosystems in the Southwest. Winter warming due to climate change has exacerbated bark beetle outbreaks by allowing more beetles, which normally die in cold weather, to survive and reproduce.[564] A study led by Los Alamos National Laboratories found that greenhouse gas-driven warming may lead to the death of 72% of the Southwest's evergreen forests by 2050, and nearly 100% mortality of these forests by 2100.[565] Climate projection modeling indicates that wildfire seasons in the west will grow longer as temperatures rise[566]—indeed, while New Mexico's fire season historically ran primarily from early May through June, the state is now experiencing fire danger year-round

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[557] Fifth National Climate Assessment, *supra* note 555, at 1361.

[558] *Id.*

[559] *Id.* at 1364.

[560] *Id.*

[561] Danielle Prokop, *Hot Harvest Season Begins in New Mexico Chile Country*, Source NM (Aug. 7, 2023), https://sourcenm.com/2023/08/07/hot-harvest-for-new-mexico-chile/.

[562] Climate Change in New Mexico, *supra* note 547, at 83.

[563] Fifth National Climate Assessment, *supra* note 555, at 1371.

[564] *Id.* at 354.

[565] Chris Mooney, *Scientists Say Climate Change Could Cause a 'Massive' Tree Die-off in the U.S. Southwest*, Wash. Post (Dec. 21, 2015), https://www.washingtonpost.com/news/energy-environment/wp/2015/12/21/scientists-say-climate-change-could-cause-a-massive-tree-die-off-in-the-southwest/.

[566] J.T. Abatzoglou & C.A. Kolden, *Climate Change in Western US Deserts: Potential for Increased Wildfire and Invasive Annual Grasses*, 64 Rangeland Ecology & Mgmt. 471–78 (2011).

due to climate change.[567] In 2022, the Calf Canyon/Hermit's Peak Fire burned more than 340,000 acres, becoming the largest wildfire in New Mexico's history.[568]

New York

In New York State, the cost of billion-dollar weather and climate disasters has more than doubled over the past 20 years compared to the previous 20 years. As shown in Table 1 and Figure 1, below, even when the costs from extreme heat events are not included, for the 20-year period from 2005 to 2024, the cost of droughts has more than tripled, the cost of severe storms has tripled, and the cost of tropical cyclones has nearly doubled when compared to the costs from the period from 1985 to 2004. The cost to human life has also increased, especially from severe floods, storms, and tropical cyclones. [569]

Table 1. Billion Dollar Disasters In New York State, 1985-2004 compared to 2005-2024

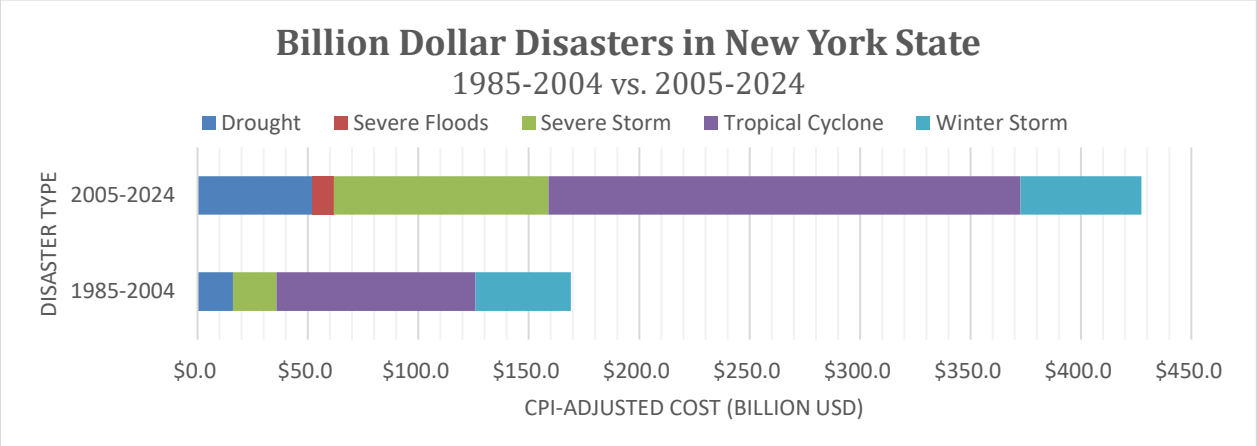
	1985-2004			2005-2024		
Disaster Type	Number	**CPI-Adjusted Cost (millions USD)**	**Deaths**	**Number**	**CPI-Adjusted Cost (millions USD)**	**Deaths**
Drought	1	$16,031.60	0	3	$51,804.90	138
Severe Floods				5	$9,957.80	48
Severe Storm	9	$19,688.20	209	38	$97,181.80	370
Tropical Cyclone	7	$90,232.70	294	9	$213,650.60	408
Winter Storm	10	$43,101.20	846	10	$54,827.20	505
Grand Total	**27**	**$169,053.70**	**1349**	**65**	**$427,422.30**	**1469**

[567] *New Mexico Fire Season: In-Depth Guide*, W. Fire Chiefs Ass'n, https://wfca.com/wildfire-articles/new-mexico-fire-season/ (last updated May 15, 2024).

[568] Fifth National Climate Change Assessment, *supra* note 555, at 1381.

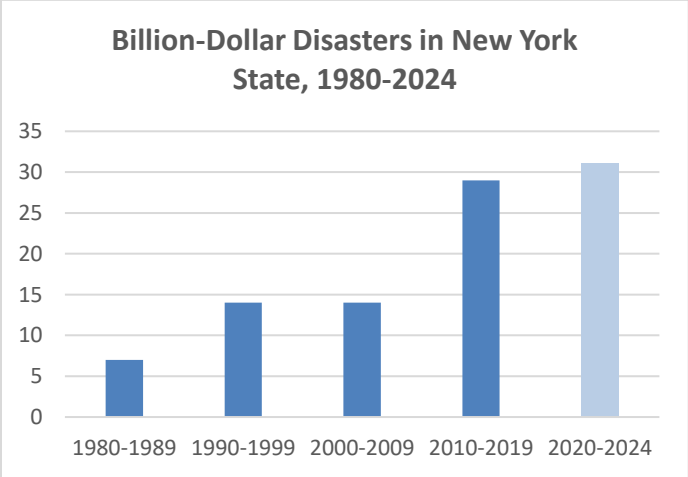
[569] *New York Summary*, *Billion-Dollar Weather and Climate Disasters*, Nat'l Ctrs. for Env't Info., https://www.ncei.noaa.gov/access/billions/ (last visited Aug. 2, 2025); *see also Tropical Cyclone Climatology*, Nat'l Hurricane Ctr. & Cent. Pac. Hurricane Ctr., https://www.nhc.noaa.gov/climo/ (last visited Aug. 2, 2025).

Figure 1. Billion Dollar Disasters In New York State, 1985-2004 Compared to 2005-2024



Climate-related disasters are getting worse, and their costs are only escalating. As shown in Table 2 below, close to 90% of all costs between 1980 and 2024 have been incurred since 2010.[570] While federal agencies provide disaster aid funding, states have borne significant portions of the costs. For instance, in 2022–2023, based just on state-funded disaster response aid to affected communities, the cost to New York was a minimum of $2.7 billion.[571]

Table 2. Comparisons of New York Billion Dollar Disasters by Decade. [572]



[570] *New York Summary*, *Billion-Dollar Weather and Climate Disasters*, *supra* note 569.

[571] Press Release, N.Y. Pub. Interest Rsch. Grp., Over 200 Organizations and Elected Officials Call on Governor Hochul to include the Climate Change Superfund Act in the State Budget (Oct. 6, 2023), https://www.nypirg.org/pubs/202310/Climate_Superfund_Media_Packet_10-6-2023.pdf.

[572] *New York Summary*, *Billion-Dollar Weather and Climate Disasters*, *supra* note 569.

Increasing temperatures and extreme heat[573]

New York experienced its hottest year on record in 2024, and July was Albany's hottest month since records at Albany International Airport began in 1874.[574] From May 1 to September 29, 2024, extreme heat resulted in 3,014 heat-related emergency department visits in New York State (excluding New York City, which reports data separately), compared to the historical baseline of 2,576 visits (average cumulative visits from May 1st to September 29th for the years 2019 to 2023, excluding 2020).[575]

Average and maximum temperatures have increased in New York State since the early 20th century and are projected to rise throughout the 21st century. The state has warmed more rapidly than the national average, and winter is warming more quickly than other seasons. Heat waves—or three of more consecutive days of 90°F temperatures—are occurring more often and becoming longer and more intense, posing greater risks for human health, infrastructure, ecosystems, and other sectors. New York City is projected to remain the warmest part of the state; northern regions will continue to be relatively cooler, while still experiencing large increases in temperature and extreme heat.

According to the 2024 New York State Climate Impacts Assessment, days over 90°F have already increased markedly from 1961 to 2021, and that trend is expected to continue. For instance, for Albany, the number of 90°F days is projected to increase from an average of less than 10 days per year to over 30 days per year by 2050, and 50 days per year by the 2080s.

Extreme heat poses risks to people's health, as well as to wildlife, infrastructure, and parts of the economy. In the United States, extreme heat causes more deaths than any other type of weather-related event. While heatwaves impact all New Yorkers, they are especially dangerous for low-income households with less access to air conditioning, outdoor workers, older adults, children, unhoused people, and people with medical conditions. Metropolitan areas tend to be more affected by heat, as areas with a lot of buildings and pavement and fewer green spaces become "heat islands" that retain and intensify heat and cool down more slowly at night.

[573] Unless otherwise noted, this section draws extensively from the 2024 New York State Climate Impacts Assessment. *Temperature*, N.Y. State Climate Impacts Assessment, https://nysclimateimpacts.org/explore-the-assessment/new-york-states-changing-climate/nysc-temperature/ (last visited Aug. 2, 2025).

[574] N.Y. State, Extreme Heat Action Planning Progress Update, July 2024 – June 2025 at 3 (May 2025), https://dec.ny.gov/sites/default/files/2025-05/ehapreadinessupdate.pdf.

[575] *Id.*

Precipitation[576] and severe storms[577]

New York State has experienced increases in total precipitation and heavy precipitation events, and these trends are expected to continue through the end of this century. From 1901 to 2022, total annual precipitation in New York State increased by 10% to 20%. Precipitation has also varied widely from year to year. Across New York State, total precipitation is projected to keep increasing by about 6% to 17% by the end of the century. The largest increases are projected for New York City, the Catskills, and the lower Hudson River Valley.

While New York is projected to remain a "water-rich" state, increases in total precipitation can affect water quality. More precipitation can lead to increased runoff—water that does not enter the ground and runs off surfaces as sheet flow into water bodies. Runoff can contaminate water sources with pathogens, pollutants, and sediment. Moreover, in urban areas like New York City, extreme precipitation can cause deadly and destructive flooding when sewer systems are past capacity and there is no natural or manmade drainage designed to meet the rate of rainfall.

In New York State, heavy precipitation events are increasing and have occurred more often since the 1950s. "Heavy precipitation" is a large amount of rain or snow falling during a short period of time, which may occur in a single day or even a single hour. Storms previously considered "once-in-100-year" events have occurred nearly twice as often as expected in recent years. Heavy precipitation events can cause flooding and threaten agriculture, infrastructure, ecosystems, and communities. Floods pose health risks like injuries, drowning, and illnesses from contaminated water. They can also damage homes, cause power outages, and block access to transportation and health care. People with fewer resources to prepare and recover are especially at risk.

Severe storms in New York include hurricanes, tropical storms, nor'easters, and lake-effect blizzards. Hurricanes and tropical storms in the Atlantic Ocean have generally become more intense since the mid-1990s and coastal storms are also becoming more destructive because sea level rise worsens flooding from storm surge.

Since Tropical Storm Lee, Hurricane Irene, and Hurricane Sandy, which collectively killed over 50 people and caused billions of dollars in damages in the 2010s, New York has experienced numerous severe storms that have produced significant rainfall. Among these were Tropical Storm Henri and Hurricane Ida, which occurred within two weeks of each other in 2021. Tropical Storm Henri broke several meteorological records in New York City, including the most rain measured within an hour with 1.94 inches recorded in Central Park; the most rain

[576] Unless otherwise noted, this section draws extensively from the 2024 New York State Climate Impacts Assessment. *Precipitation*, N.Y. State Climate Impacts Assessment, https://nysclimateimpacts.org/explore-the-assessment/new-york-states-changing-climate/nysc-precipitation/ (last visited Aug. 2, 2025).

[577] Unless otherwise noted, this section draws extensively from the 2024 New York State Climate Impact Assessment. *Extreme Events*, N.Y. State Climate Impacts Assessment, https://nysclimateimpacts.org/explore-the-assessment/new-york-states-changing-climate/nysc-extreme-events/ (last visited Aug. 2, 2025).

in a day with 4.45 inches total; and the biggest two-day rainfall event since Hurricane Irene with 7.04 inches total.[578] Eight days later, Hurricane Ida shattered many of these records—some parts of the City experienced 3.15 inches of rainfall in one hour, and the National Weather Service issued the first ever flash flood emergency for New York City.[579] In total, Hurricane Ida caused 18 deaths in New York and 7.5 billion dollars' worth of damage, including flood damage to 11,000 homes.[580]

Extreme storms can have devastating effects on ecosystems, communities, and the economy. While storms can directly harm people by causing injuries and deaths, they also pose other problems, such as power outages that shut down transportation, health care, and other key infrastructure. Such storms can also damage homes and properties, shut down business operations, and increase insurance costs. A 2025 report published by the Regional Plan Association estimates that over the next 15 years, up to 82,000 homes on Staten Island, in southeast Queens, and in the suburbs east of New York City could be lost to floods, likely exacerbating the existing housing crisis in New York City.[581] Extreme precipitation events disturb ecosystems, damaging soil, vegetation, and wildlife populations.

Drought[582]

New York State experiences drought, on average, every two to three years, with conditions typically peaking in the summer months. While snowfall and snow cover in the winter can help replenish water supplies through gradual spring melt, this melting is occurring earlier in the year due to climate change. This disruption can lead to lower-than-expected streamflows or soil moisture going into the warm season. Moreover, as winters warm, more precipitation is falling as rain instead of snow, also contributing to less spring snowmelt.

Although drought in New York tends to be short-term, it has widespread impacts. The state has a large agricultural industry that is especially vulnerable because many farms in the state do not have irrigation systems. Water quality and quantity can also decline during dry periods, requiring water utilities to closely monitor supplies. New York City, for instance,

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[578] Andy Newman & Ellen Barry, *Tropical Storm Henri Brings Power Outages and Record Rain to Northeast*, N.Y. Times (Aug. 22, 2021), https://www.nytimes.com/2021/08/22/nyregion/tropical-storm-henri.html?searchResultPosition=1.

[579] Jesus Jiménez, *New York City Faces the First 'Flash Flood Emergency' in Its History*, N.Y. Times (Sept. 2, 2021), https://www.nytimes.com/2021/09/02/nyregion/new-york-city-faces-the-first-flash-flood-emergency-in-its-history.html.

[580] Press Release, N.Y. State Governor Kathy Hochul, Governor Hochul Announces Recovery Action Plan to Assist New Yorkers Impacted by Deadly Storm (Aug. 29, 2022), https://www.governor.ny.gov/news/governor-hochul-announces-hurricane-ida-recovery-action-plan-assist-new-yorkers-impacted.

[581] Regional Plan Assoc. & Nat'l Zoning Atlas, Averting Crisis: Zoning to Create Resilient Homes for All 13 (2025), https://s3.us-east-1.amazonaws.com/rpa-org/pdfs/RPA_Averting-Crisis-print-2.pdf.

[582] *New York*, Nat'l Integrated Drought Info. System, NOAA, https://www.drought.gov/states/new-york (last visited Aug. 2, 2025).

depends on reservoirs upstate, which can be strained during droughts. Private wells across the state may also experience low water levels or run dry. In addition, dry conditions heighten the risk of wildfires, as vegetation dries out and becomes more flammable. Tourism and recreation can also suffer from drought, as lakes are too low for boating, streams are too dry for fishing, and snow depth is not sufficient for skiing or snowmobiling. All of these drought-related impacts come with serious economic consequences for New York State.

Sea level rise

Sea levels in the Northeastern United States have already risen by 5 to 6 inches from 2000 to 2020, and levels are projected to rise another foot on average by 2050.[583] This rise in sea level has intensified the effects of coastal storms, and in the lowest lying neighborhoods, flooding can occur at times of high tide during clear weather (nuisance flooding). By as early as the 2050s, some of these low-lying neighborhoods face the possibility of permanent inundation if no further protective measures are taken.

Air quality, human health, safety, and livelihoods[584]

Climate harms pose serious threats to the health, safety, and livelihoods of people across New York State. These threats include physical health effects like heat stress, dehydration, and cardiovascular illness from rising temperatures, to drowning and exposure to contaminants and mold infestation from flooding and sea level rise. Droughts and wildfires can worsen air and water quality, leading to respiratory problems and drinking water shortages, while warming temperatures and changing moisture levels create more favorable conditions for mosquito- and tick-borne diseases. Certain chronic conditions are made worse by exposure to extreme heat, poor air quality, and water-related illnesses. People with disabilities and people who depend on support programs are at risk from interrupted access to care.

Climate change increases the risk of illness and death due to the higher concentrations of pollutants in the air, including during times of drought. Increased numbers of wildfires as well as a longer pollen season can lead to more air quality-related illnesses. This phenomenon has already been documented in New York City, as increases in allergy medication sales and the number of asthma-related emergency room visits have been observed over the past decade. For instance, in June 2023, when smoke from wildfires in Canada caused the air quality index in New York City to reach 366 (24 times the World Health Organization guidelines), emergency rooms saw the highest number of visits for asthma-related conditions all year.

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[583] *Sea Level Rise Viewer*, NOAA, https://coast.noaa.gov/slr/#/layer/sce/0/-8319827.074465485/5017920.2680523/9.000/satellite/125/0.8/2050/interHigh/noAccretion/NOS_Minor (last updated Apr. 11, 2025).

[584] Unless otherwise noted, this section draws extensively from the 2024 New York State Climate Impacts Assessment. *Human Health and Safety Chapter Summary*, N.Y. State Climate Impacts Assessment, https://nysclimateimpacts.org/explore-the-assessment/explore-by-sector/human-health-and-safety-summary/ (last visited Aug. 2, 2025).

Poor air quality, especially from wildfire smoke, exacerbates environmental justice concerns. People living in New York's poorest neighborhoods are twice as likely to have had an asthma attack in the past year compared to those in the wealthiest neighborhoods, and Black communities may have less access to healthcare for treating asthma than white communities.[585] Children are also especially vulnerable because they breathe more air per minute than adults. As a result, the percentage of asthma-related emergency room visits for children is expected to rise.[586] In the Northeast, climate change is expected to cause 200–300 more ozone-related deaths in 2050 than in 2000.[587] Another study estimates an increase of 360 more deaths per year due to poor air quality by 2090.[588]

North Carolina

The effects of climate change have been felt and will continue to be felt from the mountains to the sea and across every sector of North Carolina's economy.

With approximately 3,375 miles of shoreline,[589] North Carolina is particularly vulnerable to the effects of sea level rise. In its 2010 Sea Level Rise Assessment Report, the North Carolina Coastal Resource Commission's Science Panel on Coastal Hazards concluded that a 39-inch rise in sea levels was likely to occur on the North Carolina coast in the next century.[590] The Panel's 2015 update predicted that sea levels would rise by 1.9 to 10.6 inches at different locations along North Carolina's coast by 2045.[591] The Panel's 2024 Sea Level Rise Science Update predicted a

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[585] *See* Gina Jiménez, *ER Visits for Asthma in New York City Soared as Wildfire Smoke Blanketed the Region*, Inside Climate News (June 14, 2023), https://insideclimatenews.org/news/14062023/new-york-er-asthma-willdfire-smoke/.

[586] Perry E. Sheffield et al., *Modeling of Regional Climate Change Effects on Ground-Level Ozone and Childhood Asthma*, 41 Am. J. Preventive Med. 251–57 (2011), https://www.ajpmonline.org/action/showPdf?pii=S0749-3797%2811%2900346-1.

[587] Lesly-Ann L. Dupigny-Giroux et al., U.S. Glob. Change Rsch. Program, Fourth National Climate Assessment, Ch. 18: Northeast (2018), https://mde.maryland.gov/programs/water/WetlandsandWaterways/Documents/August%201,%202023%20Supplemental%20Briefing%20from%20Waterkeepers%20Chesapeake%20and%20Lower%20Susquehanna%20Riverkeepers/2.b%20NCA4_Ch18_Northeast_Full.pdf.

[588] *Id.*

[589] NOAA Off. for Coastal Mgmt., Shoreline Mileage of the United States, https://coast.noaa.gov/data/docs/states/shorelines.pdf.

[590] N.C. Coastal Res. Comm'n Sci. Panel, North Carolina Sea-Level Rise Assessment Report (Mar. 2010), https://files.nc.gov/ncdeq/Coastal%20Management/documents/PDF/Coastal%20Hazards%20Storm%20Information/NC_Sea_Level_Rise_Assessment_Report_2010_CRC_Science_Panel.pdf.

[591] N.C. Coastal Res. Comm'n Sci. Panel, North Carolina Sea-Level Rise Assessment Report: 2015 Update to 2010 Report and 2012 Addendum (Mar. 2015), https://files.nc.gov/ncdeq/Coastal%20Management/documents/PDF/Science%20Panel/2015%20NC%20SLR%20Assessment-FINAL%20REPORT%20Jan%2028%202016.pdf.

sea level rise of 12 to 16.8 inches (1.0–1.4 feet) for the United States Southeast Coast by 2050.[592] The 2024 update also predicted a continuing increase in high tide flooding days in those areas, with a potential of 365 high tide flooding days each year by 2100.[593]

Because of eastern North Carolina's low-lying topography, North Carolina faces extensive loss of land to inundation from sea level rise.[594] In 2014, the North Carolina Division of Emergency Management concluded that over the century, North Carolina could see the inundation of 800 square miles of North Carolina's coastal plain, representing 9% of the land area in North Carolina's 20 coastal counties.[595] Another study predicted that 13 North Carolina communities will face chronic inundation from sea level rise by 2035 and that a further 36 communities will experience chronic inundation by 2100.[596] Portions of the Outer Banks are losing about 13 feet of beach per year.[597]

North Carolina sits within a frequent hurricane path, making its coastal region especially vulnerable to hurricanes and inland flooding. In 2018, Hurricane Florence claimed the lives of 42 people in North Carolina[598] and caused more than $22 billion in damage.[599] The storm shattered the previous rainfall record set by Hurricane Floyd in 1999 of 24.06 inches. During the hurricane, Elizabethtown, North Carolina saw 35.93 inches of rainfall and Swansboro, North Carolina saw more than 33 inches of rainfall.[600] A rainfall meteorologist at North Carolina State University calculated that Hurricane Florence, compared to all storms in the United States over the last 70 years, produced the second highest amount of rain in a concentrated (14,000 square mile) land area.[601] On the meteorologist's list, four of the top seven storms occurred in the

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[592] N.C. Coastal Res. Comm'n Sci. Panel, North Carolina 2024 Sea Level Rise Science Update (Oct. 2024), https://www.deq.nc.gov/2024-north-carolina-sea-level-rise-science-update/open.

[593] *Id.*

[594] N.C. Dep't of Pub. Safety, North Carolina Emergency Management Geospatial and Technology Management, North Carolina Sea Level Rise Impact Study: Final Study Report (June 2014).

[595] *Id.*

[596] Union of Concerned Scis., Fact Sheet: North Carolina Faces Chronic Inundation (July 2017), https://www.ucsusa.org/sites/default/files/attach/2017/07/when-rising-seas-hit-home-northcarolina-fact-sheet.pdf.

[597] Gilbert M. Gaul, *Shifting Sands: Carolina's Outer Banks Face a Precarious Future*, Yale Env't 360 (July 14, 2022), https://e360.yale.edu/features/outer-banks-climate-change-flooding.

[598] *Hurricane Florence: September 14, 2018*, Nat'l Weather Serv. (Nov. 17, 2018), https://www.weather.gov/ilm/HurricaneFlorence.

[599] *Five Years After Florence, A Year Into Hearings, Homeowners Finally Seeing Progress*, N.C. Gen. Assembly House Oversight & Reform Comm. (Sept. 14, 2023), https://sites.ncleg.gov/houseoversight/2023/09/five-years-after-florence-a-year-after-hearings-homeowners-finally-seeing-progress/.

[600] *Record Rainfall: Some Saw Almost 3 Feet from Florence*, WRAL-TV (Sept. 17, 2018), https://www.wral.com/florence-causes-record-rainfall-/17850750/.

[601] Seth Borenstein, *Florence Is Nation's Second Wettest Storm, Behind Harvey*, AP News (Sept. 25, 2018), https://apnews.com/weather-3ce363b1eb4d4243b0e7b2d994fd7249.

previous three years.[602] In 2016, Hurricane Matthew had devastating impacts on many of the same areas of eastern North Carolina, killing at least 27 people and causing some $1.5 billion in damage, from which the state is still recovering.[603]

In late September 2024, Hurricane Helene brought torrential rain to Western North Carolina, exceeding previous records for rainfall in the region and causing catastrophic and unprecedented damage.[604] North Carolina experienced over 30 inches of rainfall in some locations, and more than a thousand landslides.[605] As of June 17, 2025, there were 108 verified deaths in North Carolina due to Helene.[606] Helene is the most destructive storm in North Carolina's history, causing more than $53 billion in damages, and it is the deadliest hurricane in the contiguous United States since Hurricane Katrina in 2005.[607] Hurricane Helene also knocked out power to 1.18 million people, in some places for more than two weeks, and caused over $1 billion in damage to the power grid.[608] Three rapid attribution studies conducted after Helene concluded that the rainfall associated with Helene was higher due to climate change than it would have been without it.[609]

The amount of rainfall and flooding brought by these hurricanes used to be extremely rare in North Carolina, but it is not rare anymore. Based on pre-climate change weather patterns, Hurricane Florence's rainfall was described as an event that eastern North Carolina could expect to occur only once every 1,000 years.[610] Hurricane Matthew, a 500-year flood event,[611] hit

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[602] *Id.*

[603] Press Release, Fed. Emergency Mgmt. Agency, Six Months Following Hurricane Matthew, Volunteers Work for North Carolina Progress (Apr. 6, 2017), https://www.fema.gov/press-release/20250602/six-months-following-hurricane-matthew-government-partners-volunteers-work.

[604] Andrew B. Hagen et al., Nat'l Hurricane Ctr., Tropical Cyclone Report, Hurricane Helene (Apr. 8, 2025), https://www.nhc.noaa.gov/data/tcr/AL092024_Helene.pdf.

[605] *Id*. at 14, 22–24.

[606] *Hurricane Helene Storm Related Fatalities*, N.C. Dep't of Health & Human Servs., https://perma.cc/3AG7-23MA (archived Aug. 27, 2025).

[607] Hagen et al., *supra* note 604; Press Release, Off. of the Governor, Governor Cooper Proposes $3.9 Billion in State Funding to Spur Hurricane Helene Relief and Recovery (Oct. 23, 2024), https://governor.nc.gov/news/press-releases/2024/10/23/governor-cooper-proposes-39-billion-state-funding-spur-hurricane-helene-relief-and-recovery.

[608] Hagen et al., *supra* note 604, at 19, 23; Gov. Roy Cooper & N.C. Off. of State Budget & Mgmt., Hurricane Helene Recovery: Revised Damage and Needs Assessment 47 (Dec. 13, 2024), https://www.osbm.nc.gov/hurricane-helene-dna/open.

[609] Haley Thiem & Rebecca Lindsey, Hurricane Helene's Extreme Rainfall and Catastrophic Inland Flooding, NOAA (Nov. 7, 2024), https://www.climate.gov/news-features/event-tracker/hurricane-helenes-extreme-rainfall-and-catastrophic-inland-flooding.

[610] Corey Davis, Florence After Five: Redefining the Future, N.C. State Climate Off. (Sept. 14, 2023), https://climate.ncsu.edu/blog/2023/09/florence-after-five-redefining-the-future/.

[611] Off. of Water Prediction, Nat'l Weather Serv., Hurricane Matthew, 6-10 October 2016, Annual Exceedance Probabilities (AEPs) for the Worst Case 24-Hour Rainfall (Oct. 18, 2016),

eastern North Carolina just two years before Florence. A third 500-year flood event, caused by Hurricane Floyd, struck eastern North Carolina in 1999.[612] Hurricane Helene was also a 1,000-year flood event.[613] That makes four 500-year (or longer) flood events to hit eastern North Carolina in two decades, with two 1000-year flood events occurring within six years of each other.

Climate change presents severe health risks for North Carolina's citizens, especially vulnerable populations such as the elderly and children. The North Carolina Department of Health and Human Services has evaluated health risks associated with climate change impacts, such as increased drought, increased precipitation, heat waves, hurricanes, and sea level rise.[614] The health risks associated with these impacts include:

- Waterborne disease outbreaks, increased foodborne illnesses, and compromised drinking water quality.
- Increases in mosquito populations after hurricanes and high rain events.
- Physical injuries caused by hurricanes, flooding, high winds, droughts, and heat waves.
- Respiratory illness caused by prolonged drought periods.
- Lung disease and premature death from heart or lung disease from increased ground-level ozone formed by rising temperatures.[615]

Droughts caused by climate change can make a forest more prone to wildfires,[616] creating another major risk to North Carolinians' health. By the middle of this century, the number of weeks with drought-like conditions favorable to wildfires is expected to increase more than 300% for North Carolina's coastal regions and more than 50–100% for the state's mountain regions.[617] Between October and November of 2016, 30 fires scorched 80,000 acres in drought-stricken western North Carolina counties. State air quality officials detected 24 instances of code orange conditions during the fires, 11 instances of code red, two in code purple, and two in code maroon.[618] The frequency of abnormally dry conditions continues to increase in North Carolina.

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https://hdsc.nws.noaa.gov/pub/hdsc/data/aep/201610_Matthew/AEP_HurricaneMatthew_October2016.pdf.

[612] Mike Millner, *Remembering Hurricane Floyd*, Univ. of N.C. (Oct. 2009), https://docsouth.unc.edu/highlights/floyd.html.

[613] Thiem & Lindsey, *supra* note 609.

[614] N.C. Dep't of Health & Human Servs., Div. of Pub. Health, North Carolina Climate and Health Profile (Mar. 2015), https://epi.dph.ncdhhs.gov/oee/climate/ClimateAndHealthProfile.pdf.

[615] *Id.*

[616] *Id.*

[617] Kenneth E. Kunkel et al., N.C. Inst. for Climate Studies, North Carolina Climate Science Report (2020), https://ncics.org/wp-content/uploads/2020/10/NC_Climate_Science_Report_FullReport_Final_revised_September2020.pdf.

[618] Catherine Clabby, *NC Fires Brought Severe Pollution*, NC Health News (Jan. 13, 2017), https://www.northcarolinahealthnews.org/2017/01/13/nc-fires-brought-severe-pollution/.

In March of 2025, North Carolina was placed under a burn ban with 99 of the state's 100 counties experiencing drought or abnormally dry conditions.[619]

Climate change also harms North Carolina's agriculture and agribusiness sector, which is largely based in the eastern part of the state and contributed $111.1 billion to North Carolina's economy in 2022.[620] Increasingly severe droughts cause crop failures, and higher temperatures reduce livestock productivity.[621] Saltwater intrusion from sea level rise can make soils too salty for native plants to grow, impacting crop yields.[622] North Carolina's forestry industry would suffer similar impacts from saltwater intrusion, and increasingly severe and frequent hurricanes would damage North Carolina's forestlands. One study in North Carolina predicted that forest damages rise by $500 million for every increase in category level of hurricane.[623]

North Carolina's tourism industry, which generated $36.7 billion in visitor spending in 2024, is also at risk.[624] Tourism is threatened by loss of beach areas due to sea level rise and decrease in demand for coastal travel due to unpredictable weather patterns.[625]

North Carolina is already incurring significant transportation and infrastructure costs due to climate change impacts. Large numbers of North Carolina's coastal railways, ports, airports, and water and energy supply systems are at low elevations and are therefore vulnerable to the

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[619] Press Release, N.C. Dep't of Env't Quality, Drought, Abnormally Dry Conditions Continue in North Carolina (Mar. 14, 2025), https://www.deq.nc.gov/news/press-releases/2025/03/14/drought-abnormally-dry-conditions-continue-north-carolina; Press Release, N.C. Dep't of Agric. & Consumer Servs., Burn Ban Issued for All North Carolina Counties due to Hazardous Forest Fire Conditions (Mar. 20, 2025), https://www.ncagr.gov/news/press-releases/2025/03/20/burn-ban-issued-all-north-carolina-counties-due-hazardous-forest-fire-conditions.

[620] Mike Walden, N.C. State Univ., Agriculture and Agribusiness: North Carolina's Number One Industry (May 2024), https://www.ces.ncsu.edu/wp-content/uploads/2024/05/N.C.-Agriculture-Agribusiness-Industry-Impact-2024_NC-State-Mike-Walden.pdf?fwd=no; Brian Long, *Today's Topic: Economic Impact of NC Agriculture, Agribusiness Increases to $84 Billion*, N.C. Dep't of Agric. & Consumer Servs.: In the Field Blog (June 7, 2016), https://blog.ncagr.gov/2016/06/07/todays-topic-economic-impact-of-nc-agriculture-agribusiness-increases-to-84-billion/.

[621] U.S. Env't Prot. Agency, What Climate Change Means for North Carolina (Aug. 2016), https://19january2017snapshot.epa.gov/sites/production/files/2016-09/documents/climate-change-nc.pdf.

[622] *Saltwater Intrusion: A Growing Threat to Coastal Agriculture*, Climate Hubs, U.S. Dep't of Agric., https://www.climatehubs.usda.gov/hubs/northeast/topic/saltwater-intrusion-growing-threat-coastal-agriculture (last visited Aug. 2, 2025).

[623] Ctr. for Integrative Env't Rsch., Univ. of Md., Economic Impacts of Climate Change on North Carolina (Sept. 2008), https://research.fit.edu/media/site-specific/researchfitedu/coast-climate-adaptation-library/united-states/east-coast/carolinas-amp-georgia/CIER.--2008.--N.-Carolina-Economic-Impacts-of-CC.pdf.

[624] Press Release, N.C. Dep't of Com., N.C. Breaks Tourism Spending Record, Continues to Be #5 Most Visited State (May 7, 2025), https://www.commerce.nc.gov/news/press-releases/2025/05/07/nc-breaks-tourism-spending-record-continues-be-5-most-visited-state.

[625] Ctr. for Integrative Env't Rsch., Univ. of Md., *supra* note 623.

effects of sea level rise and more frequent hurricanes.[626] The North Carolina Department of Transportation is raising the roadbed of U.S. Highway 64 across the Albemarle-Pamlico Peninsula by four feet, which includes 18 inches to account for sea level rise.[627] In the decade between 2012 and 2022, the North Carolina Department of Transportation spent almost $80 million to upkeep, repair, and operate North Carolina Highway 12, deemed one of the most vulnerable highways in the nation to the effects of climate change.[628] Septic system infrastructure is particularly threatened because these systems require unsaturated soil in order to function. However, a study by the North Carolina Department of Environmental Quality revealed that groundwater levels in North Carolina's coastal communities are rising with sea level rise, which has reduced the amount of available unsaturated soil required for septic systems to operate properly.[629]

Finally, climate change harms North Carolina's tremendous ecological resources, such as its coastal estuaries. North Carolina's coastal estuaries perform essential functions, including filtering pollutants and supporting fisheries.[630] Disruption of these important resources from storm damage and saltwater intrusion negatively impacts fisheries and depletes water quality.

Oregon

Oregonians from every corner of the state have experienced the devastating impacts of climate change. These impacts include choking wildfire smoke, deadly heat, flooding, landslides, transportation system disruption, drought, damaged fisheries, burnt forests, and the costs to taxpayers of responding to many of these impacts, to name a few. As climate change progresses, these and other climate impacts are expected to intensify.

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[626] U.S. Env't Prot. Agency, What Climate Change Means for North Carolina, *supra* note 621.

[627] *See* Press Release, The White House, Fact Sheet: What Climate Change Means for North Carolina and the Southeast and Caribbean 2 (May 6, 2014), https://obamawhitehouse.archives.gov/sites/default/files/docs/state-reports/NORTHCAROLINA_NCA_2014.pdf (citing Kenneth Kunkel et al., U.S. Glob. Change Rsch. Program, Third National Climate Assessment (2014)).

[628] Gaul, *supra* note 597.

[629] Frank Graff, *Rising Sea Levels Threaten Coastal Septic Systems*, PBS: N.C., https://www.pbsnc.org/blogs/science/rising-sea-levels-threaten-coastal-septic-systems/ (last updated June 9, 2025).

[630] *See Physical Threats to Coastal Habitats*, N.C. Department of Environmental Quality, https://www.deq.nc.gov/about/divisions/marine-fisheries/habitat-information/coastal-habitat-protection-plan/threats-habitat/physical-threats-coastal-habitats (last visited Aug. 2, 2025); *see also* U.S. Env't Prot. Agency, What Climate Change Means for North Carolina, *supra* note 621.

1. Health Impacts

The Oregon Health Authority (OHA) has said that climate change "poses a significant and growing threat to public health."[631] OHA has identified multiple climate-related health risks or impacts, including wildfire smoke, extreme heat, and mental health.[632]

A. *Wildfire Smoke*

OHA has emphasized the health risks of inhalable fine particles generated from wildfires, identifying such particles as the "most concerning form of air pollution from wildfires."[633] When inhaled, these particles "can travel deep into the lungs and into the bloodstream, causing damage to the lungs, heart and other organs."[634] The Oregon Climate Change Research Institute's (OCCRI) Seventh Oregon Climate Assessment similarly identifies the link between exposure to wildfire smoke and the "exacerbation of respiratory illnesses and an increase in cardiovascular emergencies, particularly among vulnerable populations and those with pre-existing conditions."[635] The Seventh Assessment further states that the proportion of older adults with an increased vulnerability to smoke is expected to increase in Oregon.[636] Also, based on the larger and more extreme wildfires expected if greenhouse gas emissions do not decrease, wildfire smoke and associated health impacts are expected to rise. OHA has determined that additional costs for smoke-related asthma emergency department visits alone—not including other smoke-related impacts or other asthma-related costs—"will add an estimated $99.7 million to health care costs in Oregon in the 2050s."[637]

B. *Extreme Heat*

Rising global temperatures and the increased frequency of extreme heat events, both of which are associated with climate change,[638] are increasingly threatening human health.[639]

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[631] Or. Health Auth., Climate and Health in Oregon: 2023 Report 7, https://www.oregon.gov/oha/PH/HEALTHYENVIRONMENTS/CLIMATECHANGE/Documents/FINAL%20Climate%20Health%20in%20Oregon%202023%20v071124%20(1).pdf [hereinafter OHA 2023 Report].

[632] *Id.* at 26, fig. 4.

[633] *Id.* at 31.

[634] *Id.*

[635] Erica Fleishman, Or. Climate Change Rsch. Inst., Seventh Oregon Climate Assessment 242 (2025), https://doi.org/10.5399/osu/1181 [hereinafter Seventh Assessment].

[636] *Id.* at 255.

[637] OHA 2023 Report, *supra* note 631, at 31–32.

[638] Rachel H. White et al., *The Unprecedented Pacific Northwest Heatwave of June 2021*, 14 Nature Comms. 727 (2023), https://doi.org/10.1038/s41467-023-36289-3.

[639] Seventh Assessment, *supra* note 635, at 223.

Indeed, extreme heat causes more human deaths than any other weather extreme.[640] Oregonians understand this threat acutely from the June 2021 extreme heat event.

The Seventh Assessment elaborates on the June 2021 event as follows:

> In late June, 2021, an extreme heat wave across the Pacific Northwest of the United States and Canada threatened public health, disrupted economic activity, and strained the capacity of infrastructure and social services. . . . [O]bservational data from 113 long-term weather stations in Washington, Oregon, and western Idaho, with data records that began before 1955, that are archived in the Global Historical Climatology Network daily database (Menne et al. 2012). These observations indicated that the heat wave began on 26 June in Washington and western Oregon, where 48 daily records and five all-time records were broken. Over the next two days, many more daily and all-time record maximum temperatures at stations in western Washington and Oregon were broken. Prior to the event, the highest temperature recorded at Portland International Airport was 107.1°F (41.7°C), set on 30 July 1965. During the 2021 heat wave, Portland set all-time records on three consecutive days: 108.3°F (42.4°C) on 26 June, 111.9°F (44.4°C) on 27 June, and 116.1°F (46.7°C) on 28 June. On 29 June, a strong marine layer dramatically cooled western Washington and Oregon, and the heat wave mainly centered east of the Cascade Range. On the same day, the all-time maximum temperature record in Washington was broken at Hanford, which reached 120.0°F (48.9°C) (Miller and Bair 2022), and the all-time maximum temperature record in Oregon, 118.9°F (48.3°C), was tied at both Pelton Dam and Moody Farms (Vescio and Bair 2022). The heat wave ended on 1 July. During the six days from 26 June through 1 July, 350 of 666 possible daily maximum temperature records (52.6 percent) at 133 stations (Figure 2) were tied or broken. During those days, 116 all-time daily maximum temperature records (17.4 percent of possible observations) were tied or broken.[641]

The heat from this event alone caused at least 102 deaths.[642] According to OHA, from 2021 through 2023, 131 Oregon residents died due to excessive heat.[643]

OHA has also identified increased incidences of heat-related illnesses, particularly "when the Heat Index is at or above 80°F[,] . . . people visit[] emergency departments and urgent care centers at higher-than expected levels." OHA identified "210 heat-related illness emergency

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[640] *Id.*

[641] *Id.* at 15–16.

[642] Or. Health Auth., Climate and Health in Oregon: 2021–2022 Report 12 (2023), https://www.oregon.gov/oha/PH/HEALTHYENVIRONMENTS/CLIMATECHANGE/Documents/le-105251_23.pdf.

[643] OHA 2023 Report, *supra* note 631, at 27.

department visits" from May through September 2023 when the heat index was between 80°F and 90°F.[644]

Also, extreme heat events often occur during smoke events. These concurrent exposures "may produce synergistic impacts that are greater than the effects of individual exposures combined."[645] These exposures are widespread; approximately 1.7 million Oregonians, roughly 40%, live in counties that experienced at least 14 days of heat at or above 80°F and compromised air quality occurring on the same day during May–September 2023.[646]

C. *Mental Health*

OHA has identified three main pathways through which climate change affects mental health:

- Severe weather events, where people can suddenly lose a home or people and places that are significant to them. These experiences can lead to posttraumatic stress disorder and increased anxiety and depression.
- Slower moving climate-related impacts (such as drought) that involve environmental degradation can lead people to lose their livelihoods, sense of place or cultural practices.
- The knowledge of climate change, future climate projections and impacts as well as current effects on communities can lead people to experience climate anxiety or eco-anxiety.[647]

The Seventh Assessment also specifically identifies the "correlation of drought with increased rates of mental health issues, including anxiety, depression, and suicide."[648]

D. *Other Health Impacts*

Wildfire smoke, extreme heat, and mental health impacts are not the only climate-related health impacts in Oregon. For example, OHA has also identified drought, harmful algal blooms, and vector-borne diseases as additional significant health threats.[649] Drought, among its other impacts, has left domestic well users without running water in many homes in Oregon.[650] Regarding algal blooms, warming waters allow for the spread of cyanobacteria, which "release[s] toxins in rivers, lakes and reservoirs can cause serious illness or death in pets, livestock and wildlife, and in sensitive individuals also cause a red, raised rash or skin, ear and

[644] *Id.* at 27.

[645] *Id.* at 36.

[646] *Id.* at 39.

[647] *Id.* at 41 (internal citation omitted).

[648] *Id.* at 8.

[649] *Id.* at 26.

[650] *Id.* at 44.

eye irritation."[651] And regarding vector-borne diseases, climate change "increases the number and geographic range of disease-carrying insects such as ticks," creating opportunities for disease to emerge and spread, including Lyme Disease and West Nile Virus.[652] Similarly, the Seventh Assessment notes that "[i]nfectious diseases in Oregon's wild and domestic animals continue to evolve as climate changes," and that there is "every reason to believe such diseases will significantly impact" human health.[653]

2. Drought

Drought has had devastating impacts on Oregonians, causing harms beyond the health impacts discussed above. The Seventh Assessment explains that:

> Since the 1950s, the frequency, duration, and intensity of drought events across the western United States has increased as a result of rising temperatures and, to some extent, changing precipitation patterns. Rising temperatures can contribute to snow droughts due to reduced or earlier water runoff from spring snowpack, which sustains snow-fed rivers (Fosu et al. 2016). Additionally, as the population grows, demand for freshwater increases, straining water availability and increasing the likelihood of drought conditions (Barros et al. 2014).
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> Although droughts often develop more slowly than other types of natural hazards, they can still have catastrophic effects. Of the 41 weather or climate events in Oregon since 1980 with an economic loss exceeding $1 billion, 16 were droughts, representing 32.4 percent of the total costs of billion-dollar disasters in the state (NOAA n.d.). The most recent billion-dollar drought that affected Oregon occurred from April through September 2023, resulted in $14.8 billion in costs, and led to 247 documented deaths (NOAA n.d.). From 2020 through 2022, the cumulative economic costs and mortality caused by droughts in Oregon were similar to those in 2023 (NOAA n.d.).[654]

3. Sea Level Rise and Flooding

The OCCRI's prior climate assessment discussed the increased risk of flooding due to projected sea level rise:

> Taherkhani et al. (2020) used data from tide gauge stations and projections of future sea-level rise (Kopp et al. 2014) to investigate continuous shifts in flooding along coastlines in the United States. They found that approximately 7 cm (2.8 in) of sea-level rise along the Oregon coast doubles the odds that annual flood levels will exceed the 50-year event threshold (a level with a 2 percent chance of occurring in a given year). The odds of this magnitude of flooding double approximately every

[651] *Id.*

[652] *Id.* at 45.

[653] Seventh Assessment, *supra* note 635, at 8, 238.

[654] *Id*. at 263.

> 6 years until 2075. These results were based on the high emissions scenario in Sweet et al. (2022) and assumed climate stationarity.
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> * * *
>
> In 2018, the Oregon Department of Geology and Mineral Industries (DOGAMI) assessed the risks of natural hazards to the communities of Coos County, Oregon (Williams et al. 2021). This risk assessment estimated that 1870 buildings will be damaged by a 100-year flood scenario (i.e., 1 percent chance of flooding in a given year), causing an estimated loss of $125 million, damage to 13 critical facilities, and displacement of as many as 2116 individuals.[655]

Sea level rise and flooding will also have an impact on the state's transportation systems (*see* "Transportation Impacts" below).

4. Economic Impacts: Forestry and Fisheries

The OCCRI Assessments detail the significant economic impacts of climate change in Oregon. For example, the Sixth Assessment highlights the economic impact of two of Oregon's most historically (and currently) significant industries: forestry and fisheries. Regarding forests, the Sixth Assessment notes:

> Climate change also has the potential to change the compositions of Oregon's forests. It is estimated to be a contributing factor to reducing the productivity of Douglas-fir (*Pseudotsuga menziesii*) across western states (Crookston et al. 2010, Restaino et al. 2016, Weiskittel et al. 2012) and reducing post-fire viability of Douglas- fir (Davis et al. 2020). A warmer and drier climate is projected to induce a gradual shift by private landowners in Oregon away from Douglas-fir, the state's currently most valuable tree species, toward hardwood species (Hashida and Lewis 2019; Box 4). An economic model estimated that climate change will induce a loss of private timberland value of 39 percent by the year 2050 in western Oregon and Washington (Hashida and Lewis 2022).[656]

Regarding fishing, the Sixth Assessment notes:

> Climate change is already affecting tourism and fishing in Oregon, and an organization representing Dungeness crab boats is suing oil and gas companies for climate damages for harmful algal blooms caused by warming ocean waters[.] Dungeness crab and Pacific oysters are valuable commodities that are also

[655] Erica Fleishman, Or. Climate Change Rsch. Inst., Sixth Oregon Climate Assessment 126–27 (2023), https://ir.library.oregonstate.edu/concern/technical_reports/gt54kw197.

[656] *Id.* at 147.

susceptible to ocean acidification, which has potential to result in loss of fisheries productivity and reduced economic opportunity.[657]

5. Impacts on Tribal Communities

The impact of climate change on tribal communities will be wide-ranging. One major concern is the threat that climate change poses to salmon, whose populations have already declined due to dams and other factors. The Sixth Assessment noted that "[m]any Northwestern tribes have deep cultural, spiritual, subsistence, and ancestral connections to salmon," and:

> Tribes are acutely aware of the impacts of climate change on salmon, other threatened species, and other cultural resources. Increases in river temperatures directly affect the survival rates of juvenile and adult salmon by increasing the risks of disease, predation, loss of habitat, and death (UCUT et al. 2015). Increases in the frequency and severity of floods damage redds (salmon spawning beds). Extreme droughts reduce flows needed by salmon to migrate. Drought, increases in mean temperature, and heat waves are stressing forest trees and contributing to increases in the frequency, size, and severity of wildfires, causing die-offs and habitat loss. According to an assessment of the vulnerability of Pacific salmon and steelhead to climate change, the greatest climate threats to Pacific salmon are ocean acidification, increases in sea surface and stream temperatures, low summer flows, and, depending on the population and life stage, flooding or snowmelt loss (Crozier et al. 2019).[658]

The threat that climate change poses to forests is likewise a major concern for tribes:

> Changes in forest ecosystems and disturbances will affect resources and habitats that are important for the cultural, medicinal, economic, and community health of tribes (Lynn et al., 2013). In Oregon, 62% of tribal reservation land is forested, and the US government has a trust responsibility toward such forests (Indian Forest Management Assessment Team, 2013). American Indian and Alaska Native tribes that depend on forest ecosystems, whether on or off reservations, are among the first to experience the impacts that climate change is having on forests, such as the expansion of invasive species, insects, diseases, and wildfires (Norton-Smith et al., 2016). Invasive species that displace native species can negatively affect tribal subsistence and ceremonial practices, although there is little knowledge about on how climate change will interact with invasive species (Norton-Smith et al., 2016). Increasing wildfire, insects, and diseases have jeopardized the economic and ecological sustainability of tribally managed forests and important tribal resources (Indian Forest Management Assessment Team, 2013; Norton-Smith et al., 2016). Collaborative adaptive forest management that integrates tribal traditional

[657] *Id*. at 148.

[658] *Id.* at 223–24.

ecological knowledge can support socio-ecological resilience to climate change (Armatas et al., 2016).[659]

6. Transportation Impacts

Oregon's transportation system is vulnerable to climate change is various ways. The Oregon Department of Transportation's Climate Adaptation and Resilience Roadmap (2022) explains:

> The frequency, duration, and intensity of extreme heat events is … expected to increase over time. Drier and hotter conditions will exacerbate wildfire risk; fires will be more frequent, large and destructive. Floods will be more frequent and severe, and their "footprint" will expand in and beyond areas currently affected. The winter weather conditions and atmospheric river events that cause safety concerns and contribute to transportation delays and closures (i.e., "winter events") are expected to become more intense, increasingly variable, and harder to predict. These changes directly expose infrastructure, employees and the public to more frequent and intense hazard events.[660]

The Roadmap describes the transportation impacts from three primary climate stressors:

- Increased Frequency/Magnitude of Inland Flooding: Transportation impacts include: damage and road closures resulting from concentrated runoff and scour, flooding, landslides and rock-fall.

- Higher Sea Levels/coastal storms: Transportation impacts include: damage and road closures from increased wave heights, flooding, storm surge, and coastal erosion.

- Extreme Heat: Transportation impacts include: damage and road closures due to heat and wildfires. Health and safety concerns for personnel.[661]

The Roadmap explains that "[s]tatewide, 78% of total highway road miles will be exposed to inland flooding by 2050 and 72% are rated as high risk," [662] and that "72% of coastal state highways are projected to be at high risk of flooding by 2050."[663]

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[659] Meghan M. Dalton et al., Or. Climate Change Rsch. Inst., Third Oregon Climate Assessment Report 58 (2017), https://ir.library.oregonstate.edu/concern/technical_reports/41687r825.

[660] Or. Dep't of Transp., Climate Adaptation & Resilience Roadmap 6 (Dec. 2022), https://www.oregon.gov/odot/climate/Documents/ClimateAdaptation_andResilienceRoadmap.pdf [hereinafter Or. Climate Roadmap].

[661] *Id.*

[662] *Id.* at 15.

[663] *Id*. at 18.

The Roadmap identifies the risk of landslides as being "magnified by wildfire and heavy precipitation. Wildfire burns off vegetation that holds soil in place and reduces water absorption in soil. Heavy rains that follow can cause more soil erosion, destabilization and flooding." [664] It also explains the impact of extreme heat on road maintenance: "heat can add wear and tear to roadways by contributing to cracking, raveling, tracking and oxidation … Pavement is designed to withstand high heat, however more frequent and intense heat events will increase stresses and thus maintenance demand."[665]

As explained below, these climate impacts on the transportation system impose significant costs on Oregonians.

7. Costs to the State

The impacts of climate change significantly affect the state budget. In addition to the examples discussed above, such as costs associated with drought, below are a few additional examples of state costs:

- Wildfires: A record 1.9 million acres of Oregon lands burned in the 2024 wildfire season, roughly tripling the state's 10-year average of 640,000 acres per season and incurring gross costs of approximately $350 million. These exorbitant costs required Governor Kotek to call a special session of the Oregon legislature where lawmakers passed Senate Bill 5801, which allocated an additional $218 million for costs associated with the 2024 wildfire season.[666]

- Transportation: The Roadmap notes that "[c]urrent cost data show a snapshot of significant spikes related to natural hazard response over the last decade (2009–2021), with a total price tag of $168.3 million."[667] It notes that [n]ine years (2013–2021) of wildfire related emergency maintenance costs totaled $58.6 million,"[668] and the cost of repairing landslides and sinkholes have "total[ed]about $62 million over 13 years (2009–2021)."[669] The Roadmap details the staggering impact of just one extreme weather event:

> In February 2020 heavy rain and snow-melt driven by an atmospheric river led to disaster-level flooding that caused evacuations, rescues and deaths near Pendleton, Oregon. Interstate 84, one of the state's key travel and freight corridors, was closed to at least one lane of traffic for six days. Four

[664] *Id.* at 13.

[665] *Id.* at 19.

[666] Press Release, Or. Governor's Off., Governor Kotek Signs Special Session Bill to Address 2024 Wildfire Costs (Dec. 13, 2024), https://apps.oregon.gov/oregon-newsroom/OR/GOV/Posts/Post/governor-kotek-signs-special-session-bill-to-address-2024-wildfire-costs.

[667] Or. Climate Roadmap, *supra* note 660, at 24.

[668] *Id.* at 20.

[669] *Id.* at 13.

> nearby state highways were also impacted by closures (Highways 204, 207, 237 and 245). Cost estimates for road and bridge damage, and debris removal are upwards of $12 million, with an additional $17 million requested from ODOT to FHWA for damages to major transportation networks.[670]

- Health care: The health impacts of climate change, including the impacts of extreme heat and wildfire smoke, naturally drive up overall health care costs—and the State of Oregon itself pays a significant portion of such costs. OHA, relying primarily on the Oregon All Payer Claims Database, estimated that about 13% of all Oregon health care costs are borne by the state.

In addition to these direct costs, the state experiences indirect costs in terms of decreased tax revenues resulting from climate change's impacts on Oregon's industries. These impacts to Oregon industries extend beyond the forest and fishing industries discussed above and include other key Oregon industries, such as the agricultural, construction, and entertainment and tourism industries. For example, the Seventh Assessment estimates that the economic impact from a major smoke event would reduce "the state's per annum Gross Domestic Product by at least $1 billion, or about one-third of one percent."[671] The Seventh Assessment also highlights the significant costs that the $1 billion excludes:

> We acknowledge that we estimated economic loss from a single, distinct wildfire smoke event. We did not address potential compounded or cascading losses from multiple independent or interacting events within the same year. For example, a single smoke event leads to cancellation of some economic activity, but often activities only are delayed. Multiple smoke events would likely compound losses because activities are more likely to be canceled. Furthermore, our estimates almost certainly undervalue the economic impacts of wildfire smoke events. As noted above, our analysis only included 23 of Oregon's 36 counties. Additionally, we did not estimate the cost of long-term negative health outcomes such as diminished quality of life due to acute or chronic health conditions resulting from or exacerbated by smoke exposure.[672]

Finally, the Oregon Public Utility Commission (OPUC) commonly asks utilities to undertake scenario runs that include consideration of the social cost of carbon to determine the least cost/least risk options in their proposed integrated resource plans and requests for proposal, which factors into whether OPUC acknowledges a utility's plan. Utilities seek acknowledgement because it helps a utility's cost recovery arguments.[673]

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[670] *Id.* at 16.

[671] Seventh Assessment, *supra* note 635, at 127.

[672] *Id.*

[673] *See, e.g., In the Matter of Pacificorp, dba Pacific Power*, 2021 WL 5014456 (Or. P.U.C. 2021); *In the Matter of Avista Corporation, dba Avista Utilities*, 2021 WL 4923923 (Or. P.U.C. 2021).

Rhode Island

Climate change is impacting Rhode Island in multiple ways, causing rises in average temperatures, sea levels, precipitation rates, and the frequency of coastal flooding events.

Rhode Island's temperatures have risen by 4°F in the past century, with the state experiencing both the highest numbers of above-average days and above-average nights between 2015 and 2020. The state has also experienced a below-average number of very cold nights since the 1980s.[674] Hotter days pose a particular risk in Rhode Island, a highly urbanized and densely populated state.[675] Rhode Island's capital, Providence, is highly vulnerable to heat and has seen a major increase in extreme heat events since the 1980s.[676]

Precipitation rates have also increased in Rhode Island. Since the 2000s, Rhode Island has experienced a significant increase in annual precipitation and a greater number of extreme precipitation events, leading to more frequent flooding.[677] In fact, five of the top ten wettest years in Rhode Island have occurred since 2000, with 2023 recording 57.66" of precipitation, the sixth highest amount since 1904.[678] This increased precipitation is projected to continue in the coming years, especially in the winter and spring seasons, which bring severe storms.[679] The Ocean State's coastlines are highly susceptible to flooding from winter weather events and hurricanes. In August 2021, Tropical Storm Henri made landfall in Westerly, Rhode Island, dumping up to 8 inches of rain in the area and causing power outages for over 100,000 residents.[680] In response, FEMA issued a disaster declaration, and since 2021, FEMA has declared four additional storm-related disasters in Rhode Island.[681]

The state's predisposition to flooding means that Rhode Island is also disproportionately impacted by rising sea levels. The average sea level in Newport has risen by about 0.12 inches

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[674] Jennifer Runkle & Kenneth E. Kunkel, Nat'l Ctrs. for Env't Info., State Climate Summaries 2022: Rhode Island (2022), https://statesummaries.ncics.org/downloads/RhodeIsland-StateClimateSummary2022.pdf.

[675] Fabian Wagner et al., *Assessment of Urban Water-Energy Interactions and Heat Island Signatures in Rhode Island*, 7 Energy Nexus 100093 (2022), https://doi.org/10.1016/j.nexus.2022.100093.

[676] *Id.*; *Extreme Heat*, Brown Univ.: Sustainability & Resilience, https://sustainability.brown.edu/resiliency/extreme-heat (last visited Aug. 2, 2025).

[677] Ellen L. Mecray et al., U.S. Glob. Change Rsch. Program, Ch. 21: Northeast in Fifth National Climate Assessment, https://repository.library.noaa.gov/view/noaa/61592.

[678] *Id.*

[679] Runkle & Kunkel, *supra* note 674.

[680] Lara Skinner et al., Building a Just Transition for a Resilient Future: A Climate Jobs Program for Rhode Island, Cornell Univ.: ILR Worker Inst. (2022), https://www.cjnrc.org/wp-content/uploads/2022/02/Rhode-Island-Report-Final-2.3-Compressed.pdf.

[681] *See OpenFEMA Dataset: Disaster Declarations Summaries–v2*, Fed. Emergency Mgmt. Agency, https://www.fema.gov/openfema-data-page/disaster-declarations-summaries-v2 (last updated Aug. 3, 2025).

(2.97 mm) each year since 1930—nearly an increase of one foot in a century.[682] These sea level changes are expected to bring about both large increases in tidal flood events and smaller local flooding events.[683] The current sea level rise has already impacted Rhode Island, as the number of tidal flood days has increased overall, with the highest number of days occurring in 2017.[684] As sea levels continue to rise, New England is expected to face severe impacts. The National Flood Insurance Program (NFIP) expects an increase in expected annual flood damage to rise by 38% to 52% by 2100.[685] By that year, the NFIP predicts that sea levels will rise by 1 to 4 feet.[686]

Climate change is affecting the rural and urban forests of Rhode Island. As the climate warms, it will bring increased activity of forest insects, pests, and invasive plant species that damage the state's forests.[687] A decline in snowpack is expected to have a negative effect on northern forest growth as well.[688]

Climate change also threatens Rhode Island's coastal resources and ecosystems. The state's rivers, bays, and ocean waters will continue to warm, threatening vulnerable species and vital industries. The temperature of Narragansett Bay has risen 3ºF since 1960, displacing aquatic wildlife.[689] Environmental changes have devastated certain fish species, such as the winter flounder, leading to the decline of commercial and recreational fisheries.[690] Warming waters are also displacing economically significant bottom-dwelling species, including American lobster, Atlantic surf clams, and sea scallops.[691]

Vermont

Climate change is causing an increase in temperatures and precipitation in Vermont. Average annual temperature has increased by 1.47ºF since 1960 and is projected to rise by an

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[682] *Relative Sea Level Trend: 8452660 Newport, Rhode Island*, NOAA: Tides & Currents, https://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?id=8452660#tabmeantrend (last visited Aug. 3, 2025).

[683] Runkle & Kunkel, *supra* note 674.

[684] *Id.*

[685] *Id.*

[686] *Id.*

[687] R.I. Dep't of Env't Mgmt., Div. of Forest Mgmt., 2020 Forest Action Plan (June 2020), https://dem.ri.gov/sites/g/files/xkgbur861/files/programs/bnatres/forest/pdf/forest-action-plan/forest-action-plan.pdf.

[688] *Id.*

[689] *Our Region at a Glance*, Narragansett Bay Estuary Program, https://www.nbep.org/quick-facts (last visited Aug. 2, 2025).

[690] Ben Goldfarb, *A Coveted Fish is Now a 'Climate Loser,'* The Atlantic (Aug. 13, 2022), https://www.theatlantic.com/science/archive/2022/08/flounder-fish-climate-change-impact/671131/?utm_source=twitter&utm_medium=social&utm_campaign=share.

[691] Narragansett Bay Estuary Program, The State of Narragansett Bay and Its Watershed: Technical Report (2017); Mecray et al., *supra* note 677.

additional 5–9ºF, or more, by 2100.[692] Since 1960, average annual precipitation has increased by 6.71 inches.[693]

Heavy rainfall events are becoming more common.[694] Increasingly frequent heavy rains threaten to flood communities located in Vermont's many narrow river valleys. In 2011, Tropical Storm Irene dumped up to 11 inches of rain on Vermont, impacting 225 municipalities and causing $733 million in damage.[695] The storm destroyed or damaged more than 3,500 homes and businesses, 500 miles of state roads, 200 bridges, and nearly 1,000 culverts.[696]

On July 10–11, 2023, a storm dumped as much as 9 inches of rain on Vermont, at a time when rivers were high and soils were saturated from prior storms.[697] The storm caused catastrophic flooding in downtown Montpelier, the state's capital, and numerous other cities and towns, including Barre, Weston, Ludlow, and Johnson. The Winooski River near Montpelier crested 2 feet higher than during Tropical Storm Irene, and high waters threatened to overtop a 115-foot-high flood control dam upstream of Montpelier built following a catastrophic flood in 1927. By the evening of July 11, more than 175 rescue operations had been conducted to reach stranded Vermonters, many conducted by boat.

Exactly one year later, on July 10–11, 2024, the remnants of tropical cyclone Beryl interacted with a quasi-stationary front, leading to heavy localized rainfall and riverine and flash flooding across northeastern and northwestern Vermont.[698] Rainfall exceeded 7 inches, with heavy thunderstorms resulting in heavy winds and large hail up to 1.5 inches in diameter. On the morning of July 11, Vermont Emergency Management received nearly 700 reports of damage related to flooding. Numerous roads and bridges were impacted, or in some cases washed out, and more than 100 evacuations were conducted by local first responders or teams from Vermont Swift Water Rescue. Two deaths are believed to have been caused by the flooding.[699]

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[692] Gillian Galford et al., Vermont Climate Assessment (2021), https://site.uvm.edu/vtclimateassessment/.

[693] *Id.*

[694] *Id.*

[695] Pierre-Louis, Kendra, *Five Years After Hurricane Irene, Vermont Still Striving for Resilience*, Inside Climate News (Sept. 1, 2016), https://insideclimatenews.org/news/01092016/five-years-after-hurricane-irene-2011-effects-flooding-vermont-damage-resilience-climate-change/.

[696] *Remembering Irene: The Destruction and the Recovery*: WCAX: Burlington, Vt. (Aug. 24, 2021), https://www.wcax.com/video/2021/08/23/remembering-irene-destruction-recovery/.

[697] Seven Days Staff, *'Historic and Catastrophic': Unrelenting Rain Swamped Vermont's Cities, Towns and Hamlets. The Recovery is Just Beginning*, Seven Days Vt. (July 13, 2023), https://www.sevendaysvt.com/vermont/historic-and-catastrophic-unrelenting-rain-swamped-vermonts-cities-towns-and-hamlets-the-recovery-is-just-beginning/Content?oid=38643810.

[698] John Goff et al., *The Significant Flooding and Severe Weather Event of 10-11 July 2024*, Nat'l Weather Serv.: Burlington, Vt. (Aug. 10, 2024), https://www.weather.gov/btv/The-Significant-Flooding-and-Severe-Weather-Event-of-10-11-July-2024.

[699] Jenna Russell, *Flash Flooding Leads to Evacuations and Rescues in Central Vermont*, N.Y. Times (July 11, 2024), https://www.nytimes.com/2024/07/11/us/vermont-flood.html.

In addition to threatening human lives and property, increasingly frequent heavy rains present challenges for state and local land use planning. Further, storm water runoff carries pollutants to the state's streams and lakes and hinders the state's efforts to address phosphorous pollution and resulting algal blooms in Lake Champlain.

Climate change is also increasing the variability in weather, which means Vermont is seeing more frequent dry-spells or droughts in addition to more intense rainstorms.[700] Increased dry spells heighten the risk of wildfires, and in 2024, Vermont experienced 82 wildfires—burning 159 acres in the state, the most fire damage incurred since 2016.[701] As the occurrence of wildfire in Vermont increases, it presents challenges for municipal fire department and state wildfire response resources, stressing a structure that has not historically had to respond to wildfires of that scale or frequency.

Climate change also threatens Vermont's environment and economy by affecting activities dependent on seasonal climate patterns, such as maple sugaring and winter sports.[702] Vermont is the nation's leading maple-syrup producing state.[703] Warmer temperatures are likely to shift the suitable habitat for sugar maples farther north into Canada.[704] Vermont's skier visits, a key business metric of the ski industry, averaged 4 million over the past 10 years, making Vermont the top ski state in the East and the fourth largest nationally.[705] Warmer winters may bring more rain and less snow to Vermont, harming the skiing, snowboarding, and snowmobiling industries and local economies that depend on them.[706] During the winter of 2022–2023, Vermont recorded 4.1 million skier visits, the highest total among eastern states.[707]

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[700] Caitlin Crossett & Mahalia Clark, The Vermont Climate Assessment, Ch. 1: Climate Change in Vermont (2021), https://site.uvm.edu/vtclimateassessment/files/2021/11/VCA-Chapter-1-11-4-21-1.pdf

[701] Sophia Thomas, *Vermont Endures Record Wildfire Season*, WCAX: Burlington, Vt. (Dec. 3, 2024), https://www.wcax.com/2024/12/03/vermont-endures-record-fall-wildfire-season/.

[702] U.S. Env't Prot. Agency, What Climate Change Means for Vermont (Aug. 2016), https://19january2017snapshot.epa.gov/sites/production/files/2016-09/documents/climate-change-vt.pdf

[703] *Vermont Sugar Season Sweet Success*, Vt. Agency of Agric. Food & Mkts. (June 10, 2022), https://agriculture.vermont.gov/agency-agriculture-food-markets-news/vermont-sugar-season-sweet-success#:~:text=Vermont%20remains%20the%20top%20producing,150K%20over%20the%202021%20total.

[704] U.S. Env't Prot. Agency, What Climate Change Means for Vermont, *supra* note 702.

[705] Vt. Outdoor Recreation Econ. Collaborative, Move Forward Together Vermont (2024), https://fpr.vermont.gov/sites/fpr/files/documents/SCORP%20Report%20Full_FINAL.pdf.

[706] *Id.*

[707] *Vermont Ski Industry Business Increased 10% Despite Weather Challenges*, Vt. Biz Mag. (June 9, 2023), https://vermontbiz.com/news/2023/june/09/vermont-ski-industry-business-increased-10-despite-weather-challenges.

Climate change is also contributing to increased distribution and abundance of ticks and increased tickborne diseases, including Lyme disease and Anaplasmosis, in Vermont.[708] As of 2019, Vermont's 3-year average per capita rate of Lyme disease was second among the states.[709]

Although Vermont is known for having some of the nation's cleanest air, in recent years, Vermont has suffered bouts of air quality that is unhealthy for either all people or sensitive people, attributable to wildfire smoke migrating to Vermont from western states or Canada.[710] Such incidents are expected to occur with increasing frequency as the climate warms.[711]

Washington

Washington is a coastal state, a mountain state, and a forest state, home to 8.0 million people[712] and more than 3,375 different plant and animal species.[713] Climate change is significantly and adversely affecting each of these signature features of Washington, in addition to the industries that support the state's economy. Climate change is also causing significant harm to the health of Washington's ecosystems and public health, with a disproportionate impact on historically marginalized communities.

During the past decade, the Pacific Northwest has had more extremely hot days and warm nights compared to the long-term average from 1900–2020. The region has also had fewer extremely cold nights in the past decade compared to the long-term average from 1900–2020. Washington's annual average air temperatures have increased by almost 1.1°C (2.0°F) since 1900. Modeling shows that climate change will continue to transform our region. By 2080, annual average temperatures in the Pacific Northwest are projected to increase by an average of 2.6°C (4.7°F) to 5.6°C (10.0°F) relative to 1950–1999. Future warming in the Pacific Northwest

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[708] *Health Risks of Climate Change*, Vt. Dep't of Health, https://www.healthvermont.gov/environment/climate-health/health-risks-climate-change#tick (last updated May 1, 2025).

[709] Summer Sorg, *Tick Populations Are Increasing and So Is Vermont's Lyme Disease Rate; Here's What to Know*, Burlington Free Press (Feb. 24, 2022), https://www.burlingtonfreepress.com/story/news/2022/02/24/vermonts-tick-populations-rising-due-weather-urbanization/6828673001/.

[710] Paige Fisher, *Air Quality Worsens Across State Due to Wildfires and Dust from Flood Cleaning*, Vt. Digger (July 18, 2023), https://vtdigger.org/2023/07/18/air-quality-worsens-across-state-due-to-wildfires-and-dust-from-flood-cleaning; Emma Cotton, *Air Quality Improves After Heavy Weekend Haze, but Officials Recommend Caution*, Vt. Digger (June 26, 2023), https://vtdigger.org/2023/06/26/air-quality-improves-after-heavy-weekend-haze-but-officials-recommend-caution/.

[711] Cotton, *supra* note 710.

[712] *Washington Data & Research: Total Population and Percent Change*, Off. of Fin. Mgmt., https://ofm.wa.gov/washington-data-research/statewide-data/washington-trends/population-changes/total-population-and-percent-change (last updated Jan. 3, 2025).

[713] The Nature Conservancy, State of the Union: Ranking America's Biodiversity 12 (Apr. 2002), https://www.natureserve.org/sites/default/files/stateofunions.pdf; Wash. Biodiversity Council, Washington's Biodiversity: Status and Threats 1 (2019), https://rco.wa.gov/wp-content/uploads/2019/07/BiodiversityStatusThreats.pdf.

will also intensify regional heatwaves, which has cascading effects on communities, health, and infrastructure.[714]

Climate change is significantly harming Washington's coasts and waterways.

Climate change will cause the sea level to rise and permanently inundate low-lying areas in the Puget Sound region,[715] which is currently home to approximately 4.3 million Washingtonians.[716] Under intermediate projections for sea level rise, the sea level in Seattle is predicted to rise relative to 2000 levels by 0.74 feet by 2050 and 2.92 feet by 2100.[717] Sea level rise will increase the frequency of coastal flood events.[718] For example, with 2 feet of sea level rise (predicted for Seattle), a 1-in-100 year flood event will become an annual event.[719]

Sea level rise will also cause coastal bluffs (the location of many family homes in Puget Sound) to erode and recede by as much as 75–100 feet by 2100 relative to 2000.[720] This would be a doubling, on average, of the rate of recession in 2015.[721] This erosion is not only depleting an important natural resource for biodiversity conservation,[722] but it is also reducing and degrading tribal lands.[723] Sea level rise will also result in reduced harvest for commercial fishing and shellfish operations.[724]

Climate change is also causing ocean acidification, through the ocean's absorption of excess carbon dioxide from the atmosphere. Ocean waters on the outer coast of Washington and

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[714] Li Erikson et al., U.S. Glob. Change Rsch. Program, Ch. 27. Northwest in Fifth National Climate Assessment (2023), https://doi.org/10.7930/NCA5.2023.CH27 [hereinafter Fifth National Climate Assessment Northwest].

[715] Climate Impacts Grp., Univ. of Wash., State of Knowledge: Climate Change in Puget Sound 4-1 (Nov. 2015), https://data.cig.uw.edu/picea/mauger/ps-sok/PS-SoK_2015.pdf [hereinafter 2015 State of Knowledge, Puget Sound].

[716] *Orca Facts*, Puget Sound Starts Here, https://www.pugetsoundstartshere.org/Facts.aspx (last visited Aug. 2, 2025).

[717] *See Interagency Sea Level Rise Scenario Tool–NASA Sea Level Change Portal*, NASA, https://sealevel.nasa.gov/task-force-scenario-tool (last visited Aug. 2, 2025).

[718] 2015 State of Knowledge, Puget Sound, *supra* note 715, at 4-6.

[719] *Id.*

[720] *Id.* at 4-6, 4-7.

[721] *Id.* at 4-7.

[722] Christopher B. Chappell, Wash. Dep't of Nat. Res., Plant Associations of Balds and Bluffs of Western Washington 4-5 (June 2006), https://file.dnr.wa.gov/publications/amp_nh_balds_bluffs.pdf.

[723] Christopher Flavelle & Kalen Goodluck, *Dispossessed, Again: Climate Change Hits Native Americans Especially Hard*, N.Y. Times (June 27, 2021), https://www.nytimes.com/2021/06/27/climate/climate-Native-Americans.html.

[724] *Id.*

the Puget Sound have become 10% to 40% more acidic since 1800.[725] This increased acidity is already affecting some shellfish species.[726] Washington has the largest shellfish industry on the west coast, contributing $270 million per year to Washington's economy and employing 3,200 workers.[727] Under a business as usual greenhouse gas scenario, ocean waters are expected to become at least 100% more acidic by 2100 relative to 1986–2005.[728] The predicted level of ocean acidification is expected to cause a 34% decline in shellfish survival by 2100.[729]

Washington depends on yearly winter mountain snowpack for drinking water, as well as water for irrigation, hydropower, and salmon. Washington's winter mountain snowpack is decreasing because climate change is causing more precipitation to fall as rain rather than snow. Using figures from 2022, April snowpack in Washington has decreased by an average of about 28% since 1955.[730] By the 2040s, snowpack is predicted to decrease 38% to 46% relative to 1916–2006,[731] and by the 2080s, snowpack is expected to decline 56% to 70%.[732] This loss of snowpack will contribute to a 29% to 54% increase in the frequency of water shortage years,[733] in addition to predicted decrease in summer stream flow by 34% to 44% by the 2080s.[734]

Washington invested $81.5 million in salmon-recovery projects to protect salmon habitat, preserve jobs that depend on salmon, and help Washington communities adapt to climate change.[735] Salmon populations that formerly supported both tribal communities and industry are now estimated to be at only 5% of historic highs.[736] The decrease in summer stream flows combined with higher stream temperatures is resulting in stream temperatures too high to support

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[725] Climate Impacts Grp., Univ. of Wash., State of Knowledge Report: Climate Change Impacts and Adaptation in Washington State: Technical Summaries for Decision Makers 2-6 (Dec. 2013), https://cig.uw.edu/wp-content/uploads/sites/2/2020/12/snoveretalsok816.pdf [hereinafter 2013 State of Knowledge Report].

[726] *Id.* at 2-3.

[727] NOAA Fisheries Serv., From the Tides of Puget Sound to Your Plate (Jan. 2012), https://media.fisheries.noaa.gov/dam-migration/noaa_shellfish_initiative_f_sheet_011312.pdf.

[728] 2013 State of Knowledge Report, *supra* note 725, at ES-2.

[729] *Id.* at 8-4.

[730] *Climate Change Indicators: Snowpack*, U.S. Env't Prot. Agency, https://www.epa.gov/climate-indicators/climate-change-indicators-snowpack (last visited Aug. 3, 2025).

[731] 2013 State of Knowledge Report, *supra* note 725, at ES-2.

[732] *Id.* at 6-10.

[733] *Id.* at 6-5.

[734] *Id.* at 6-3.

[735] Press Release, Wash. State Recreation & Conservation Off., State Invests More than $81 Million in Salmon Recovery (Sept. 18, 2023), https://rco.wa.gov/salmon-recovery-grants/.

[736] Kelcie Walther, *Rising Water Temperatures Could Be A Death Sentence For Pacific Salmon*, Colum. Climate Sch.: State of the Planet (Feb. 10, 2021), https://news.climate.columbia.edu/2021/02/10/rising-temperatures-pacific-salmon/.

adult salmon,[737] and high emissions projections indicate there will be a 22% reduction in Washington salmon habitat.[738] The reduction in salmon habitat has already caused a $4.2 billion loss (in 2023 dollars) in the fishing industry.[739] The fish kills directly resulting from higher temperatures have consequences for years after temperature spikes.[740] Higher temperatures also increase the number of salmon predators, which further compromises salmon recovery efforts.[741]

> Climate impacts on Washington's landscape will significantly harm state forestry, agriculture, and recreation industries.

Climate change is also harming Washington's forests. Of Washington's total area (45.6 million acres),[742] about half (almost 23 million acres) is forested.[743] Washington's forest products industry generates a gross business income of about $36 billion per year,[744] provides more than 100,000 jobs, and contributes approximately $4.9 billion in annual wages.[745] Climate change is threatening this industry in a number of ways. For example, Douglas-fir trees account for almost half the timber harvested in Washington.[746] Under a moderate greenhouse gas scenario, Douglas-fir habitat is expected to decline 32% by the 2060s relative to 1961–1990.[747] In addition, the area of Washington forest where tree growth is severely limited by water availability is projected to increase (relative to 1970–1999) by about 44% in the 2040s, with an additional 12% increase in the 2080s.[748]

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[737] 2013 State of Knowledge Report, *supra* note 725, at ES-4, 6-6, 6-11, 6-12.

[738] Charles Luce et al., U.S. Glob. Change Rsch. Program, Chapter 24: Northwest in Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment 1036 (2018), https://repository.library.noaa.gov/view/noaa/19487 [hereinafter Fourth National Climate Assessment].

[739] *Id.*; *Inflation Calculator*, U.S. Inflation Calculator, https://www.usinflationcalculator.com/ (last visited Aug. 3, 2025).

[740] Fifth National Climate Assessment Northwest, *supra* note 714.

[741] Wash. State Recreation & Conservation Off., Governor's Salmon Recovery Off., 2018 State of Salmon in Watersheds: Executive Summary 17 (2018), https://app.leg.wa.gov/ReportsToTheLegislature/Home/GetPDF?fileName=SOS-ExecSumm-2018-FINAL%20web_14054b82-91a9-47f8-aebc-d4b4151bba20.pdf.

[742] Wash. State Recreation & Conservation Off., Washington Public Lands Inventory 3 (July 2014), https://rco.wa.gov/wp-content/uploads/2019/08/PLIP-2014.pdf.

[743] *Healthy Working Forests Are Essential to Jobs and Washington's Economy*, Wash.'s Working Forests, https://data.workingforests.org/ (last visited Aug. 3, 2025).

[744] *Forest Products*, Wash. State Dep't of Com., http://choosewashingtonstate.com/why-washington/our-key-sectors/forest-products/ (last visited Aug. 3, 2025).

[745] *Healthy Working Forests*, *supra* note 743.

[746] Wash. Dep't of Nat. Res., 2017 Washington Timber Harvest Report (Aug. 2018), https://www.dnr.wa.gov/publications/em_obe_wa_timber_harvest_2015_final2.pdf.

[747] 2013 State of Knowledge Report, *supra* note 725, at 7-1.

[748] *Id.* at 7-3.

Wildfires pose another threat to Washington's forests. Under a business as usual greenhouse gas scenario, decreases in summer precipitation, increases in summer temperatures, and earlier snow melt are predicted to result in up to a 300% increase in the area in eastern Washington burned annually by forest fires[749] and up to a 1,000% increase in area burned annually on the west side of the state (typically, the wet side).[750] Unpredictable timber prices and supplies resulting from increased wildfires could lead to a decrease in mill investment, which would have a particularly devastating effect on rural timber-based economies in Washington, which face heightened economic risks from wildfires and drought.[751]

Another important Washington crop that will be impacted by climate change is the apple. Washington is the nation's leading apple producer,[752] growing 70% of U.S. apples which support a $2.185 billion industry.[753] The majority of these apples are grown east of the Cascades along the Columbia River.[754] In the Columbia River Basin, there is a projected increase in irrigation demands of 5% by 2030.[755] In addition to predicted increase in water demand for all crops in the Basin, apple production will be specifically harmed by the effects of climate change. Potential risks to Washington's apple crops include a mismatch of pollinator availability and flowering times due to earlier flowering, increased parasites, and scalding of the apples due to increased temperatures.[756] Federal crop insurance and drought indemnity payments from 2006 to 2020 in Oregon, Washington, and Idaho reflect increasing challenges for the production of wheat and potatoes in the region.[757]

Finally, the Washington outdoor recreation economy stands to be decimated by the impacts of climate change. The $26 billion industry maintains over 200,000 jobs in Washington.[758] The ski industry, in particular, will be harmed by the impacts of climate change. Ski seasons could be reduced by 50% by 2050 and 80% in 2090 in some locations due to climate

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[749] *Id*.

[750] *Id*. at 7-4.

[751] Fifth National Climate Assessment Northwest, *supra* note 714.

[752] U.S. Dep't of Agric., Noncitrus Fruits and Nuts 2022 Summary 14 (May 2023), https://downloads.usda.library.cornell.edu/usda-esmis/files/zs25x846c/zk51wx21m/k356bk214/ncit0523.pdf.

[753] *Agriculture: A Cornerstone of Washington's Economy*, Wash. State Dep't of Agric., https://agr.wa.gov/washington-agriculture (last visited Aug. 2, 2025).

[754] *Washington Apple Orchards*, Wash. Apple Comm'n, https://waapple.org/regions/ (last visited Aug. 2, 2025).

[755] Fourth National Climate Assessment, *supra* note 738, at 1035.

[756] Fifth National Climate Assessment Northwest, *supra* note 714.

[757] *Id*.

[758] Todd Elsworth, *Washington State Outdoor Recreation Report–Outdoor Industry Association*, Recreation Nw. (Oct. 26, 2018), https://www.recreationnorthwest.org/recreation-economy/washington-state-outdoor-recreation-report-outdoor-industry-association/.

change impacts.[759] This decrease in length of the winter recreation seasons is projected to decrease snow-based recreation revenue by 70% annually across the Northwest in a higher warming scenario accounting for continued reliance on fossil fuels.[760]

The public health of Washington is in grave danger due to the harms of climate change.

By far the highest costs to the state are expected to come from harm to public health. More frequent and intense flooding, fire, and heat waves will harm human health directly.[761] Climate-related health risks are often greatest for the elderly, children, those with existing chronic health conditions, individuals with greater exposure to outside conditions, and those with limited access to health resources.[762] Washington is especially vulnerable to heat-related health impacts for several reasons, including that Seattle is the least air-conditioned metropolitan city in the United States,[763] and Washington has the second largest population of Americans experiencing homelessness.[764] Health impacts also trend higher when analyzing race and class. For example, low-income households and communities of color tend to be concentrated in hotter urban neighborhoods.[765] This trend is prominent in Seattle, where historically redlined communities are 2.1°F warmer than the city average.[766]

Washington's tribal communities are uniquely vulnerable to the impacts of climate change. Indigenous populations face disproportionate impacts of climate change compared to nonindigenous communities.[767] Washington has the 10th largest tribal population in the United

[759] Cameron Wobus et al., *Projected Climate Change Impacts on Skiing and Snowmobiling: A Case Study of the United States*, 45 Glob. Env't Change, 1–14 (2017), https://doi.org/10.1016/j.gloenvcha.2017.04.006.

[760] Fourth National Climate Assessment, *supra* note 738, at 1036.

[761] NRDC, Issue Brief: Climate Change and Health in Washington 2 (Sept. 2019), https://www.nrdc.org/sites/default/files/climate-change-health-impacts-washington-ib.pdf.

[762] 2015 State of Knowledge, Puget Sound, *supra* note 715, at ES-7.

[763] Sjoukje Y. Philip et al., *Rapid Attribution Analysis of the Extraordinary Heatwave on the Pacific Coast of the US and Canada June 2021*, 13 Earth System Dynamics 1689, 1707 (2022), https://esd.copernicus.org/articles/13/1689/2022/esd-13-1689-2022.pdf/.

[764] U.S. Dep't of Housing & Urban Dev., The 2024 Annual Homelessness Assessment Report (AHAR to Congress), Part 1: Point-In-Time Estimates of Homelessness 62 (Dec. 2024), https://www.huduser.gov/portal/sites/default/files/pdf/2022-AHAR-Part-1.pdf.

[765] NRDC, *supra* note 761.

[766] *Urban Heat Islands in the Northwest*, Climate Hubs, U.S. Dep't of Agric., https://www.climatehubs.usda.gov/hubs/northwest/topic/urban-heat-islands-northwest (last visited Aug. 3, 2025).

[767] Kirsten Vinyeta & Kathy Lynn, U.S. Forest Serv., Exploring the Role of Traditional Ecological Knowledge in Climate Change Initiatives 1 (2013), https://www.fs.usda.gov/research/treesearch/43431#.

States,[768] and is home to over 140,000 people who identify as American Indian/Alaska Native.[769] Many of the impacts discussed above directly impact tribal interests. For example, the reduction of the bluffs and increased flooding are forcing tribal migration inland.[770] Tribes in Washington also rely on shellfish harvesting for their livelihood, including commercial trade, subsistence, and ceremony.[771] Disparities in overall health outcomes in native communities also mean that the health impacts of climate change will also disproportionately affect this population.[772]

The extreme heatwave in 2021 showcases Washington's vulnerability to not only heat-related mortality, but also the cascading effects of climate change within the state.[773] Between June 26 and July 2, 2021, the Pacific Northwest experienced a "once-in-a-millennium" heat wave that caused 100 heat-related deaths in Washington State,[774] and an additional 38 deaths related to the heat wave after it had ceased.[775] In the summer of 2021, 67% of heat deaths were in people over the age of 65.[776] In addition to the human death toll, the heat was so intense that hundreds of millions of shellfish baked to death in the Puget Sound.[777] This event likely impacted the health of all shellfish reproduced around this time, and it will take years to examine the full scale impact of this event on aquatic life, cultural connections, and fisheries.[778] Marine heat waves—periods of unseasonable warmth in ocean environments—exacerbate the impacts of climate change on fisheries in the northeast Pacific Ocean. Marine heat waves create stress in

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[768] Natasha Brennan, *Native American Population in Washington State Has Grown by More Than Half*, News Tribune: Tacoma (Sept. 24, 2021), https://www.thenewstribune.com/news/state/washington/article254452573.html (citing U.S. Census data).

[769] *Washington State Population by Race*, Off. of Fin. Mgmt., https://ofm.wa.gov/washington-data-research/statewide-data/washington-trends/population-changes/population-race (last updated Jan. 3, 2025).

[770] Flavelle & Goodluck, *supra* note 723.

[771] *Shellfish*, Nw. Indian Fisheries Comm'n, https://nwifc.org/about-us/shellfish/ (last visited Aug. 2, 2025).

[772] Brennan, *supra* note 768.

[773] Philip et al., *supra* note 763.

[774] *See* Nicholas Turner, *Window Shades, Ventilation and Other Key Lessons from the 2021 Pacific Northwest Heat Wave*, Seattle Times (June 25, 2022), https://www.seattletimes.com/seattle-news/environment/window-shades-ventilation-and-other-key-lessons-from-the-2021-pacific-northwest-heat-wave/; *Heat Wave 2021*, Wash. State Dep't of Health, https://doh.wa.gov/emergencies/be-prepared-be-safe/severe-weather-and-natural-disasters/hot-weather-safety/heat-wave-2021 (last visited Aug. 2, 2025).

[775] *Heat Wave 2021*, *supra* note 774.

[776] *Id.*

[777] *See* John Ryan, *Extreme Heat Cooks Shellfish Alive on Puget Sound Beaches*, KUOW: Puget Sound Pub. Radio (June 23, 2022), https://www.kuow.org/stories/extreme-heat-wave-cooked-many-shellfish-spared-others-study-finds.

[778] Wendel W. Raymond et al., *Assessment of the Impacts of an Unprecedented Heatwave on Intertidal Shellfish of the Salish Sea*, 103 Ecological Society of Am. 3798 (2022), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9786359/.

juvenile chum salmon populations, resulting in lower adult salmon populations in following years.[779] The marine heat wave of 2014 to 2016 in the northeastern Pacific Ocean led to many fishery disaster declarations, including salmon, crab, cod, and sardines, that impacted the livelihoods of fishers, especially those with smaller vessels.[780] This led to a $641.1 million (in 2022 dollars) reduction in commercial fishing revenue.[781] Modeling of future marine heat waves in the Gulf of Alaska and California Current predict steep biomass declines in pelagic fish (such as cod and halibut) and salmon.[782]

> Climate change has significant impacts on Washington's infrastructure, including state-owned facilities.

Increased precipitation and more intense winter storms lead to increased mudslides, localized flooding, and wind damage.[783] Rising sea levels and higher storm surges may erode and weaken roads and bridges, damage stormwater drainage and tide gates, and corrode state-owned coastal facilities.[784] Higher temperatures and drought pose threats of fire damage, buckling of roads and rail tracks, and loss of roadside vegetation, worsening erosion, and landslides in Washington State.[785]

Wisconsin

Wisconsin recognizes the urgency of addressing the increasing threats from climate change and continued reliance on traditional fossil fuels. Wisconsin also recognizes that impacts of both climate change and fossil-fuel-based energy production are often borne disproportionately by communities throughout the state.[786] Without changes to current emissions trends, Wisconsin will face increasing impacts related to severe weather events, human health and justice, and economic consequences.

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[779] Edward V. Farley et al., *Critical Periods in the Marine Life History of Juvenile Western Alaska Chum Salmon in a Changing Climate*, 726 Marine Ecology Progress Series 149–60 (2024), https://doi.org/10.3354/meps14491.

[780] Emily B. Osborne et al., U.S. Glob. Change Rsch. Program, Ch. 10 Ocean Ecosystems and Marine Resources in Fifth National Climate Assessment (2023), https://repository.library.noaa.gov/view/noaa/61592.

[781] Fifth National Climate Assessment Northwest, *supra* note 714.

[782] William W.L. Cheung & Thomas L. Frölicher, *Marine Heatwaves Exacerbate Climate Change Impacts for Fisheries in the Northeast Pacific*, 10 Sci. Reps. 6678 (2020), https://doi.org/10.1038/s41598-020-63650-z.

[783] Wash. State Dep't of Transp., Guidance for Considering Impacts of Climate Change in WSDOT Plans 4 (2017), https://wsdot.wa.gov/sites/default/files/2021-10/Guidance-Doc-Considering-Climate-Change-In-WSDOT-Plans.pdf.

[784] *Id.*

[785] *Id.*

[786] U.S. Env't Prot. Agency, EPA 430-R-21-003, Climate Change and Social Vulnerability in the United States: A Focus on Six Impacts (2021), https://www.epa.gov/system/files/documents/2021-09/climate-vulnerability_september-2021_508.pdf.

In August 2019, Governor Tony Evers issued Executive Order #38 in which he created the Office of Sustainability and Clean Energy (OSCE) and directed the Office to develop a pathway to multi-sector deep decarbonization and a transition to a strong clean energy economy that prioritizes environmental justice, ensures a diverse workforce, and fosters technology innovation. The OSCE serves as the state's lead on coordinated planning, programs, and policy development that addresses climate change and clean energy transition, primarily positioning Wisconsin to achieve 100% carbon-free electricity consumption within the state by 2050. The OSCE partners with other state agencies and other key stakeholders to accomplish this work.

Recognizing the existing conditions in Wisconsin and the role the state plays in regional and national emissions reduction initiatives, OSCE created a comprehensive Clean Energy Plan, which seeks to achieve the following objectives:

- Putting Wisconsin on a path for all electricity consumed within the state to be 100% carbon-free by 2050,
- Reducing the disproportionate impacts of energy generation and use on low-income communities and communities of color,
- Maximizing the creation of clean energy jobs, economic development, and stimulus, and retention of energy investment dollars in Wisconsin,
- Improving reliability and affordability of the energy system,
- Strengthening the clean energy workforce through training and education while retraining workers affected by the transition from fossil fuel to clean energy sources, and
- Protecting human and environmental health by reducing pollution from fossil fuels.[787]

Climate Change Impacts on Extreme Weather

Staying on our current emissions path will only exacerbate the impacts of climate change, and Wisconsinites should not have to deal with the harmful effects of increased heat, humidity, and precipitation. A 2020 University of Wisconsin's Global Health Institute report stated, "Extreme heat kills more Wisconsinites than other weather disasters (i.e., tornadoes, floods, blizzards) combined."[788] By 2050, Wisconsin's average temperatures are projected to warm 2–8°F above the late 20th-century annual average. By mid-century, extreme heat days (over 90°F) in Wisconsin are projected to triple.[789]

Climate Change Impacts on Public Health and Justice

[787] Wis. Off. of Sustainability & Clean Energy et al., State of Wisconsin Clean Energy Plan (Apr. 2022), https://osce.wi.gov/Documents/Clean%20Energy%20Plan%20-%20DML%20-%20Summary%20(1).pdf.

[788] Jonathan Patz et al., Univ. of Wis.-Madison, Medical Alert! Climate Change is Harming our Health in Wisconsin (2020), https://ghi.wisc.edu/wp-content/uploads/sites/168/2020/10/Medical-Alert-Climate-Change-is-Harming-Our-Health-in-Wisconsin.pdf.

[789] *Trends and Projections*, Wis. Initiative on Climate Change Impacts, https://wicci.wisc.edu/wisconsin-climate-trends-and-projections/ (last visited Aug. 3, 2025).

If Wisconsin does not make significant strides in addressing emissions, the state and its residents will experience substantial cumulative health and economic impacts.

The University of Wisconsin-Madison's Center for Sustainability and the Global Environment (SAGE) and the Holloway Group conducted a preliminary screening on the air and health impacts of decarbonizing Wisconsin's energy supply. The estimated emission changes across several sectors correspond to Energy Policy Simulator modeling projections in which fossil fuel use declines from 83% to 36% through a suite of multi-sector policy options.[790] In addition to reducing CO_2 emissions, changes to the energy supply will also reduce particulate matter (PM_{10}), fine particulate matter ($PM_{2.5}$), nitrogen oxides (NO_x), and sulfur oxides (SO_x) emissions.

Wisconsin's Clean Energy Plan uses the U.S. Environmental Protection Agency's CO-Benefits Risk Assessment, Health Impacts Screening and Mapping Tool (COBRA) to estimate the health benefits of the deployment of clean energy strategies. Based on the full implementation of the strategies outlined in the Clean Energy Plan, the estimated number of premature deaths avoided is 102 to 231 per year. COBRA reported estimates for annual avoided hospital admissions, including for acute bronchitis (131), non-fatal heart attacks (9 to 11), other cardiovascular admissions (17), and asthma (36). Additional annual impacts estimated by COBRA include 11,900 avoided days of work lost to illness, 71,400 minor restricted activity days, and 6,570 instances of respiratory symptoms and asthma exacerbation.

The COBRA model reported that annual financial benefits for Wisconsinites were $78 to $247 million from avoided non-fatal health impacts and $970 million to $2.5 billion from avoided mortality. A simple extrapolation of these benefits, assuming a linearly scaled implementation of energy system changes between 2023 and 2050, results in an estimated cumulative "cost of inaction" of between $4.6 and $21 billion (net present value) using a 7% and 3% discount rate, respectively.

Climate Change Impacts on Wisconsin's Economy

Climate inaction in Wisconsin will have significant costs for our communities and economy, particularly for low-income communities and communities of color, which face disproportionate harms from climate change, as well as our agricultural industries, statewide infrastructure, and the broader economy.

Many analysts project that Wisconsin stands to suffer substantial economic impacts due to climate change. These include warmer winters, which may in turn result in fewer fish and less seasonal recreation. Wisconsin's outdoor recreation is a top driver for Wisconsin's economy, creating $11.2 billion that contributes to the state's gross domestic product; supporting nearly 97,000 jobs across diverse sectors; providing $5.4 billion in compensation to Wisconsinites; and

[790] *Energy Policy Simulator Documentation,* Energy Policy Solutions (retrieved 2022 from https://us.energypolicy.solutions/docs/).

positioning the state as a leader in outdoor recreation manufacturing.[791] Climate impacts have a direct correlation with reduced recreation and seasonal outdoor activities, resulting in a substantial decrease in billions of dollars that can directly affect Wisconsin's economy.[792]

In conjunction with warming, Wisconsin residents can expect an increase in their energy burden as they use more energy to cool indoor spaces during the summertime. Not only will unchecked warming lead to higher utility bills, but climate inaction will also be costly for all aspects of Wisconsin residents' lives.[793]

District of Columbia

The District of Columbia is a densely populated area located at the confluence of two tidal rivers, and accordingly, is particularly vulnerable to the impacts of climate change, including flooding caused by rising tides and heavy rains, increasingly severe weather, and dangerous heat waves.

Water levels along the Potomac and Anacostia Rivers have increased about 13–14 inches over the past century due to a combination of sea level rise and subsidence.[794] As a result, nuisance flooding has increased by more than 300% according to the National Oceanic and Atmospheric Administration.[795] The District is expected to experience 1.1 to 1.7 feet of sea level rise by 2050 and 1.6 to 4.4 feet by 2080, an increase of up to 60% over previous projections.[796] At the same time, heavy rain events are projected to grow more frequent and intense, according to local climate change projections completed by the District. High-intensity, short-duration storms are expected to become more frequent, with 100-year storm events delivering 10–20% more rainfall.[797] The combined impact of rising tides and heavier rains poses significant threats to the District's infrastructure, community resources, cultural assets, government and military

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[791] *Economic Impact of Outdoor Recreation*, Wis. Off. of Outdoor Recreation, https://outdoorrecreation.wi.gov/Pages/Resources/Report.aspx#:~:text=Content_Area1,improvements%20and%20community%20development%20gains (last visited Aug. 3, 2025).

[792] *Climate Change Impacts in Wisconsin*, Wis. Dep't of Nat. Res., https://dnr.wisconsin.gov/climatechange/impacts#:~:text=Climate%20change%20also%20threatens%20the,But%20so%20are%20possible%20solutions (last visited Aug. 3, 2025).

[793] Wis. Off. of Sustainability & Clean Energy et al., State of Wisconsin Clean Energy Plan (Apr. 2022), https://osce.wi.gov/Documents/Clean%20Energy%20Plan%20-%20DML%20-%20Summary%20(1).pdf.

[794] *Sea Level Rise in the DC Area*, Nat'l Park Serv., https://www.nps.gov/articles/000/sea-level-rise-in-the-dc-area.htm (last updated May 21, 2024).

[795] Nat'l Oceanic & Atmospheric Admin., Technical Rep. NOS CO-OPS 073, Sea Level Rise and Nuisance Flood Frequency Changes around the United States (2014), https://tidesandcurrents.noaa.gov/publications/NOAA_Technical_Report_NOS_COOPS_073.pdf.

[796] D.C. Dep't of Energy & Env't, Climate Projections & Scenario Development 3–4 (2024), https://doee.dc.gov/sites/default/files/dc/sites/doee/publication/attachments/2024%20Climate%20Change%20Projections%20%26%20Scenario%20Update%20-%20District%20of%20Columbia_1.pdf [hereinafter DC Climate Projections & Scenario Development].

[797] *Id.* at 28–29.

facilities, and residents. For example, during the second half of the century, Joint Base Anacostia-Bolling and Washington Navy Yard can expect more frequent and extensive tidal flooding, the loss of currently utilized land, and substantial increases in the extent and severity of storm-driven flooding. With an intermediate rate of sea level rise, Naval Support Facility Anacostia could lose roughly 50% of its land area, and the Washington Navy Yard about 30% of its current land area, by end of century.[798]

The District is also vulnerable to rising temperatures and a corresponding increase in extreme heat events. In the coming decades, the frequency of extreme heat events is expected to nearly quadruple by the 2080s, and 75% of the summer could exceed 95°F.[799] By the 2050s, the District will experience an annual average temperature increase of 3–5°F from the year 2000 average temperature.[800] The number of days above 95°F is expected to rise from around 9 days per year to between 22–24 days by the 2030s and up to 67 days by the 2080s under a worst-case scenario.[801] Days exceeding 100°F, historically less than one per year, may increase to as many as 32 per year by the end of the century.[802] Heat waves will not only become more frequent, but they will also last longer and become more intense.[803] These conditions are expected to place a serious strain on public health systems, particularly affecting vulnerable groups such as older adults, children, and those without access to cooling. Hotter temperatures can also stress infrastructure like roads, rail lines, and our power grid, causing disruptions.

City of Chicago

The City of Chicago has experienced significant impacts from climate change. These impacts have affected Chicago's residents, infrastructure, and economy.

Statewide, average daily temperatures have increased 1–2°F over pre-industrial levels, with the greatest amount of warming occurring during the winter and spring months.[804] 2024 was the warmest year on record in Chicago.[805]

Unfortunately, Chicago has experience with the potential danger of increased hot weather. A heat wave in July 1995 resulted in the deaths of more than 700 Chicagoans,[806] leading

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[798] *On the Front Lines of Rising Seas: Joint Base Anacostia-Bolling and Washington Navy Yard*, Union of Concerned Scis. (July 15, 2016), https://www.ucs.org/resources/front-lines-rising-seas-joint-base-anacostia-bolling-and-washington-navy-yard#.WlPQVrynHRY.

[799] DC Climate Projections & Scenario Development, *supra* note 796, at 14–15.

[800] *Id.* at 16.

[801] *Id.* at 17, tbl. 1.

[802] *Id.* at 16–17, tbl. 1, 19, fig. 4.

[803] *Id.* at 20–22.

[804] *Climate Change in Illinois*, Ill. State Climatologist, https://stateclimatologist.web.illinois.edu/climate-change-in-illinois/ (last visited Aug. 3, 2025).

[805] *2024 Calendar Year Climate Summary—Chicago, Illinois*, Nat'l Weather Serv., https://www.weather.gov/lot/2024AnnualClimate (last visited Aug. 3, 2025).

[806] Semenza et al., *supra* note 362.

the City to drastically expand access to cooling centers and invest in large scale educational campaigns, while also adopting policies to build more heat-absorbing green roofs, plant more trees, and expand natural spaces. The City continues investing in these programs. Today, the City of Chicago, Cook County, the Chicago Park District, and the Chicago Public Library operate a network of cooling centers to protect the City's residents from extreme heat. The City of Chicago has also undertaken an ambitious tree planting campaign that will address extreme heat and stormwater management by planting 75,000 trees over five years.

These efforts, along with public education campaigns and an expansion of at-home air conditioning, have so far prevented another loss of life like that seen in 1995, but the City's infrastructure has continued to experience heat-related impacts. On June 21, 2022, extreme heat caused significant roadway buckling on DuSable Lake Shore Drive, one of the City's most significant thoroughfares.[807] This type of roadway buckling has become increasingly common in Chicago and also poses a threat to railways and bridges.

Heat-related impacts to Chicago's infrastructure

Roadway buckling on DuSable Lakeshore Drive during a heat wave on June 21, 2022
Source: NBC Chicago

Chicago Fire Department cooling a stuck bridge during a heat wave on July 18, 2013.
Source: Chicago Tribune

Chicago's infrastructure has also felt the impact of warming winters. Historically, Chicago has experienced long stretches of freezing temperatures, during which time the City's infrastructure remains relatively stable. But as temperatures have risen, the City has begun to see more freeze/thaw events. These events happen when the temperature fluctuates around the freezing point, causing water and ice to freeze, melt, and refreeze. When this occurs, rainwater and snow melt seeps into pavement cracks, where it eventually expands as it turns to ice, causing the crack to widen into a pothole. The process then repeats each time the temperature crosses the freezing point. This challenge has been further exacerbated by an increase in precipitation during the winter months, which is expected to continue and increase during the coming decades.

[807] *Near-Record Heat Causes Pavement to Buckle on Chicago's DuSable Lake Shore Drive*, NBC News: Chi. (June 21, 2022), https://www.nbcchicago.com/news/local/near-record-heat-causes-pavement-to-buckle-on-chicagos-dusable-lake-shore-drive/2862746/.

Because warmer air can hold more moisture than cooler air,[808] this increase in temperature has led to a corresponding increase in precipitation. Statewide, total annual precipitation has increased 12% to 15% during the last 120 years, resulting in approximately five additional inches of rainfall each year. Chicago and the State of Illinois have also seen a significant increase in the intensity of storms, including the increase in extreme rainfall events.[809] The number of 2-inch rain days has increased 40% since the start of the 20th century.[810] Impacts from flooding have also increased in recent years. During the summer of 2023, Chicago and surrounding communities experienced two 500-year (0.2% chance) flood events.[811] Both of these floods received federal disaster declarations. The July 2 storm is estimated to have caused at least $500 million in damage, and more than 8,000 Chicagoans reported their basements flooded.[812]

The City has experienced a number of other major flooding events in recent years, including major flash flood events on May 17, 2020, and September 11–12, 2022.[813]

Flooding in Chicago

[808] Alan Buis, *Steamy Relationships: How Atmospheric Water Vapor Supercharges Earth's Greenhouse Effect*, NASA (Feb. 8, 2022), https://perma.cc/QV7K-PNP3.

[809] W. Scott Lincoln & Trent Ford, Nat'l Weather Serv. Chi., Ill., An Analysis of Extreme Rainfall Events in Chicago and Vicinity Since 1950 3 (June 2024), https://www.weather.gov/media/crh/publications/TSP/TSP-21.pdf; Momcilo Markus & Shu Wu, Ill. State Water Survey, Projected Precipitation Frequency for Illinois 2 (Jan. 2025), https://www.ideals.illinois.edu/items/132431.

[810] *Climate Change in Illinois*, Ill. State Climatologist, *supra* note 804.

[811] W. Scott Lincoln, Nat'l Weather Serv. Chi., Ill., The July 2 and September 17, 2023, Flash Flood Events in the Chicago Metro Area (2023), https://www.weather.gov/media/lot/events/2023/07_02/2023_07_02_and_2023_09_17_Chicago_FlashFloods.pdf.

[812] *Id.*; Heather Cherone, *Biden Approves Disaster Relief for Cook County Residents Whose Homes Flooded During Severe July Storms*, WTTW: Chi. (Aug. 15, 2023), https://news.wttw.com/2023/08/15/biden-approves-disaster-relief-cook-county-residents-whose-homes-flooded-during-severe.

[813] *September 11–12, 2022: Heavy Rain Results in Flash Flooding on the North Side of Chicago*, Nat'l Weather Serv., https://www.weather.gov/lot/2022sep11 (last visited Aug. 3, 2025).

Basement flooding on September 11, 2022
Source: Block Club Chicago

Roadway flooding on July 2, 2023
Source: CNN Weather

Chicago is further affected by recent changes in the variability of Lake Michigan water levels.[814] From 2013 to 2015, Lake Michigan swung from its lowest level on record to its highest level in more than a decade.[815] Low lake levels have significant impacts on commercial shipping and recreational boating; for every inch the lake loses, a freighter must forgo 270 tons of cargo.[816] High levels also present significant challenges for beach loss, erosion, and property damage. The increasing variability of lake levels makes it difficult to plan for the future.

Finally, in recent years, wildfire smoke has emerged as a new and significant threat to Chicago's residents and economy. Studies have shown that climate change has increased the frequency and severity of wildfires,[817] and the smoke from these fires has emerged as a significant threat to the health and economy of urban areas.[818] In June 2023, smoke from wildfires burning in Canada blanketed the Midwest, pushing Chicago's air quality index as high

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[814] *Lake Levels*, Great Lakes Integrated Scis. & Assessments, https://glisa.umich.edu/resources-tools/climate-impacts/lake-levels/#:~:text=The%20past%20decade%20has%20seen,6 (last visited Aug. 2, 2025).

[815] Ill. Emergency Mgmt. Agency, 2023 State of Illinois Hazard Mitigation Plan 166 (Oct. 2023), https://iemaohs.illinois.gov/content/dam/soi/en/web/iemaohs/recovery/documents/plan-illmitigationplan.pdf.

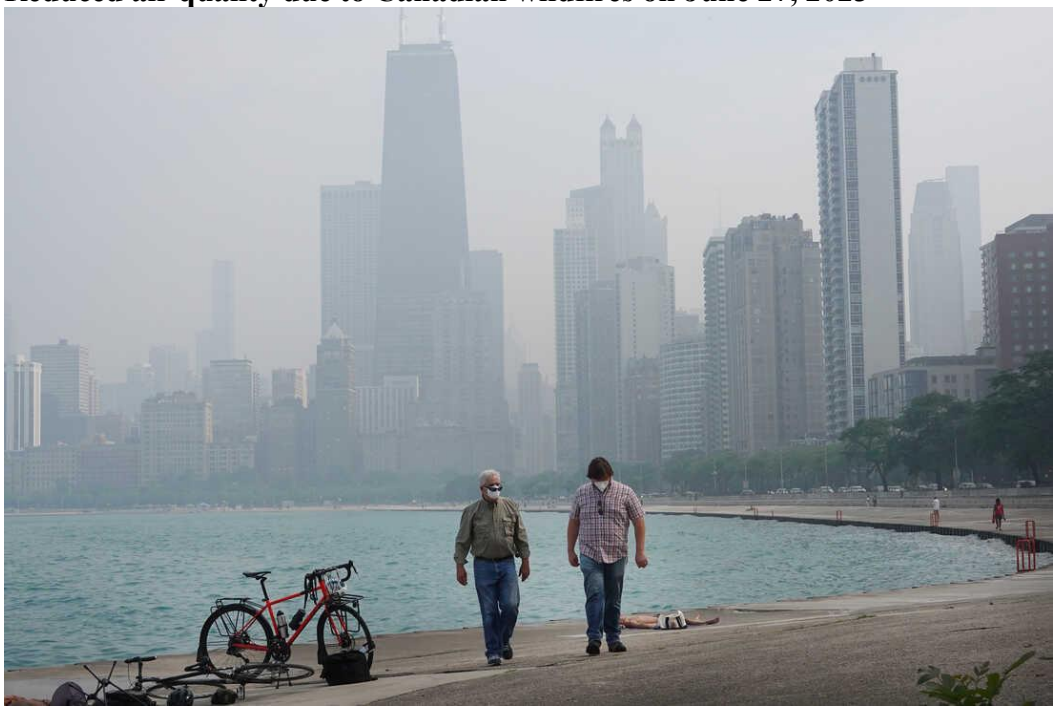
[816] Briscoe, *supra* note 346; *see also* The Nature Conservancy, An Assessment of the Impacts of Climate Change in Illinois (2021), https://www.nature.org/content/dam/tnc/nature/en/documents/IL_Climate_Assessment_2020_Executive_Summary.pdf.

[817] Beverly E. Law et al., *Anthropogenic Climate Change Contributes to Wildfire Particulate Matter and Related Mortality in the United States*, 6 Comms. Earth & Env't 336 (2025), https://www.nature.com/articles/s43247-025-02314-0.

[818] Mark Borgschulte et al., *The Broadening Impact of Rising Wildfire Smoke in the United States*, Chi. Fed. Letter No. 500 (Sept. 2024), https://www.chicagofed.org/publications/chicago-fed-letter/2024/500.

as 228, which indicates "very unhealthy" air.[819] In June 2025, Canadian wildfire smoke caused Chicago's air quality to be among the worst in the world.[820] These conditions significantly affect public health and cause meaningful economic impacts through the forced cancelation of public events, day camps and recreational activities, tourist trips, and shifts for outdoor workers.

Reduced air quality due to Canadian wildfires on June 27, 2023



Source: NPR

New York City

Climate change poses existential risks to New Yorkers' health and safety. Sea level rise in New York City ("City") is putting communities and infrastructure at risk of regular flooding. New York City has seen an averaged 1.2 inches of sea level rise per decade (for a total of 1.1 feet) since 1900, and the City expects that rate to accelerate in the future. The City is exceptionally vulnerable to sea level rise, because of its 520-mile coastline and significant low-lying coastal lands that are home to more than 218,000 residents. By the 2050s, approximately 43 miles of New York City's coastline (including many residential neighborhoods) could be at

[819] Caitlin O'Kane, *Chicago Has the Worst Air Quality in the World due to Canadian Wildfire Smoke*, CBS News: Chi. (June 27, 2023), https://www.cbsnews.com/news/chicago-worst-air-quality-canadian-wildfire-smoke-june-27-2023/.

[820] Mohammad Samra et al., *Chicago's Air Quality Ranked Among Worst in the World due to Canadian Wildfire Smoke*, Chi. Sun Times (June 5, 2025), https://chicago.suntimes.com/weather/2025/06/05/air-quality-alert-issued-throughout-chicago-area-due-to-canadian-wildfire-smoke.

risk of daily or weekly tidal inundation, even during non-storm conditions.[821] Climate change also threatens the quality and quantity of ground and surface water in New York. For example, groundwater wells in coastal areas will be subject to saltwater intrusion from sea level rise.[822] Sea level rise also pushes the saltwater boundary on estuary rivers farther upstream during drought periods, potentially affecting freshwater use and withdrawals.[823]

Extreme weather events can result in injury and loss of life due to exposure, interrupted utility service, or lack of access to emergency services. In 2012, Superstorm Sandy brought 48 hours of wind, rain, and flooding to New York City. It destroyed approximately 300 homes, left hundreds of thousands without power, and damaged critical public and private infrastructure. The storm resulted in the deaths of 44 New Yorkers and inflicted an estimated $19 billion in damages and lost economic activity across the City. Over 69,000 residential housing units were damaged, and thousands of people were temporarily displaced.[824] To make matters worse, climatic events such as Superstorm Sandy are increasingly common. Less than a decade later, in September 2021, the remnants of Hurricane Ida reached New York City, bringing so much rain that the storm set a new City record of 3.15 inches of rain in a single hour, shut down the City's subway system, and resulted in the deaths of 13 New Yorkers.[825]

In addition to the threats from sea level rise, extreme storms, and flooding, warming temperatures exacerbate or introduce a wide range of health problems, including increased deaths due to extreme heat[826] and poor air quality. The NYC Health Department produces an annual heat-related mortality report, which finds that each summer, on average, more than 500 New Yorkers die prematurely because of hot weather in New York City, and that heat-exacerbated deaths have increased in the past decade, mainly due to hotter summers overall with more "non-extreme hot days" of 82°F up to but below the extreme heat threshold (95°F).[827]

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[821] N.Y.C., A Stronger More Resilient City, Ch. 3: Coastal Protection 46 (June 2013), http://www.nyc.gov/html/sirr/downloads/pdf/final_report/Ch3_Coastal_FINAL_singles.pdf.

[822] Kelsey Leonard et al., New York State Climate Impacts Assessment, Ch. 10: Water Resources 582, Annals of the N.Y. Acad. of Scis. (2024), https://nyaspubs.onlinelibrary.wiley.com/doi/epdf/10.1111/nyas.15197.

[823] *Id.*

[824] OneNYC 2050, Building a Strong and Fair City: A Livable Climate (Volume 7) at 6 (2024), http://onenyc.cityofnewyork.us/reports-resources/ [hereinafter OneNYC 2050 Building a Strong and Fair City Report Volume 7].

[825] N.Y.C., The New Normal, Combatting Storm-Related Extreme Weather in New York City (Oct. 2021), https://www1.nyc.gov/assets/orr/pdf/publications/WeatherReport.pdf.

[826] OneNYC 2050 Building a Strong and Fair City Report Volume 7, *supra* note 824, at 6.

[827] NYC Department of Health and Mental Hygiene, 2025 NYC Heat-Related Mortality Report. https://a816-dohbesp.nyc.gov/IndicatorPublic/data-features/heat-report/.

In the coming decades, climate change is projected to further increase fire activity across North America.[828] Even when not near New York City, these massive wildfires have impacts in the City. The rising heat from the wildfires takes particulate matter and toxic gases in the smoke into the jet stream, which can carry those hazardous substances thousands of miles and cause harmful air pollution across the country. Indeed, during the 2020 wildfire season and again in July of 2021, smoke from wildfires burning on the West Coast caused New York City to experience some of the worst air quality in the world.[829] New York City was once again blanketed in smoke from Canadian wildfires in June 2023, resulting in the highest measurements of $PM_{2.5}$ since recording began in 1999.[830] The health consequences of climate change disproportionately affect New York City's most vulnerable populations—the elderly, children, unhoused, and low-income communities who already experience elevated instances of cardiovascular and respiratory diseases.[831]

[828] IPCC, Chapter 14: North America in Climate Change 2022 – Impacts, Adaptation and Vulnerability: Working Group II Contribution to the Sixth Assessment Report 1948 (2023), https://www.cambridge.org/core/books/climate-change-2022-impacts-adaptation-and-vulnerability/north-america/B182CC819A36A0F9FD27A5DA184F47A2.

[829] *See, e.g.*, Oliver Milman, *New York Air Quality Among Worst in World as Haze from Western Wildfires Shrouds City*, Guardian (July 21, 2021), https://www.theguardian.com/us-news/2021/jul/21/new-york-air-quality-plunges-smoke-west-coast-wildfires.

[830] Aatish Bhatia, Josh Katz & Margot Sanger-Katz, *Just How Bad Was the Pollution in New York?*, N.Y. Times (June 9, 2023) https://www.nytimes.com/interactive/2023/06/08/upshot/new-york-city-smoke.html.

[831] *See* N.Y.C. Dep't of Health & Mental Hygiene, Air Pollution and the Health of New Yorkers: The Impact of Fine Particles and Ozone 4 (2010), https://www1.nyc.gov/assets/doh/downloads/pdf/eode/eode-air-quality-impact.pdf.