STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
PO Box 47600, Olympia, WA 98504-7600 • 360-407-6000

September 2, 2025

The Honorable Chris Wright, Secretary
U.S. Department of Energy
1000 Independence Ave., SW
Washington, DC 20585

RE: A Critical Review of Impacts of Greenhouse Gas Emissions on the U.S. Climate
Docket Number: DOE-HQ-2025-0207

Dear Secretary Wright:

As the Director of the Washington State Department of Ecology, our state's lead agency addressing climate change, I write to express disappointment with U.S. Department of Energy's draft report titled "A Critical Review of Impacts of Greenhouse Gas Emissions on the U.S. Climate" authored by the Climate Working Group (CWG), published in the Federal Register on August 1, 2025 (2025-14519 90 FR 36150; Docket No. DOE-HQ-2025-0207).

This so-called "science review" report lacks scientific integrity, ignores current climate impacts on Washington communities and fails to protect Americans from what we know is coming. It is a means crafted to justify a predetermined end. I urge you to withdraw this report as it will only serve to justify increasing greenhouse gas pollution, accelerating climate change impacts, furthering economic hardship, and intensifying extreme weather events on Washingtonians.

1. Energy's draft report is unduly biased and lacks scientific integrity.

It is extremely concerning that this report was produced without regard to presenting unbiased information firmly rooted in the full body of available scientific literature. First, the draft report was produced without following procedures required of federal agency reports to prevent bias and undue influence, established in the Information Quality Act of 2000 and the Federal Advisory Committee Act of 1972. Second, the selection of a small handful of authors, all of whom are critical of US policy that addresses climate change and have advocated for the continued use of fossil fuels suggests that the authors were chosen mainly for their policy stances, not their scientific credentials. This is the opposite of the "diverse team of independent experts" that Energy misleadingly touts as authoring the report.

Finally, a strong policy bias and lack of scientific integrity is apparent from the draft report's substance as well. The report ignores decades of science and the remarkable consensus from the scientific community on the key drivers and attributes of climate change. Energy's report blatantly ignores well-established and extensively peer-reviewed science, such as that produced through the Intergovernmental Panel for Climate Change (Assessment Report 6) and the US Global Change Research Program's Fifth National Climate Assessment (2023). The report's failure to address the bulk of the extensive body of climate science renders its characterizations and conclusions highly suspect and unreliable.

2. Energy's draft report is inconsistent with scientific evidence in Washington State, including observed impacts and forecasted conditions due to climate change.

The report grossly understates both the impacts of climate change we already observe in Washington State and the role of greenhouse gas emissions in causing these impacts. The draft report's critiques of climate science conflict with our experience and the science on conditions in Washington State and what we expect based on forecasted conditions. Below are some examples of harms endured by the people we serve due to greenhouse gas emissions and subsequent climate change.

<u>Extreme Heat:</u>
Since 1900, temperatures in Washington have risen almost 2°F, and all but 5 years have been above the long-term (1895–2020) average. In 2021, Washington experienced a heat dome that set 128 all-time high temperature records across the state and caused the deadliest weather-related disaster in state history, killing over 126 people.[1] Multiple robust, peer-reviewed research papers indicate that climate change clearly contributed to the severity of this heatwave.[2] The report fails to acknowledge or grapple with much of this peer-reviewed science, and then ignores the clearly acknowledged role of climate change in contributing multiple degrees of warming to the severity of the heat-wave in the studies it does rely upon. Then the report authors inexplicably conclude that this event was caused by rare meteorological conditions alone and not made more probable by global warming.

<u>Drought and Water Availability:</u>
Ecology has declared drought an unprecedented 6 of the last 10 years. Drought is declared when hydrologic conditions are less than 75% of the 30-year normal and lack of water will cause hardships. Snowmelt is an important source of water for many parts of Washington. Yet, in the Cascade Mountains, spring snowpack has already declined by about 25% since the middle of the 20th century due to climate change.[3] This has led to reduced water for agriculture, industry, hydropower production, and communities. It also limits streamflow for salmon and other wildlife that depend on cool, clean water during dry summer months. Washington's agricultural losses during the 2015 drought were estimated to cost between $633 and 733 million dollars.[4] The report ignores these trends in drought in Washington State, the link to greenhouse gas emissions, and resulting harmful impacts.

Ocean Acidification:
As a coastal state, Washington's economy depends on a productive and healthy marine ecosystem. Increasing carbon dioxide emissions and uptake by the ocean have led to an increase in acidity in the Puget Sound and the Pacific Ocean.[5] In the late 2000s, commercial shellfish growers experienced massive mortality of baby oysters due to ocean acidification, causing an estimated $110 million loss for the industry.[6] Our shellfish industry is the largest in the nation, and this loss prompted the state to study the science of this issue and develop a comprehensive response to ocean acidification that continues to this day.[7] Our immediate response included supporting water quality monitoring, so shellfish hatcheries could buffer the water used in their tanks to reduce the acidity. More recently scientists discovered ocean acidification damaged the shells and sensory organs of young Dungeness crabs in the wild along the West Coast.[8]

Carbon dioxide emissions from burning fossil fuels is the largest single source of acidifying pollution in the Pacific Northwest.[9] Reducing these emissions is one of the most important interventions to address ocean acidification trends in Washington and across the globe. The vast body of scientific evidence shows that the current rate of ocean acidification is happening at a pace that has not been previously observed or recorded.[10] In fact, it is changing so rapidly that our marine species may not be able to keep up or cope with these changes. None of this scientific evidence is discussed or evaluated in Energy's draft report.

Wildfires and Smoke:
Data clearly indicate that larger and more severe wildfires in Washington have increased in recent decades, driven by climate change impacts like extreme heat, drought, and pest expansion that have increased fuel loads and, in turn, wildfire risk.[11] These fires, as well as those outside our borders, have led to increasingly poor air quality for all parts of Washington.[12] Again, the report fails to address these troubling trends and the role of climate change in severe wildfire.

3. Energy's draft report fails to account for best available science on future climate change trends and greenhouse gas emissions.

Finally, the report fails to appropriately consider future impacts of climate change, driven by continued greenhouse gas emissions. Modeling conducted by the Climate Impacts Group at the University of Washington shows that climate change impacts from greenhouse gas emissions like those presented above, and others, will become more frequent and more severe into the future. Reducing greenhouse gas emissions to lessen and prevent future impacts of climate change is imperative for communities, infrastructure, and natural and working lands across Washington.

A more detailed accounting of the current literature and best available science as it relates to current and future climate change impacts in Washington can be found in the attached appendix. Energy's report fails to consider this information and has not provided thorough review of similar science covering the entire country. Such a comprehensive scientific review would be required to provide an adequate factual basis for a scientifically valid critical review of greenhouse gas emissions on the U.S. climate. Energy's report fails in this regard.

Again, I urge you to withdraw this deeply flawed report. Denying the harms caused by climate change doesn't make them less real. Disregarding settled science will not help farmers water their crops during drought. It will not stop wildfire smoke from filling the lungs of children heading back to school. It will only intensify the problem, leave people without a plan for a better future, and diminish our nation's global standing. Please do not finalize this report in its current form.

If you have any questions, please reach out to Joel Creswell, Climate Pollution Reduction Program Manager, at 360-972-5035 or joel.creswell@ecy.wa.gov.

Sincerely,

Casey D. Sixkiller
Director

---

[1] https://cig.uw.edu/wp-content/uploads/sites/2/2023/06/CIG-Report-Heat-202-pages.pdf

[2] White, R. H., Anderson, S., Booth, J. F., Braich, G., Draeger, C., Fei, C., Harley, C. D. G., Henderson, S. B., Jakob, M., Lau, C.-A., Mareshet Admasu, L., Narinesingh, V., Rodell, C., Roocroft, E., Weinberger, K. R., & West, G. (2023). The unprecedented Pacific Northwest heatwave of June 2021. *Nature Communications*, *14*(1), 727. https://doi.org/10.1038/s41467-023-36289-3

[3] University of Washington Climate Impacts Group Washington Climate Projections: Summary by Region https://apps.ecology.wa.gov/publications/parts/2401006part1.pdf

[4] Raymond, C.L, T.P. Nadreau, M. Rogers, Z. Kearl. 2022. *Biophysical Climate Risks and Economic Impacts for Washington State*. Report prepared for the Washington State legislature. Climate Impacts Group, University of Washington, Seattle.

[5] Feely, R.A., C.L. Sabine, K. Lee, W. Berelson, J. Kleypas, V.J. Fabry, and F.J. Millero. 2004. Impact of anthropogenic CO2 on the CaCO3 system in the oceans. Science 305(5682):362–366, https://doi.org/10.1126/science.1097329.

Franco, A.C., D. Ianson, T. Ross, R.C. Hamme, A.H. Monahan, J.R. Christian, M. Davelaar, W.K. Johnson, L.A. Miller, M. Robert, and P.D. Tortell. 2021. Anthropogenic and climatic contributions to observed carbon system trends in the Northeast Pacific. Global Biogeochemical Cycles 35(7), https://doi.org/10.1029/2020GB006829.

[6] Ekstrom, Julia & Suatoni, Lisa & Cooley, Sarah & Waldbusser, George & Cinner, Joshua & Ritter, Jessica & van Hooidonk, Ruben & Langdon, Chris & Beck, Michael & Brander, Luke & Rittschof, Daniel & Edwards, Peter & Wellman, Katharine. (2015). Vulnerability and adaptation of US shellfisheries to ocean acidification. Nature Climate Change. 5. 207-214. 10.1038/nclimate2508.

[7] Washington State Department of Agriculture: https://agr.wa.gov/departments/agricultural-products/aquaculture;
Washington Ocean Acidification Center | University of Washington;
Washington Marine Resources Advisory Council (2017): 2017 Addendum to Ocean Acidification: From Knowledge to Action, Washington State's Strategic Response. EnviroIssues (eds.) Seattle, WA. 2017_Addendum_BRP_Report_fullreport.pdf

[8] Nina Bednaršek, Richard A. Feely, Marcus W. Beck, Simone R. Alin, Samantha A. Siedlecki, Piero Calosi, Emily L. Norton, Casey Saenger, Jasna Štrus, Dana Greeley, Nikolay P. Nezlin, Miranda Roethler, John I. Spicer, Exoskeleton dissolution with mechanoreceptor damage in larval Dungeness crab related to severity of present-day ocean acidification vertical gradients, Science of The Total Environment, Volume 716, 2020, 136610, ISSN 0048-9697, https://doi.org/10.1016/j.scitotenv.2020.136610

[9] Harris, K. E., M. D. DeGrandpre, and B. Hales. 2013 (and references therein). Aragonite saturation state dynamics in a coastal upwelling zone. Geophysical Research Letters, 40: 1-6

[10] Gruber, N., C. Hauri, Z. Lachkar, D. Loher, T. L. Frölicher, and G.-K. Plattner. 2012. Rapid progression of ocean acidification in the California Current System. Science, 337(6091): 220–223.
Hauri, C., N. Gruber, M. Vogt, S. C. Doney, R. A. Feely, Z. Lachkar, A. Leinweber, A. M. P. McDonnell, M. Munnich, and G.-K. Plattner. 2013. Spatiotemporal variability and long-term trends of ocean acidification in the California Current System. Biogeosciences, 10: 193-216

[11] Halofsky, J. E., Peterson, D. L., & Harvey, B. J. (2020). Changing wildfire, changing forests: The effects of climate change on fire regimes and vegetation in the Pacific Northwest, USA. *Fire Ecology*, *16*(1), 4. https://doi.org/10.1186/s42408-019-0062-8
Wing, M.G. and Long, J., (2015). A 25-year history of spatial and temporal trends in wildfire activity in Oregon and Washington, USA. *Modern Applied Science*, *9*(3), p.117.

[12] Washington State Climate Resilience Strategy.
https://apps.ecology.wa.gov/publications/SummaryPages/2401006.html

Technical Appendix: Washington State Climate Change Impacts

This technical appendix expands on some of the scientific resources and evidence for the impacts of greenhouse gas emissions on climate change in Washington State. Washington State Department of Ecology submits this to illustrate the vast range of science not considered or assessed in the recent Department of Energy (Energy) report "A Critical Review of Impacts of Greenhouse Gas Emissions on the U.S. Climate" by the Climate Working Group (CWG).

Warming Temperatures

The Fifth National Climate Assessment shows that impacts of climate change in the Pacific Northwest are already clear: a 1.1°C (2.0°F) increase in average temperature since 1900, more extremely hot days and warm nights, and fewer extremely cold nights.[1] Looking to the future, the University of Washington's Climate Impacts Group (CIG) predicts that increased warming will result in more frequent and more severe climate change impacts in Washington. CIG models project more days above 37.8°C (100°F), higher summer maximum temperatures, more heavy precipitation with individual storms, higher magnitude flood events, lower snowpack, and lower river flows in late summer.[2] These conditions have widespread economic and ecosystem impacts that Washingtonians must manage.

Extreme Weather

Temperature and Flood Events

CWG argues that the number of hot days is low relative to the 1920s and 1930s. However, records in Washington show that the temperature has risen almost 2°F since 1900, and all but 5 years have been above the long-term (1895–2020) average.[3] CWG further argues that US climate has become less extreme over time, but records and projections in Washington show 6-9 times more extreme heat days by 2050s compared to the historical 50-year average, indicating a clear shift towards more frequent heat extremes.[4]

---

[1] Fifth National Climate Assessment. https://nca2023.globalchange.gov/

[2] 2025 Summary Report on the Science of Human Caused Climate Change and Recommendations for Washington State's Greenhouse Gas Emission Reduction Limits. https://apps.ecology.wa.gov/publications/SummaryPages/2514064.html

[3] NOAA National Centers for Environmental Information | State Climate Summaries 2022 150-WA. https://statesummaries.ncics.org/downloads/Washington-StateClimateSummary2022.pdf

[4] 2025 Summary Report on the Science of Human Caused Climate Change and Recommendations for Washington State's Greenhouse Gas Emission Reduction Limits. Appendix C. https://apps.ecology.wa.gov/publications/SummaryPages/2514064.html

Temperatures will become hotter and extreme heat events will become more frequent in Washington state in the coming years. Climate model projections indicate summer temperatures in the Pacific Northwest in the 2050s warming by about 4 to 6°F relative to the last half of the 20th century. Between 1971 and 2021, Washington experienced an average of three extreme heat days per year. By the 2050s, there will be between 17 and 27 extreme heat days on average for western Washington and between 20 and 30 for eastern Washington.[5] Larger increases are projected for eastern Washington compared to western Washington with a large proportion of dryland agriculture,[6] where wheat, legumes, and canola are rotated without irrigation.

Higher global average temperatures will bring more rain and less snow, with more precipitation with individual storms, increasing the frequency and severity of flood events.[7] Extreme precipitation events are projected to become more intense, with a 20% increase in the intensity of the biggest daily events each winter, by the 2080s.[8] Associated risks include river flooding, costly stormwater management, and negative effects on salmon habitat.[9] The 2-year flood is projected to increase in magnitude for all of Washington, and larger peak flow events are expected to contribute to flooding and associated damage for communities, ecosystems, and infrastructure. Flooding is expected to be more frequent in areas that already flood and reach new areas that have rarely flooded historically.[10]

Water Scarcity (Drought, Snowpack, and Streamflow)

Higher global average temperatures will cause lower snowpack and lower normal summer stream-flows. Statewide, snowpack (April 1st snow water equivalent) would decrease by 21% with 1.5°C increase in global temperature, 33% with 2.0°C increase, and 50% with 3.0°C increase in global temperature.[11] In the Cascades, spring snowpack has declined by about 25% since the

---

[5] Vogel, J., J. Hess, Z. Kearl, K. Naismith, K. Bumbaco, B.G. Henning, R. Cunningham, N. Bond. 2023. In the Hot Seat: Saving Lives from Extreme Heat in Washington State. Report prepared by the University of Washington's Climate Impacts Group, UW's Center for Health and the Global Environment, the Washington State Department of Health, the Office of the Washington State Climatologist, and Gonzaga University's Center for Climate, Society & the Environment.

[6] Washington State Climate Resilience Strategy https://apps.ecology.wa.gov/publications/documents/2401006.pdf

[7] Climate Impacts Group (2025), Projected Changes in Peak Flows for the Snohomish River Basin, https://cig.uw.edu/publications/projected-changes-in-peak-flows-for-the-snohomish-river-basin/

[8] Washington Climate Projections: Summary by Region https://apps.ecology.wa.gov/publications/parts/2401006part1.pdf

[9] 2025 Summary Report on the Science of Human Caused Climate Change and Recommendations for Washington State's Greenhouse Gas Emission Reduction Limits. https://apps.ecology.wa.gov/publications/SummaryPages/2514064.html

[10] Washington Climate Projections: Summary by Region https://apps.ecology.wa.gov/publications/parts/2401006part1.pdf

[11] 2025 Summary Report on the Science of Human Caused Climate Change and Recommendations for Washington State's Greenhouse Gas Emission Reduction Limits. Appendix C. https://apps.ecology.wa.gov/publications/SummaryPages/2514064.html

middle of the 20th century and 2006, with the largest decreases at low elevations.[12] By the 2080s, Washington's spring snowpack is projected to decrease by about 40-60%.[13] Associated risks include reduced water storage in reservoirs and soil, disruption to ecological communities, irrigation shortage for agricultural systems, and winter and summer recreation loss.[14]

Snowmelt is an important source of water in spring and early summer, whereas late summer streamflow is more influenced by summer precipitation. By the end of the century, late summer streamflow is projected to decline by 7-14%, on average.[15] Lower river flow will likely result in warmer water temperatures, which could harm salmon and other cold-water fish.[16] Further, associated risks with reduced late summer streamflow include reduced hydropower production in the summer and water resource conflicts.[17]

Additional research is required to better understand the climate impacts to groundwater, but changes in precipitation intensity and timing of snowpack melt could affect groundwater availability. Communities, ecosystems, and agricultural systems with a high reliance on groundwater, particularly in the summer and in dry areas, are at risk with changes in groundwater availability.[18]

Associated Impacts

Agriculture

Washington's agricultural industry includes farms and ranches that have been in operation for multiple generations. Many aspects of agricultural production are disrupted or threatened by climate change. CWG argues that atmospheric carbon dioxide enrichment will be a net benefit for US agriculture, which is a narrow portrayal of the requirements for agricultural productivity, and ignores other critical requirements.

Agriculture is dependent on multiple factors. As global temperatures rise, hot and cold extremes, as well as drought and flooding will occur with greater frequency during growing seasons, which are large determining factors in crop success. Chill accumulation is critical for fruit trees to set

[12] Washington Climate Projections: Summary by Region
https://apps.ecology.wa.gov/publications/parts/2401006part1.pdf
[13] Washington Climate Projections: Summary by Region
https://apps.ecology.wa.gov/publications/parts/2401006part1.pdf
[14] 2025 Summary Report on the Science of Human Caused Climate Change and Recommendations for Washington State's Greenhouse Gas Emission Reduction Limits.
https://apps.ecology.wa.gov/publications/SummaryPages/2514064.html
[15] Washington State Climate Resilience Strategy
https://apps.ecology.wa.gov/publications/documents/2401006.pdf
[16] Washington State Climate Resilience Strategy
https://apps.ecology.wa.gov/publications/documents/2401006.pdf
[17] 2025 Summary Report on the Science of Human Caused Climate Change and Recommendations for Washington State's Greenhouse Gas Emission Reduction Limits.
https://apps.ecology.wa.gov/publications/SummaryPages/2514064.html
[18] Washington State Climate Resilience Strategy
https://apps.ecology.wa.gov/publications/documents/2401006.pdf

fruit while high heat events can sunburn apples. Warm autumns have been linked to honeybee colony failure, wildfire smoke threatens winegrape industry growth. Another critical challenge is increasing drought, which restricts irrigation capacity, terminating dryland agricultural crops before they produce their full yield. Drought also reduces forage availability for livestock operations and other species. Increasing federal crop insurance indemnity payments from 2006 to 2020 are linked to declining snowpack and climate change-related shifts – underscoring the negative effects of climate change on agriculture.[19]

Salmon

In July 2015, a record-breaking heatwave combined with low snowpack the previous winter killed almost all naturally migrating adult salmon in the Snake River due to high water temperatures.[20] Marine heatwaves and algal blooms have led to $641.1 million (in 2022 dollars) reduction in commercial fishing revenue on the West Coast.[21] Increases in wildfire size and intensity are expected to lead to local extinctions of resident fish species,[22] warmer stream temperatures,[23] and increased sediment transport, turbidity, and fine sediments in streambeds.[2428]

Wildfire

CWG argues that wildfires are not more common or extensive in the US than they were in the 1980s.[25] The report further argues that US wildfire activity is strongly affected by forest management practices. These arguments lack a basis in science and in the experience in Washington. In Washington, recent increases in wildfire size and severity are strongly driven by climate.[26] Records clearly indicate that larger and more severe wildfires in Washington have increased in recent decades.[27] Concurrent heat and drought are increasing fuel loads and wildfire

---

[19] Diffenbaugh NS, FV Davenport, and M Burke (2021) Historical warming has increased US crop insurance losses. Environmental Research Letters, 16(8), 084025. https://doi.org/10.1088/1748-9326/ac1223.
Reyes JJ and E Elias (2019) Spatio-temporal variation of crop loss in the United States from 2001 to 2016. Environmental Research Letters, 14(7), 074017. https://doi.org/10.1088/1748-9326/abtac9

[20] Fifth National Climate Assessment. https://nca2023.globalchange.gov/

[21] Bellquist, I, V. Saccomanno, BX Semmens, M Gleason, and J Wilson, 2021: The rise in climate change-induced federal fishery disasters in the United States. PeerJ, 9, e11186. https://doi.org;10.7717/peerj.11186

[22] Dunham, J. B., Young, M. K., Gresswell, R. E., & Rieman, B. E. (2003). Effects of fire on fish populations: landscape perspectives on persistence of native fishes and nonnative fish invasions. *Forest Ecology and Management*, *178*(1-2), 183-196.

[23] Isaak, D. J., Luce, C. H., Rieman, B. E., Nagel, D. E., Peterson, E. E., Horan, D. L., ... & Chandler, G. L. (2010). Effects of climate change and wildfire on stream temperatures and salmonid thermal habitat in a mountain river network. *Ecological Applications*, *20*(5), 1350-1371.

[24] University of Washington Climate Impacts Group (CIG) Washington Climate Projections: Summary by Region https://apps.ecology.wa.gov/publications/parts/2401006part1.pdf

[25] CWG section 6.8

[26] Halofsky, J. E., Peterson, D. L., & Harvey, B. J. (2020). Changing wildfire, changing forests: The effects of climate change on fire regimes and vegetation in the Pacific Northwest, USA. *Fire Ecology*, *16*(1), 4. https://doi.org/10.1186/s42408-019-0062-8

[27] Wing, M.G. and Long, J., (2015). A 25-year history of spatial and temporal trends in wildfire activity in Oregon and Washington, USA. *Modern Applied Science*, *9*(3), p.117.

risk. Beetle outbreaks driven by climate change induced water stress have resulted in 60% stand-level mortality over large extents of forest land.[28]

Climate change is contributing to the conditions needed for extreme wildfires,[29] and the frequency and severity of wildfires are projected to increase.[30] Summer precipitation in Washington is projected to decrease. Drier conditions during the summer could increase reliance on diminishing snowmelt for irrigation. Additionally, the combination of drier summers, higher temperatures, and earlier melting of the snowpack tends to increase the frequency and extent of wildfires. These wildfire-favorable conditions are projected to increase in the central Cascade Mountains, southwestern Washington, and northeast Washington.[31]

Summer precipitation is projected to decline under all future projections contributing to longer and more severe drought that increases the risk of tree mortality and wildfire. Washington data show climate change is resulting in earlier snowpack melt, reduced summer precipitation, and higher temperatures, which all contribute to the increase in the frequency and extent of wildfires.[32]

Energy

In a typical year, Washington State produces 25-33% of conventional hydroelectric generation in the United States.[33] The Grand Coulee Dam, located on the Columbia River, is one of the largest hydroelectric power plants in the world.[34] Reduced snowpack and late summer streamflow have a direct impact on the amount of electricity generated by conventional hydropower plants within Washington State, and we are already seeing the effects of drought in the Yakima region. In 2024 with ongoing drought conditions, the Grand Coulee Dam generated nearly half of the electricity as the record output in 2012, and total in-state electricity generated from hydropower was down about one-third compared to its peak electricity generation in 2011.[35]

Health Impacts

Climate Change amplifies existing public health challenges, particularly health inequities faced by certain populations.[36] In 2021, an extreme heat event caused by a “heat dome” descended

---

[28] Fifth National Climate Assessment. https://nca2023.globalchange.gov/
[29] 2023 Washington State Enhanced Hazard Mitigation Plan. https://mil.wa.gov/asset/651ec296d76a9/2023_WA_SEHMP_final_20231004.pdf
[30] NOAA National Centers for Environmental Information | State Climate Summaries 2022 150-WA. https://statesummaries.ncics.org/downloads/Washington-StateClimateSummary2022.pdf
[31] NOAA National Centers for Environmental Information | State Climate Summaries 2022 150-WA. https://statesummaries.ncics.org/downloads/Washington-StateClimateSummary2022.pdf
[32] NOAA National Centers for Environmental Information | State Climate Summaries 2022 150-WA. https://statesummaries.ncics.org/downloads/Washington-StateClimateSummary2022.pdf
[33] EIA. 2025. Washington State Energy Profile. https://www.eia.gov/state/print.php?sid=WA#23
[34] EIA. 2025. Washington State Energy Profile. https://www.eia.gov/state/print.php?sid=WA#23
[35] EIA. 2025. Washington State Energy Profile. https://www.eia.gov/state/print.php?sid=WA#23
[36] 2025 Summary Report on the Science of Human Caused Climate Change and Recommendations for Washington State’s Greenhouse Gas Emission Reduction Limits. https://apps.ecology.wa.gov/publications/SummaryPages/2514064.html

upon the Pacific Northwest, killing 126 Washingtonians due to heat-related causes. Overall, 441 more people died during that period than would have been expected based on prior years.[37] Climate-related health risks disproportionately affect certain individuals and groups, including older adults, communities of color, Tribal communities, and low-income communities.[38] As the climate warms, extreme heat events are occurring more frequently in Washington state,[39] and the region most at-risk to extreme weather is the Puget Sound-Northwestern region.[40] This unequal distribution of climate change impact is likely to exacerbate existing health inequities.

In addition to heat extremes, wildfires can also contribute to health inequities.[41] Wildfire smoke is a mixture of gases and fine particles that poses a significant health risk to Washingtonians. Wildfire smoke is diminishing air quality in the western US[42] with observable increases in mortality among some Washington residents.[43] Southwest Washington is expected to experience relatively high increases in the number of excess asthma events during the wildfire season.[44] Lower birth weight and premature birth are also attributed to heat waves and wildfire smoke events. Trends between long-term smoke exposure and cancer incidence are emerging.[45]

---

[37] Vogel, J., J. Hess, Z. Kearl, K. Naismith, K. Bumbaco, B.G. Henning, R. Cunningham, N. Bond. 2023. In the Hot Seat: Saving Lives from Extreme Heat in Washington State. Report prepared by the University of Washington's Climate Impacts Group, UW's Center for Health and the Global Environment, the Washington State Department of Health, the Office of the Washington State Climatologist, and Gonzaga University's Center for Climate, Society & the Environment.

[38] Fifth National Climate Assessment. https://nca2023.globalchange.gov/

[39] Vogel, J., J. Hess, Z. Kearl, K. Naismith, K. Bumbaco, B.G. Henning, R. Cunningham, N. Bond. 2023. In the Hot Seat: Saving Lives from Extreme Heat in Washington State. Report prepared by the University of Washington's Climate Impacts Group, UW's Center for Health and the Global Environment, the Washington State Department of Health, the Office of the Washington State Climatologist, and Gonzaga University's Center for Climate, Society & the Environment.

[40] 2023 Washington State Enhanced Hazard Mitigation Plan. https://mil.wa.gov/asset/651ec296d76a9/2023_WA_SEHMP_final_20231004.pdf

[41] 2025 Summary Report on the Science of Human Caused Climate Change and Recommendations for Washington State's Greenhouse Gas Emission Reduction Limits. https://apps.ecology.wa.gov/publications/SummaryPages/2514064.html

[42] McClure, C.D. and Jaffe, D.A., 2018. US particulate matter air quality improves except in wildfire-prone areas. *Proceedings of the National Academy of Sciences*, *115*(31), pp.7901-7906.

[43] Doubleday, A., Schulte, J., Sheppard, L., Kadlec, M., Dhammapala, R., Fox, J. and Busch Isaksen, T., 2020. Mortality associated with wildfire smoke exposure in Washington state, 2006–2017: a case-crossover study. *Environmental health*, *19*(1), p.4.

[44] McDermot D and M Kadlec (2022) Increased medial and emergency department claims for asthma following wildfire smoke exposure in Washington State, 2014-2018. Washington State Health Services Research Project Research Brief No. 104. Washington State Office of Financial Management. https://ofm.wa.gov/sites/default/files/public/dataresearch/researchbriefs/brief104.pdf

[45] Korsiak J, L Pinault, T Christidis, RT Burnett, M Abrahamowicz and S Weichenthal (2022) Long-term exposure to wildfires and cancer incidence in Canada: A population-based observational cohort study. The Lancet Planetary Health, 6(5), 3400-e409. https://doi.org/101016/s2542-5196(22)00067-5.

Marine and Coastal Changes

Increasing greenhouse gas concentrations in the atmosphere are expected to impact oceans by raising sea levels and temperature and increasing ocean acidity. The risks of global sea level rise include coastal erosion, inundation of groundwater, and increased coastal flooding. The risks of ocean acidification include decreasing shellfish population and loss of fish habitats.[46]

While natural variability in storm surge contributes to coastal flooding, sea level rise contributes to increasing reach of waves and, thus, exacerbates coastal flooding beyond the background natural variability. In the San Juan Islands, sea level already rose over 4 inches between 1934 and 2018. By 2100, sea level is projected to rise about 1.5 to 2.5 ft on average.[47]

The 2014-2016 marine heat wave caused domoic acid poisoning of sea lions with detectable levels in dolphins, whales, and seals along the Pacific coast. Many salmon populations also declined sharply after the heat wave. Salmon abundance, age at maturation, and size at maturity are correlated with climate trends.[48] Harmful algal blooms associated with increased marine temperatures and marine heat waves threaten marine mammals, fish, and shellfish.[49]

Human-driven carbon emissions have already driven ocean acidification of surface and subsurface waters off the coast of Washington,[50] with harmful effects on shellfish and other marine ecosystems which are important cultural and economic fisheries in Washington State.

[46] 2025 Summary Report on the Science of Human Caused Climate Change and Recommendations for Washington State's Greenhouse Gas Emission Reduction Limits. https://apps.ecology.wa.gov/publications/SummaryPages/2514064.html

[47] Washington Climate Projections: Summary by Region https://apps.ecology.wa.gov/publications/parts/2401006part1.pdf

[48] Cline TJ, J Ohlberger, DE Schindler (2019) Effects of warming climate and competition in the ocean for life-histories of Pacific salmon. Nature Ecology and Evolution, 3(6), 935-942. https://doi.org/10.1038/s41559-019-0901-7.

[49] Moore SK, JA Johnstone NS Banas and EP Salathe (2015) Present-day and future climate pathways affecting Alexandrium blooms in Puget Sound, WA, USA. Harmful Algae, 48, 1-11. http://doi.org/10.1016/j.hal.2015.06.008 Ralston, DK, and SK Moore (2020). Modeling harmful algal blooms in a changing climate. Harmful Algae, 91, 101729. https://doi.org/10.1016/j.hal.2019.101729

[50] Feely RA, SR Alin, B Carter, N Bednarsek, B Hales F Chan, TM Hill, B Gaylord, E Sanford, RH Byrne, CI Sabine, D Greeley, and L Juranek 2016. Chemical and biological impacts of ocean acidification along the west coast of North America. Estuarine, Coastal and Shelf Science, 183 (Part A), 260-270. https://doi.org/10.1016/j.ecss.2016.08.043.