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SUMMARY

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Extreme Heat: Background, NOAA's Role, and Issues for Congress

Higher air temperatures, including extreme heat, are associated with adverse impacts on human health, wildlife, and the built and natural environments. Experts estimate that average air temperatures in the contiguous United States have risen since 1970, with the frequency, duration, and intensity of multiday extreme heat episodes across multiple U.S. metropolitan areas also increasing over a similar time period. Average air temperatures and the frequency, severity, duration, and spatial extent of extreme heat episodes are expected to continue to grow into the future.

The term *extreme heat* is often used interchangeably with related terms, such as *excessive heat, heat index, wet bulb globe temperature*, and *heatwave*, among others. There is no one definition for extreme heat, and entities may use different atmospheric, geographic, and social factors to define extreme heat. The factors that comprise risk from extreme heat include the frequency, duration, and intensity of extreme heat episode (i.e., the *hazard*) and the exposure and vulnerability of communities to the episodes.

The National Oceanic and Atmospheric Administration (NOAA), within the Department of Commerce, has led or supported extreme heat-related observations, forecasting, modeling, communication, research, and coordination. NOAA has applied its authorities primarily to work on extreme heat as a hazard; however, some of NOAA's activities also address aspects of extreme heat exposure and vulnerability. Other federal agencies have a greater role than NOAA in these other components of extreme heat risk. NOAA's extreme heat-related activities occur across its sub-agencies or *line offices*, including the National Environmental Satellites, Data, and Information Service (NESDIS), National Ocean Service (NOS), National Weather Service (NWS), Office of Oceanic and Atmospheric Research (OAR), and Office of Marine and Aviation Operations (OMAO). NOAA has coordinated with other agencies on extreme heat-related activities through mechanisms such as the National Integrated Heat Health Information System (NIHHIS); NOAA and the Centers for Disease Control and Prevention, with representatives from several federal departments and agencies, established NIHHIS with the goal "to develop and provide actionable, science-based information to help protect people from heat."

Members of Congress may continue to consider evaluating NOAA's existing activities, potential additional actions the agency could take to address extreme heat, funding for said activities, and the agency's role in coordinating with other federal agencies and nonfederal entities working to address the various aspects of extreme heat. Some stakeholders have argued for NOAA to implement or support certain activities—observations, modeling, forecasts, communications, research, and coordination—related to understanding and addressing extreme heat as a hazard. Likewise, some have advocated to expand the agency's role in understanding and addressing extreme heat exposure and vulnerability. Others, including the Trump Administration, have proposed or made changes to NOAA staffing and funding, the impacts of which for the agency's existing and future extreme heat-related activities remain unclear.

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Higher air temperatures are associated with adverse human health impacts, especially for children; adults over the age of 65; people with disabilities, mental health, or substance-use disorders; and those who are pregnant, lack access to cooling, or work outside.[1] Studies also have found that extreme heat affects wildlife and other aspects of the natural environment.[2] Experts estimate that average air temperatures in the contiguous United States have risen since 1970,[3] with the frequency, duration, and intensity of multiday extreme heat episodes across multiple U.S. metropolitan areas also increasing over a similar time period.[4] Average air temperatures and the frequency, severity, duration, and spatial extent of extreme heat episodes are expected to continue to grow into the future.[5]

At times, Congress and stakeholder groups have expressed support for a federal role in addressing extreme heat. The National Oceanic and Atmospheric Administration (NOAA), within the Department of Commerce, has led or supported extreme heat-related observations, forecasting, modeling, communication, research, and coordination.[6] Some have advocated for NOAA to have a greater role in certain federal extreme heat-related activities; others, including the Trump Administration, have proposed or made changes to agency staffing and funding that may impact NOAA's existing and future activities.

This report discusses extreme heat and related terms, the impacts of extreme heat, and NOAA's existing role in understanding and addressing extreme heat.[7] The report finishes with considerations for Congress regarding NOAA's extreme heat-related observations, modeling, forecasts, communication, research, funding, and coordination. Other federal agencies perform and support extreme heat-related activities, especially other aspects of extreme heat such as a community's exposure or vulnerability. A discussion of those agencies' activities is beyond the scope of this report.[8]

[1] U.S. Global Change Research Group (USGCRP), "Chapter 15: Human Health," in *Fifth National Climate Assessment*, 2023.

[2] Camille Parmesan et al., "Chapter 2: Terrestrial and Freshwater Ecosystems and Their Services, Cross-Chapter Box EXTREMES: Ramifications of Climatic Extremes for Marine, Terrestrial, Freshwater and Polar Natural Systems," in *Climate Change 2022: Impacts, Adaptation, and Vulnerability, Contributions of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC)*, IPCC, 2022, pp. 216-217 (hereinafter IPCC, "Chapter 2: Cross-Chapter Box EXTREMES," *Climate Change 2022*).

[3] USGCRP, "Chapter 2: Climate Trends," in *Fifth National Climate Assessment*, 2023 (hereinafter USGCRP, "Chapter 2: Climate Trends," *Fifth Climate Assessment*).

[4] USGCRP, "Chapter 2: Climate Trends," *Fifth Climate Assessment*; and U.S. Environmental Protection Agency (EPA), "Climate Change Indicators: Heat Waves," https://www.epa.gov/climate-indicators/climate-change-indicators-heat-waves (hereinafter EPA, "Heat Waves."). EPA defines an *extreme heat episode* or *heat wave* as a period of two or more consecutive days when the daily minimum temperature exceeds the 85th percentile of historical July and August temperatures for that city over the 1981-2010 timeframe. Read more about definitions of extreme heat in "What Is Extreme Heat?".

[5] USGCRP, "Chapter 2. Climate Trends," in *Fifth Climate Assessment* Section 2.3.

[6] The National Oceanic and Atmospheric Administration's (NOAA) mission, as stated by the agency, is "to understand and predict changes in climate, weather, ocean and coasts; to share that knowledge and information with others; and to conserve and manage coastal and marine ecosystems and resources." NOAA, "About Our Agency," https://www.noaa.gov/about-our-agency, archived April 8, 2025, at https://perma.cc/V6J4-7U8K.

[7] The report does not discuss marine heat waves.

[8] For more about the federal role in emergency response to extreme heat, see CRS Report R46873, *Emergency Response to Extreme Heat: Federal Financial Assistance and Considerations for Congress*, coordinated by Erica A. Lee.

What Is Extreme Heat?

Various entities have defined *extreme heat* and related terms in different ways and often use the terms interchangeably. One set of terms focuses on the measurements of temperature and other atmospheric conditions. For instance, some groups define extreme heat as high ambient air temperature (or *dry-bulb temperature*); NOAA combines humidity, wind, solar radiation, and other indicators to note *excessive heat* or estimate the *heat index* and *wet bulb globe temperature* (defined below). Congress has not defined extreme heat or related terms in statute, nor have federal agencies done so in regulation.

- *Excessive heat* occurs from a combination of high temperatures (significantly above normal) and high humidity.[9]
- *Heat index* (or *apparent temperature* or *real feel*) is a measure of how hot it feels when the relative humidity is combined with the air temperature.[10]
- *Wet bulb globe temperature* uses temperature, humidity, wind, solar radiation, and other parameters to measure heat stress on the human body.[11]

Other experts define extreme heat, heat waves, and similar terms as high temperatures, or other combining factors, over a certain length of time. Some terms and definitions include the following (in alphabetical order):

- *Extreme heat*, according to the Federal Emergency Management Agency (FEMA), is a period of high heat and humidity with temperatures above 90 degrees for at least two to three days.[12] Alternatively, according to the Centers for Disease Control and Prevention (CDC), *extreme heat* or *heat waves* "occur when the temperature reaches extremely high levels or when the combination of heat and humidity causes the air to become oppressive."[13] This report will use the term *extreme heat*.
- *Heat wave,* according to NOAA, is a period of abnormally and uncomfortably hot and unusually humid weather. It is typically two or more days.[14] According to the U.S. Environmental Protection Agency (EPA), a *heat wave* is "a prolonged period of excessive heat, often combined with excessive humidity."[15]

Still others also consider the geographic area in their definitions. For example, a *heat dome* occurs regionally when high pressure in the atmosphere prevents warm air below from rising,

[9] NOAA, National Weather Service (NWS), "Glossary," https://forecast.weather.gov/glossary.php, archived April 8, 2025, at https://perma.cc/C4SJ-6HX7 (hereinafter NWS, "Glossary").

[10] NWS, "Glossary." *Relative humidity* is defined as the amount of atmospheric moisture present in comparison to the amount that would be present if the air were saturated, expressed as a percentage.

[11] NOAA, NWS, "Heat Forecast Tools," https://www.weather.gov/safety/heat-tools, archived April 8, 2025, at https://perma.cc/9BY6-9CWD; and NOAA, NWS, "Wet Bulb Globe Temperature: How and When to Use It," https://www.weather.gov/news/211009-WBGT, archived April 8, 2025, at https://perma.cc/T2BN-HS47.

[12] Ready.gov, "Extreme Heat," https://www.ready.gov/heat.

[13] Centers for Disease Control and Prevention (CDC), "Beat the Heat: Extreme Heat," https://www.cdc.gov/extreme-heat/media/pdf/beat-the-heat-2017.pdf.pdf.

[14] NWS, "Glossary."

[15] EPA, "Climate Change Terms: Heat Waves," https://sor.epa.gov/sor_internet/registry/termreg/searchandretrieve/glossariesandkeywordlists/search.do;jsessionid=HDGz8feYS2Q5lEURlRLXtqkJ1figJmZ5HImdbjDe5tPdQijaGoVs!-2141398553?details=&vocabName=Glossary%20Climate%20Change%20Terms&filterTerm=heat%20wave&checkedAcronym=false&checkedTerm=false&hasDefinitions=false&filterTerm=heat%20wave&filterMatchCriteria=Contains.

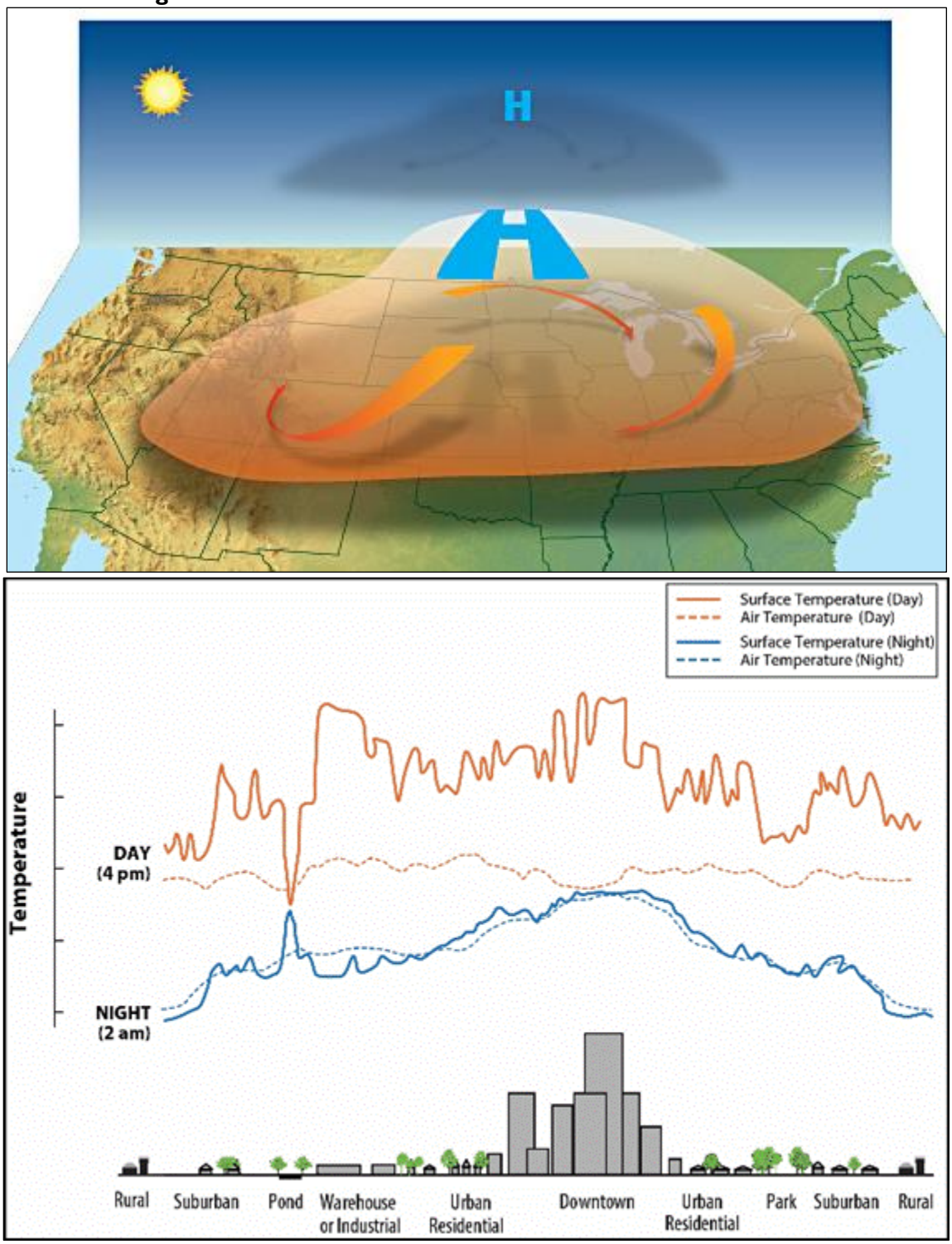
thus trapping the warm air near the land surface as if it were under a dome.[16] A heat dome may lead to an extreme heat episode (**Figure 1**). More locally, the term *urban heat island* describes how a combination of factors—such as urban geometry, heat from human activities, and the use of heat-retaining materials—can contribute to higher local air temperatures in comparison to nearby less developed areas; in some cases, these areas may experience extreme heat episodes locally (**Figure 1**).[17] Congress has defined a *heat island* in the context of military installations as an area with a high concentration of structures (such as building, roads, and other infrastructure) that absorb and reemit the sun's heat more than natural landscapes, such as forests or bodies of water.[18]

[16] American Meteorological Society (AMS), "Glossary of Meteorology," https://glossary.ametsoc.org/wiki/Welcome. AMS is a scientific society with a focus on advancing the atmospheric and related sciences, technologies, applications, and services for the benefit of society. AMS, *Constitution with Amendments to 31 July 2012*, https://ametsoc.org/index.cfm/ams/about-ams/ams-organization-and-administration/constitution-and-bylaws/.

[17] NWS, "Glossary."

[18] 10 U.S.C. §2911 note.

Figure 1. Schematics of a Heat Dome and Urban Heat Island



Sources: Top figure: Congressional Research Service, adapted from National Oceanic and Atmospheric Administration (NOAA), "Heat Index," https://www.noaa.gov/jetstream/synoptic/heat-index. Bottom figure: U.S. Environmental Protection Agency, "What Are Heat Islands?," https://www.epa.gov/heatislands/what-are-heat-islands.

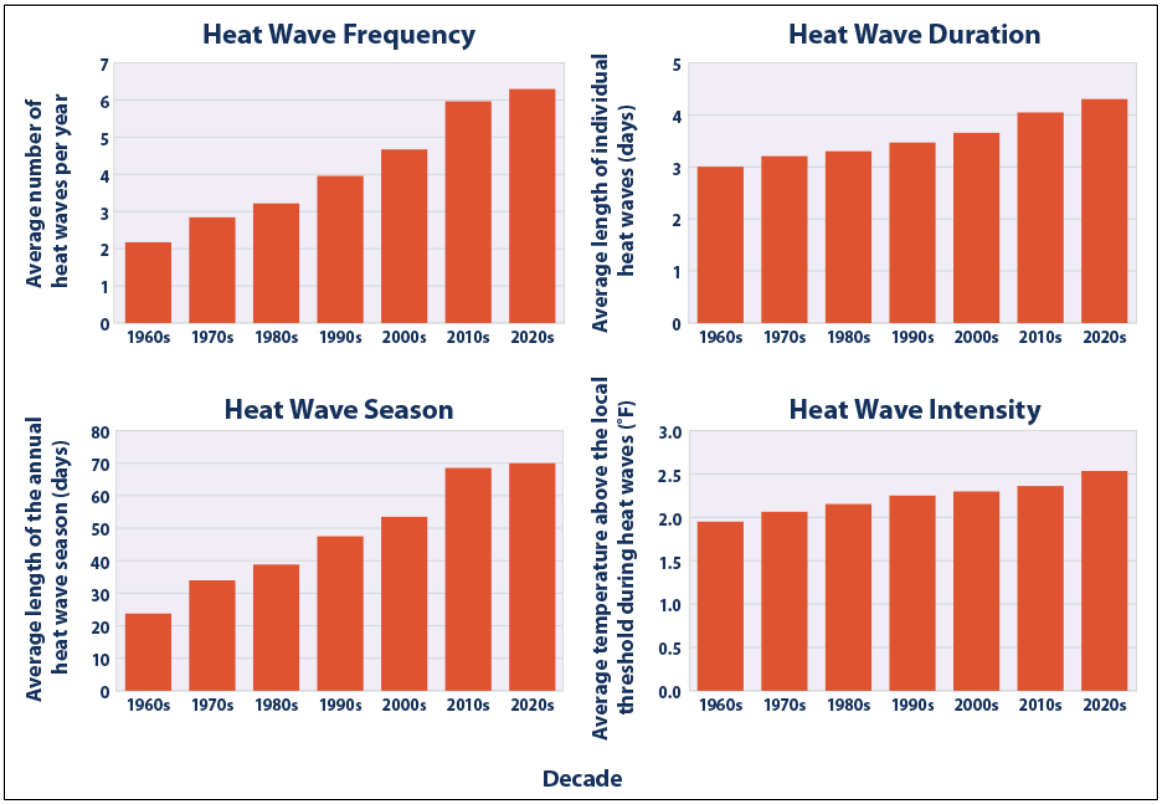
Notes: Top figure: According to NOAA, the high pressure in the middle layers of the atmosphere acts as a dome, allowing heat to build up at the Earth's surface.

Observed and Future Potential Extreme Heat

As noted above, experts have found that the frequency, duration, and intensity of extreme heat episodes increased in 50 metropolitan areas across the country from 1961 to 2023, with the greatest changes in the average number of episodes per year and length of the annual extreme heat seasons (**Figure 2**).[19] Researchers anticipate that extreme heat episodes very likely will increase in frequency, severity, duration, and spatial extent as average air temperatures continue to warm.[20] Some experts estimate that humidity also will increase due to greater atmospheric moisture content in parts of the country.[21] For more information about the relationship between extreme heat and climate change, see CRS In Focus IF12733, *Extreme Heat and Climate Change*, by Jonathan D. Haskett.

Figure 2. Characteristics of Extreme Heat Episodes in the United States, by Decade

(1961-2023, averages across the 50 large metropolitan areas for which data were available)



Source: U.S. Environmental Protection Agency (EPA), "Climate Change Indicators: Heat Waves," June 2024, https://www.epa.gov/climate-indicators/climate-change-indicators-heat-waves.

Notes: According to EPA, the data are from the National Oceanic and Atmospheric Administration from April 2024. EPA defines a *heat wave* as "a period of two or more consecutive days when the daily minimum apparent

[19] USGCRP, "Chapter 2: Climate Trends," *Fifth Climate Assessment*; and EPA, "Heat Waves." EPA defines a *heat wave* as "a period of two or more consecutive days when the daily minimum apparent temperature (the actual temperature adjusted for humidity) in a particular city exceeds the 85th percentile of historical July and August temperatures (1981–2010) for that city."

[20] USGCRP, "Chapter 2: Climate Trends," in *Fifth Climate Assessment*, Section 2.3. USGCRP defines *very likely* as 90%-100% probability of the outcome occurring.

[21] USGCRP, "Chapter 2: Climate Trends," in *Fifth Climate Assessment*.

temperature (the actual temperature adjusted for humidity) in a particular city exceeds the 85th percentile of historical July and August temperatures (1981–2010) for that city."

Impacts on Communities, Wildlife, and the Environment

As noted above, the risks associated with extreme heat to a community, wildlife, or the environment depend on the frequency, intensity, and duration of the extreme heat episode (the hazard) and the degree of exposure and vulnerability to the hazard (**Figure 3**). Depending on the level of exposure and vulnerability, extreme heat episodes may affect humans and the built environment directly and indirectly, causing productivity losses, health effects, and damage to assets, as well as disruptions to education, outdoor activities, and tourism, among other effects.[22] As noted above, human health effects can include adverse pregnancy and birth outcomes, mental health impacts, and increased emergency room visits and hospitalization.[23] A community's exposure depends on its population density, time spent outside, and level of development, among other factors. A community's vulnerability generally will depend on its demographics; infrastructure and housing conditions; access to resources; and awareness, preparedness, and acclimatization to heat.[24] Therefore, two communities exposed to the same extreme heat episode but with different levels of exposure and vulnerability face different risks and impacts. Populations with the greatest risk of effects include children; adults over the age of 65; people with disabilities, mental health, or substance-use disorders; and people who are pregnant, lack access to cooling, or work outside.

Figure 3. Components of Risk

Source: Congressional Research Service, adapted from Ara Begum et al., "Point of Departure and Key Concepts," in *Climate Change 2022: Impacts, Adaptation, and Vulnerability, Contributions of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*, 2022.

Experts have found that extreme heat episodes adversely affect the health, breeding, daily activity, geographic distribution, and mortality of some species, including birds and other warm-blooded animals.[25] Extreme heat can lead to high freshwater temperatures and reduced lake oxygen levels. Many freshwater fish and invertebrates are especially susceptible to temperature

[22] Arsht-Rockefeller Foundation Resilience Center, *Extreme Heat: The Economic and Social Consequences for the United States*, 2021, https://www.atlanticcouncil.org/wp-content/uploads/2021/08/Extreme-Heat-Report-2021.pdf.

[23] USGCRP, "Chapter 15: Human Health," in *Fifth National Climate Assessment*, 2023.

[24] U.S. Department of Housing and Urban Development, *Extreme Heat Quick Guide*, 2024, p. 4, https://www.cakex.org/sites/default/files/documents/Extreme-Heat-Quick-Guide.pdf.

[25] IPCC, "Chapter 2: Cross-Chapter Box EXTREMES," *Climate Change 2022*.

and oxygen stress, and species may have adverse reactions or die off in response.[26] Such conditions also may contribute to the growth of harmful algal blooms.[27]

NOAA's Extreme Heat-Related Activities

Congress has directed the Secretary of Commerce and NOAA to fulfill various responsibilities related to weather and climate observations, modeling, forecasts, communication, research, and coordination.[28] NOAA has applied these authorities to better understand and disseminate information about extreme heat as a hazard: the frequency, duration, and intensity of extreme heat episodes in the past, present, and future. Some of NOAA's activities also address aspects of extreme heat exposure (e.g., population density, time spent outside, level of development) and vulnerability (e.g., demographics; infrastructure and housing conditions; access to resources; awareness, preparedness, and acclimatization to heat); as noted above, other federal agencies have a greater role than NOAA in these other components of extreme heat risk. The Congressional Research Service has not identified extreme heat-specific legislation related to NOAA.

NOAA's extreme heat-related activities occur across its sub-agencies or *line offices*, including the National Environmental Satellites, Data, and Information Service (NESDIS); National Ocean Service (NOS); National Weather Service (NWS); Office of Oceanic and Atmospheric Research (OAR); and Office of Marine and Aviation Operations (OMAO).[29]

Observations

NOAA, via NESDIS, NOS, OAR, and OMAO, manages and supports an array of instruments that collect temperature-related observations and information across the United States and the world. Sources of observations include automated observation stations, weather balloons, aircraft, radar, uncrewed aircraft systems, and a fleet of Earth-observing satellites.[30] According to NOAA, observation systems collect billions of atmospheric observations around the world each day.[31]

[26] IPCC, "Chapter 2: Cross-Chapter Box EXTREMES," *Climate Change 2022*.

[27] For more information about marine harmful algal blooms, see CRS Report R46921, *Marine Harmful Algal Blooms (HABs): Background, Statutory Authorities, and Issues for Congress*, by Eva Lipiec.

[28] CRS has not identified a comprehensive list of NOAA's authorities. Some sources of authorities include Department of Commerce, Office of Privacy and Open Government, "Under Secretary of Commerce for Oceans and Atmosphere and Administrator of the National Oceanic and Atmospheric Administration," DOO 10-15, December 12, 2011, https://www.commerce.gov/opog/directives/DOO_10-15, archived April 8, 2025, at https://perma.cc/EQQ3-DNNJ; and NOAA General Counsel, *Legal Authorities for GCW*, https://www.gc.noaa.gov/documents/authorities-gcw07.pdf, archived April 8, 2025, at https://perma.cc/2TJA-KALX. Both sources provide incomplete lists of NOAA's authorities.

[29] For more about NOAA's line offices, see CRS Report R47636, *National Oceanic and Atmospheric Administration (NOAA): Organization Overview and Issues for Congress*, by Eva Lipiec.

[30] NOAA, Climate.gov, "How Do We Measure Weather and Climate?," https://www.climate.gov/maps-data/climate-data-primer/how-do-we-observe-todays-climate, archived April 8, 2025, at https://perma.cc/57EY-LDSZ; NOAA, Integrated Ocean Observing System, "IOOS by the Numbers," https://ioos.noaa.gov/about/ioos-by-the-numbers/, archived April 8, 2025, at https://perma.cc/SX7B-Q4KH; NOAA, Climate.gov, "Land-Terrestrial Climate Variables," https://www.climate.gov/maps-data/climate-data-primer/how-do-we-observe-todays-climate/land-terrestrial-climate-variables, archived April 8, 2025, at https://perma.cc/8KCX-27KT; NOAA, Climate.gov, "Air-Atmospheric Climate Variables," https://www.climate.gov/maps-data/climate-data-primer/how-do-we-observe-todays-climate/air-atmospheric-climate-variables, archived April 8, 2025, at https://perma.cc/PH6P-UFAX; NOAA, Office of Marine and Aviation Operations, "About NOAA Uncrewed Systems Operations," https://perma.cc/529X-ZHM7; and NOAA, NWS, "NOAA Observation Systems," https://www.weather.gov/about/observation-equipment, archived April 8, 2025, at https://perma.cc/4DZX-HFAM (hereinafter NWS, "NOAA Observations Systems").

[31] NWS, "NOAA Observations Systems."

NOAA also has supported nonfederal efforts to collect temperature-related information. For example, NOAA has provided funding to over 60 communities in the United States to map their urban heat islands, including high-resolution temperature and humidity data.[32] NOAA stores the observations it collects, as well as data from other sources, at the NESDIS-administered National Centers for Environmental Information.[33]

Modeling

Within NOAA, NWS and OAR—as well as NOAA-funded scientists and researchers external to NOAA—use observations and models, such as numerical weather models, to understand the frequency, duration, and intensity of extreme heat episodes. Operational models include the High-Resolution Rapid Refresh model (high resolution, short term, local), North American Mesoscale system (high to medium resolution, short term, over North America), and the Global Forecast System (medium resolution, short to medium term, over the entire Earth).[34] These models provide a location's predicted temperature, relative humidity, and wind at various altitudes, among other aspects.[35] NOAA also has identified ensemble forecast systems, such as the Global Ensemble Forecast System, Global Ensemble Prediction System, and European Centre for Medium-Range Weather Forecasts Ensemble, as the primary driver of 8- to 14-day hazards outlooks, including *excessive heat* and *much-above-normal temperatures*, described below.[36]

Forecasts

Using the observations and models described above, as well as knowledge of the local environment, NWS meteorologists issue a series of temperature outlooks and forecasts, with lead times from seasons to minutes across various geographic scales. For example, the NWS Climate Prediction Center (CPC) issues outlooks regarding the *probability of above-normal air temperatures* for periods of up to three months in advance.[37] CPC also publishes an experimental hazards outlook for the 8- to 14-day timeframe focused on identifying the probability of *excessive heat* and *much-above-normal temperatures*, among other hazards, in the contiguous United States

[32] Heat.gov, "Mapping Campaigns," https://www.heat.gov/pages/mapping-campaigns, archived April 8, 2025, at https://perma.cc/7N57-B2JQ.

[33] NOAA, National Centers for Environmental Information, "About," https://www.ncei.noaa.gov/about-us, archived April 8, 2025, at https://perma.cc/3WFT-T6F8.

[34] NOAA, NWS, "About Models," https://www.weather.gov/about/models, archived April 8, 2025, at https://perma.cc/NFT3-W5FD. For more about these and other models listed, see NOAA, National Centers for Environmental Prediction, "NCEP Numerical Forecast/Analysis Systems," https://www.emc.ncep.noaa.gov/emc/pages/ncep-numerical-forecast-systems.php, archived April 8, 2025, at https://perma.cc/9GF5-M96Y.

[35] NOAA, NWS, "Model Analyses and Guidance—HRRR Continental United States," https://mag.ncep.noaa.gov/model-guidance-model-parameter.php?group=Model%20Guidance&model=HRRR&area=CONUS&ps=area;%20NOAA%20NWS,%20%E2%80%9CModel%20Analyses%20and%20Guidance%20%E2%80%93%20NAM%20North%20America%20%E2%80%93%20US,%20Canada,%20and%20northern%20Mexico,%E2%80%9D%20https://mag.ncep.noaa.gov/model-guidance-model-parameter.php?group=Model%20Guidance&model=NAM&area=NAMER&ps=area, archived April 8, 2025, at https://perma.cc/GCK2-NB32; and NOAA, NWS, "Model Analyses and Guidance—GFS North America—U.S., Canada, and Northern Mexico," https://mag.ncep.noaa.gov/model-guidance-model-parameter.php?group=Model%20Guidance&model=GFS&area=NAMER&ps=model, archived April 8, 2025, at https://perma.cc/6GPZ-SKGM.

[36] NOAA, Climate Prediction Center (CPC), "Product Description Document: 8- to 14-day Hazards Outlook (Contiguous U.S. and Alaska) with Experimental Probabilistic Hazard Information," February 4, 2025, p. 4, https://www.cpc.ncep.noaa.gov/products/predictions/threats/week2_us_hazards_info.pdf, archived May 5, 2025, at https://perma.cc/LEH3-UNK3 (hereinafter CPC, "Product Description Document").

[37] NOAA, CPC, "Home," https://www.cpc.ncep.noaa.gov/, archived April 8, 2025, at https://perma.cc/PKW4-26LW.

and Alaska.[38] The NWS Weather Prediction Center (WPC) issues 3- to 7-day and ½- to 2½-day forecasts for the United States based on predictions from the outlooks, models, and meteorologist expertise. The 3- to 7-day forecasts focus on a range of indicators, including daily minimum and maximum temperatures and minimum, mean, and maximum heat index forecasts exceeding certain thresholds.[39] According to NWS, these heat index forecasts provide "early indications of significant heat related events."[40] WPC also issues a 3- to 7-day hazards outlook with information about *hazardous heat*, defined as 40% probability of exceeding widespread NWS Heat Advisory criteria across the United States, and high-temperature thresholds above 70 degrees Fahrenheit (°F) during the summer months in Alaska.[41]

The ½- to 2½-day forecasts, or *short-range forecasts*, are a joint effort between WPC, other NOAA centers, and local weather forecast offices (WFOs).[42] Local WFOs monitor weather within their areas of responsibility and issue forecasts two to four times a day. They also issue watches and warnings (described in the "Communication" section, immediately below), as needed, for hazardous weather, including extreme heat.[43]

Communication

NOAA disseminates its climate outlooks and weather forecasts to users across the government, partners in the media and private sector, and various mobile and social media. One of the main ways NWS interacts with the public before and during extreme heat episodes is through its watches and warnings. NWS issues watches and warnings based on the frequency, duration, and intensity of an extreme heat episode (i.e., hazard) combined with information about the geographic area in question, accounting for differences between a community's regular weather conditions and heat preparedness (i.e., exposure and vulnerability).

[38] NOAA, CPC, "U.S. Week-2 Hazards Outlook," https://www.cpc.ncep.noaa.gov/products/predictions/threats/threats.php, archived April 8, 2025, at https://perma.cc/PC7L-BRNS. CPC identifies "excessive heat for hazardous warm/hot temperatures during the warm season (May-Sep) and much above normal maximum temperatures (for anomalously high temperatures that may be hazardous) during the cooler season" (CRS correspondence with NOAA CPC staff, August 2, 2024). However, the NWS product description document for the outlook uses the terms *extreme heat* and *much-above-normal temperatures* and provides thresholds for each term (CPC, "Product Description Document," pp. 4-5). It is unclear whether the terms *excessive heat* and *extreme heat* are meant to be synonymous or different.

[39] NOAA, NWS, Weather Prediction Center (WPC), "Medium-Range Forecasts (Days 3-7), Maximum Temperatures," https://www.wpc.ncep.noaa.gov/medr/medr_max.shtml, archived April 8, 2025, at https://perma.cc/4SZJ-8NDZ; and NWS WPC, "Heat Index Forecasts (Days 3-7)," https://www.wpc.ncep.noaa.gov/heat_index.shtml, archived April 8, 2025, at https://perma.cc/N2ZR-453B.

[40] NOAA, NWS, *National Weather Service Instruction 10-516, National Non-Precipitation Weather Products Specification,* May 24, 2022, p. 4, https://www.weather.gov/media/directives/010_pdfs/pd01005016curr.pdf.

[41] NOAA, NWS, WPC, "U.S. Day 3-7 Hazards Outlook," https://www.wpc.ncep.noaa.gov/threats/threats.php; and NWS, WPC, *About the WPC Day 3-7 Hazards Outlook,* https://www.wpc.ncep.noaa.gov/threats/about_hazards.pdf.

[42] NOAA, NWS, WPC, "Short Range Forecasts (Days ½-2 ½)," https://www.wpc.ncep.noaa.gov/basicwx/basicwx_ndfd.php, archived April 8, 2025, at https://perma.cc/7ZQB-WQEE. The National Digital Forecast Database is a suite of products generated from the National Centers for Environmental Prediction and local weather forecast offices (https://vlab.noaa.gov/web/mdl/ndfd, archived April 8, 2025, at https://perma.cc/7JC6-Z844).

[43] NOAA, "NOAA Weather Forecast Offices," https://www.noaa.gov/jetstream/wfos, archived April 8, 2025, at https://perma.cc/EE7E-7NBT. In March 2025, NWS renamed its *excessive heat* watch and warning to *extreme heat* watch and warning. The underlying criteria for each alert remained the same (NOAA, NWS, "Service Change Notice 24-88, Renaming of Excessive Heat Watch and Warning to Extreme Heat Watch and Warning: Effective March 4, 2025," September 5, 2024, https://www.weather.gov/media/notification/pdf_2023_24/scn24-88_heat_haz_simp.pdf, archived April 8, 2025, at https://perma.cc/Y5ME-GVUC).

According to NOAA, the following thresholds for WFOs to issue an extreme heat warning, extreme heat watch, or heat advisory generally apply:[44]

Extreme Heat Warning. When heat index values are forecast to meet or exceed locally defined warning criteria for at least two days. Typical values include a maximum daytime heat index greater than or equal to 105°F (in the northern United States) to 110°F (in the southern United States) and minimum nighttime temperature greater than or equal to 75°F.

Extreme Heat Watch. When conditions are favorable for an extreme heat event to meet or exceed local extreme heat warning criteria in the next 24 to 72 hours.

Heat Advisory. When heat index values are forecast to meet or exceed locally defined advisory criteria for one to two days. Typical values include a maximum daytime heat index greater than or equal to 100°F (North) to 105°F (South) and minimum nighttime temperatures greater than or equal to 75°F.

On a regional level, each of the NWS regions (Alaska, Central, Eastern, Hawaii, Puerto Rico and U.S. Virgin Islands, and Western) has identified more specific criteria for its subregions on when to issue a warning, watch, or advisory related to extreme heat (**Table 1**). WFOs determine whether to issue an extreme heat warning, watch, or advisory in Alaska based on temperature, whereas WFOs in the Central, Eastern, Hawaii, and Puerto Rico and the U.S. Virgin Islands regions use a location's expected heat index (HI) or combination of HI and temperature. Since 2018, the Western region has used a location's HeatRisk value as the basis for whether to issue an extreme heat warning, watch, or advisory. NOAA and CDC developed HeatRisk, an experimental alert service focused on extreme heat, to integrate health-based temperature thresholds with information about local temperature conditions.[45] It is supplementary to official NWS products and meant to provide guidance of actions to take at levels below current NWS extreme heat warning and watch thresholds.[46] HeatRisk considers how unusual the heat is for the time of the year; the duration of the heat, including both daytime and nighttime temperatures; and if those temperatures pose an elevated risk of heat-related impacts based on data from CDC.[47] HeatRisk values range from 0/Green ("Little to no risk from expected heat") to 4/Magenta ("Extreme—This level of rare and/or long-duration extreme heat with little to no overnight relief affects anyone without effective cooling and/or adequate hydration. Impacts likely in most health systems, heat-sensitive industries and infrastructure.")[48]

[44] NOAA, NWS, *NWS Instruction 10-515, WFO Non-Precipitation Weather Products Specification*, November 20, 2024, pp. 6-7, https://www.weather.gov/media/directives/010_pdfs/pd01005015curr.pdf. See footnote 43 for information about NWS's renaming of excessive heat watches and warnings.

[45] NOAA, NWS, "HeatRisk-CDC/NWS Collaboration," https://www.wpc.ncep.noaa.gov/heatrisk/, archived April 8, 2025, at https://perma.cc/R3GD-Z6WD (hereinafter NWS, "HeatRisk"). NWS is soliciting user feedback on the tool through FY2025 (NOAA, NWS, "Public Information Statement 24-31, Updated, Soliciting Comments on Experimental HeatRisk Grids in the National Digital Forecast Databases (NDFD) and WPC HeatRisk CONUS Viewer Through September 30, 2025," April 16, 2025, https://www.weather.gov/media/notification/pdf_2025/pns24-31_Updated_HeatRisk_ExtExp2025.pdf).

[46] NWS, "HeatRisk."

[47] NOAA, NWS, "HeatRisk—What's in HeatRisk?," https://www.wpc.ncep.noaa.gov/heatrisk/, archived April 8, 2025, at https://perma.cc/R3GD-Z6WD.

[48] NWS, "HeatRisk."

Table 1. Regional Extreme Heat Warning, Watch, and Advisory Thresholds

Region	Subregion	Extreme Heat Warning	Extreme Heat Watch	Heat Advisory
Alaska	Fairbanks	n/a	n/a	Max: 75°F or 85°F depending on forecast zone
	Juneau	n/a	n/a	Max: 80°F
Central	North and Eastern	Min: HI ~75°F or higher Max: HI ~105°F	When conditions are favorable (e.g., 50% or greater chance) for a hazardous event to develop over part or all of the forecast area, but the occurrence is uncertain	Max: HI ~100°F or higher
	Central	Min: HI ~75°F or higher Max: HI ~110°F		Max: HI ~105°F or higher
	Western (High Plains/Mountains)	Min: HI ~75°F or higher Max: HI ~105°F /~100°F		Min: HI ~75°F or higher Max: HI ~100°F /~95°F
	Across Subregions	n/a	n/a	Forecaster discretion to issue a heat advisory if certain heat conditions just under the advisory criteria are expected to last for four or more consecutive days.
Eastern	Northern	Min: temperature (T) of 75°F Max: HI 105°F or higher for at least two consecutive days	n/a	HI 95°F-99°F for two consecutive days or 100°F-104°F for any duration
	North Central	Min: T 77°F Max: HI 110°F or higher for at least two consecutive days	n/a	HI 100°F or higher for two consecutive hours
	South Central		n/a	HI 105°F or higher for two consecutive hours
	Southern	Min: T 78°F Max: HI 115°F or higher for at least two consecutive days	n/a	HI 110°F or higher for two consecutive hours
Hawaii	Elevations at or below 3000 feet	n/a	n/a	Daytime HI 105°F or higher for two consecutive days or longer Nighttime HI 80°F or higher for two consecutive days or longer
Puerto Rico and U.S. Virgin Islands	—	HI 112°F or higher within next 24 hours	HI 112°F or higher beginning in next 12 to 48 hours	HI 108°F or higher within next 24 hours
Western	—	HeatRisk Value of 2.66-4.00	Issued in anticipation of a warning event	HeatRisk Value of 2.40-2.65 Forecaster discretion for HeatRisk values of 2.00-2.39

Sources: Congressional Research Service, using National Oceanic and Atmospheric Administration (NOAA), National Weather Service (NWS), "Service Change Notice 25-39, Weather Forecast Offices Fairbanks and Juneau, AK, to Begin Issuing Heat Advisories on or about June 2, 2025," April 30, 2025, https://www.weather.gov/media/notification/pdf_2025/scn25-39_heat_advisory_public_notice_AR.pdf ; NOAA,

NWS, *NWS Alaska Region Supplement 07-2002, WFO Winter Weather Products Specification, NWSI 10-513, and WFO Non-Precipitation Weather Products Specification, NWSI 10-515*, April 26, 2019, https://www.weather.gov/media/directives/010_pdfs/pd01005013a072002curr.pdf; NOAA, NWS, *NWS Central Region Supplement 06-2003, Central Region Non-Precipitation Weather Products Specification, NWSI 10-515*, November 11, 2019, pp. 4 and 6, https://www.weather.gov/media/directives/010_pdfs/pd01005015c062003curr.pdf; NOAA, NWS, *NWS Eastern Region Supplement 02-2011, Eastern Region Non-Precipitation Weather Products Specification, NWSI 10-515*, April 10, 2017, pp. C-1-C-2, https://www.weather.gov/media/directives/010_pdfs/pd01005015e022011curr.pdf; NOAA, NWS, "Questions About Products," https://www.weather.gov/hfo/prod_questions; NOAA NWS, "Heat Risk," https://www.weather.gov/sju/heat_risk; and NOAA, NWS, *NWS Western Region Supplement 01-2018, Western Region Heat Services*, June 8, 2018, pp. 5-7, https://www.weather.gov/media/directives/010_pdfs/pd01005015w012018curr.pdf.

Notes: F = Fahrenheit, HI = heat index, Max = maximum; Min = minimum, n/a = not applicable; T = temperature

NWS renamed its *excessive heat warning* to *extreme heat warning* and its *excessive heat watch* to *extreme heat watch* in March 2025, following feedback from stakeholders (NOAA, NWS, "Service Change Notice 24-88, 'Renaming of Excessive Heat Watch and Warning to Extreme Heat Watch and Warning: Effective March 4, 2025,'" September 5, 2024, https://www.weather.gov/media/notification/pdf_2023_24/scn24-88_heat_haz_simp.pdf, archived April 8, 2025, at https://perma.cc/Y5ME-GVUC). The NWS directives listed in the sources above use the term *excessive heat* rather than *extreme heat*.

Some parts of the Eastern region, especially around Philadelphia, PA, use thresholds based on Kalkstein Procedures. The Kalkstein Procedures identify *oppressive* air masses historically associated with increased human mortality (Laurence S. Kalkstein et al., "The Philadelphia Hot Weather-Health Watch/Warning System: Development and Application, Summer 1995," *Bulletin of the American Meteorological Society,* vol. 77, no. 7 [July 1, 1996], pp. 1519-1528).

Research

NOAA supports research on extreme heat, directly and indirectly, across a range of activities and line offices. The agency's research activities include those focused on the hazard itself, as well as how to best address extreme heat exposure and vulnerability. For example, OAR supports improvements to the understanding of heat impacts and forecast communication primarily through grants to and cooperative agreements with nonfederal entities.[49] OAR-supported laboratories across the United States have studied the impact of anthropogenic warming on the occurrence of extreme heat episodes, on extreme seasonal temperatures, and on heat stress affecting humans.[50] NWS and NESDIS support and provide funding to scientists to advance observations, modeling, and forecasting of atmospheric factors that may improve extreme heat prediction.[51] NWS also has funded heat-related research to improve heat education and messaging to underserved populations, among other projects, to ultimately incorporate into NWS operations.[52]

NESDIS has tracked impacts from excessive heat in various ways. Since 1996, NESDIS has documented significant weather phenomena, including excessive heat and heat having "sufficient intensity to cause loss of life, injuries, significant property damage, and/or disruption to commerce," "rare, unusual, weather phenomena," and other significant meteorological events that

[49] For example, NOAA, Climate Program Office, "Science and Services Helping Society Address Climate Challenges," https://cpo.noaa.gov/climate-risk-areas-initiative/, archived April 8, 2025, at https://perma.cc/SJU2-RDT4.

[50] NOAA, Geophysical Fluid Dynamics Laboratory, "Heat Stress and Temperature Extremes," https://www.gfdl.noaa.gov/heat-stress-and-temperature-extremes/, archived April 8, 2025, at https://perma.cc/R87H-VLZL.

[51] NOAA, NWS, "Science and Technology," https://www.weather.gov/about/science-and-technology, archived April 8, 2025, at https://perma.cc/5Y9G-R7ZU; and NOAA, NWS, Office of Science and Technology Integration (OSTI), "About OSTI," https://vlab.noaa.gov/web/nws-osti/about, archived April 8, 2025, at https://perma.cc/99TL-WF2R.

[52] NOAA, NWS, OSTI, "CSTAR Projects," https://vlab.noaa.gov/web/nws-osti/cstar, archived April 8, 2025, at https://perma.cc/BYK2-DSE5.

occur in connection with another event.[53] NESDIS collects information about these events from NWS, "county, state and federal emergency management officials, local law enforcement officials, skywarn spotters, NWS damage surveys, newspaper clipping services, the insurance industry and the general public, among others."[54] According to the agency, due to time and resource constraints, the types and quality of the information compiled are limited.

Until May 2025, NESDIS also tracked impacts from drought and heat waves in its billion-dollar disaster estimates.[55] For example, NOAA noted that in 2024, Southern, Eastern, and Northwestern states experienced drought conditions and heat that led to an estimated $5.5 billion in costs and 136 deaths.[56] In calculating billion-dollar disaster estimates, NOAA relied primarily on a disaster's costs in terms of damage to physical infrastructure or agriculture. Extreme heat episodes, however, mostly incur costs from losses related to the environment more broadly, health care, or values associated with the loss of life—not accounted for in agency estimates.[57]

More broadly, scientists across NOAA have endeavored to summarize the impacts of extreme heat on the United States, among other activities, as part of their work for the statutorily mandated periodic assessment of the U.S. Global Change Research Program's (USGCRP's) findings and the effects of global change, which has been published as the *National Climate Assessment*.[58] The most recent assessment was released in 2023.[59]

Coordination

NOAA coordinates with other federal agencies and nonfederal entities on extreme heat-related activities through several means. Specific NOAA offices, such as local WFOs, interact with, coordinate, and collaborate with local stakeholders, such as emergency managers and local government officials.[60] NOAA more broadly coordinates with other entities on larger initiatives, for example, through the National Integrated Heat Health Information System (NIHHIS). NOAA

[53] NOAA, NWS, *NWS Instruction 10-1605, Storm Data Preparation*, July 26, 2021, pp. 2-3, https://www.weather.gov/media/directives/010_pdfs/pd01016005curr.pdf; and NOAA, National Centers for Environmental Information (NCEI), "Storm Events Database," https://www.ncdc.noaa.gov/stormevents/details.jsp.

[54] NOAA, NCEI, "Storm Data FAQ Page," https://www.ncdc.noaa.gov/stormevents/faq.jsp; and NOAA, NWS "Weather Related Fatality and Injury Statistics," https://www.weather.gov/hazstat/.

[55] For further information about NOAA's billion-dollar disaster estimates, see CRS In Focus IF12944, *Understanding NOAA's "Billion-Dollar Disasters"*, by Eva Lipiec, and the "Role in Addressing Extreme Heat Exposure and Vulnerability" subsection in the "Congressional Considerations" section of this report.

[56] NOAA, NCEI, "Billion-Dollar Weather and Climate Disasters: Events," https://www.ncei.noaa.gov/access/billions/events, archived May 5, 2025, at https://perma.cc/HCY2-PNA9.

[57] NOAA, NCEI, "Billion-Dollar Weather and Climate Disasters: Time Series," https://www.ncei.noaa.gov/access/billions/time-series, archived April 9, 2025, at https://perma.cc/682L-NYGP. Other entities also have released estimates of economic losses and mortality related to weather and climate events. For example, see World Meteorological Organization, "Status of Mortality and Economic Losses due to Weather, Climate and Water Extremes (1970-2021)," https://storymaps.arcgis.com/stories/8df884dbd4e849c89d4b1128fa5dc1d6. The Federal Emergency Management Agency (FEMA) also releases expected annual losses to structures, population, and agriculture based on historic data for each U.S. county and various hazards, including heat waves, as part of its *National Risk Index* (FEMA, *National Risk Index, Technical Documentation*, March 2025, https://www.fema.gov/sites/default/files/documents/fema_national-risk-index_technical-documentation.pdf).

[58] USGCRP, "Fifth National Climate Assessment, Report Credits," https://nca2023.globalchange.gov/credits/.

[59] USGCRP, *Fifth National Climate Assessment*, 2023. For more information about the USGCRP and its National Climate Assessment, see CRS Report R48478, *U.S. Global Change Research Program (USGCRP): Overview and Considerations for Congress*, by Kathryn G. Kynett, and the "Research" subsection in the "Congressional Considerations" section of this report.

[60] NOAA, NWS, "Federal, State, and Local Partners," https://www.weather.gov/about/fsl-partners, archived April 8, 2025, at https://perma.cc/P6S4-CQDW.

and CDC established NIHHIS in 2015 with a goal "to develop and provide actionable, science-based information to help protect people from heat," including HeatRisk (described in the "Communication" section, above).[61] Over the course of its existence, NIHHIS has comprised representatives from over 20 federal departments and agencies.[62] NOAA and the other federal agencies that are a part of NIHHIS work under broad statutory authorities related to weather forecasting, public health, and emergency management, among others. NIHHIS administers Heat.gov, where the group shares tools and research to support local- and state-level planning, mitigation, and response to extreme heat.[63]

In its inaugural *National Heat Strategy for 2024-2030*, NIHHIS established goals of "strengthen[ing] the NIHHIS organization, staffing and infrastructure across the federal government to ensure program sustainability and mission performance" and "formal[izing] and "sustain[ing] an interagency governance structure," among others.[64] In addition to providing information through its public-facing website, NIHHIS's federal agencies support nonfederal partners working to build long-term resilience to extreme heat through its Centers of Excellence and local monitoring and tabletop planning and coordination exercises, among other activities.[65]

Congressional Considerations

As described above, episodes of extreme heat have impacts on communities, wildlife, and the environment, and researchers expect the frequency, duration, and intensity of those episodes to increase in the future. Some Members of Congress or congressional committees may consider evaluating NOAA's existing activities, potential additional actions NOAA could take to address extreme heat, funding for said activities, and coordination among federal agencies working on extreme heat. Some stakeholders have argued for NOAA to implement or support certain activities related to understanding extreme heat episodes as a hazard (e.g., observations, modeling, forecasting, communications, research) and/or to expand its role in understanding and addressing extreme heat exposure and vulnerability. The proposals discussed below focus primarily on NOAA's activities that relate directly to extreme heat; this section does not discuss

[61] National Integrated Heat Health Information System (NIHHIS), "National Integrated Heat Health Information System," 2022, https://cpo.noaa.gov/wp-content/uploads/2023/06/NIHHIS-2-Pager-2022.pdf, archived April 8, 2025, at https://perma.cc/KSR4-D349; and Heat.gov, "About Heat.gov," https://www.heat.gov/pages/about-heat-gov, archived April 8, 2025, at https://perma.cc/GKR6-S2FA (hereinafter Heat.gov, "About").

[62] Departments and agencies include NOAA; EPA, Centers for Disease Control and Prevention; Agency for Healthcare Research and Quality; Administration for Community Living; Administration for Children and Families; Administration for Strategic Preparedness and Response; Food and Drug Administration; Departments of Agriculture, Defense, Energy, Health and Human Services, Homeland Security, Housing and Urban Development, the Interior, State, Transportation, and Veterans Affairs; Federal Emergency Management Agency; Food and Drug Administration, General Services Administration; National Institute for Occupational Safety and Health; National Institute of Environmental Health Sciences; National Institutes of Health; National Park Service; Occupational Safety and Health Administration; Office of Climate Change and Health Equity; Substance Abuse and Mental Health Services Administration; U.S. Agency for International Development; U.S. Census Bureau; and U.S. Forest Service (Heat.gov, "About").

[63] NIHHIS and Interagency Working Group (IWG) on Extreme Heat, *2024-2030 National Heat Strategy*, 2024, https://web.archive.org/web/20250201023959/https://cpo.noaa.gov/wp-content/uploads/2024/07/National_Heat_Strategy-2024-2030.pdf (hereinafter NIHHIS and IWG on Extreme Heat, *National Heat Strategy*).

[64] NIHHIS and IWG on Extreme Heat, *National Heat Strategy*, p. 29.

[65] NIHHIS, "NIHHIS Centers of Excellence," https://www.heat.gov/pages/nihhis-centers-of-excellence, archived April 8, 2025, at https://perma.cc/9B27-C8S9 (hereinafter NIHHIS, "Centers of Excellence"); NIHHIS, "Introduction to Heat Tabletop Planning and Coordination," https://www.heat.gov/pages/introduction-to-heat-tabletop-planning-and-coordination, archived April 8, 2025, at https://perma.cc/6NPC-X3DN; and NIHHIS, "Mapping Campaigns," https://www.heat.gov/pages/mapping-campaigns, archived April 8, 2025, at https://perma.cc/7N57-B2JQ.

broader weather and climate-related activities (e.g., improvements to radars, high performance computing, artificial intelligence, new observation platforms) that could help NOAA to address extreme heat indirectly.

Observations

Some stakeholders have argued for NOAA to support improved monitoring of the environment to enhance understanding of extreme heat. One proposal would establish an interagency extreme heat monitoring network, led by NOAA and EPA. The effort could include federal financial and technical assistance for nonfederal entities to develop or purchase additional air temperature sensors and data infrastructure to support real-time monitoring.[66] Some groups have argued for greater data collection at schools to provide better guidance to administrators and direct mitigation efforts.[67] Others have advocated for a greater emphasis on real-time, consistent monitoring in rural areas.[68]

In addition to maintaining the status quo, Congress could consider directing NOAA to further support nonfederal monitoring efforts, such as those most recently funded by NOAA and NIHHIS, and/or to advise agencies to monitor certain types of facilities or work with states and localities more broadly. In the 118th Congress, some Members introduced legislation that could have supported such work, for instance by directing NOAA to increase weather observations and develop new weather observational capabilities related to heat, among other weather conditions, for *under-observed*, *underserved*, or *highly vulnerable regions*.[69] One bill would have ordered NIHHIS to "enhance observations, surveillance, monitoring, and analysis" related to extreme heat.[70] Bills in the 119th Congress would direct other agencies to provide grants to local and state agencies to deploy monitoring equipment to evaluate extreme heat conditions, among other phenomena.[71]

Other stakeholders may argue for a reduced or different federal or NOAA role in addressing aspects of extreme heat. Some may contend that nonfederal partners should fund local

[66] Bianca Corpuz, "Improve Extreme Heat Monitoring by Launching Cross-Agency Temperature Network," Federation of American Scientists (FAS), Day One Project, April 1, 2024, https://fas.org/publication/cross-agency-heat-monitoring/. For example, the *New Jersey Extreme Heat Resilience Action Plan, 2024*, recommends the state install new instrumentation to enrich current satellite-based data sets (Michael Baker International Inc., *New Jersey Extreme Heat Resilience Action Plan*, 2024, Interagency Council on Climate Resilience, p. 82, https://dep.nj.gov/wp-content/uploads/climatechange/extreme_heat_rap_071924-screen-version.pdf). As part of its Day One Project, FAS convened over 85 experts in fall 2023 who generated a series of policy ideas related to extreme heat. FAS then recruited over 30 professionals to author policy recommendations related to these ideas, spanning infrastructure and the built environment, workforce safety and development, public health, medical preparedness, and health security, food security and multi-hazard resilience, planning and response, and data and indices (FAS, "Hot Policy Ideas to Tackle the Extreme Heat Crisis," March 31, 2024, https://fas.org/accelerator/extreme-heat-policy-challenge/; and Grace Wickerson and Autumn Burton, "For America to Become Climate Resilient, We Need Innovative Policy Solutions to Address the Extreme Heat Crisis," FAS, January 9, 2024, https://fas.org/publication/heat-policy-solutions-cohort-launch/).

[67] Rebecca Morgenstern Brenner et al., "A Comprehensive Strategy to Address Extreme Heat in Schools," FAS, Day One Project, April 2, 2024, https://fas.org/publication/extreme-heat-schools/.

[68] Heat Policy Innovation Hub, *Confronting Heat Challenges—Cross-Sector Strategies for National Resilience: A Report from the 2024 HeatWise Policy Partnership Summit*, 2024, p. 16, https://nicholasinstitute.duke.edu/sites/default/files/publications/confronting-heat-challenges.pdf (hereinafter Heat Policy Innovation Hub, *Confronting Heat Challenges*).

[69] H.R. 6093, §203, and S. 5601, §203, in the 118th Congress. The bills did not define the terms *under-observed*, *underserved*, or *highly vulnerable regions*.

[70] H.R. 4953 in the 118th Congress.

[71] H.R. 903/S. 341 in the 119th Congress.

observations, as they benefit most from such efforts, or that other methods exist to obtain this information, perhaps relying on new uses of existing datasets or improved modeling. Others have proposed narrowing NOAA's focus as an agency to its data-gathering services to "increase both accountability and return on taxpayer investment."[72] Some private weather companies and organizations have come out against the proposal, stating that although one of NWS's core roles is to disseminate all "foundational" weather data, the agency also fulfills important functions in modeling, forecasting, and issuing watches and warnings.[73] Changes to the agency's mission may impact the type, quality, quantity, and cost of heat-related information available to various users, including local and state governments. The Trump Administration has reduced staffing and funding for its NOAA observational functions, which has decreased the frequency of observations in some cases.[74] The impact of fewer weather observations on the agency's heat-related forecasting remains unclear.[75]

Modeling and Forecasting

Advances in the resolution of weather forecasting (i.e., weather prediction at a fine scale over a small geographic area and short time interval) and longer lead times also could lead to improved predictions of extreme heat. Forecasting at a greater resolution would require observations of current conditions in small geographic areas, as proposed above, as well as a better understanding of the relationship between local atmospheric and land surface conditions. Advocates contend that NOAA should work with other federal agencies to assess present and future regional extreme heat risk and to identify local exposure to extreme heat through indoor and outdoor air temperature modeling.[76] Some may argue that NOAA is already doing so through NWS and its location-specific forecasts and watch and warnings thresholds, as well as through the HeatRisk tool. Others may contend that some proposed activities, such as indoor temperature modeling, are beyond NOAA's purview and better suited for other federal agencies, or that such efforts should be led by states and localities or avoided entirely, as they may lead to federal regulation of indoor spaces.

Some stakeholders also have proposed changes to NOAA's forecasting responsibilities that could impact the agency's extreme heat-related activities. For example, one proposal would fully commercialize NOAA's forecasting operations, as noted above, to "increase both [its]

[72] The Heritage Foundation, *Mandate for Leadership: The Conservative Promise 2025*, 2023, pp. 663 and 675.

[73] AccuWeather, "AccuWeather Does Not Support Project 2025 Plan to Fully Commercializing NWS Operations; NOAA Has Critical Role in American Weather Enterprise," July 10, 2024, https://www.accuweather.com/en/press/accuweather-does-not-support-project-2025-plan-to-fully-commercializing-nws-operations-noaa-has-critical-role-in-american-weather-enterprise/1670156 (hereinafter AccuWeather, "Does Not Support Project 2025 Plan"); and American Meteorological Society (AMS), "The U.S. Weather Enterprise: A National Treasure at Risk," March 3, 2025, https://blog.ametsoc.org/2025/03/03/the-u-s-weather-enterprise-a-national-treasure-at-risk/.

[74] See, for example, NWS reductions and suspensions of radiosonde observations (i.e., instruments attached to weather balloons) throughout the United States at NOAA, NWS, "Service Change Notice 25-36, Temporary Reduction of Radiosonde Observations, from Selected Sites, Effective April 17, 2025," April 17, 2025, https://www.weather.gov/media/notification/pdf_2025/scn25-36_suspension_of_raob_launches.pdf, archived May 7, 2025, at https://perma.cc/ECF5-AUKC.

[75] For example, Hilary McQuilkin and Deborah Becker, "How Trump Administration Job Cuts Could Affect the Future of Weather Forecasting," April 7, 2025, WBUR, https://www.wbur.org/onpoint/2025/04/07/trump-administration-jobs-national-weather-service-forecasting (hereinafter McQuilkin and Becker, "Future of Weather Forecasting").

[76] Vivek Shandas et al., "Preparing and Responding to Extreme Heat Through Effective Local, State, and Federal Action Planning," April 5, 2024, FAS, https://fas.org/publication/preparing-and-responding-to-extreme-heat-through-effective-local-state-and-federal-action-planning/.

accountability and return on taxpayer investment."[77] It is unclear how such a change would impact NOAA's current extreme heat outlooks, forecasts, and warnings. Commercialization could affect how heat-related information is made available to various users, including local and state governments and emergency responders. Some private weather companies and organizations that rely on NOAA's modeling and forecasts have come out against the proposal, stating that NWS's value is "maximized" when it develops the "world's best numerical weather prediction models and forecast guidance."[78] In addition, as previously noted, the Trump Administration has reduced NWS staffing through various means; the impacts of the reductions on weather modeling and forecasts remain unclear, but some meteorologists and other weather-related scientists have noted the potential for degraded forecasting from the agency.[79]

Communication

Some stakeholders have advocated for changes to NOAA's extreme heat-related communications before, during, and after extreme heat episodes. Proposals have focused on defining extreme heat, naming or ranking extreme heat episodes, making changes to extreme heat warnings and alerts, and offering NOAA's heat expertise to other entities.

Defining Extreme Heat

Some stakeholders have argued that the lack of a standard definition of *extreme heat* complicates risk assessment and resource allocation.[80] They contend that NWS should define "extreme heat weather events, such as 'heat domes.'"[81] Some Members introduced bills in the 118th and 119th Congresses that would have defined terms such as *excess urban heat effect, extreme heat, heat, heat event, heat-health*, and *urban heat island* or would have directed the National Academies of Science, Engineering, and Medicine or the EPA Administrator to define several terms.[82] Alternatively, Congress could direct NOAA and/or NIHHIS to define extreme heat-related terms. Congress also could direct NOAA and other federal agencies to use the same definition across agency policies and procedures. Using a single definition of certain extreme heat-related terms across agencies could improve federal and nonfederal coordination to address extreme heat events, as arguably each agency could agree on what each heat-related term means. At the same time, a single definition of a term may not suit each agency's mission and needs and may complicate an agency's existing extreme heat-related activities if the chosen definition does not align with other agency policies and procedures.

[77] The Heritage Foundation, *Mandate for Leadership: The Conservative Promise 2025*, 2023, pp. 663 and 675. For a discussion of other proposals introduced since NOAA's establishment in 1970, see CRS Report R47636, *National Oceanic and Atmospheric Administration (NOAA): Organization Overview and Issues for Congress*, by Eva Lipiec.

[78] See footnote 73.

[79] McQuilkin and Becker, "Future of Weather Forecasting"; AMS, "Without a Strong Weather Enterprise America's Economic Leadership Is at Risk," April 24, 2025, https://blog.ametsoc.org/2025/04/24/without-a-strong-weather-enterprise-americas-economic-leadership-is-at-risk/; and Jeff Young, "All Living Former Weather Service Directors Oppose Trump Staff Cuts," May 2, 2025, *Newsweek*, https://www.newsweek.com/all-living-former-weather-service-directors-oppose-trump-staff-cuts-2067576.

[80] Heat Policy Innovation Hub, *Confronting Heat Challenges*, p. 14.

[81] Grace Wickerson et al., "2025 Heat Policy Agenda," January 13, 2025, FAS, https://fas.org/publication/2025-heat-policy-agenda/ (hereinafter FAS, "2025 Heat Policy Agenda").

[82] H.R. 4953 and S. 2645 in the 118th Congress and H.R. 903/S. 341, H.R. 2486/S. 1214, H.R. 3703/S. 1166, H.R. 3704, and S. 325 in the 119th Congress. In the bills, Congress defined the terms in the context of new and existing federal financial assistance programs.

Naming or Ranking Extreme Heat Episodes

Some stakeholders have advocated for naming and ranking heat waves.[83] Other types of hazards, such as hurricanes, are named and categorized, with goals of reducing the public's confusion if multiple storms occur at the same time and quickly sharing information about the strength of the storm.[84] Some groups have advocated for broader use, stating that naming heat waves would raise public awareness of the dangers of heat and promote measures and actions to reduce heat risk.[85] Others have argued against the practice, stating that unofficial (e.g. released by the media and certain states, not by NOAA or other government entities) naming of heat waves may cause confusion and may undermine national-level warnings systems.[86] These stakeholders also posit that the impact of naming other phenomena, such as hurricanes and winter storms, on public planning and preparedness is unclear. One bill in the 118th Congress proposed that NOAA study the impact of naming heat waves on public preparedness and response.[87]

Some U.S. cities and states (e.g., California) have adopted the practice of ranking heat waves, stating that the heat-health ranking system provides awareness of local and regional extreme heat events in the state.[88] A bill from the 118th Congress would have directed NOAA to establish a national ranking system to evaluate and communicate the severity and risk of extreme heat based on human health outcomes.[89] It is unclear how such a ranking system would differ from the HeatRisk tool, which ranks the risk of heat-related health impacts from 0 to 4.[90] Members of Congress could reintroduce legislation, such as H.R. 4314 from the 118th Congress, that would require NOAA to evaluate the efficacy of naming and ranking heat waves. Or, if Congress decided that naming heat waves was unnecessary or that a ranking system was duplicative of the HeatRisk tool, it could direct NOAA to make HeatRisk operational and a standard part of each WFO's product suite. The Trump Administration's changes to federal agency staffing at NOAA and CDC, as reported by some news sources, could complicate operationalization of the HeatRisk tool.[91]

[83] The advocates typically use the term *heat wave* and not *extreme heat*, so the term *heat wave* is used throughout this section.

[84] NOAA, National Hurricane Center and Central Pacific Hurricane Center, "Tropical Cyclone Naming History and Retired Names," https://www.nhc.noaa.gov/aboutnames_history.shtml, archived May 7, 2025, at https://perma.cc/3CKD-HLEV.

[85] Atlantic Council, "Categorizing and Naming Heat Waves," https://onebillionresilient.org/project/categorizing-and-naming-heat-waves/.

[86] World Meteorological Organization, *Technical Brief: Considerations Regarding the Naming of Heat Waves*, September 2022, https://library.wmo.int/viewer/58333/?offset.

[87] H.R. 4314 in the 118th Congress.

[88] California Office of Environmental Health Hazard Assessment, "CalHeatScore," https://calheatscore.calepa.ca.gov/.

[89] H.R. 4314 in the 118th Congress.

[90] NOAA, NWS, "NWS HeatRisk," https://www.wpc.ncep.noaa.gov/heatrisk/, archived April 8, 2025, at https://perma.cc/R3GD-Z6WD.

[91] Ariel Whittenburg, "HHS Extreme Heat Programs Hollowed Out by Trump Staff Cuts," April 3, 2025, *Climate Wire, E&E News by Politico*, https://subscriber.politicopro.com/article/eenews/2025/04/03/hhs-extreme-heat-programs-hollowed-out-by-trump-staff-cuts-00267005; Seth Borenstein, "Nearly Half of National Weather Service Offices Have 20% Vacancy Rates, and Experts Say It's a Risk," April 4, 2025, AP News, https://apnews.com/article/doge-weather-cuts-tornado-dangerous-staff-warnings-aa7db3e0d0009d99c143742ab722c40a; and Ariel Wittenberg, "Inside Trump's Purge of Federal Heat Experts," June 9, 2025, *Climate Wire, E&E News by Politico*, https://www.eenews.net/articles/inside-trumps-purge-of-federal-heat-experts/.

Warning System and Alerts

Some stakeholders have advocated for changes to NOAA's extreme heat-related warnings and alerts. For example, according to one group, NOAA, FEMA, and CDC could support a real-time heat alert system, in line with early warning systems supported by the World Meteorological Organization.[92] Some experts, by contrast, have argued that NOAA's current activities related to extreme heat outlooks and forecasts already constitute a heat health warning system.[93] Heat health warning systems in some other countries also address extreme heat exposure and vulnerability through national and state heat health action plans, weekly reports during the summer, and an annual report after each summer, among other activities.[94] Congress could consider directing NOAA to evaluate whether these additional types of activities are appropriate for federal agencies. Some may argue that local and state governments should lead on the development of local early warning systems for their specific location and population, supported by federal guidance and funding, for example.

In addition, as noted above, some stakeholders have proposed focusing the NWS on its data-gathering services. Depending on the implementation of such a proposal, NOAA's role in issuing heat-related watches and warnings could diminish, with private forecasting companies and others releasing their own watches and warnings. Competing warnings from private sources could confuse the public, leading to impacts to life and property. Some private weather forecasting companies have argued against such changes to NWS's responsibilities, stating that the agency has an important role in issuing warnings and watches to the public for severe weather.[95]

Other actions NOAA could take include improving its public alert system for hazardous events, including extreme heat. Congress directed the agency to "ensure that all weather forecast and warning products [could] be understood by limited English proficiency individuals" in FY2023 and FY2024.[96] NOAA has been doing so in an experimental way by using artificial intelligence to translate its products into Spanish, Chinese, Vietnamese, French, and Tagalog for use at certain weather forecasting offices.[97] The translations were paused due to a contract lapse and restarted in

[92] FAS, "2025 Heat Policy Agenda." The World Meteorological Organization (WMO) is "United Nations system's authoritative voice on the state and behaviour of the Earth's atmosphere, its interaction with the land and oceans, the weather and climate it produces and the resulting distribution of water resources," according to the agency (WMO, "Overview," https://wmo.int/about-wmo/overview).

[93] Global Heat Health Information Network (GHHIN), *From the G7 Health Communique to Action: Health and Climate-Heat Preparedness through Early Warning Systems*, 2022, https://ghhin.org/wp-content/uploads/G7-report-heat-EWS.pdf (hereinafter GHHIN, *Early Warning Systems*).

[94] GHHIN, *Early Warning Systems*.

[95] AccuWeather, "Does Not Support Project 2025 Plan."

[96] U.S. Congress, House Appropriations Committee, *Commerce, Justice Science, and Related Agencies Appropriations Bill, 2023, Report Together with Minority Views to Accompany H.R. 8256*, 117th Cong., 2nd sess., June 30, 2022, H.Rept. 117-395, p. 46, as referred to in "Explanatory Statement Submitted by Sen. Patrick Leahy, Chair of the Senate Committee on Appropriations, Regarding H.R. 2617, Consolidated Appropriations Act, 2023," *Congressional Record*, vol. 168 (December 20, 2022), p. S7898; and U.S. Congress, Senate Appropriations Committee, *Departments of Commerce and Justice, Science, and Related Agencies Appropriations Bill, 2024, Report to Accompany* S. 2321, 118th Cong., 1st sess., July 13, 2023, S.Rept. 118-62, p. 54, as referred to in Sen. Patty Murray, "Unanimous Consent Agreement—H.R. 4366," *Congressional Record*, vol. 170 (March 5, 2024), p. S1398.

[97] NOAA, "NOAA Uses Artificial Intelligence to Translate Forecasts, Warnings into Spanish and Chinese," October 26, 2023, https://www.noaa.gov/news-release/noaa-uses-artificial-intelligence-to-translate-forecasts-warnings-into-spanish-and-chinese, archived April 9, 2025, at https://perma.cc/CB99-3USL; and NOAA, "NWS Product Translations," https://www.weather.gov/translate/?lan=ENG, archived May 7, 2025, at https://perma.cc/CXQ5-XW7E.

April 2025.[98] According to news sources, NWS typically issues the translated weather alerts, including Spanish-language products, and broadcasts them on NOAA Weather Radio.[99]

Congress could continue to direct NOAA in appropriations report language or codify in statute that the agency issue multilingual alerts for extreme heat via the NOAA Weather Radio and Integrated Public Alert and Warning System (IPAWS), national systems for local alerting that include cell phone, radio, and television components.[100] A bill in the 119th Congress would change the form, content, and methods of communication to the public to "more clearly inform action and increase the likelihood that the public takes such action to prevent the loss of life or property," among other changes.[101] Other bills introduced in the 119th Congress would codify NIHHIS within NOAA and direct it to improve the "delivery of data, information, forecasts, warnings, predictions, and projections related to temperature and extreme heat and related impacts."[102]

Providing Technical Assistance

Some stakeholders have argued for NOAA to have a greater role in providing technical assistance to other federal agencies and nonfederal entities to aid those agencies in their missions. For example, one group argued for NOAA, and other agencies, to provide subject matter expertise on extreme heat episodes and support curriculum development by the Department of Veterans Affairs.[103]

Others may argue for continued support of communities, such as through NOAA's Centers of Excellence, including its Center for Heat Resilient Communities, which was established to provide technical assistance in "determining the best strategies for local heat mitigation and management."[104] The center was created under the authorization of and funded by the budget reconciliation legislation known as the Inflation Reduction Act of 2022 (IRA; P.L. 117-169) through FY2026.[105] The effort's funding status is unclear due to the release of the Trump Administration's Executive Order 14154, which paused IRA funding disbursement to ensure alignment with the Administration's priorities,[106] and news source reporting that the center's

[98] NOAA NCEP Central Operations, "SDM Administrative Messages—Senior Duty Meteorologist NWS Administrative Message, NWS NCEP Central Operations College Park MD 2004Z Tue Apr 01 2025," https://www.nco.ncep.noaa.gov/status/messages/, archived April 9, 2025, at https://perma.cc/TK96-WXM8; and NOAA Communications (@NOAAComms), "Update: The National Weather Service's contract to produce common language translations for @NWS products has been reinstated…," X post, April 24, 2025, https://x.com/NOAAComms/status/1915420007447605391, archived May 7, 2025, at https://perma.cc/LM4X-RVLD.

[99] Adam Kemp, "National Weather Service Pauses Severe Weather Alerts in Spanish and Other Languages," April 4, 2025, PBS News, https://www.pbs.org/newshour/nation/national-weather-service-pauses-severe-weather-alerts-in-spanish-and-other-languages.

[100] FAS, "2025 Heat Policy Agenda"; and FEMA, "Integrated Public Alert and Warning System," https://www.fema.gov/emergency-managers/practitioners/integrated-public-alert-warning-system.

[101] S. 258 in the 119th Congress.

[102] S. 325/H.R. 3704 in the 119th Congress.

[103] Kari Nadeau and Nile Nair, "Enhancing Public Health Preparedness for Climate Change-Related Health Impacts," April 4, 2024, FAS, Day One Project, https://fas.org/publication/climate-heat-public-health/.

[104] NIHHIS, "Centers of Excellence."

[105] NOAA, "Biden-Harris Administration Invests $4.55 Million for Community Heat Resilience Through Investing in America Agenda," May 20, 2024, https://www.noaa.gov/news-release/biden-harris-administration-invests-4-point-55-million-for-community-heat-resilience, archived April 9, 2025, at https://perma.cc/AN2Y-9BUB.

[106] Executive Order 14154, "Unleashing American Energy," 90 *Federal Register* 8353, January 29, 2025.

funding was terminated in June 2025.[107] Congress may consider whether the Center for Heat Resilient Communities meets congressional goals for addressing extreme heat and what level of appropriations, if any, the center is to receive.

Research

Stakeholders have proposed changes to NOAA's research activities aimed at improving modeling, forecasting, and communication. As Congress required under the Weather Research and Forecasting Innovation Act of 2017 (P.L. 115-25), NOAA has been working to improve medium-term forecasts, known as *subseasonal forecasting* (i.e., forecasts two weeks to three months out) to aid in extreme heat preparedness and response. Some Members of Congress in the 118th Congress introduced legislation that would have directed NOAA, through NIHHIS, to "improve the capacity of weather, subseasonal, and seasonal forecasts for the [United States]" to allow for the planning and preparation for, adaptation to, and mitigation of health risks of extreme heat across multiple timescales.[108] The 119th Congress may wish to examine whether NOAA has made suitable progress toward achieving the goals of P.L. 115-25 or whether further direction to the agency is needed.

Other sources have identified other potential areas of research. For example, in a 2020 report to Congress, NOAA noted that an important area of research to improve forecasting is the assessment of predictability of extreme events, such as heat waves, and not only average conditions and average events.[109] In another instance, scientists developed a new metric of "stickiness" to address how heat and humidity contribute to humid heat across climatologically diverse regions, which NOAA may decide to include in its operational models and forecasts.[110] The NIHHIS *National Heat Strategy* took a more expansive view, broadly identifying "research to improve understanding, modeling, and prediction of the physical mechanisms of extreme and chronic heat, such as climate variability, predictability, attribution, and interactions with other hazards such as drought, fire, and air quality" as a goal, although the strategy did not note which agencies should support such research.[111] NOAA could support such research efforts internally at the agency or provide technical and financial assistance to nonfederal entities to do so.

Another area of potential research is related to understanding the efficacy of federal extreme heat-related communication efforts. One bill in the 119th Congress proposed that FEMA conduct a study to evaluate the effectiveness of extreme heat emergency alerts and language used in such alerts and examine metrics for defining and communicating the severity and risks of extreme heat, among other issues.[112] Whether FEMA or NOAA is the appropriate agency to conduct this research is an open question. A bill in the 119th Congress would direct NOAA to develop metrics to track and evaluate the agency's hazardous event communications, including those related to extreme heat episodes, and perform post-event surveys and assessments.[113] The bill also would

[107] Matt Simon, "Funding to Protect American Cities from Extreme Heat Just Evaporated," June 4, 2025, *Grist*, https://grist.org/cities/funding-american-cities-extreme-heat-noaa-ira/.

[108] H.R. 4953 in the 118th Congress.

[109] NOAA, *Report to Congress: Subseasonal and Seasonal Forecasting Innovation: Plans for the Twenty-First Century*, 2020, p. 25, https://repository.library.noaa.gov/view/noaa/27408, archived April 9, 2025, at https://perma.cc/BDG7-KDVV.

[110] Catherine C. Ivanovich et al., "Stickiness: A New Variable to Characterize the Temperature and Humidity Contributions Toward Humid Heat," *Journal of Atmospheric Sciences*, vol. 81, no. 5 (May 1, 2024), pp. 819-837.

[111] NIHHIS and IWG on Extreme Heat, *National Heat Strategy*, p. 19.

[112] H.R. 3661 in the 119th Congress.

[113] S. 258 in the 119th Congress.

instruct the Government Accountability Office to examine NWS's system for timely public notification of hazardous event alerts and updates.

Role in Addressing Extreme Heat Exposure and Vulnerability

Stakeholders and some Members of Congress have suggested expanding NOAA's role to more broadly understanding and addressing the overall risk of extreme heat by including exposure and vulnerability, in addition to its current focus on extreme heat as a hazard (see **Figure 3**). This would include, for example, activities to improve understanding of the impacts of extreme heat episodes and to assess and assist nonfederal extreme heat planning, preparedness, response, and adaptation.

Some stakeholders may contend that NOAA, through NIHHIS, could broaden its current activities and assess the overall risk of extreme heat on agriculture, energy, health, housing, labor, and transportation.[114] Bills in the 119th Congress would direct other agencies to evaluate or fund research into the impacts of extreme heat on certain communities, sectors, and health outcomes but would provide no role for NOAA.[115] Some observers may argue that such assessments would be too similar to the extreme heat findings in what has been included in the USGCRP-led *National Climate Assessments*.[116]

Alternatively, Congress could direct NOAA to estimate the economic costs of extreme heat episodes. As noted, until May 2025, NOAA released information about disasters estimated to cost $1 billion or more, relying primarily on costs of damage to infrastructure and agriculture. Extreme heat episodes mostly incur costs in other ways, such as decreases in labor productivity and increases in mortality, occupational injuries, and health care costs generally. Congress could direct NOAA to continue to release such estimates moving forward. Bills in the 119th Congress, so far, would direct NOAA to conduct a one-time economic impact study of the financial costs of extreme heat, including quantifying the dollar value of loss of life, medical assistance, life and health insurance claims, workers compensation, and other costs.[117] The bills also would require the agency to recommend how best to develop and implement a national tracking system of heat-related medical assistance costs, deaths, and labor productivity.

Some may argue that it is not NOAA's role to assess the overall risk of extreme heat beyond just understanding the hazard. For example, one stakeholder group has proposed to direct the Congressional Budget Office to estimate the costs of extreme heat to the United States.[118] Alternatively, NOAA could work in conjunction with other federal agencies to develop such estimates, as it has on other heat-related products (e.g., HeatRisk with CDC) and other types of datasets (e.g., the Marine Economy Satellite Account with the Bureau of Economic Analysis).[119]

[114] FAS, "2025 Heat Policy Agenda."

[115] H.R. 903/S. 341 and H.R. 3661 in the 119th Congress.

[116] USGCRP, "Chapter 2: Climate Trends," in *Fifth National Climate Assessment*, 2023. In April 2025, the Trump Administration dismissed the USGCRP authors; it is unclear whether the next assessment, set to be published in 2027, will be developed and released (Rebecca Hersher, "White House Dismisses Authors of Major Climate Report," April 29, 2025, NPR, https://www.npr.org/2025/04/29/nx-s1-5380816/climate-assessment-authors-released).

[117] H.R. 3702/S. 1743 in the 119th Congress.

[118] FAS, "2025 Heat Policy Agenda."

[119] NWS, "HeatRisk"; and Bureau of Economic Analysis, "Marine Economy," https://www.bea.gov/data/special-topics/marine-economy.

NOAA has supported efforts to help nonfederal entities better plan for extreme heat events under the broader umbrella of NIHHIS. However, some note that gaps remain. In the 118th Congress, one proposal would have directed NOAA, through the National Academies of Science, Engineering, and Medicine, to identify policy, research, operations, communications, and data gaps affecting regional heat-health planning, preparedness, response, and adaptation and to provide recommendations to address the gaps.[120] The bill also would have directed the NIHHIS Director, through NOAA, to financially assist various nonfederal entities to reduce heat-health risks and support training programs and various data, research, communication, and preparedness actions.[121] Other legislation introduced in the 119th Congresses would direct EPA to provide grants to communities to develop and implement plans to mitigate the impacts of extreme heat or for heat mitigation and management projects.[122]

By contrast, some stakeholders may support no federal involvement. They may contend that state and local governments and other entities should primarily support funding for planning, preparedness, and response at the community level.

Funding

NOAA and other federal agencies do not track how much they spend on extreme heat-related activities per year. Congress could direct NOAA to track its own spending and to work with other entities to develop an annual interagency estimate of such activities to determine whether the level of funding appropriately supports congressional goals.

Congress has not appropriated funds specifically for extreme-heat activities until recently; instead, NOAA historically used funding appropriated for broader programs to fund its extreme heat-related activities.[123] By contrast, in recent years, Congress has directed NOAA to fund specific extreme heat-related activities. For example, in FY2024 report language, Congress directed OAR, through NIHHIS, to support research to "advance heat resilience across all U.S. geographies."[124] In FY2023 report language, Congress also instructed OAR, through NIHHIS, to "study and raise awareness about the many impacts of extreme heat."[125] In addition, NOAA allocated some funding provided in IRA toward extreme heat-related research and the establishment of the Centers of Excellence.[126] In January 2025, however, the Trump

[120] H.R. 4953 in the 118th Congress. The National Academies of Science, Engineering, and Medicine (NASEM) have supported extreme heat-related work, most recently through workshops held in 2023 and 2025, for example (NASEM, *Communities, Climate Change, and Health Equity: Lessons Learned in Addressing Inequities in Heat-Related Climate Change Impacts: Proceedings of a Workshop-in Brief*, 2023; and NASEM, "Extreme Weather and Lessons for More Resilient Communities: Board of Atmospheric Sciences and Climate 2025 Spring Meeting," May 5-6, 2025, https://www.nationalacademies.org/event/44902_05-2025_extreme-weather-and-lessons-for-more-resilient-communities-board-on-atmospheric-sciences-and-climate-2025-spring-meeting).

[121] H.R. 4953 in the 118th Congress.

[122] H.R. 903/S. 341 in the 119th Congress.

[123] For example, see NOAA, *NOAA Budget Estimates FY2025*, 2024, p. OAR-37 and PDF p. 987, https://www.noaa.gov/sites/default/files/2024-03/NOAA_FY25_Congressional_Justification.pdf, archived April 1, 2025, at https://perma.cc/ZZD7-2KW3.

[124] S.Rept. 118-62, p. 48, referred to within Senator Patty Murray, "Unanimous Consent Agreement –H.R. 4366," *Congressional Record*, vol. 170 (March 5, 2024), p. S1398.

[125] Senator Patrick Leahy, "Explanatory Statement Submitted by Sen. Leahy, Chair of the Senate Committee on Appropriations, Regarding H.R. 2617, Consolidated Appropriations Act, 2023," *Congressional Record*, vol. 168, part 1 (December 20, 2022), p. S7911.

[126] For example, NOAA, "Regional Climate Data and Information," https://www.noaa.gov/inflation-reduction-act/inflation-reduction-act-climate-data-and-services/regional-climate-data-and-information, archived April 9, 2025, at (continued...)

Administration paused the disbursement of funds appropriated through the IRA,[127] and some news sources have since reported funding for the centers was canceled.[128] Congress may consider whether to retain its practice of including extreme heat-related directives in language accompanying annual appropriations law, establishing a budget line item specifically for NIHHIS, or allowing the agency to use funds from across the agency. Alternatively, Congress could develop other mechanisms to fund such efforts. For example, legislation in the 119th Congress would set up a fund for various federal agencies to support efforts to address extreme heat, among other topics.[129] Congress could consider expanding the pool of agencies to include NOAA, in support of the agency's existing or new activities. Some may argue that any or additional funding for such efforts would be better spent elsewhere.

Coordination

NOAA and CDC established NIHHIS in 2015 at the agency level to "facilitate an integrated approach to providing a suite of decision support services to reduce heat related illness and death."[130] Some stakeholders have argued for the codification in statute and explicit funding of NIHHIS. One group has contended that "insufficient congressional support prevents NIHHIS from reaching its full potential to lead effectively and engage across sectors and organizations" and that NIHHIS is disproportionally underfunded in comparison to other interagency efforts.[131] Another group suggested the creation of a NIHHIS Interagency Committee (e.g., leadership at each partner agency) and a National Heat Executive Council (i.e., a nonfederal advisory council).[132] It is not clear whether NOAA would remain cochair of NIHHIS under the proposal and what the agency's responsibilities would entail, although some have proposed NOAA take the lead in regularly reviewing and updating the NIHHIS *National Heat Strategy.*[133]

In the 119th Congress, some Members of Congress have introduced legislation to codify NIHHIS as a program within NOAA and to coordinate with other agencies on a research program on heat health, among other topics. The bills also would establish the NIHHIS Interagency Committee, to include representatives from departments and agencies that historically have been a part of

https://perma.cc/25D4-V22F; NOAA, "Biden-Harris Administration Invests $4.55 Million for Community Heat Resilience Through Investing in America Agenda," May 20, 2024, https://www.noaa.gov/news-release/biden-harris-administration-invests-4-point-55-million-for-community-heat-resilience, archived April 9, 2025, at https://perma.cc/AN2Y-9BUB; and NOAA, "NOAA Awards $700,000 to Communities, Academia for Extreme Heat Planning, Research," January 14, 2025, https://www.noaa.gov/news-release/noaa-awards-700-thousand-dollars-to-communities-academia-for-extreme-heat-planning-research, archived April 9, 2025, at https://perma.cc/DB2K-DY8Y.

[127] Executive Office of the President, "Unleashing American Energy," 90 *Federal Register* 8357, January 29, 2025.

[128] Matt Simon, "Funding to Protect American Cities from Extreme Heat Just Evaporated," June 4, 2025, *Grist,* https://grist.org/cities/funding-american-cities-extreme-heat-noaa-ira/; and Ariel Wittenberg, "Inside Trump's Purge of Federal Heat Experts," June 9, 2025, *Climate Wire, E&E News by Politico*, https://www.eenews.net/articles/inside-trumps-purge-of-federal-heat-experts/.

[129] H.R. 1135/S. 25 in the 119th Congress.

[130] Hunter Jones et al., "The National Integrated Heat Health Information System (NIHHIS)," presentation to the Global Heat Health Information Network, December 18, 2018, p. 3, https://ghhin.org/wp-content/uploads/5.-2018-12-18-NIHHIS-Overview-for-GHHIN-Forum.pdf.

[131] Heat Policy Innovation Hub, *Confronting Heat Challenges*, p. 15.

[132] FAS, "Hot Policy Ideas to Tackle the Extreme Heat Crisis," March 31, 2024, Day One Project, https://fas.org/accelerator/extreme-heat-policy-challenge/; and FAS, "2025 Heat Policy Agenda."

[133] Daniel J. Metzger, "The National Heat Strategy is a Strong First Step," *Climate Law: A Sabin Center Blog*, August 26, 2024, https://blogs.law.columbia.edu/climatechange/2024/08/26/national-heat-strategy/ (hereinafter Metzger, "Strong First Step," 2024).

NIHHIS and additional ones.[134] NOAA would be cochair of the committee and tasked with directing the committee's work, including developing a strategic plan; coordinating across federal agencies; and building partnerships with nonfederal entities. Some may argue that NIHHIS is duplicative of other interagency groups, such as USGCRP's Interagency Crosscutting Group on Climate Change and Human Health, led by CDC, NOAA, and EPA.[135] Still others may argue that the federal government should have a minimal role in addressing natural hazards, such as extreme heat, and efforts should be left to states and localities, as supported in President Trump's March 2025 executive order.[136] According to NOAA staff interviewed by some news sources, the Trump Administration's changes to federal agency staffing at NOAA, CDC, FEMA, the Department of Health and Human Services, and the Small Business Administration has limited NIHHIS's ability to continue its work "in anything other than putting a forecast out" and it is unclear whether the interagency group will continue to exist.[137]

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[134] S. 325/H.R. 3704 in the 119th Congress.

[135] Some news sources reported that the Trump Administration terminated the contracts supporting the USGCRP, so it is unclear whether the Interagency Crosscutting Group on Climate Change and Human Health (CCHHG) remains active. CCHHG released a report entitled *Review of Current Comprehensive Heat Vulnerability and Adaptation Indices: Analysis of Regional Differences and Gaps in Knowledge* in September 2023 (USGCRP, "Interagency Crosscutting Group on Climate Change and Human Health (CCHHG)," https://www.globalchange.gov/our-work/interagency-groups/cchhg, archived May 5, 2025, at https://perma.cc/FQ6E-QSU5).

[136] Executive Order 14239, "Achieving Efficiency Through State and Local Preparedness," 90 *Federal Register* 13267, March 21, 2025.

[137] Ariel Wittenberg, "Inside Trump's Purge of Federal Heat Experts," June 9, 2025, *Climate Wire, E&E News by Politico*, https://www.eenews.net/articles/inside-trumps-purge-of-federal-heat-experts/.