

Climate and Health in Region 7

Understanding the Impacts and Preparing for the Future



Agenda



Climate Change and Extreme Climate Events in Region VII



Health Impacts of Climate Change



What Can We Do?

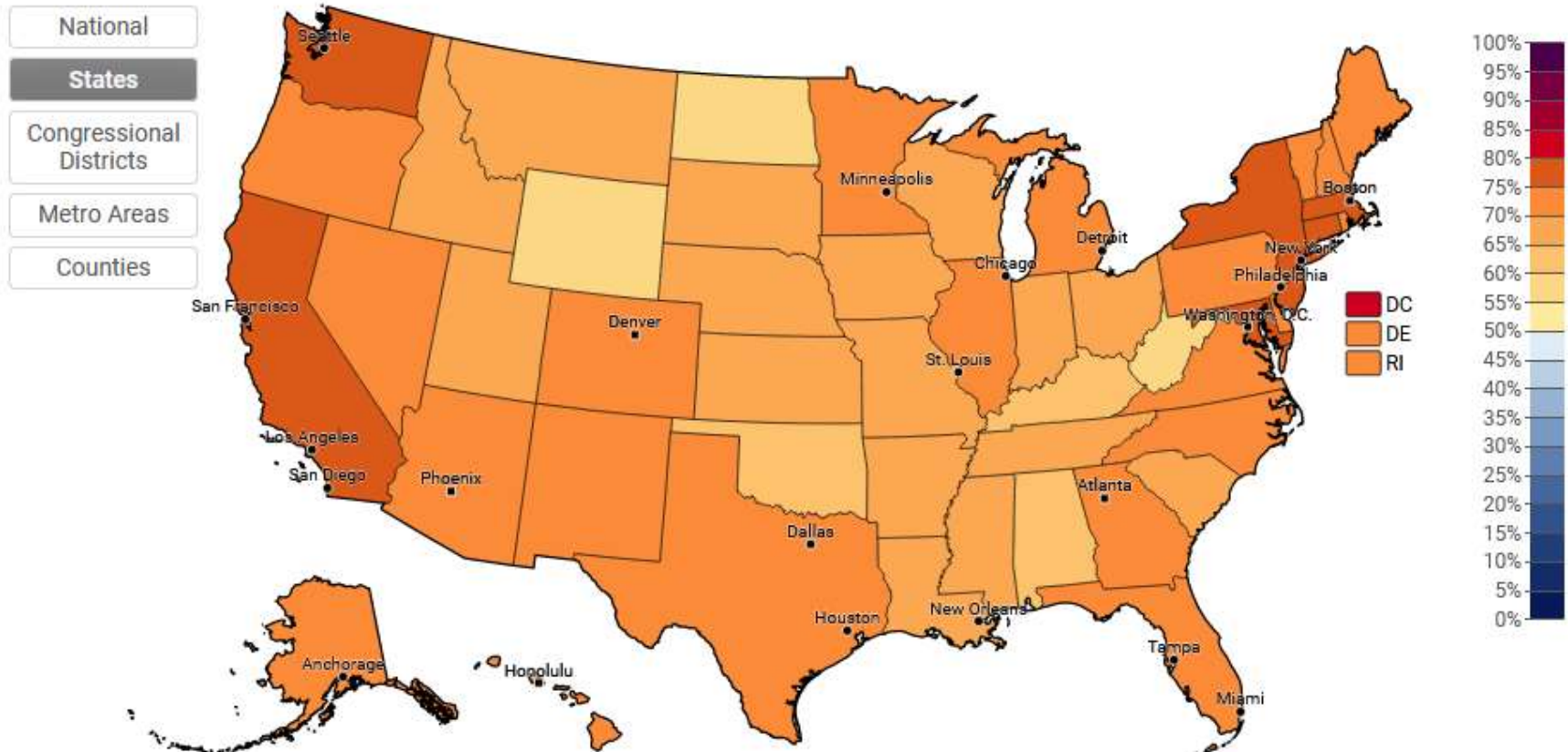


Estimated % of adults who think global warming is happening (nat'l avg. 72%), 2021

Select Question: Global warming is happening

Absolute Value

Click on map to select geography, or: Select a State



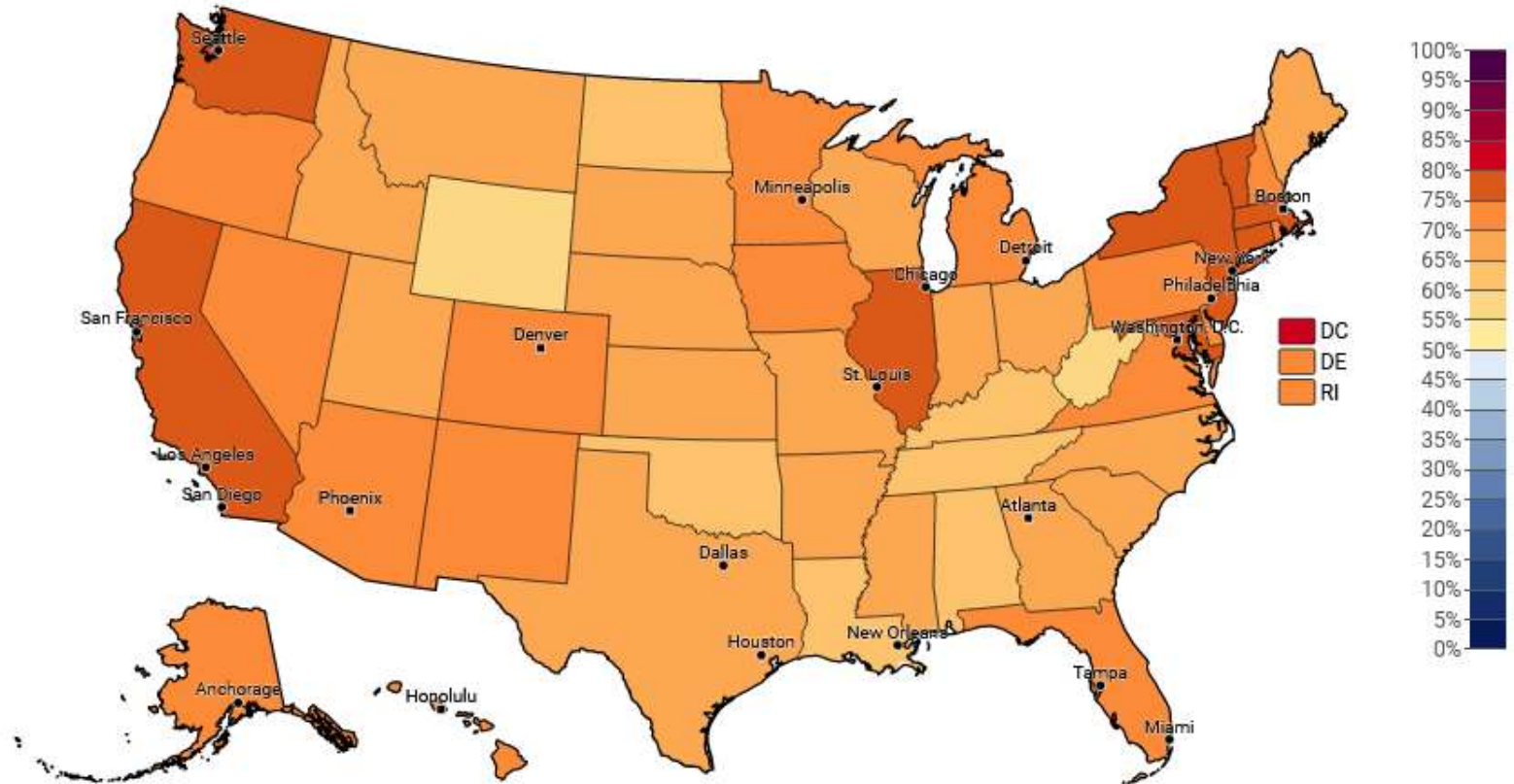
Estimated % of adults who think global warming will harm plants and animals (nat'l avg. 71%), 2021

Select Question: Global warming will harm plants and animals

Click map or: Select a State

Absolute Value

National States Cong. Districts Metro Areas Counties



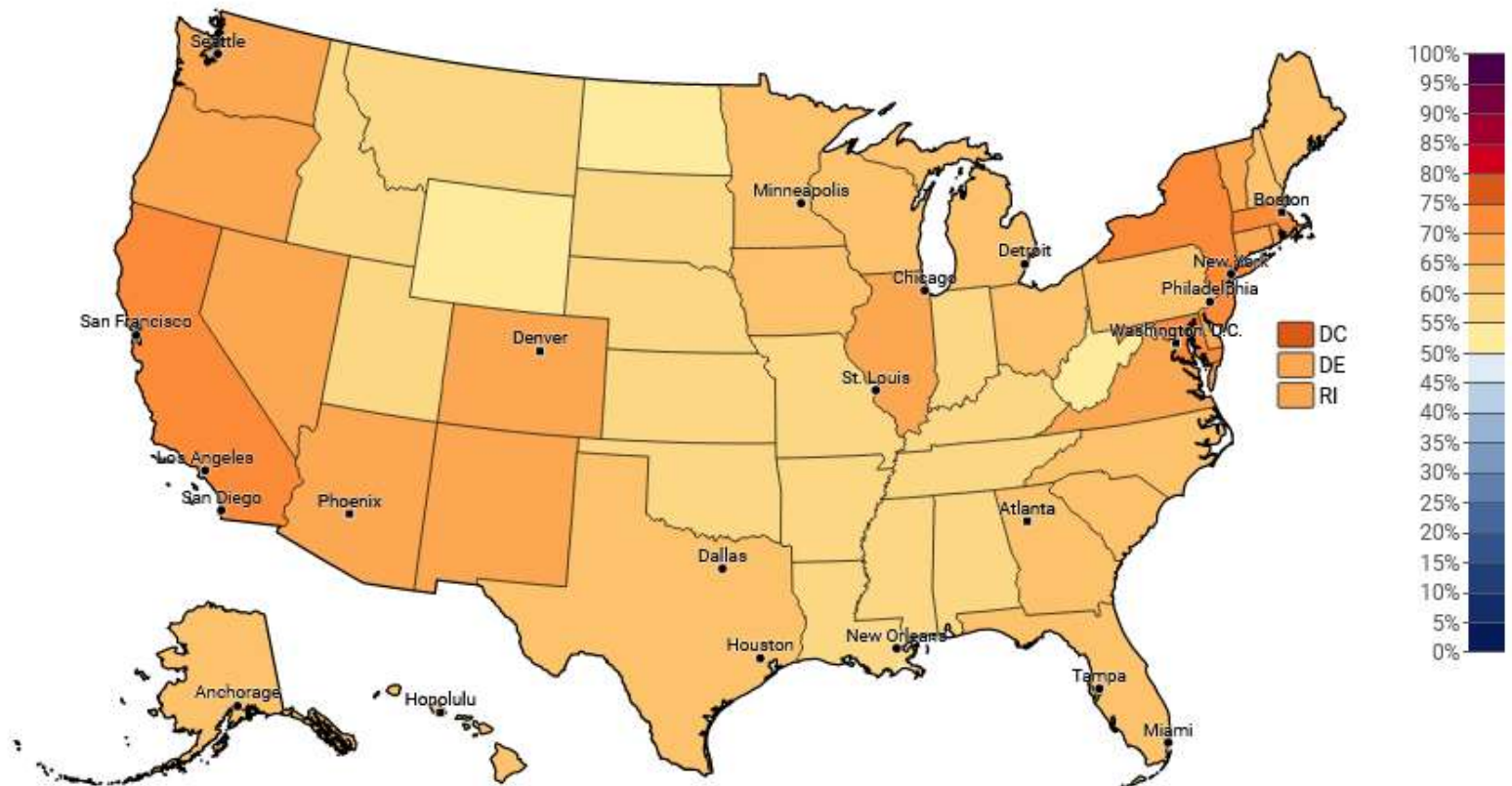
Estimated % of adults who think global warming will harm people in the US (nat'l avg. 64%), 2021

Select Question: Global warming will harm people in the US

Click map or: Select a State

Absolute Value

National States Cong. Districts Metro Areas Counties





Climate Change & Extreme Climate Events in Region VII

Weather vs. Climate

Climate is what you expect, weather is what you get.



What is Climate?



Weather is the current conditions of the atmosphere

Extremely variable
What is it like outside?



Climate is the behavior of the atmosphere over long time periods

Is a Nebraska summer warmer than a Nebraska winter?
Florida vs. Nebraska
This year vs. a previous year

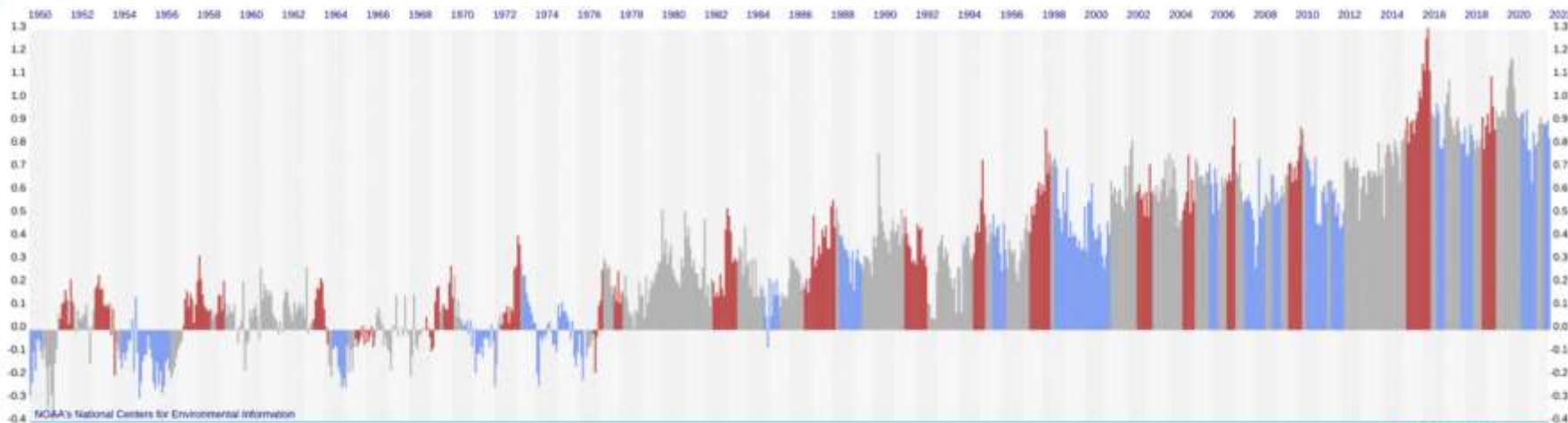


Climate Change vs. Climate Variability

Climate change is a long-term continuous change in temperature and weather patterns

Climate variability is fluctuation above or below the long-term average

Extreme Weather are weather phenomena that are outside the usual historical distribution (flooding rains, heat waves, droughts, etc.)



Global Surface Temperature Departures (°C), colored by monthly ENSO values
Jan 1950 through Dec 2021

El Niño Months
ENSO Neutral Months
La Niña Months



Major U.S. Climate Trends



Wildfires

Wildfires in the West start earlier in the spring, last later into the fall, and burn more acreage.



Heat Waves

Heat waves have become more frequent and intense, especially in the West.



Drought

Drought has increased in the West. Over the last decade, the Southwest has experienced the most persistent droughts on record.



Cold Waves and Winter Storms

Cold waves have become less frequent and intense across the Nation. Winter storms have increased in frequency and intensity since the 1950s and their tracks have shifted northward.



Rising Temperatures

U.S. average temperature has increased by 1.3°F to 1.9°F since record keeping began in 1895. Warming has been the greatest in North and West while some parts of the Southeast have experienced little change.



Floods

Floods have been increasing in parts of the Midwest and Northeast.



Extreme Precipitation

Heavy downpours are increasing nationally, especially over the last three to five decades. The largest increases are in the Midwest and Northeast.



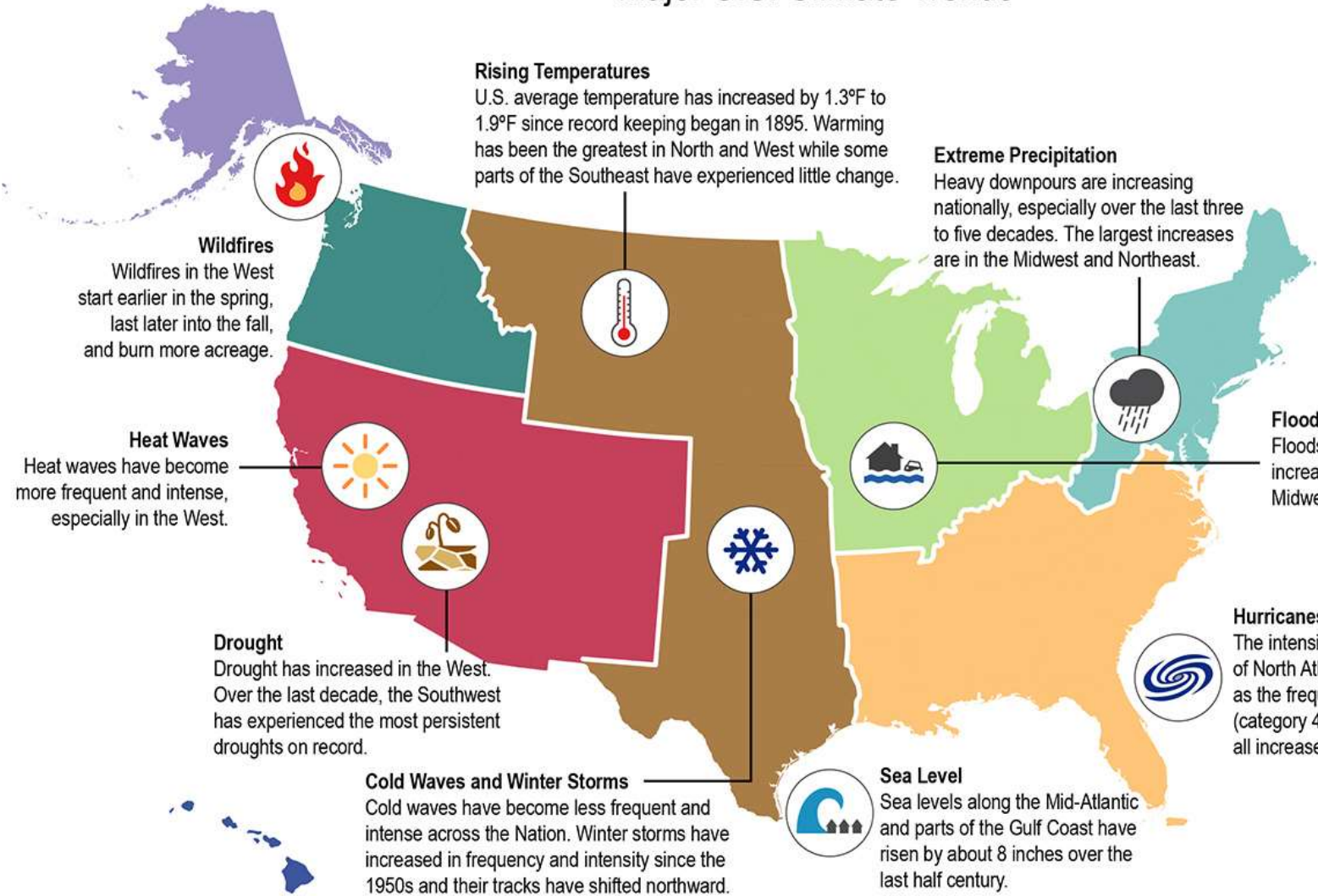
Hurricanes

The intensity, frequency, and duration of North Atlantic hurricanes, as well as the frequency of the strongest (category 4 and 5) hurricanes, have all increased since the early 1980s.



Sea Level

Sea levels along the Mid-Atlantic and parts of the Gulf Coast have risen by about 8 inches over the last half century.



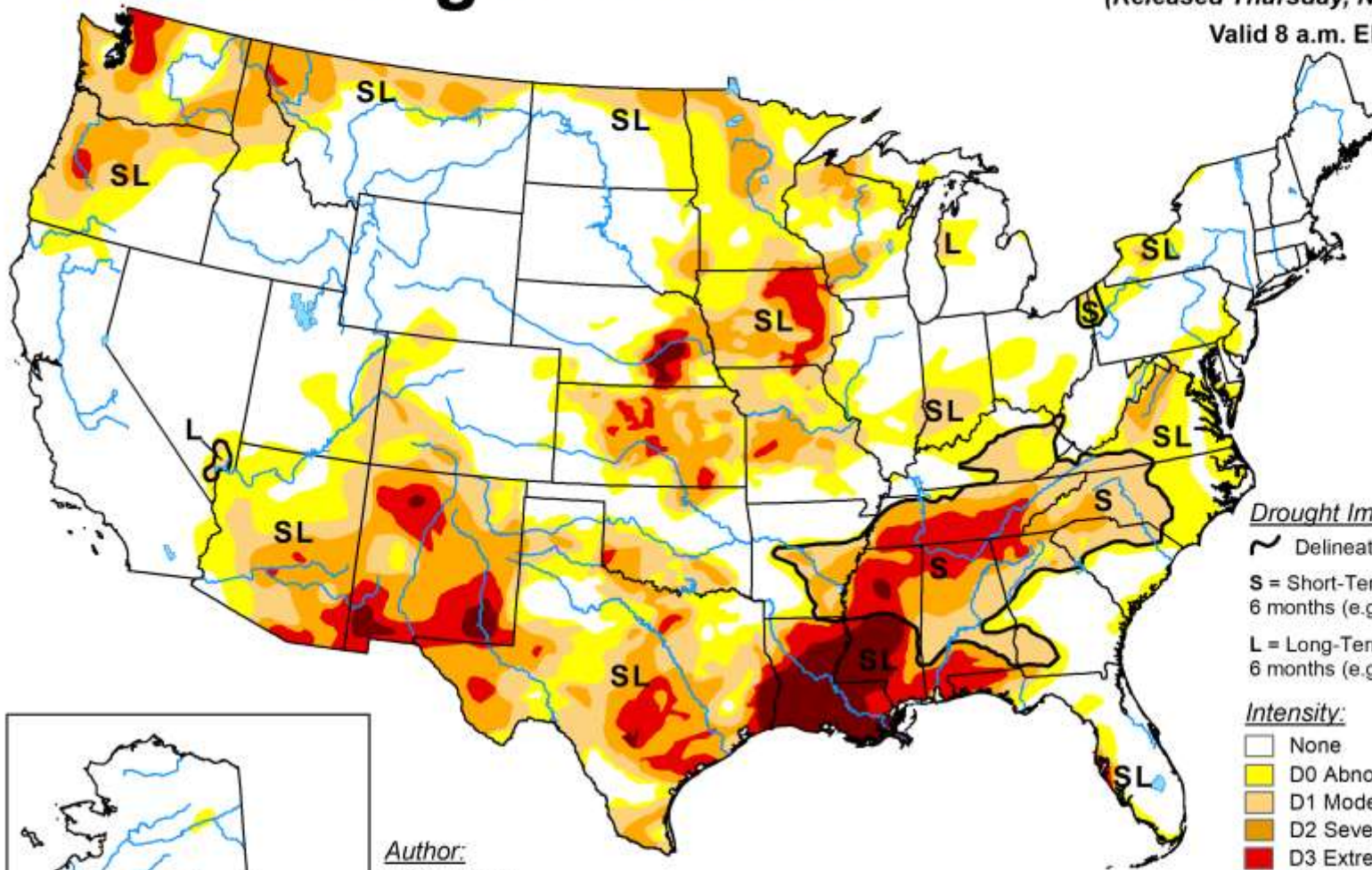
**What climate events have you
seen in your
state/community?**



U.S. Drought Monitor

October 31, 2023
(Released Thursday, Nov. 2, 2023)

Valid 8 a.m. EDT

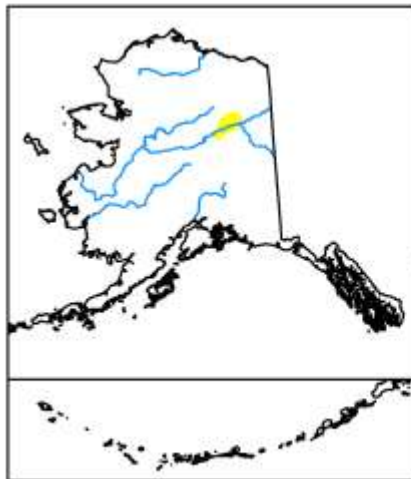


Drought Impact Types:

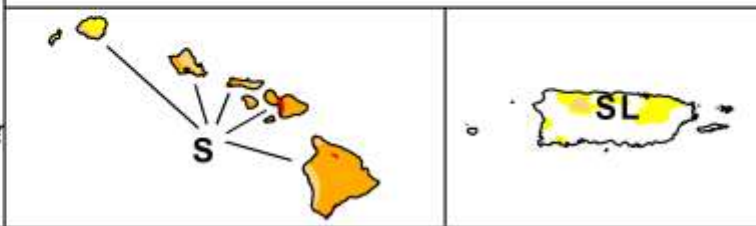
- ~ Delineates dominant impacts
- S = Short-Term, typically less than 6 months (e.g. agriculture, grasslands)
- L = Long-Term, typically greater than 6 months (e.g. hydrology, ecology)

Intensity:

- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought



Author:
Brian Fuchs
National Drought Mitigation Center

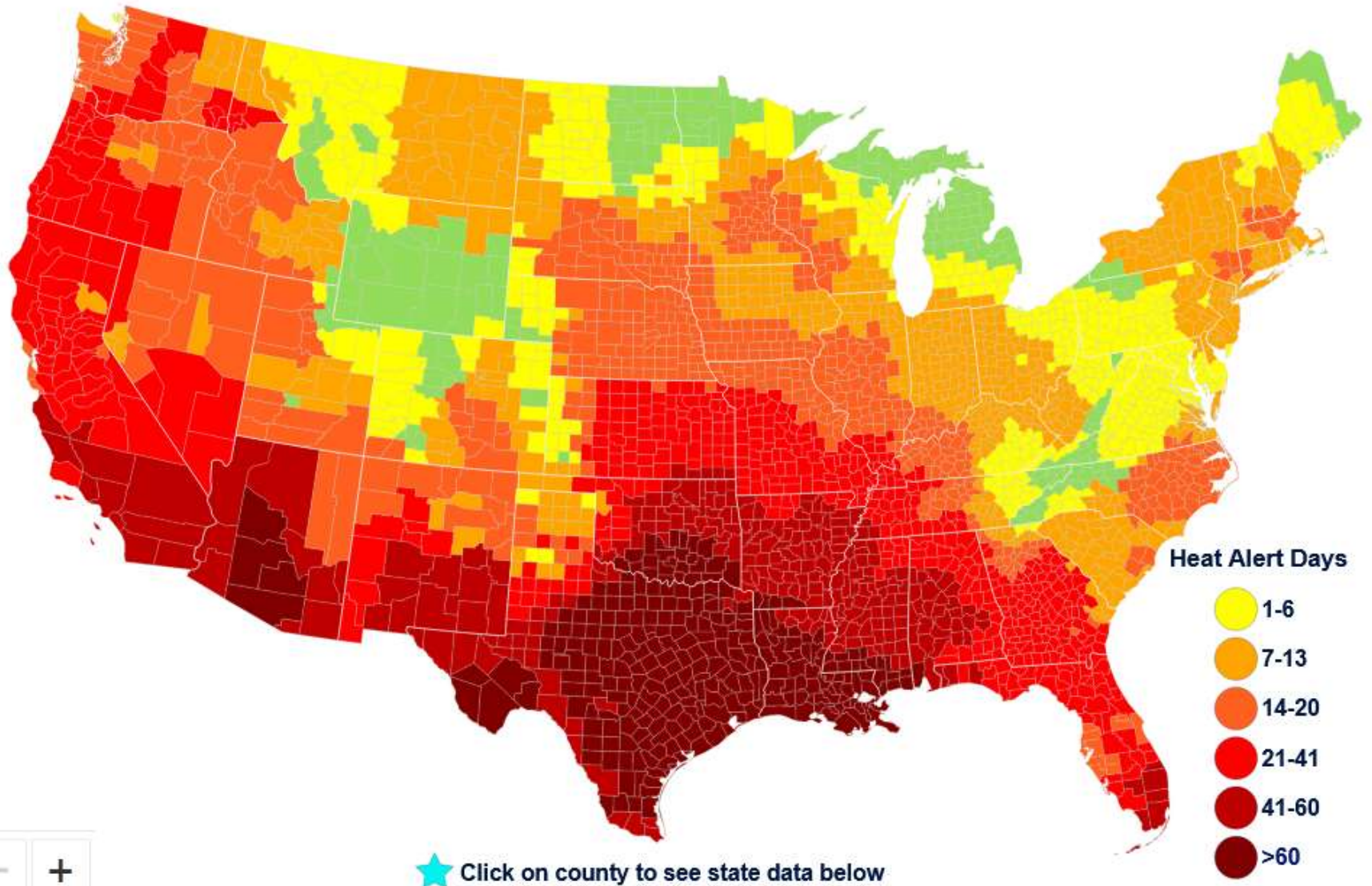


The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to <https://droughtmonitor.unl.edu/About.aspx>




droughtmonitor.unl.edu

Extreme Heat Alerts Issued May 1, 2023 – October 2, 2023



3 Downpours in 8 Days: How Extreme Rain Soaked the Midwest

Back-to-back deluges swamped Kentucky, Missouri and Illinois. These types of storms are expected to be more frequent and more intense as the planet warms, climate experts say.

 Share full article



 170



The United States has seen an increase in the frequency of extreme rainstorms as a result of climate change caused by humans. Robert Cohen/St. Louis Post-Dispatch, via Associated Press

By **Amanda Holpuch**

Aug. 5, 2022





Photo by: US Army Corps of Engineers

Flooding surrounding the Fort Calhoun Nuclear Plant



Jace Anderson/FEMA



US Army Corps of Engineers

Water overtopping the levee in Atchison County Missouri



The Great Flood of 2019: A Complete Picture of a Slow-Motion Disaster

By Sarah Almkhtar, Blacki Migliozi, John Schwartz and Josh Williams Sept. 11, 2019

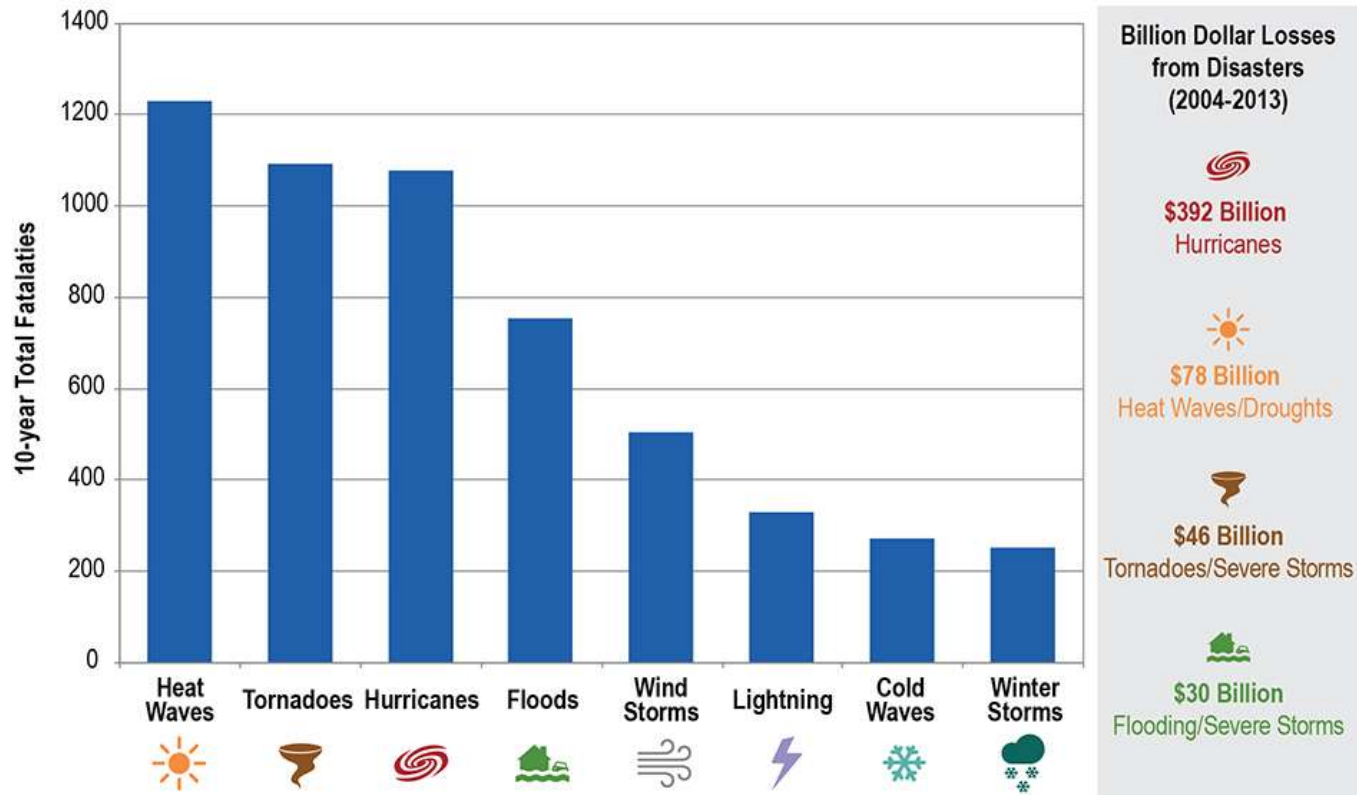


Homes are surrounded by floodwater on March 20, in Hamburg, Iowa, following a massive storm. NOAA forecast this week that flooding in the central US is going to get worse through May. | Scott Olson/Getty Images



Costs of Extreme Events

Estimated Deaths and Billion Dollar Losses
from Extreme Events in the U.S., 2004–2013

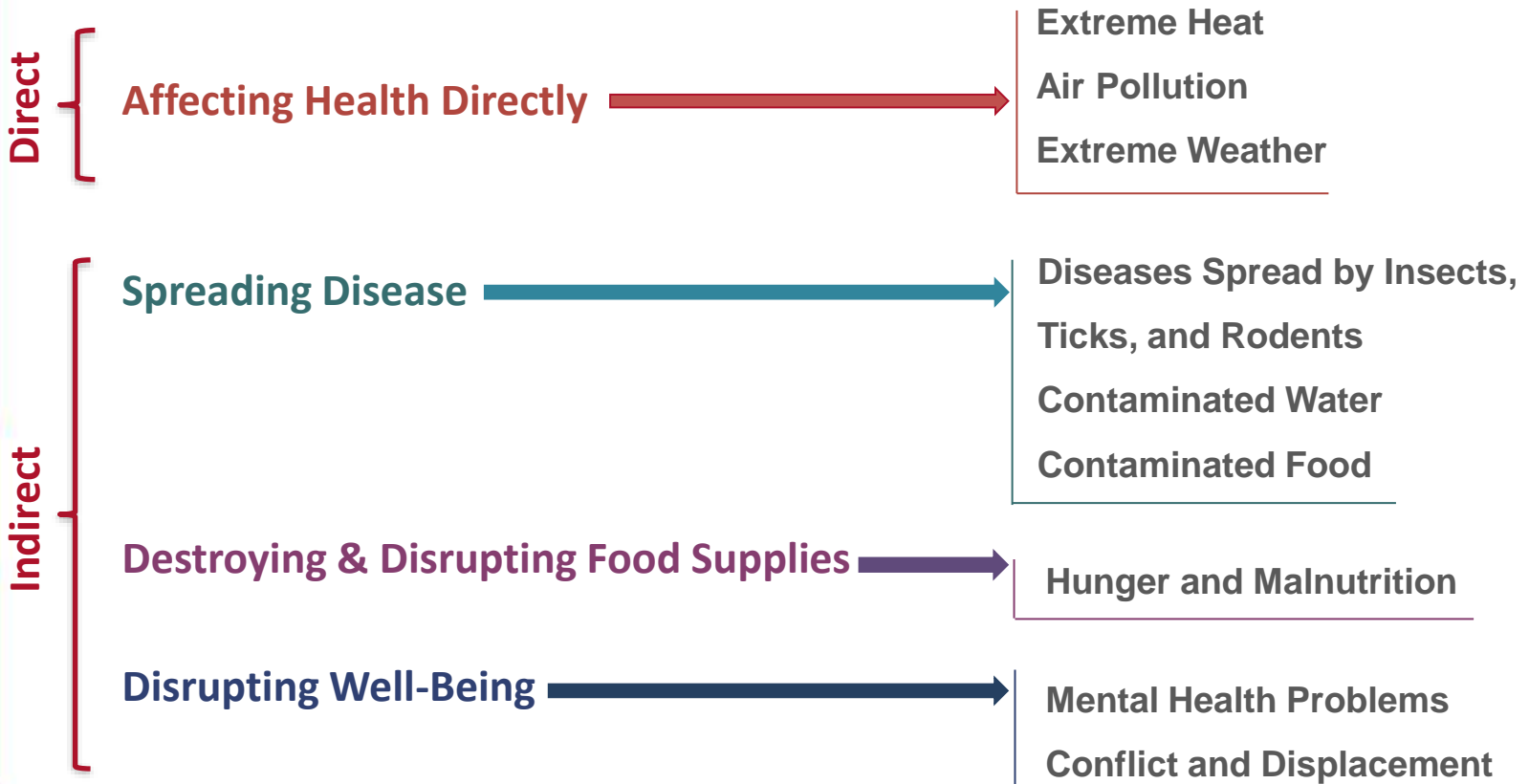




Climate Change & Health



Climate is Affecting Your Health

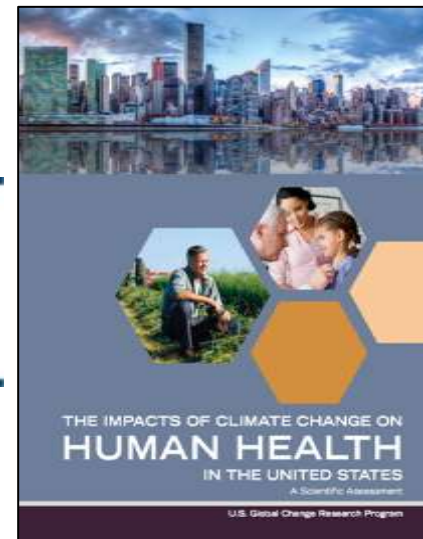


Executive Summary

Climate change is a significant threat to the health of the American people.

Every American is vulnerable to the health impacts associated with climate change

health2016.globalchange.gov



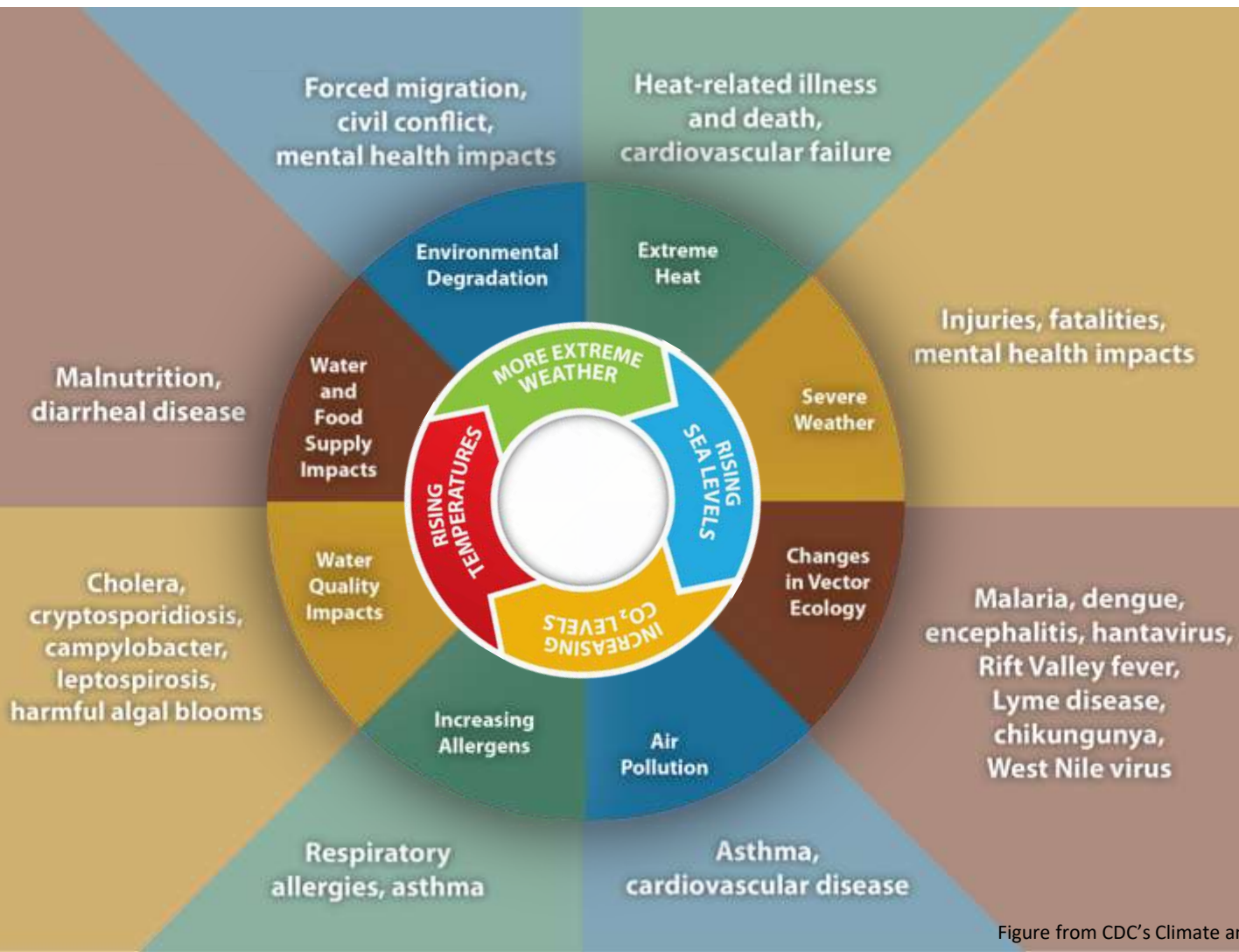
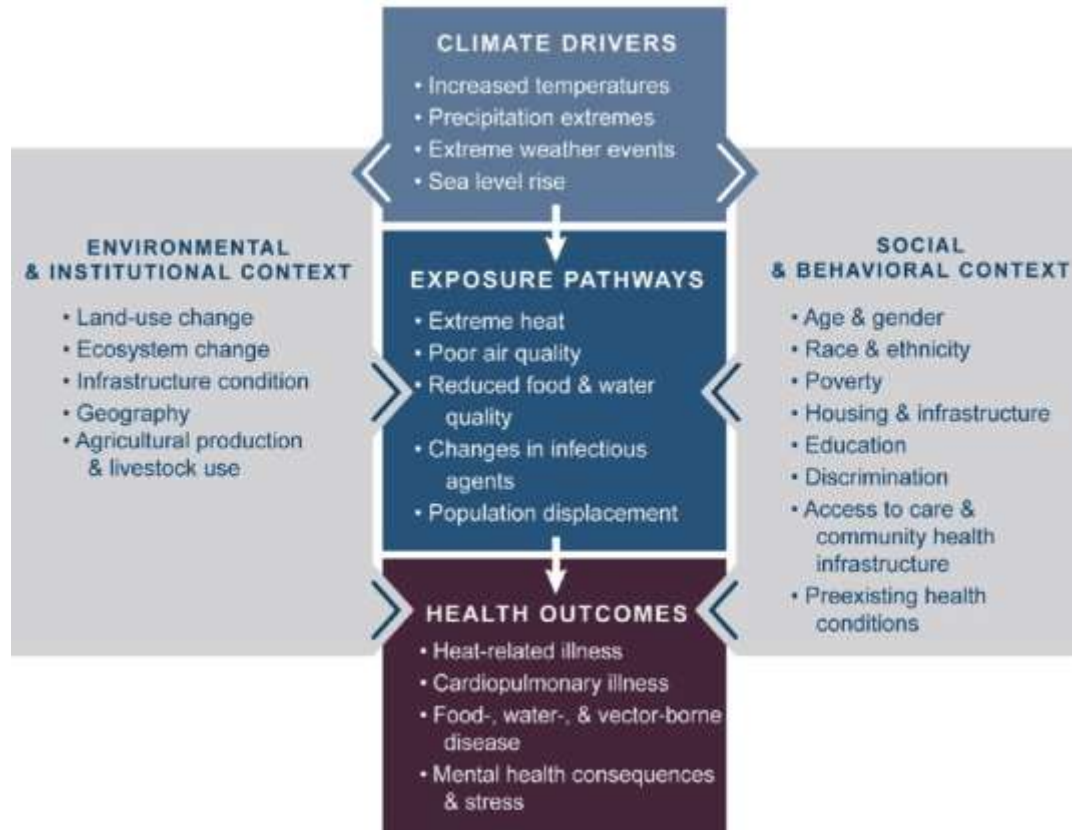


Figure from CDC's Climate and Health Program

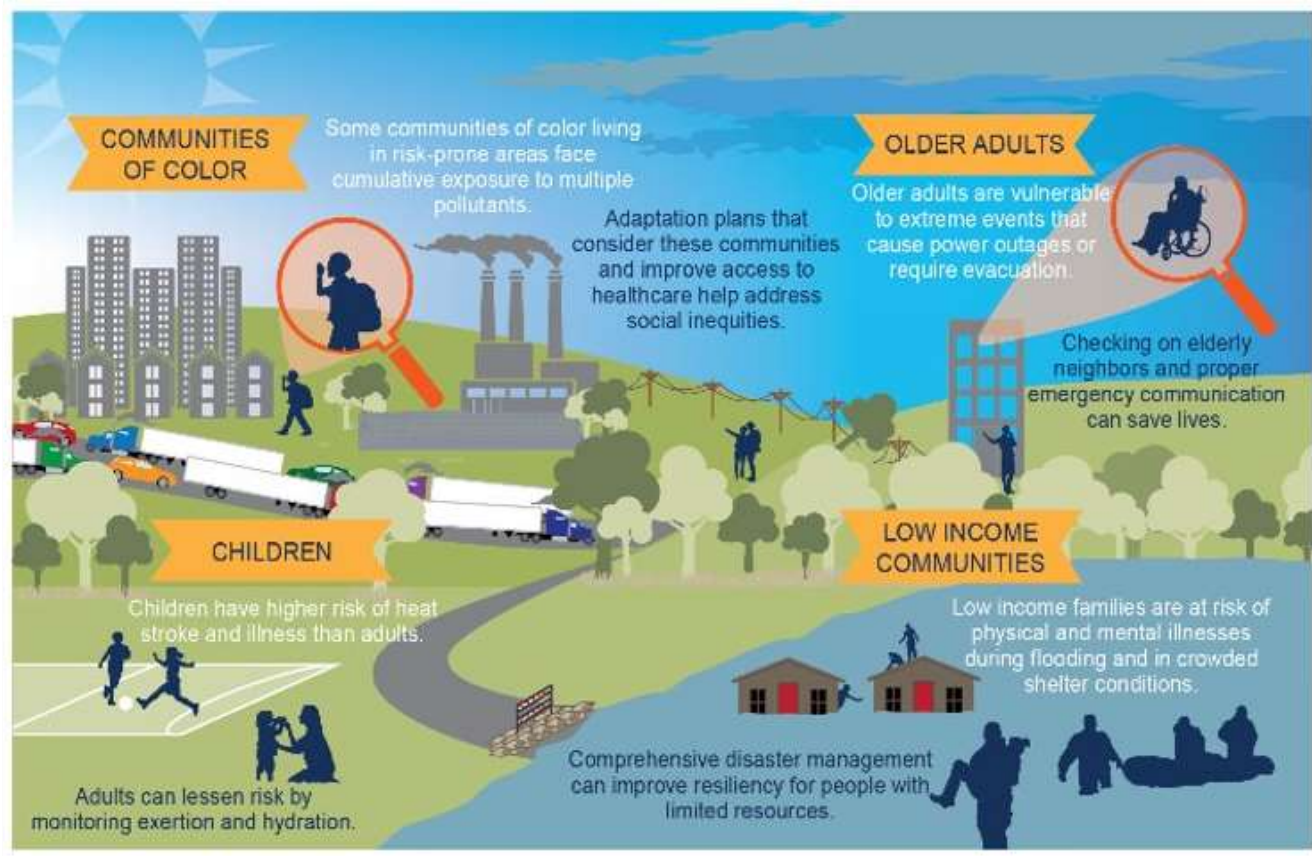
Climate Change and Health



How we prepare and respond influences the outcomes



Populations of Concern

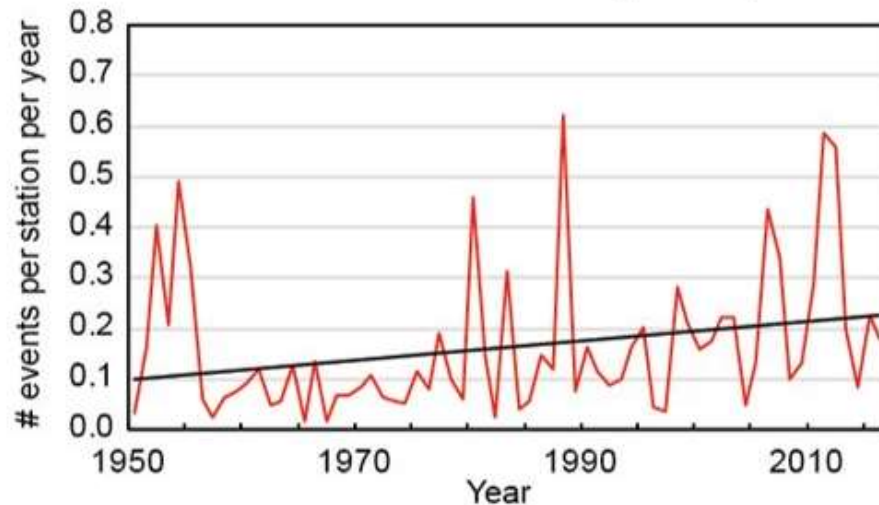




Extreme Heat

Extreme Heat

Heat Wave Index: 4-day, 1-in-5yr



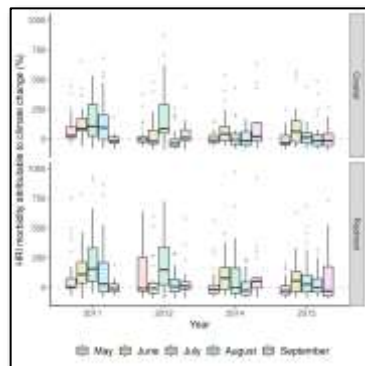
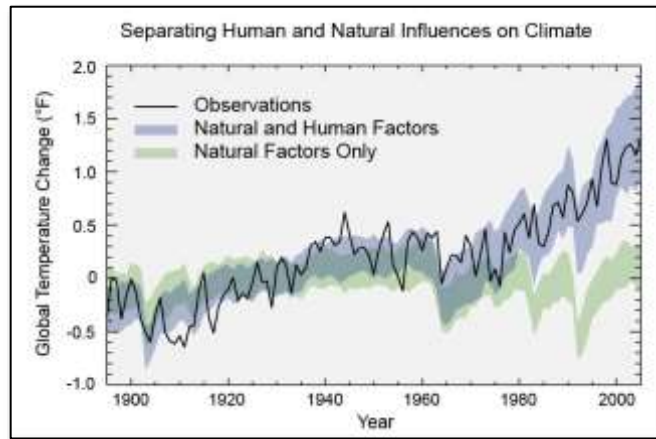
Increased temperatures, higher humidity, longer and more frequent heat waves

Heat stroke, dehydration, and heat-related illness

At-risk populations: Outdoor workers, student athletes, people in cities, people without air conditioning, people with chronic diseases, pregnant women, older adults, and young children



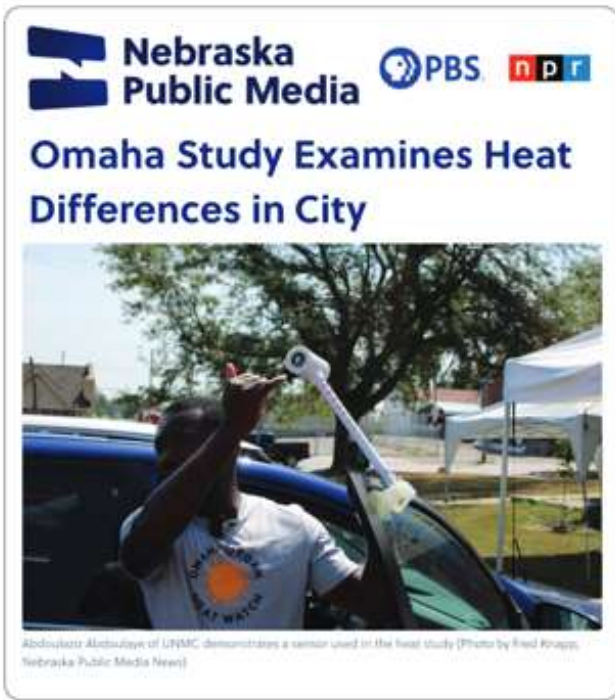
Heat Impacts are Now



In North Carolina, 13.4% and 16.4% of emergency room visits for heat-related illness from 2011-2016 occurred because of climate change.

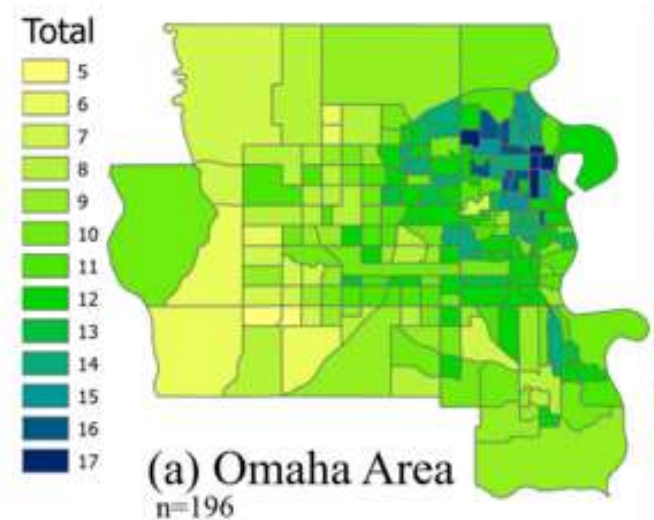


Mapping Heat in Omaha



Jalalzadeh Fard, B., et al. (2021). Mapping heat vulnerability index based on different urbanization levels in Nebraska, USA. *GeoHealth*, 5, e2021GH000478.

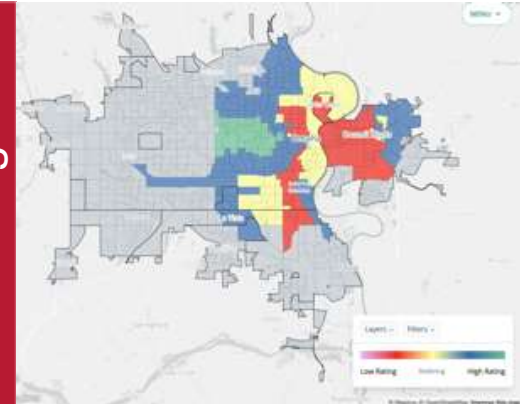
Heat Vulnerability



Hospitalizations



Redlining



An aerial photograph showing a stark contrast between a blue body of water on the left and a vast expanse of cracked, dry, brown earth on the right. The cracks in the earth form a complex, irregular pattern. A red banner with white text is overlaid on the cracked earth. In the top right corner, there is a red triangular graphic containing a white stylized logo.

Flooding, Drought, & Extreme Weather

Extreme Weather



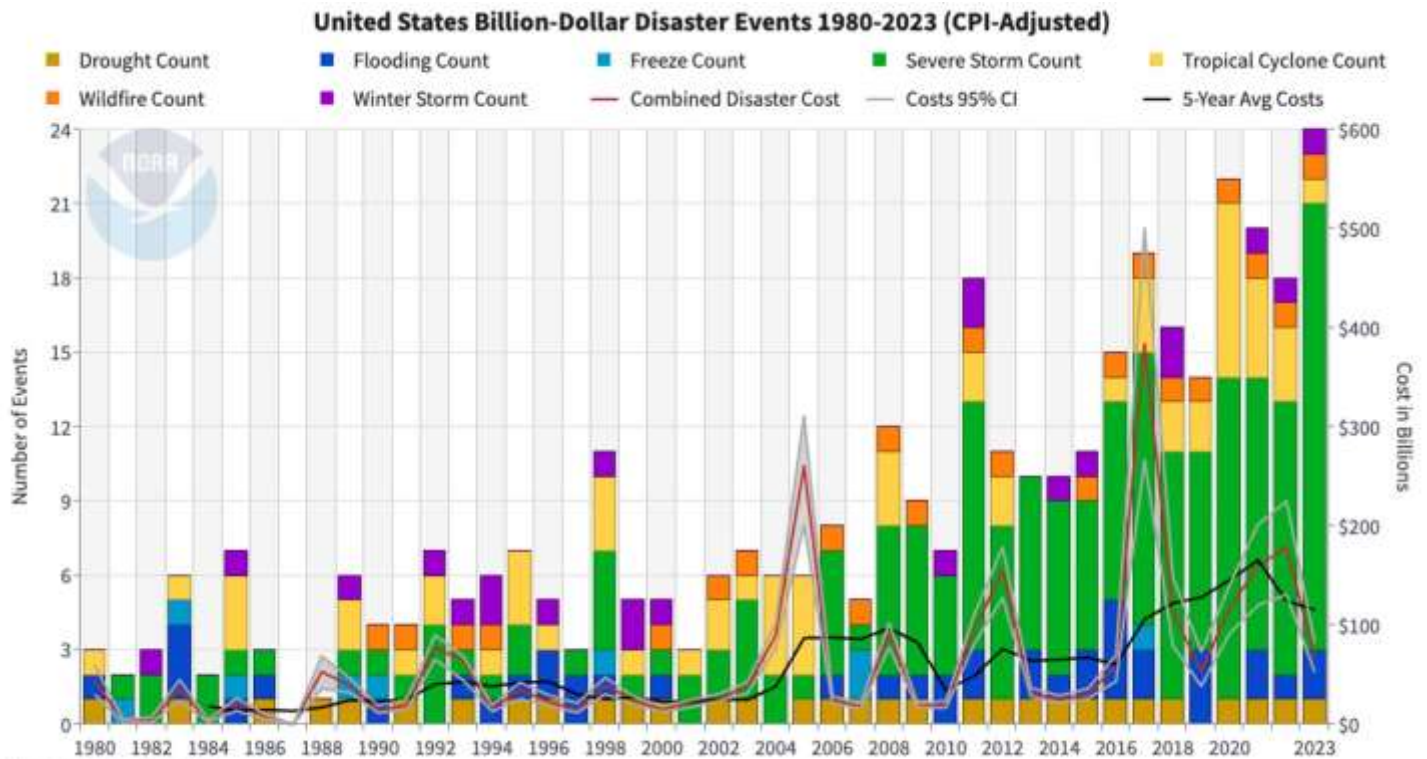
Increased frequency and severity of heavy downpours, floods, droughts, and major storms

Injury, illness, displacement, and death

At-risk populations: People who lack access to evacuation routes and people who can't use stairs when elevators are out of service, people in wheelchairs, older adults, the poor, and people with disabilities, particularly if they are unable to access elevators and evacuation routes



Increase in Billion Dollar Disasters



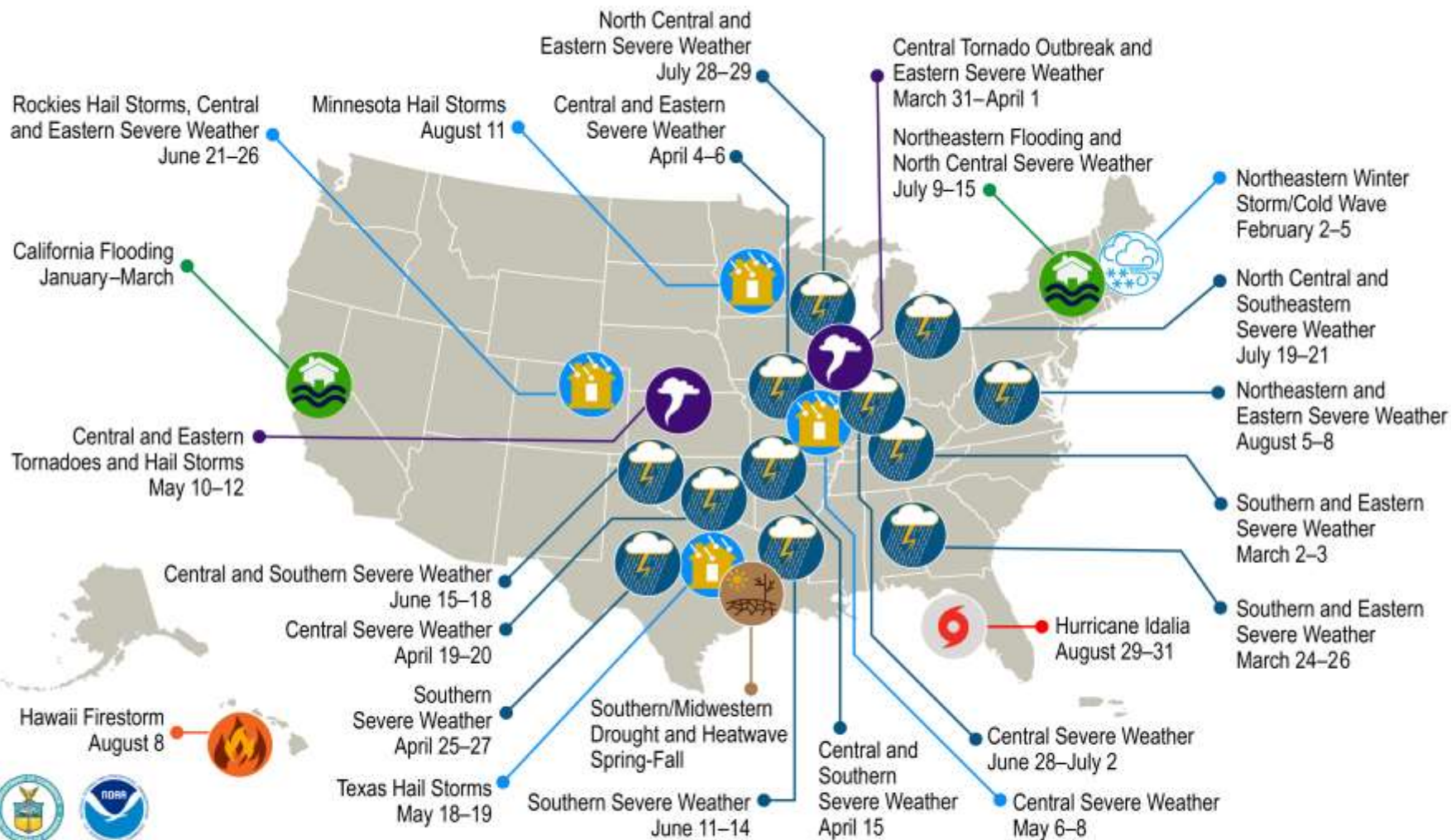
Updated: October 10, 2023

Powered by ZingChart



U.S. 2023 Billion-Dollar Weather and Climate Disasters

Drought/Heat Wave
 Flooding
 Hail
 Hurricane
 Severe Weather
 Tornado Outbreak
 Wildfire
 Winter Storm/Cold Wave



This map denotes the approximate location for each of the 24 separate billion-dollar weather and climate disasters that impacted the United States through September 2023.



Missouri River and North Central Flooding

March 2019

\$10.8 Billion Dollars of Economic Loss

3 Deaths

Hundreds Displaced

Costliest inland flooding event in U.S. history

At least 2 hospitals sustained damage

At least a dozen long term care facilities were evacuated

Lack of access to care

- Flooded roads
- Damaged infrastructure



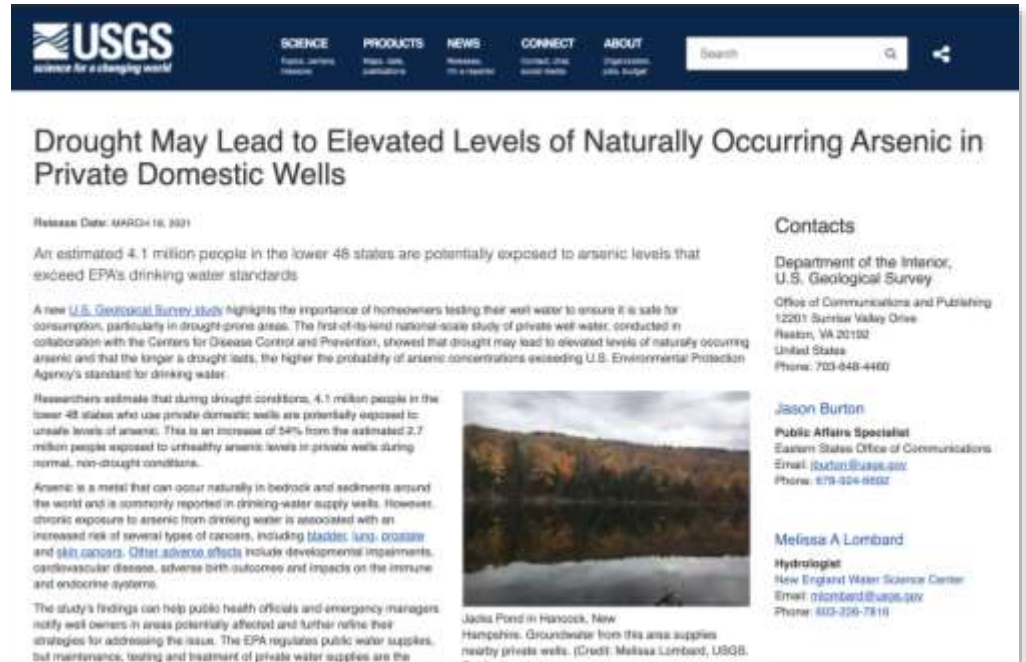
Water Quality



Surface Water



Groundwater



USGS
science for a changing world

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Drought May Lead to Elevated Levels of Naturally Occurring Arsenic in Private Domestic Wells

Release Date: MARCH 16, 2021


An estimated 4.1 million people in the lower 48 states are potentially exposed to arsenic levels that exceed EPA's drinking water standards.

A new [U.S. Geological Survey study](#) highlights the importance of homeowners testing their well water to ensure it is safe for consumption, particularly in drought-prone areas. The first-of-its-kind national-scale study of private well water, conducted in collaboration with the Centers for Disease Control and Prevention, showed that drought may lead to elevated levels of naturally occurring arsenic and that the longer is drought lasts, the higher the probability of arsenic concentrations exceeding U.S. Environmental Protection Agency's standard for drinking water.

Researchers estimate that during drought conditions, 4.1 million people in the lower 48 states who use private domestic wells are potentially exposed to unsafe levels of arsenic. This is an increase of 54% from the estimated 2.7 million people exposed to unhealthy arsenic levels in private wells during normal, non-drought conditions.

Arsenic is a metal that can occur naturally in bedrock and sediments around the world and is commonly reported in drinking-water supply wells. However, chronic exposure to arsenic from drinking water is associated with an increased risk of several types of cancers, including [bladder](#), [lung](#), [breast](#) and [skin cancers](#). [Other adverse effects](#) include developmental impairments, cardiovascular disease, adverse birth outcomes and impacts on the immune and endocrine systems.

The study's findings can help public health officials and emergency managers notify well owners in areas potentially affected and further refine their strategies for addressing the issue. The EPA regulates public water supplies, but maintenance, testing and treatment of private water supplies are the



Jacks Pond in Hancock, New Hampshire. Groundwater from this area supplies nearby private wells. (Credit: Melissa Lombard, USGS).

Contacts

Department of the Interior,
U.S. Geological Survey
Office of Communications and Publishing
12201 Sunrise Valley Drive
Reston, VA 20192
United States
Phone: 703-648-4460

Jason Burton
Public Affairs Specialist
Eastern States Office of Communications
Email: jburton@usgs.gov
Phone: 678-924-8932

Melissa A Lombard
Hydrologist
New England Water Science Center
Email: mlombard@usgs.gov
Phone: 603-250-7811



Air Quality

- Increased wildfires, smog, pollen, and mold
- Asthma, respiratory, and allergy issues
- At-risk populations: People with heart and respiratory conditions such as heart disease, asthma, or chronic lung disease



Spreading Disease: INSECTS, TICKS, AND RODENTS

- Higher temperatures, changes in rain patterns, and disrupted ecosystems
- Lyme disease, West Nile disease, etc.
- At-risk populations: People who spend more time outdoors in places where these insects and other disease-carriers live



Mental Health Problems

- Increased frequency and severity of extreme weather events
- Stress, depression, anxiety, PTSD, and suicidal thoughts
- At-risk populations: Children, older adults, pregnant and postpartum women, people with mental illnesses, lower socioeconomic status, people with housing instability, first responders, and people who rely on the environment for their livelihood



Drought & Stress in Farmers



The association between drought conditions and increased occupational psychosocial stress among U.S. farmers: An occupational cohort study

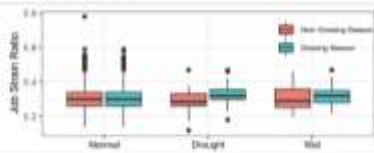
Jesse D. Berman^{a,*}, Marizen R. Ramirez^a, Jose E. Bell^b, Rocky Bhatta^c, Fredric Cerv^d, Nathan B. Fretwell^e

^a Division of Environmental Health Sciences, University of Minnesota School of Public Health, 430 Johnson Street SE, Minneapolis, MN 55455, USA
^b Environmental and Occupational Health Science Center, University of Minnesota School of Public Health, 430 Johnson Street SE, Minneapolis, MN 55455, USA
^c Center for Health and Safety, University of Minnesota School of Public Health, 430 Johnson Street SE, Minneapolis, MN 55455, USA
^d Department of Environmental and Occupational Health, University of Iowa College of Public Health, 181 Hawkins Drive, Iowa City, IA 52242, USA

HIGHLIGHTS

- Drought risk for farmers associated with psychosocial stress in workers.
- Farmers are a vulnerable population to occupational stress.
- A brief stress relief intervention could potentially benefit farm workers.
- Growing season drought increased farmers' occupational psychosocial stress.
- Drought planning should consider occupational psychosocial stress effects.

GRAPHICAL ABSTRACT



ABSTRACT

Background: Drought represents a globally relevant natural disaster linked to adverse health. Evidence has shown that drought may impact occupational stress in farmers. **Objective:** This occupational cohort study examined the association between drought conditions among Agricultural Workers' Cohort study, including 486 Minnesota U.S. farmers surveyed with a Job-Demand Questionnaire (JDQ), at six time points (in 112 farmers from 2012 through 2015). A longitudinal linear mixed effects model was used to estimate the change in job-demand ratio, a continuous measure of job-demand and psychosocial stress, during drought conditions measured with a 13-month agricultural production index. We further evaluated associations between drought and psychosocial job-demand and job-demand ratio, the job-demand components, and applied a stratified analysis to evaluate differences by geographic area, age, and geographic region. **Results:** During the growing season, the job-demand ratio increased by 0.011 (95% CI: 0.001, 0.021) during drought conditions, an effect equivalent to a one-half standard deviation change (SD) of 0.11, compared to non-drought conditions. The association between drought and the job-demand ratio was also observed for increases in the psychosocial job-demand (OR: 1.011; 95% CI: 1.004, 1.018) and job-demand ratio (OR: 1.011; 95% CI: 1.004, 1.018) components. Our results suggest a previously unobserved association between drought and increased occupational psychosocial stress among farmers. With health department and extension engagement to increase drought and other disaster planning could provide important health effects data for farm drought early warning systems and mitigation plans.
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* Corresponding author. Division of Environmental Health Sciences, University of Minnesota School of Public Health, 430 Johnson Street SE, Minneapolis, MN 55455, USA.
E-mail address: jesse@epi.umn.edu (J.D. Berman).

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Local Kansas farmer on alarming suicide rate: 'Nothing gets farmers more down than a drought'

By Emily Wenger



Drought causes stress in farmers





What Can We Do?

What can Healthcare do about climate change?

- Participate in more research before, during, and after a climate-related disaster to understand impacts and vulnerabilities
- Build climate-resilient health systems
 - Conducting vulnerability and adaptation assessments
 - Reduce vulnerabilities and build capacity to address climate disasters
 - 1/3 of excess deaths from Hurricane Maria were from delayed or interrupted health service (Kishore et al. 2018)
 - Disaster Risk Management Plans that address local climate threats
- Educate and train the next generation of health professionals



What can HCCs do?



Include climate change/extreme climate events in your Hazard Vulnerability Assessments



Conduct exercises around climate-related threats



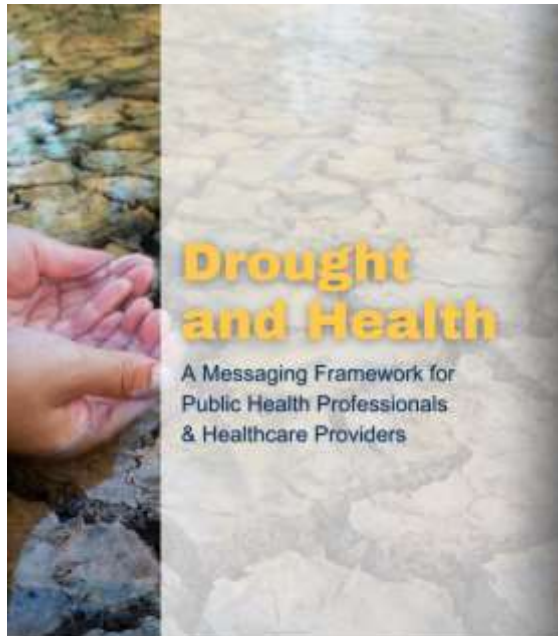
Connect with your state climatologists



**What would help your HCC
address climate change?**



Drought & Health Messaging Toolkit



The Stages of Drought

Drought is categorized into five severity-based stages. While different geographic locations face conditions specific to their region during each drought stage, there are certain drought stage characteristics that apply to all locations. See the [Drought Impacts by State and U.S. Drought Monitor Category](#) tool for more detailed information about drought stages specific to your location.



Figure 1. The Stages of Drought, adapted from NIDIS Drought Impacts. www.drought.gov/monitor/drought-stages

How do I know what stage of drought my area is experiencing?

Knowing what stage of drought your area is experiencing will help you tailor your response and messaging to the public. You can determine this quickly using the following sources:



1) The [County Drought Information System](#) tool here the National Integrated Drought Information System (NIDIS), which will give a county-level summary of drought conditions in your area.



2) The U.S. Drought Monitor at www.droughtmonitor.unl.edu.

3) Your state climatologist's office



Figure 2. Image from NIDIS County Drought Information. www.drought.unl.edu/nidis

The Health Impacts of Drought

Drought can have multiple impacts on public health. As a drought event occurs, changes in the environment can cause secondary impacts to emerge. Secondary impacts of drought can include changes in mosquito and tick habitats, loss of agriculture and food stability, decreases in water quality and quantity, more frequent wildfires, more frequent and intense heatwaves, and increased dust and dust storms. These impacts can happen over both short and long periods of time.



Each of these secondary impacts are associated with several negative health outcomes and one or more of these can increase the risk of 1) negative mental health outcomes (i.e.: depression, anxiety, and suicide), 2) infectious diseases (i.e.: West Nile virus & Lyme disease), 3) heat-related illnesses (i.e.: heat stroke and heat exhaustion), 4) respiratory illnesses (i.e.: exacerbation of asthma symptoms and hospitalizations), 5) gastrointestinal illness (i.e.: *Vibrio vulnificus* & *E. coli*), 6) injuries, 7) hunger or famine, and 8) allergy-related illnesses. It is important to note that environmental and socioeconomic factors can affect the severity and risk of each health outcome.



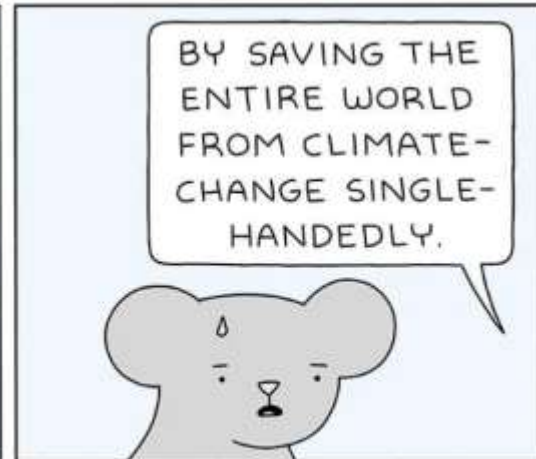
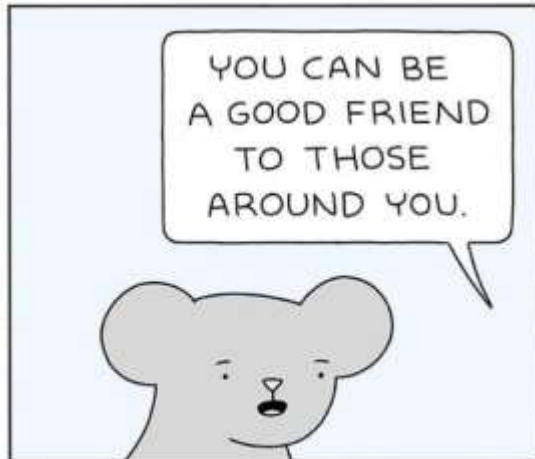
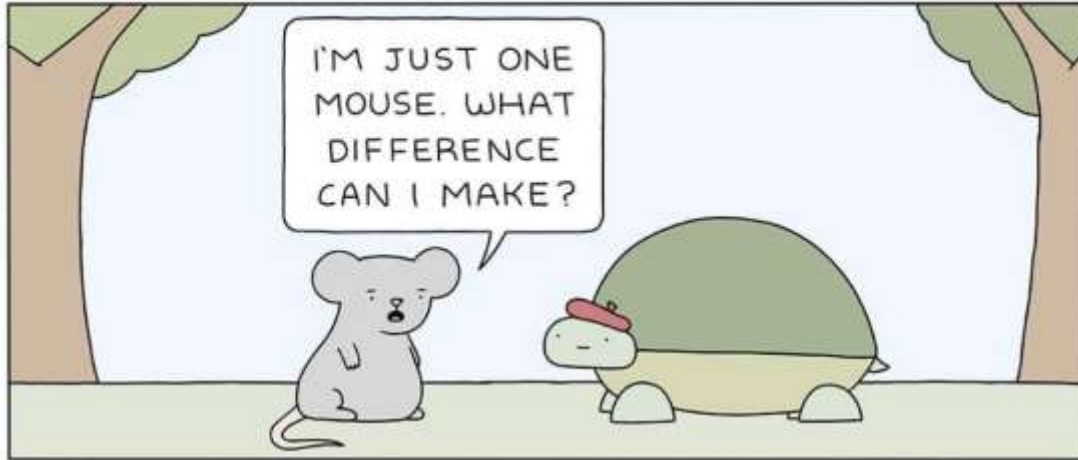
Figure 3. Image from NIDIS County Drought Information. www.drought.unl.edu/nidis



Closing thoughts

- Climate Change is a Significant Health Threat
- All people are vulnerable... some more than others
- Much to gain by combining expertise
- Multiple opportunities to address this issue
- **Lack of preparedness, planning, and understanding can increase the severity of a disaster**





POORLY DRAWN LINES





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