



NEW MEXICO
HEALTH
PROFESSIONALS
FOR CLIMATE ACTION

Asthma and Climate: Translating Science into Action

Paul Charlton, MD
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July 28, 2023

Limiting global warming to 1.5 - 2.0° C: A necessary and unique role for health professionals.

Edward Maibach, MPH, PhD
@MaibachEd



GEORGE MASON UNIVERSITY
CENTER for CLIMATE CHANGE
COMMUNICATION

Every child born today will be affected by climate change. How we respond will determine the world we live in tomorrow and will shape the health of children across the globe, at every stage of their lives.



“Greatest global health threat facing the world in the 21st century”

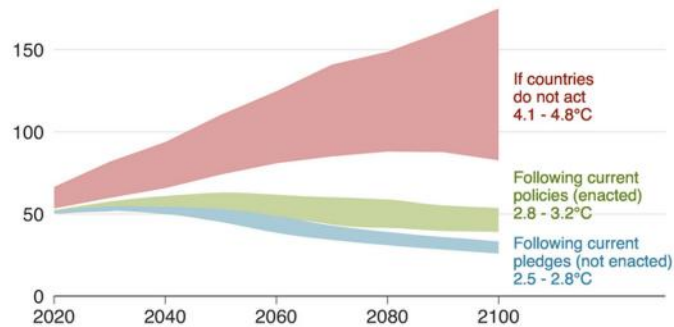
- Lancet Countdown

Most Americans understand that climate change is happening.

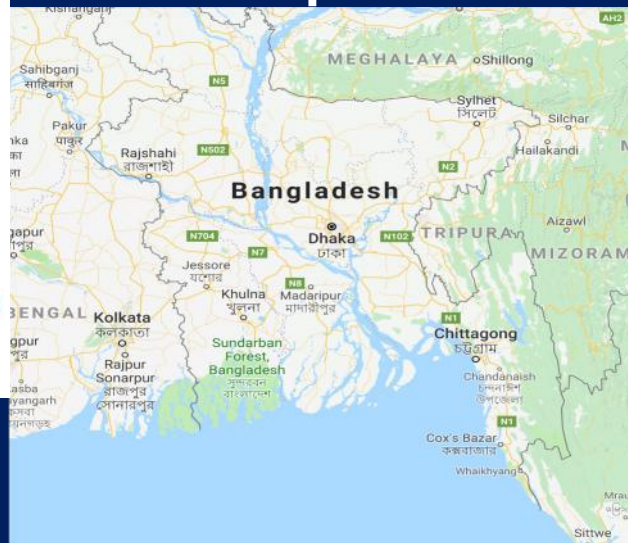
However, until recently they saw it as a distant threat...

in time

How much worse will the problem get?
Emissions* and expected warming by 2100



in space



in species



Slide: Courtesy Ed Maibach, 2023, used with permission

Watch

Home

Live

Reels

Shows

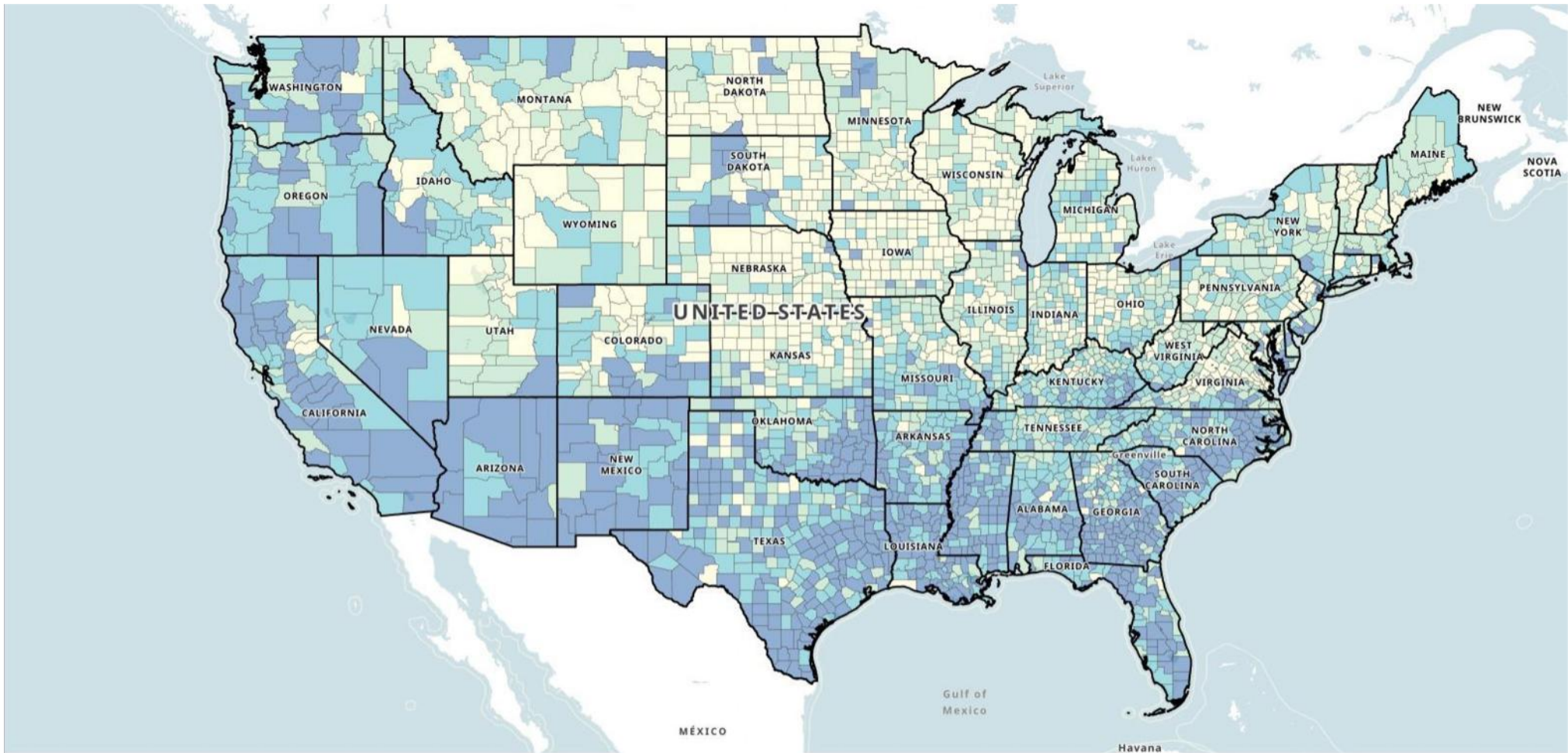
Explore



"Sheep Springs, NM" 🌩️👊

<https://www.facebook.com/teesto.az/videos/sheep-springs-nm/3301776903414763/>





<https://www.atsdr.cdc.gov/placeandhealth/svi/index.html>

Level of Vulnerability

Low

Low-Medium

Medium-High

High

No Data



Census Tract 35031945300,
Mckinley County, New Mexico

2020 Statewide Overall SVI Score:

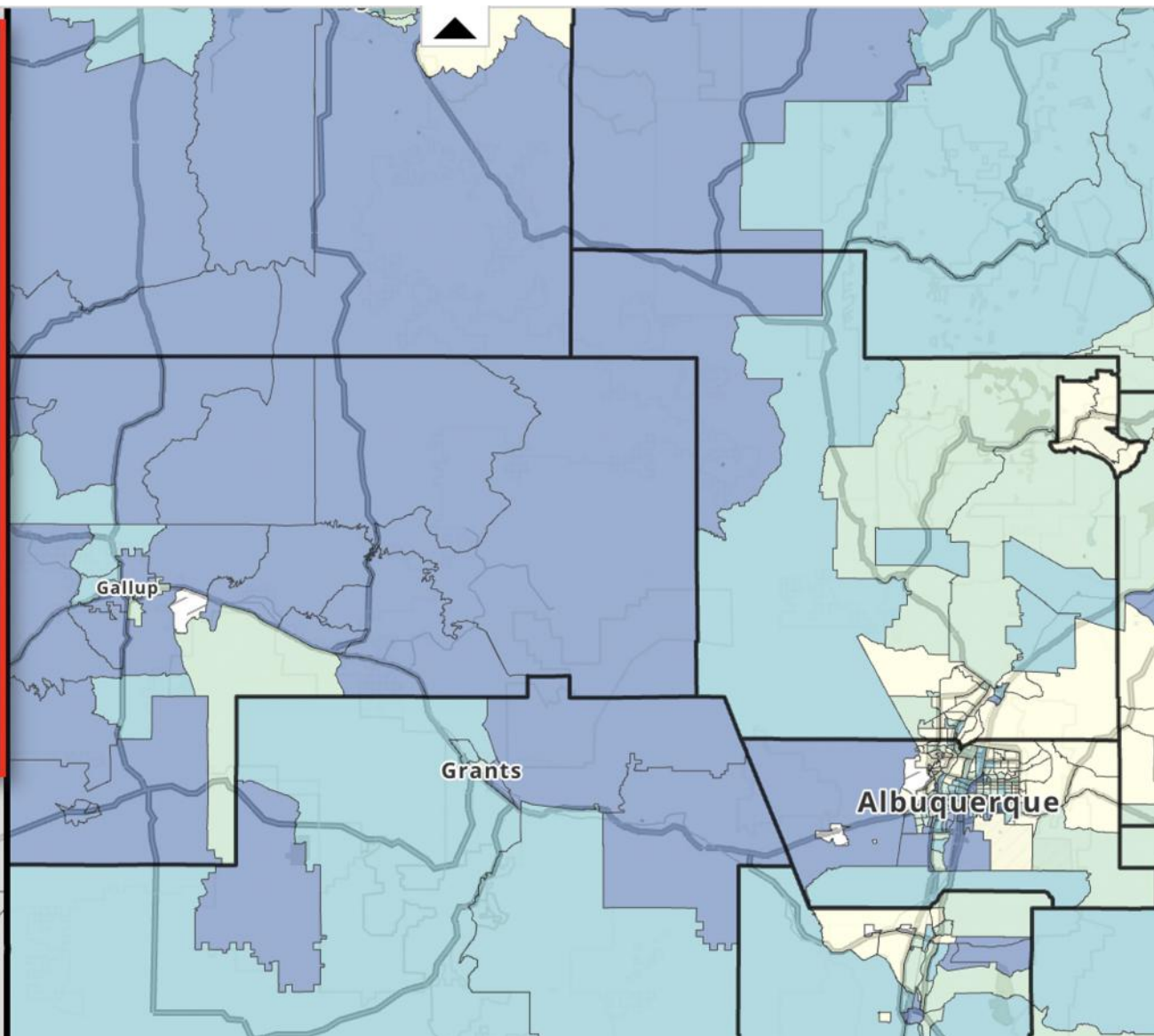
0.9883

Possible scores range from 0 (lowest vulnerability) to 1 (highest vulnerability).

A score of **0.9883** indicates a **high** level of vulnerability.

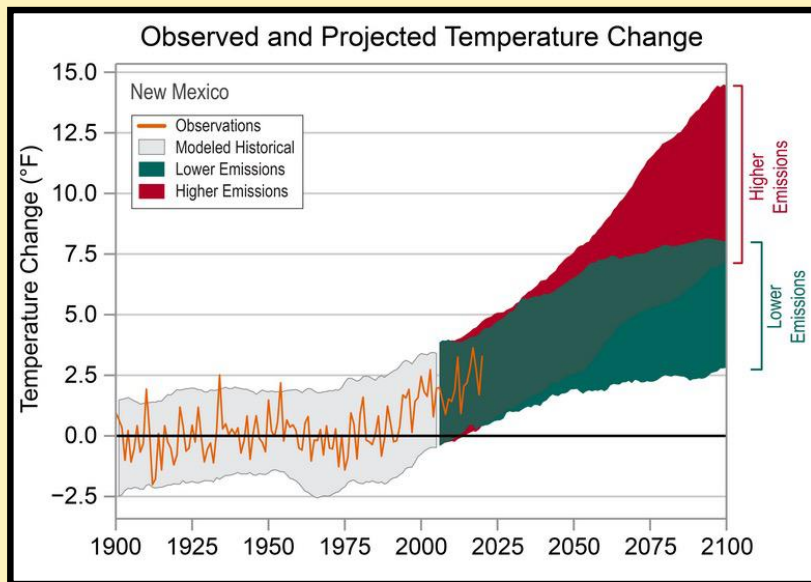
[View Prepared County Map](#)

View in Table





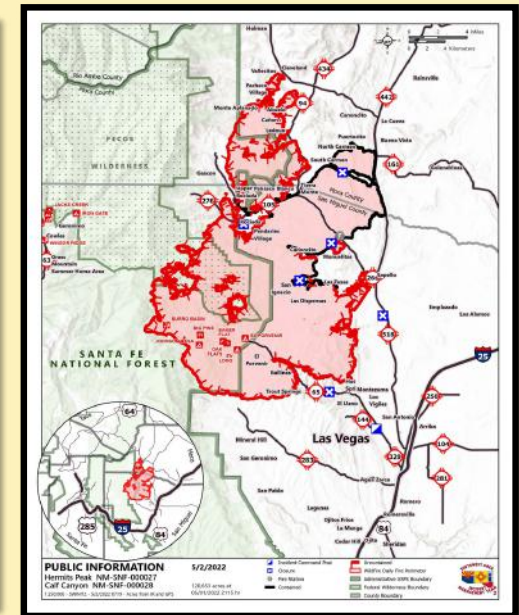
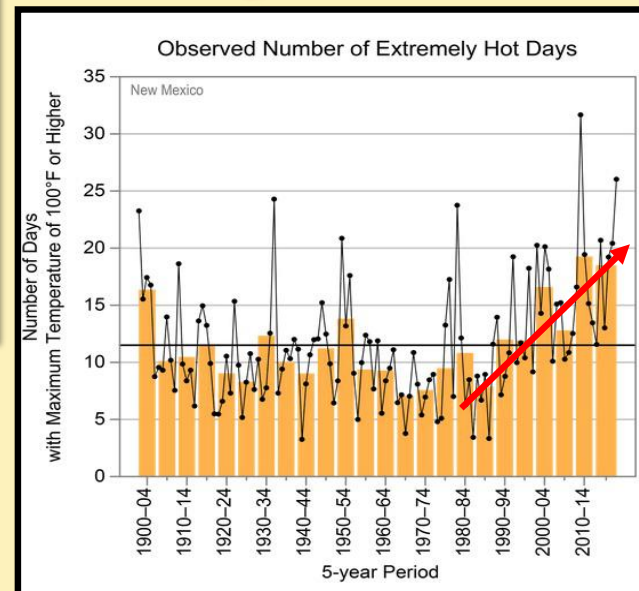
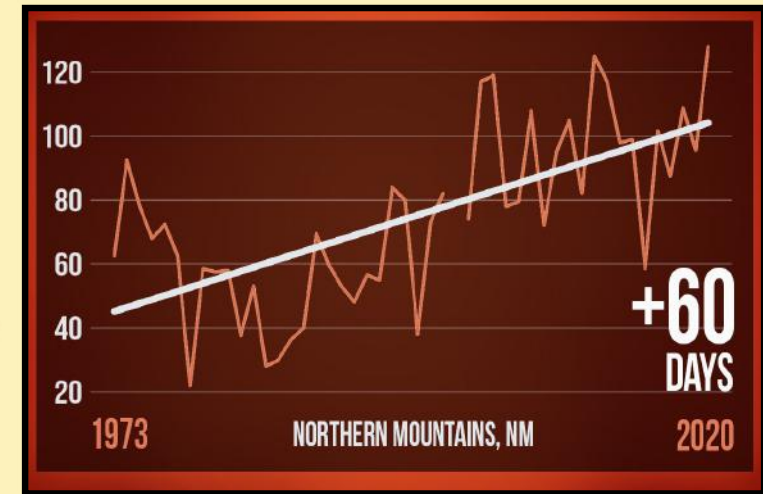
New Mexico is on the frontlines of the climate crisis.



CISESS and NOAA NCEI

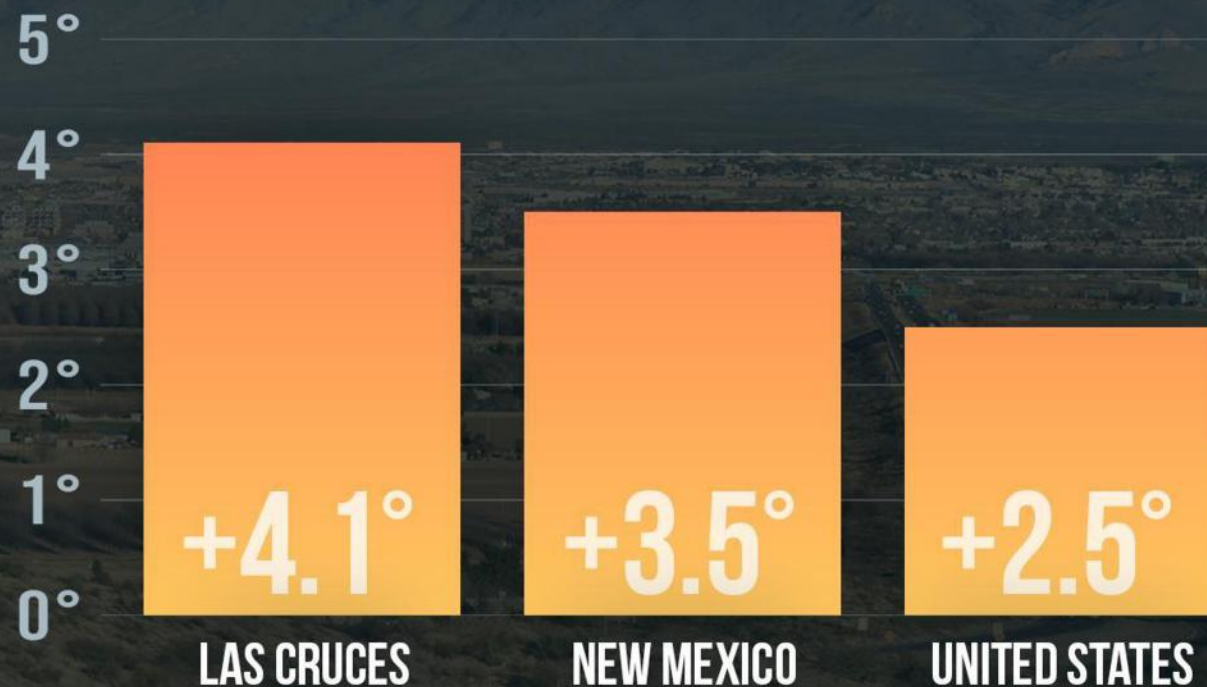
Temperature change from pre-industrial baseline is virtually certain to at least double (+2.5F) the warming we've already seen in New Mexico

Slide: Courtesy Nathaniel Matthews-Trigg, 2023, used with permission



WARMING AT ALL LEVELS

Temperature change (°F) since 1970



Based on linear trends of average annual temperature (1970-2022).
Source: RCC-ACIS.org; NCEI Climate at a Glance

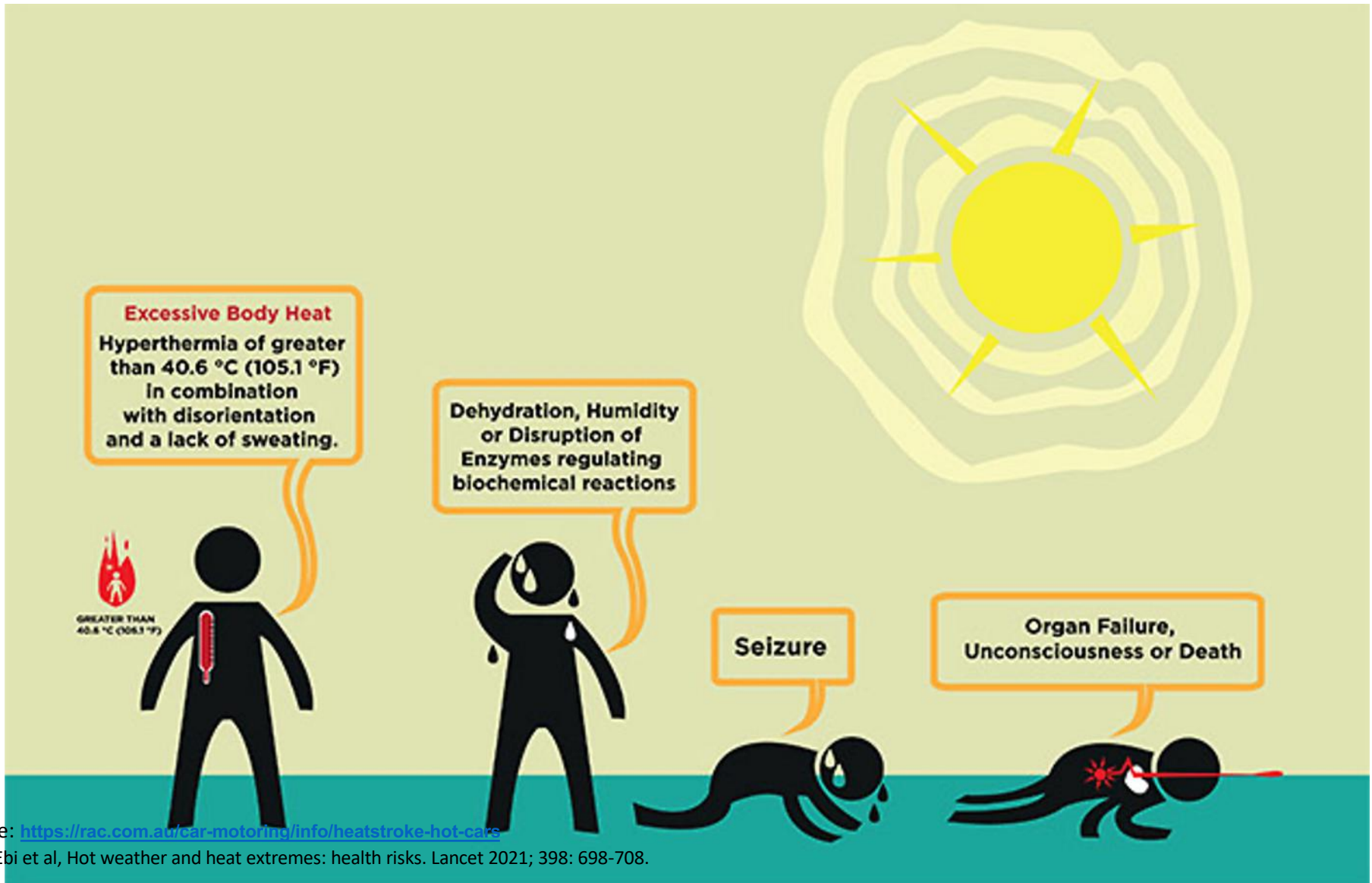
CLIMATE  CENTRAL

LAS CRUCES DAYS ABOVE 100°



Change in days above 100°F based on rate of change since 1970.
Source: RCC-ACIS.org

CLIMATE  CENTRAL



Heat Wave and Blackout Would Send Half of Phoenix to E.R., Study Says

New research warns that nearly 800,000 residents would need emergency medical care for heat stroke and other illnesses in an extended power failure. Other cities are also at risk.

Headline: <https://www.nytimes.com/2023/05/23/climate/blackout-heat-wave-danger.html>

Research study: Stone et al. How Blackouts During Heat Waves Amplify Mortality and Morbidity Risk. Environmental Science and Technology. May 3, 2023.
<https://pubs.acs.org/doi/pdf/10.1021/acs.est.2c09588>

COMMUNITIES OF COLOR

Some communities of color living in risk-prone areas face cumulative exposure to multiple pollutants.

Adaptation plans that consider these communities and improve access to healthcare help address social inequities.

OLDER ADULTS

Older adults are vulnerable to extreme events that cause power outages or require evacuation.

Checking on elderly neighbors and proper emergency communication can save lives.

CHILDREN

Children have higher risk of heat stroke and illness than adults.

Adults can lessen risk by monitoring exertion and hydration.

LOW INCOME COMMUNITIES

Low income families are at risk of physical and mental illnesses during flooding and in crowded shelter conditions.

Comprehensive disaster management can improve resiliency for people with limited resources.

Source: 4th US Climate Assessment, [Human Health - Fourth National Climate Assessment](#) (globalchange.gov)

New Mexico is particularly vulnerable

- Elderly – 18.5%¹
- Children – 22.4% (5.4% under 5yo)²
- People living in poverty – 18.2%⁶
- Disabled – 26%³
- Migrants – 10%⁴
- Outdoor workers – 47%⁵
- Homeless - 0.6%⁷
- Mental Illness – 32%⁸

Slide: Courtesy Nathaniel Matthews-Trigg, 2023, used with permission



Eddie Moore/Albuquerque Journal

Large percentage of NM population is

1 – 2021 www.census.gov

2 - 2021 www.census.gov

3 – CDC [Disability & Health U.S. State Profile Data: New Mexico](https://www.cdc.gov/disabilityandhealth/)

4 – [American Immigration Council -](https://www.americanimmigrationcouncil.org/sites/default/files/research/immigrants_in_new_mexico.pdf)

https://www.americanimmigrationcouncil.org/sites/default/files/research/immigrants_in_new_mexico.pdf

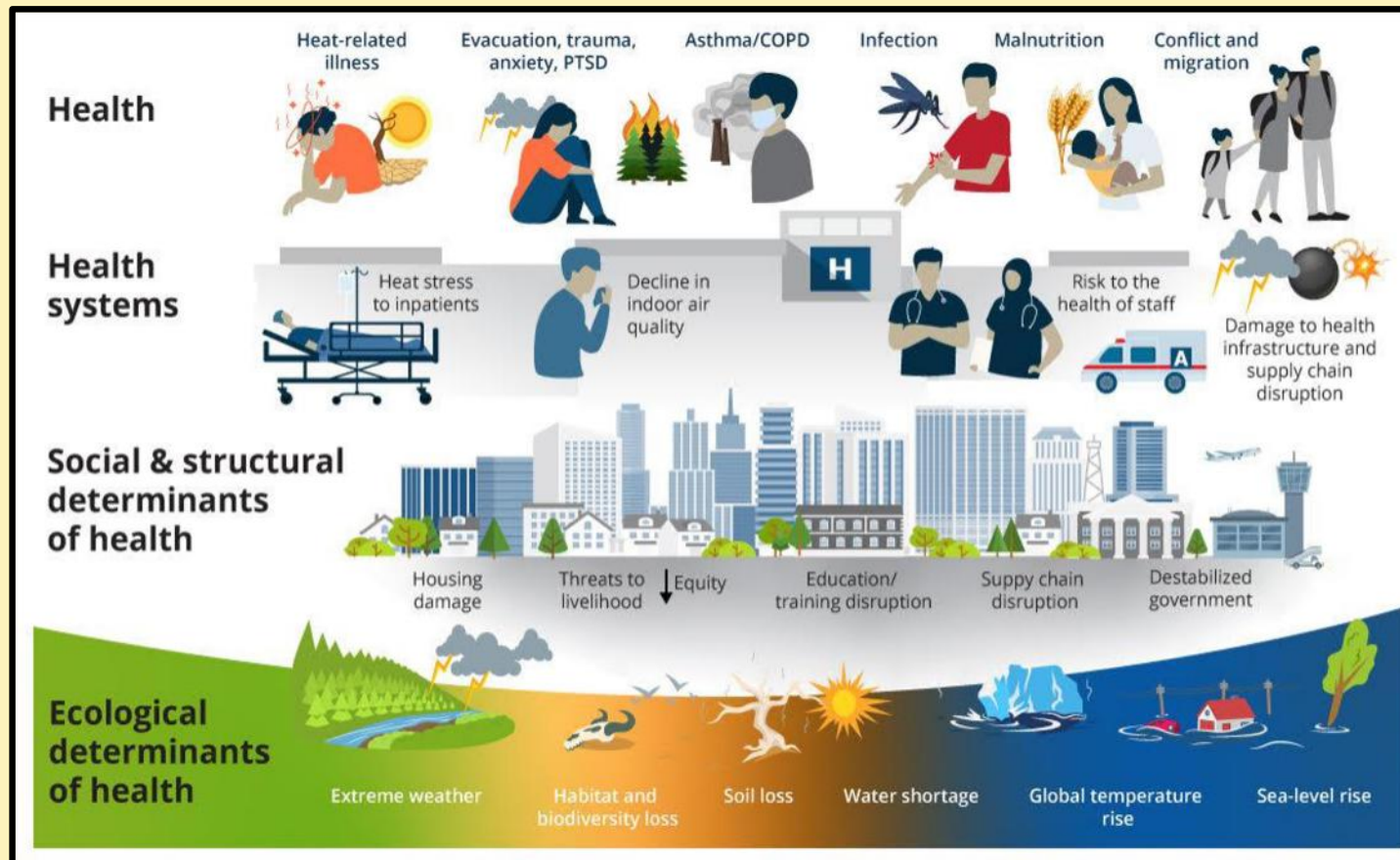
5 – US Bureau of Labor statistics - <https://www.bls.gov/opub/ted/2017/over-90-percent-of-protective-service-and-construction-and-extraction-jobs-require-work-outdoors.htm>

6 - https://www.dws.state.nm.us/Portals/0/DM/LMI/Poverty_in_NM_2019.pdf

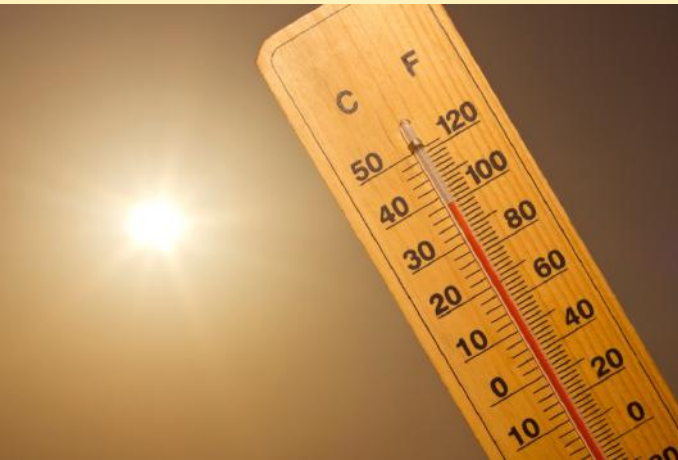
7- US Interagency on homelessness council - <https://www.usich.gov/homelessness-statistics/nm/>

8 - <https://www.kff.org/statedata/mental-health-and-substance-use-state-fact-sheets/new-mexico/>

Climate change is affecting *OUR* patients, families, wellbeing, and communities



Asthma-specific risks from climate change



Heat and Humidity



Allergenic Pollens

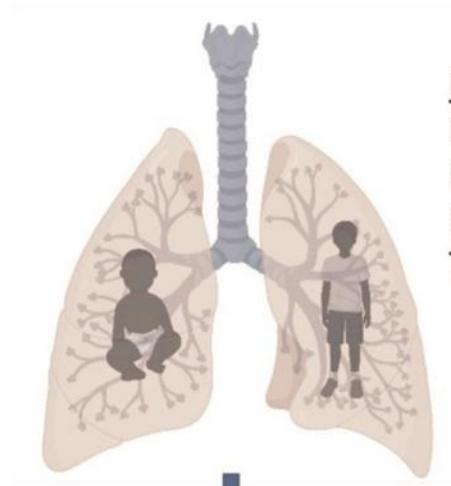


Air pollution

Temperature, Air Pollution, Wildfires, Flooding, Drought, Dust Storm, Hurricane



PM2.5, Ozone, Pollen, Fungal Spores, Poor Water Sanitation, Poor Nutrition



Developmental Differences

Increased Respiratory Rate

Narrow airways

Developing Lungs

Thermoregulation



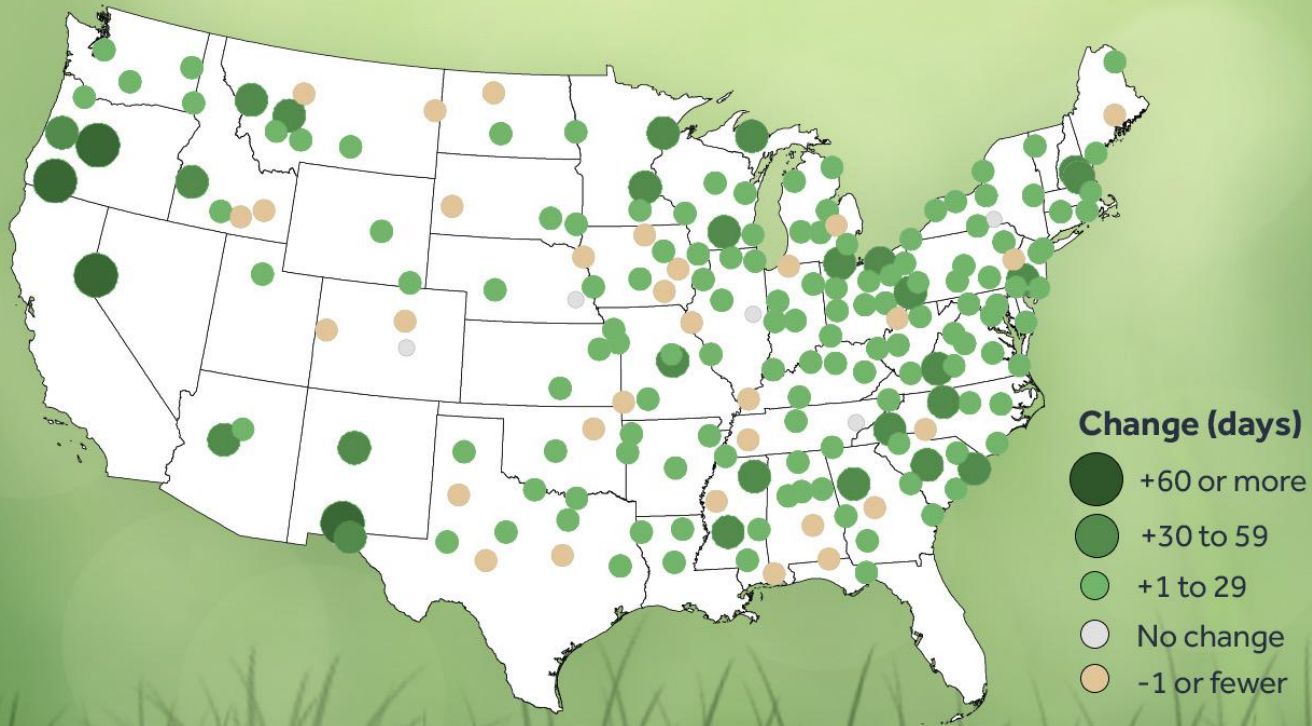
Asthma Exacerbation, Infection, Bronchitis, Pneumonia, Allergic Disease

Kline and Prunicki, Climate change impacts on children's respiratory health, Curr Opin Pediatr 2023, 35:350 – 355.

FIGURE 1. Selected climate change and respiratory health impacts in children.

LONGER GROWING SEASON

Change in freeze-free season length from 1970-2022

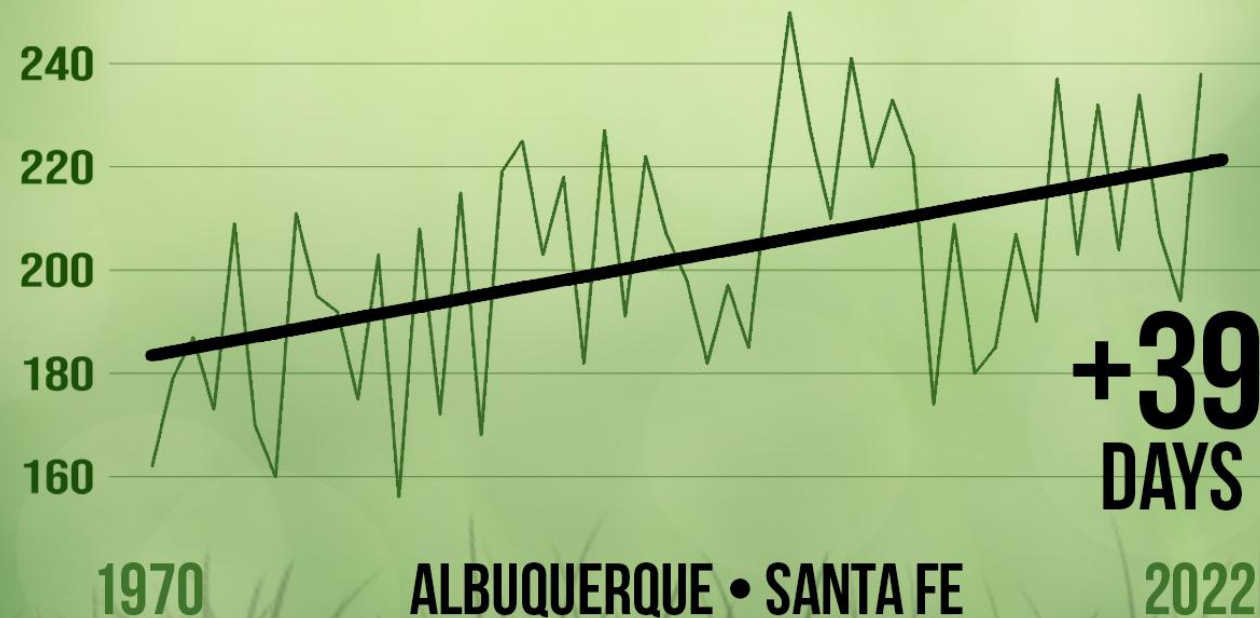


Freeze-free season = consecutive days between the annual last and first occurrence of 32°F
Source: RCC-ACIS.org

CLIMATE  CENTRAL

LONGER GROWING SEASON = LONGER ALLERGY SEASON

Freeze-free season (days)



Freeze-free season = consecutive days between the annual last and first occurrence of 32°F
Source: RCC-ACIS.org

CLIMATE  CENTRAL

SEASONAL AIRBORNE ALLERGENS

Carried by wind

Cause allergic reactions

Can trigger asthma

POLLEN



Tiny grains released by plants

Peaks in the freeze-free season

MOLD



Grows on soil and dead plants

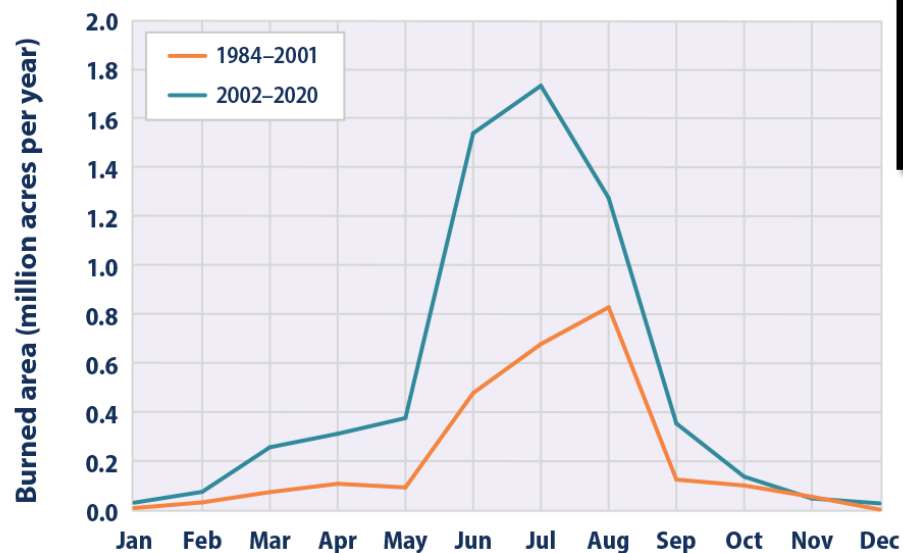
Releases tiny spores year-round



Photo: Jim Weber / Santa Fe New Mexican

Increase in wildfire season length

Comparison of Monthly Burned Area Due to Wildfires in the United States Between 1984–2001 and 2002–2020



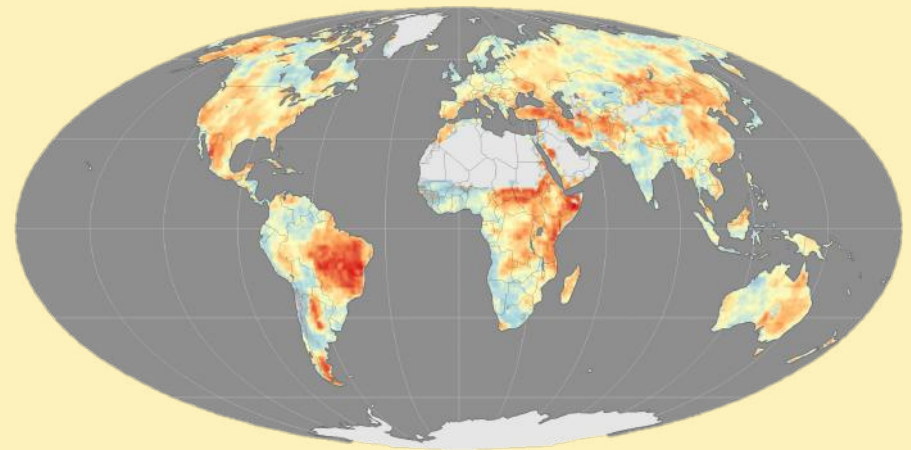
Data source: MTBS (Monitoring Trends in Burn Severity). 2022. Direct download. Accessed April 2022.
www.mtbs.gov/direct-download.

For more information, visit U.S. EPA's "Climate Change Indicators in the United States" at www.epa.gov/climate-indicators.

Colorado winter wildfires destroy hundreds of homes as thousands flee

Gusts of up to 105 mph whipped up flames, destroying hundreds of homes and prompting the governor to declare a state of emergency

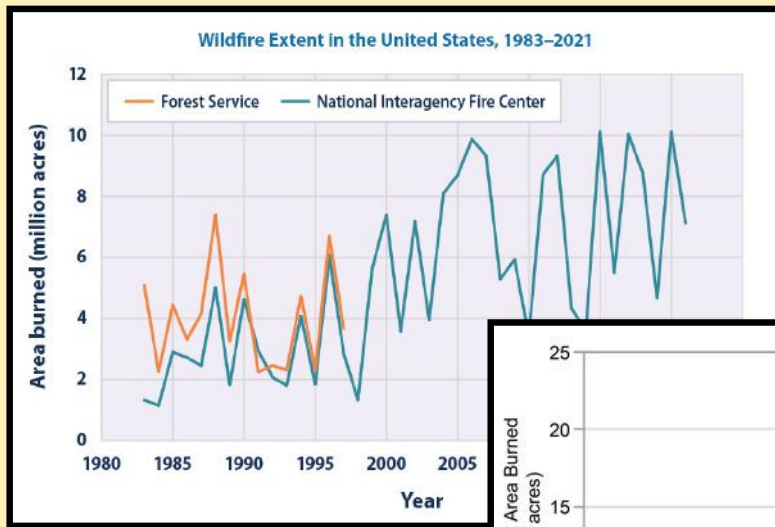
The Guardian, 2021 [1]



J. Stevens, Earth Observatory maps, USDA Forest Service, created from Jolly et al., 2015 [2]

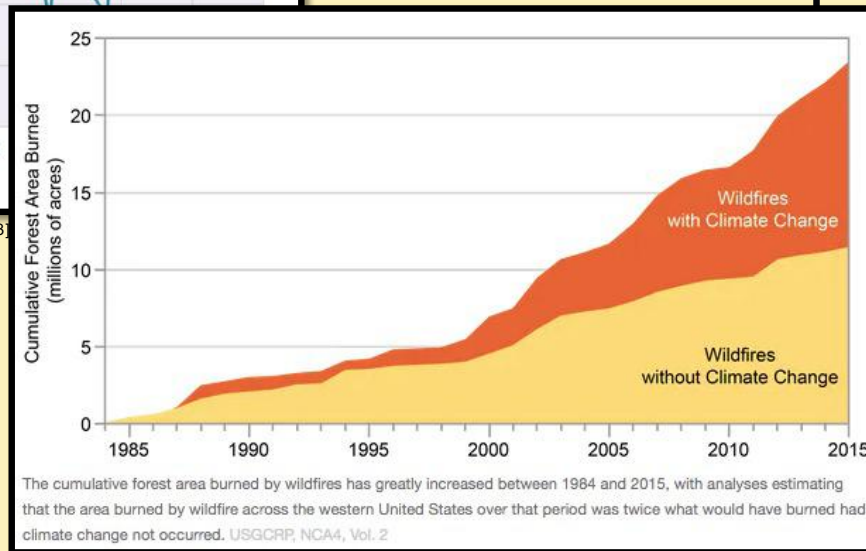
**Impacts, Risks, and Adaptation in the United States: The Fourth National Climate Assessment, Volume II*, 2018 [4]

Increase in wildfire area burned



Short et al., 2015 [3]

Data sources:
• NIFC National Interagency Fire Center, 2022. Total wildland fires and acres (1983–2022). Accessed June 2022.
www.nifc.gov/fireinfo/fireinfo_stats_totalfires.html
• Short, K.C. 2015. Sources and implications of bias and uncertainty in a century of U.S. wildfire activity data. *Int. J. Wildland Fire* 26(7):882–897.
For more information, visit U.S. EPA's "Climate Change Indicators in the United States" at www.epa.gov/climate-indicators.



Markon et al., 2018 – USGCRP, NCA4., Vol 2 [4]

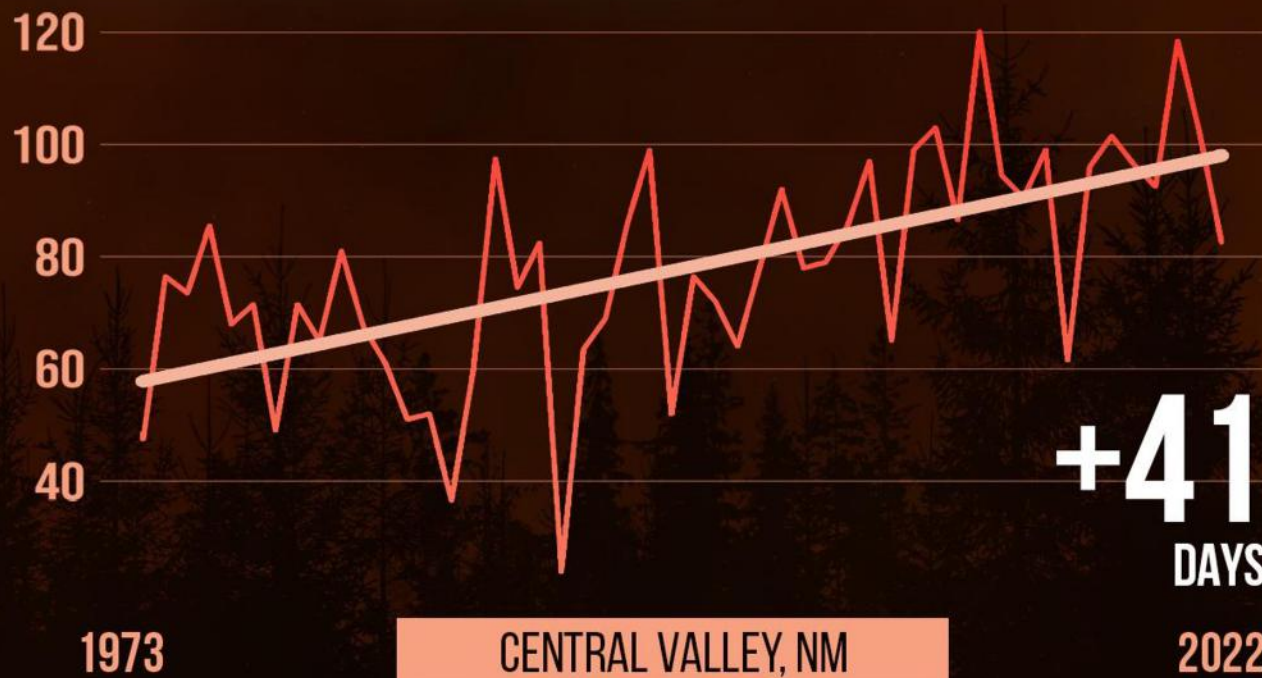
Top 5 largest wildfires in the U.S.

1. 2021 – Dixie Fire, CA
2. 2020 – Bay Area Fire, CA
3. 2018 - Camp Fire, CA
4. 2017 – Tubbs Fire, CA
5. 2013 – Yarnell Fire, AZ

Impacts, Risks, and Adaptation in the United States: The Fourth National Climate Assessment, Volume II, 2018

FIRE WEATHER DAYS

Change in hot, dry, windy days



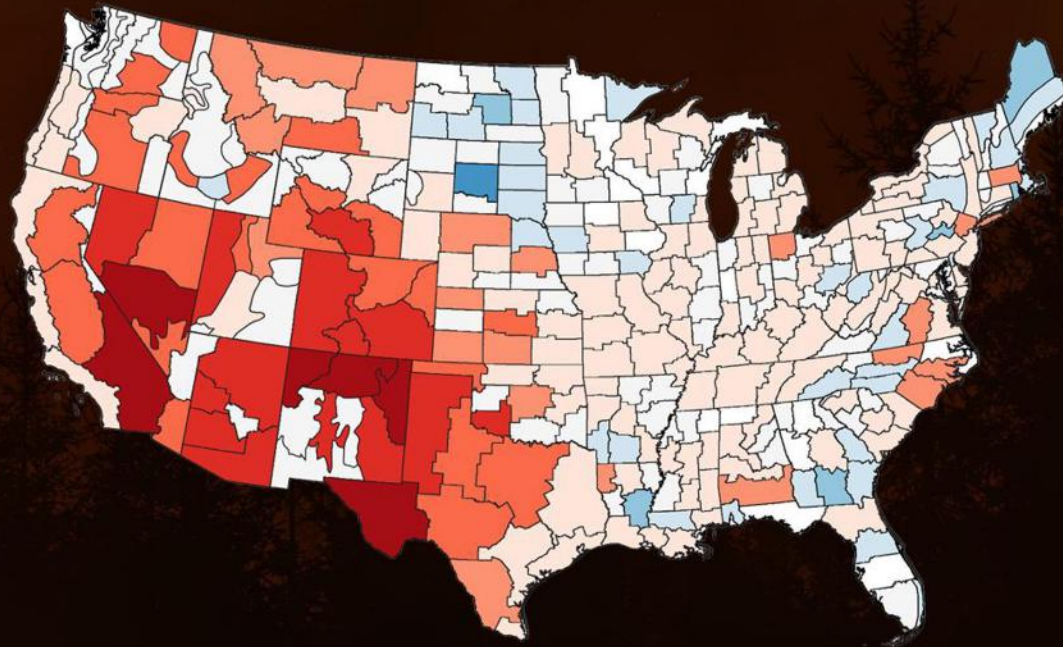
Annual days (1973-2022) at/above fire weather thresholds in at least two hourly observations per day, (2 stations in climate division)
Source: NOAA/NCEI Local Climatological Data (LCD)

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CHANGE IN FIRE WEATHER DAYS

Change in annual hot, dry, windy days, 1973–2022

-56 -28 -14 -7 -1 1 7 14 28 56



Change in average annual days from 1973 to 2022 at/above fire weather thresholds in at least two hourly observations per day.

Source: NOAA/NCEI Local Climatological Data (LCD)

CLIMATE  CENTRAL



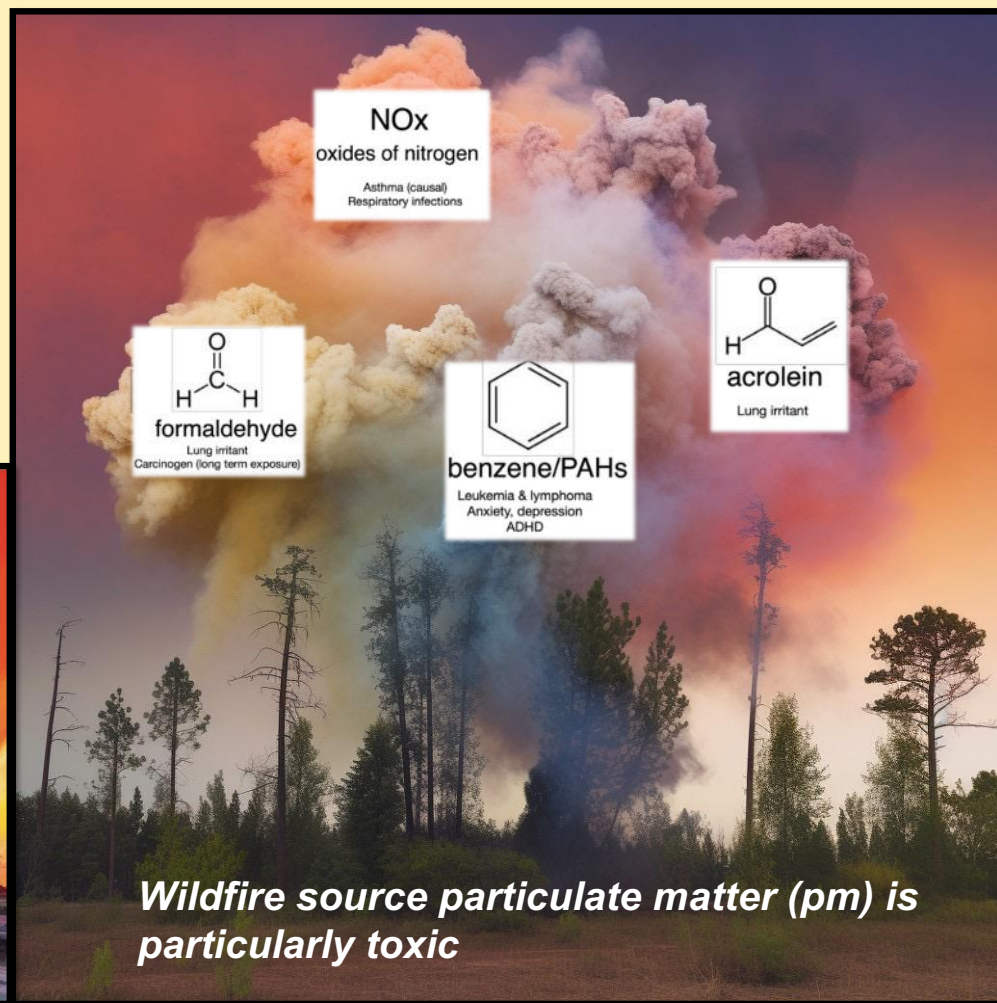
<https://www.npr.org/2022/05/08/1097455610/new-mexico-residents-brace-for-extreme-wildfire-conditions>

Smoke - chemical composition

Household chemicals



Industrial chemicals



NOx
oxides of nitrogen
Asthma (causal)
Respiratory infections

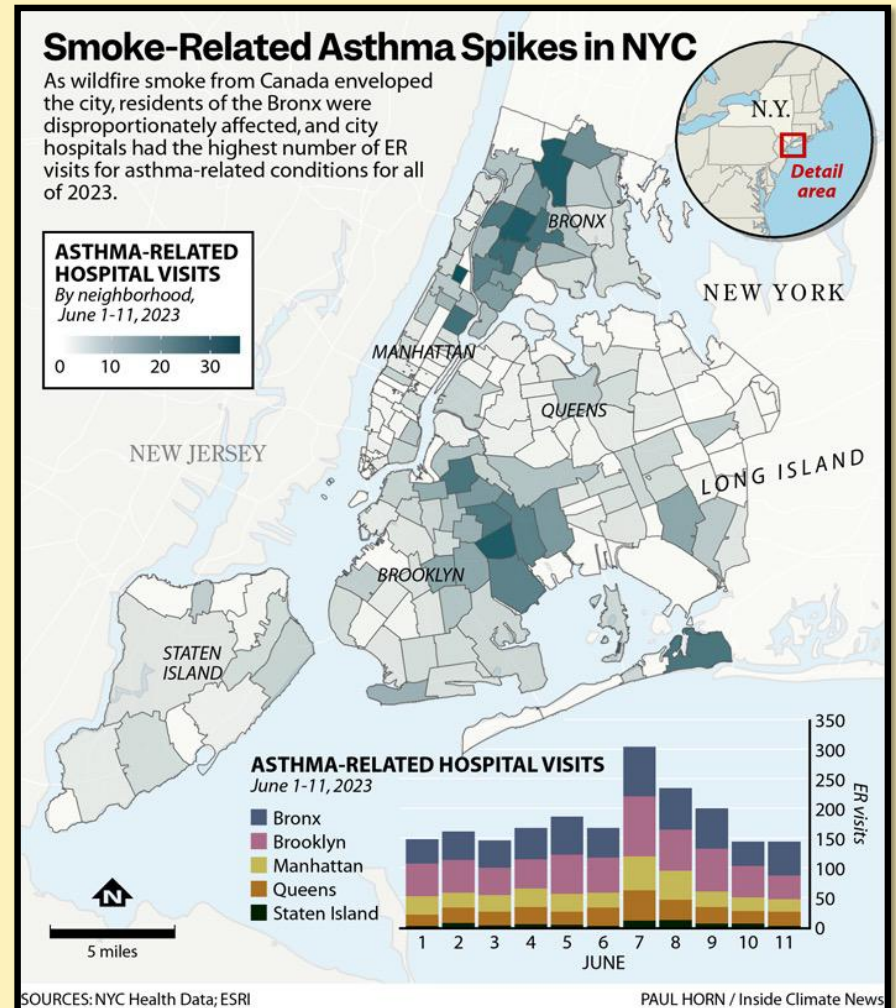
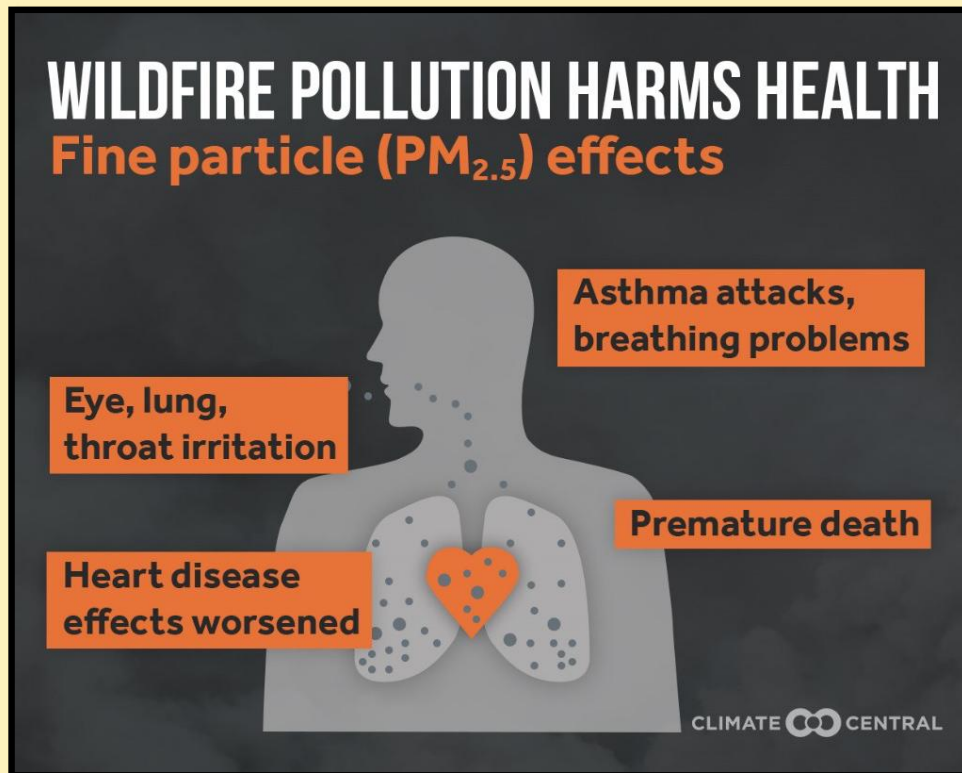
H-C(=O)-H
formaldehyde
Lung irritant
Carcinogen (long term exposure)

c1ccccc1
benzene/PAHs
Leukemia & lymphoma
Anxiety, depression
ADHD

CC=CC=O
acrolein
Lung irritant

Wildfire source particulate matter (pm) is particularly toxic

Short-term Impacts on Health



Increased Risk



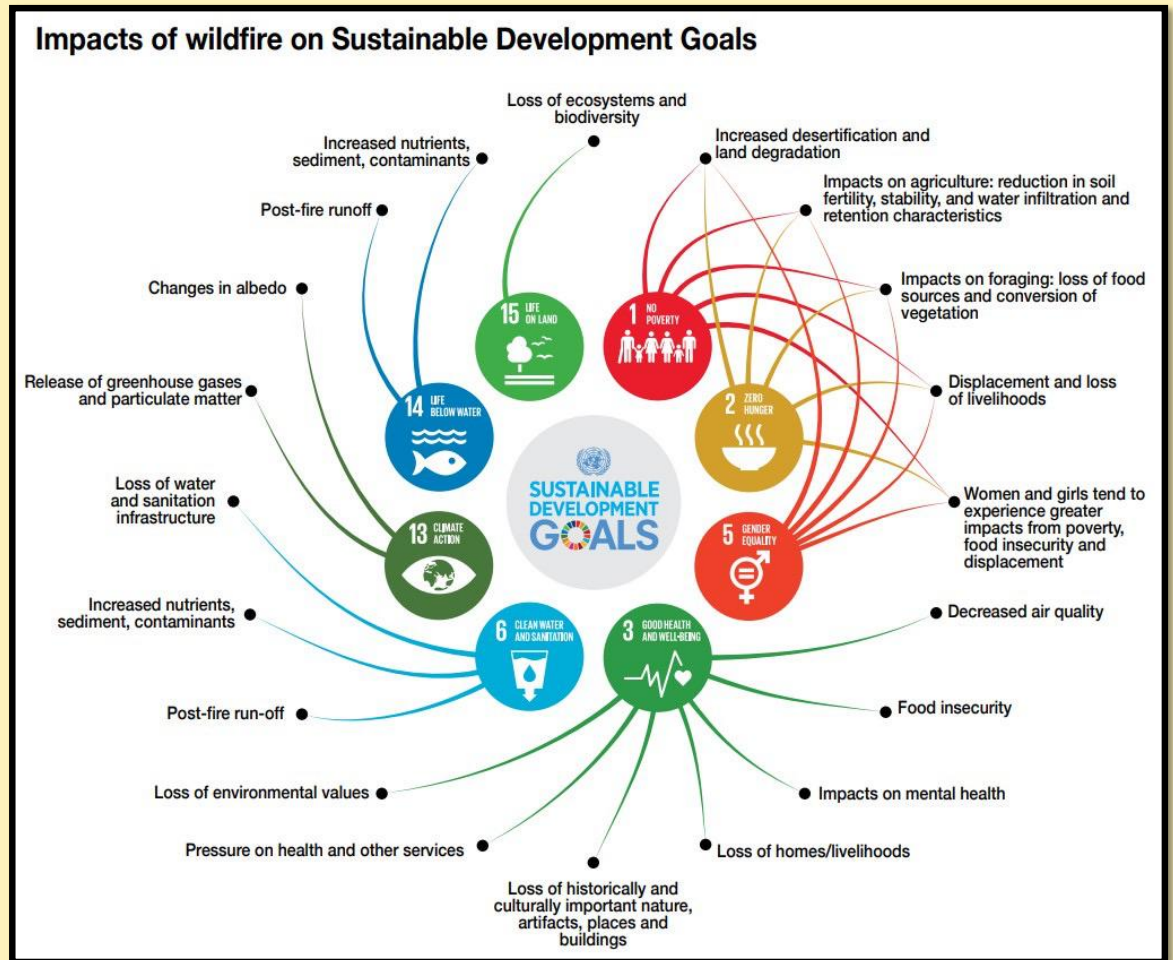
Images: Midjourney generated images, 2023 [16].

Condition/Individual with Greater Sensitivity to Smoke Exposure	Potential Health Effects from Wildfire Smoke Exposure
Asthma, COPD, and other chronic respiratory diseases	Respiratory symptoms including breathing difficulties (e.g., coughing, wheezing, and chest tightness). Greater medication usage, emergency department visits, and hospital admissions. ⁵⁻⁷
Cardiovascular disease (CVD)	Ischemic events; worsening of heart failure; or arrhythmias. Excess emergency department visits, hospital admissions, and even death from CVD. ^{8,9}
Children	Coughing, wheezing, difficulty breathing, chest tightness, decreased lung function, pneumonia. ¹⁰
Chronic Kidney Disease	Excess same-day mortality for dialysis patients. ¹¹ Decreased renal function and progression to end-stage renal disease. ¹²
Low wealth individuals	Greater smoke exposure as well as lesser access to exposure reducing measures (e.g., air filtration) and healthcare. ¹³
Older adults	Increased vulnerability to smoke effects, and therefore higher rates of healthcare utilization and mortality, due to higher prevalence of chronic medical conditions. ⁵
Outdoor workers	Increased vulnerability to smoke effects due to extended periods of time exposed to high concentrations of wildfire smoke, possibly without adequate protection.
Pregnant women	May increase risk of low birth weight and preterm birth. ^{14,15}

Adapted from <https://www.epa.gov/wildfire-smoke-course/which-populations-experience-greater-risks-adverse-health-effects-resulting>

Longer-term Impacts on Health and Wellbeing

“Ambient (outdoor) air pollution...is causing fine particulate matter which result in **strokes, heart diseases, lung cancer, acute and chronic respiratory diseases.**” (Ambient outdoor air pollution – WHO, 2022)[14]



GRID-Arendal/Studio Atlantis, 2021 & Spreading like Wildfire – The Rising Threat of Extraordinary Landscape Fires, 2022 [8]

Asthma-specific Interventions

- Vigilance during high-risk periods
- Air filtration
- Avoid outdoor exposures during dangerous time periods
- Attention to health equity issues



Mitigation

Adaptation

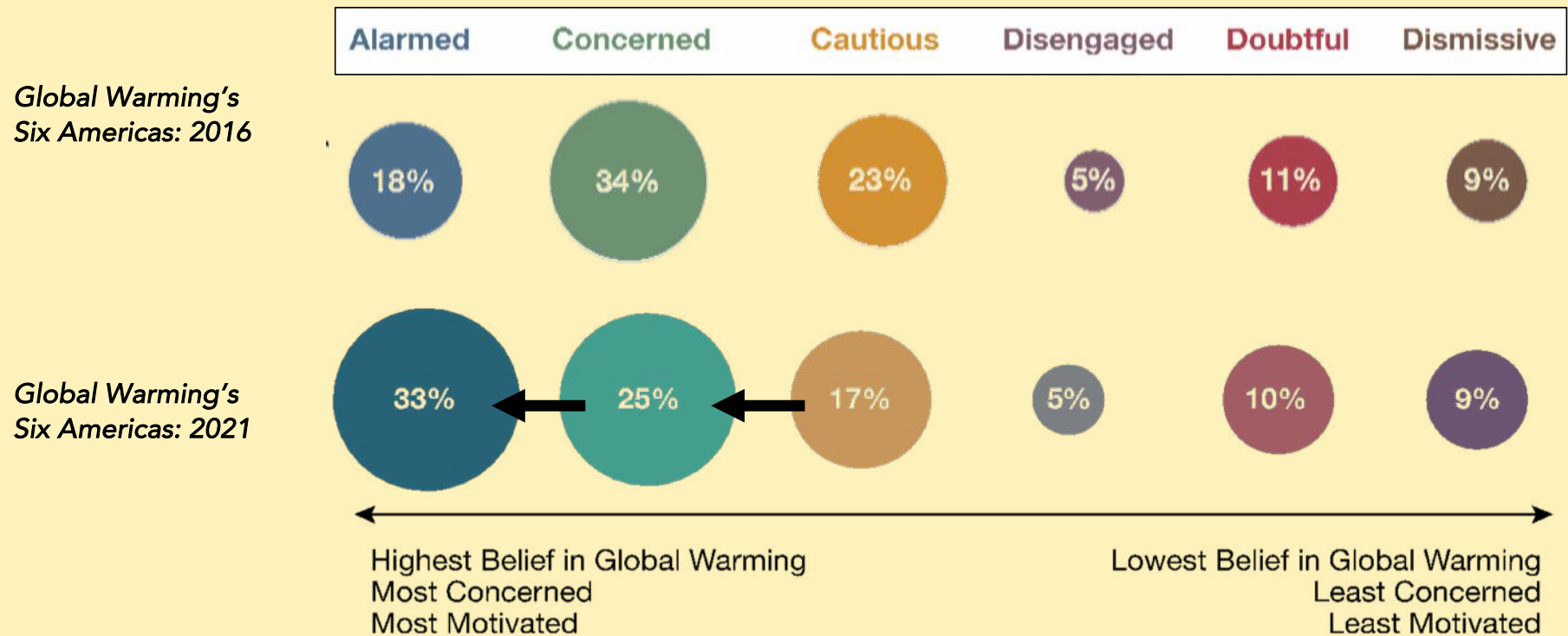
Suffering

“We basically have three choices: mitigation, adaptation and suffering. We’re going to do some of each. The question is what the mix is going to be. The more mitigation we do, the less adaptation will be required and the less suffering there will be.”

- John Holdren, energy and climate expert at Harvard

(Statement at 2007 launch of the fourth IPCC report, <https://earthbound.report/2019/10/31/mitigation-adaptation-and-suffering/>)

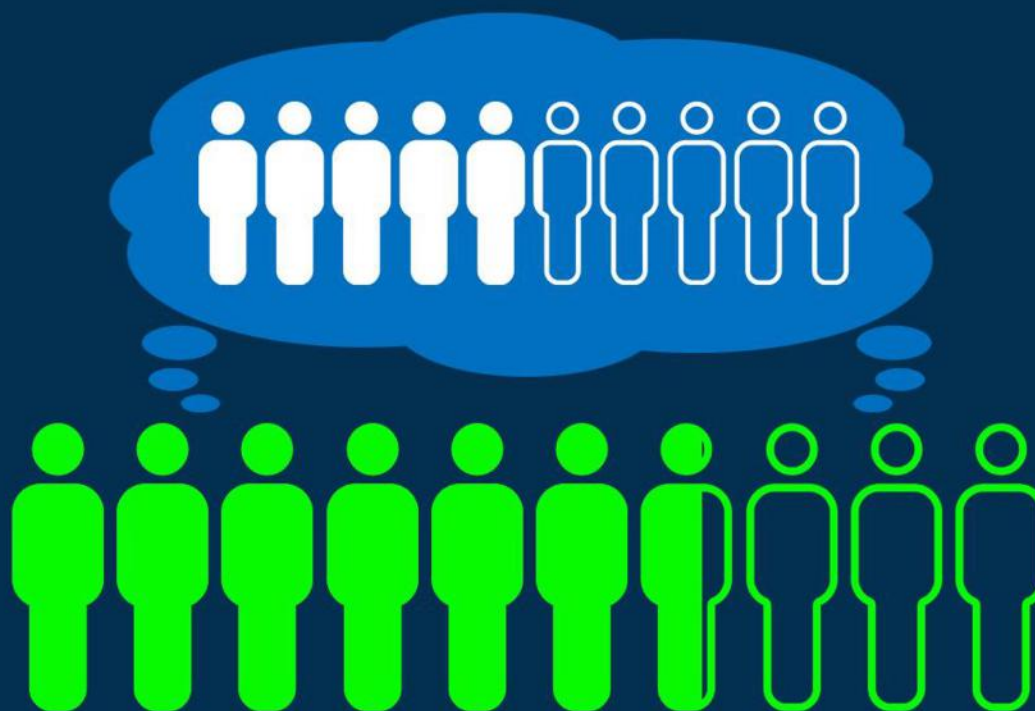
Most Americans understand that climate change is real and they're getting more concerned



September 2021
(n=1,006)



**67% OF PEOPLE IN NEW MEXICO
ARE CONCERNED ABOUT CLIMATE CHANGE...**
but they think only 51% are.



Source: Yale Program on Climate Change Communication (2021) and Sparkman et al. (2022).

CLIMATE  CENTRAL

Leading Institutions, Organizations, and Associations are Sounding the Alarm

PRESS RELEASES

AMA adopts new policy declaring climate change a public health crisis

Climate change can impact the overall health of all humans and is a medical emergency. Stay up-to-date on climate change with n

JUN 13, 2022

American Academy
of Pediatrics



DEDICATED TO THE HEALTH OF ALL CHILDREN®

Climate change poses significant threats to human health, safety and security.

Children are especially vulnerable to the health effects and other impacts of climate change.

The U.S. Call to Action on Climate, Health, and Equity...has support from more than 150 health organizations from across the country. The Call to Action declares climate change one of the greatest threats to health America has ever faced and sets priority policy actions.



AMERICAN PSYCHOLOGICAL ASSOCIATION

Urgent need to address mental health effects of climate change, says report



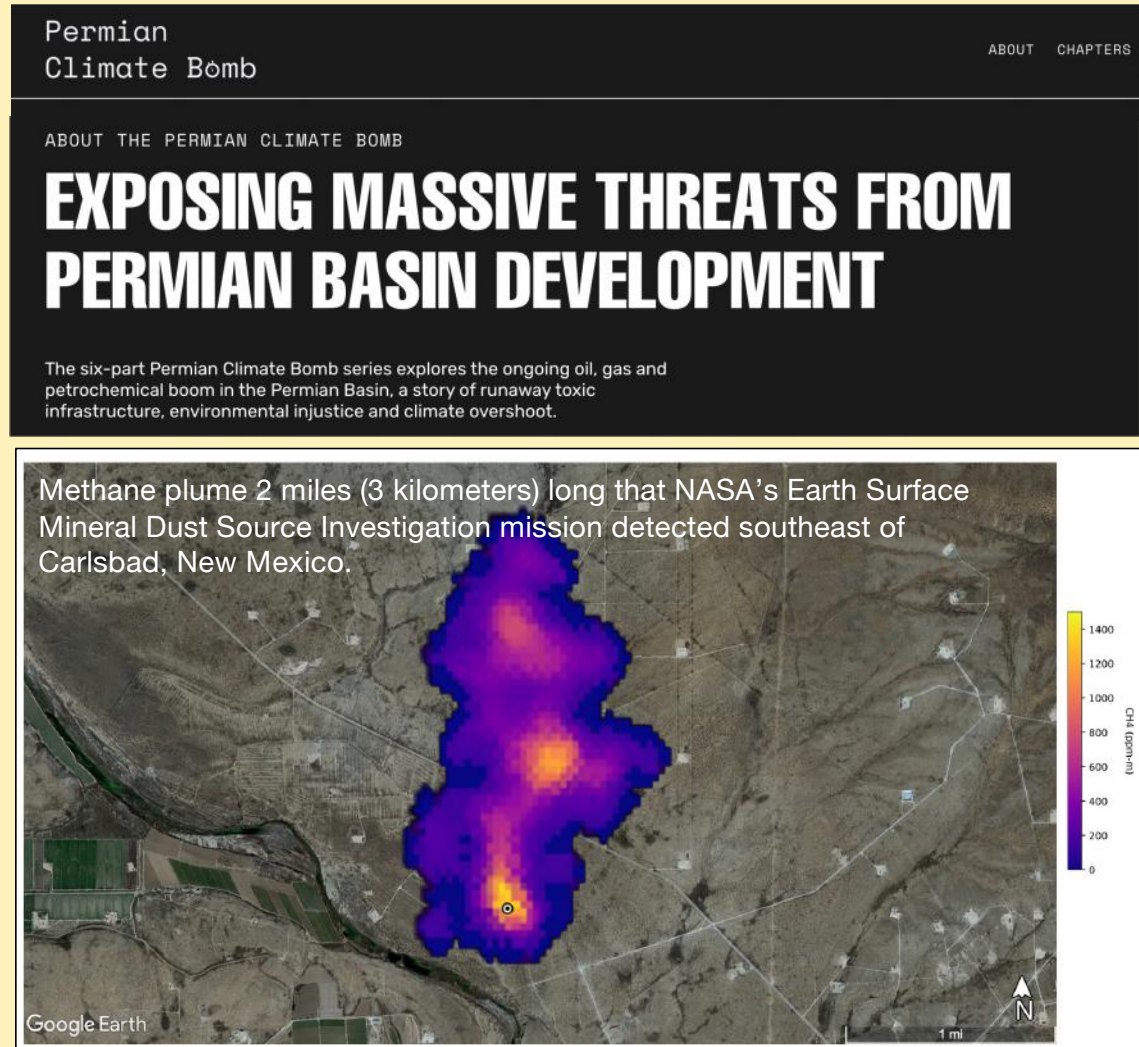
AAFP

American Academy of Family Physicians

To raise awareness about the impact that climate change has on patient health, the AAFP partnered with 20 other medical organizations and associations (representing more than 500,000 health care professionals) to form the Medical Society Consortium on Climate and Health.

Why us? why now?

- Outsized impact on global fossil fuel extraction
- Third largest US oil-producing state.
- There is very little going on in New Mexico
- Health professional voices are too often absent
- We are at a pivotal moment in history



What do NM health professionals have to offer?

1. We are on the frontlines, and we have stories to tell.
2. We are a trusted sources of information for our patients and communities
3. Climate impacts on health will continue to involve health professionals
4. Leveraging our expertise and experience to ensure that climate policies are meaningful, equitable, and rooted in protecting our communities.





NEW MEXICO
**HEALTH
PROFESSIONALS**
FOR CLIMATE ACTION

NM Health Professionals for Climate Action

A new climate and health movement in New Mexico

OUR MISSION

**To mobilize New Mexico healthcare and public health professionals
to advocate for healthy and equitable climate solutions**



NEW MEXICO HEALTH PROFESSIONALS FOR CLIMATE ACTION

MOBILIZE



EDUCATE



ADVOCATE





What Can You Do to Help? LOTS

- 1. Participate in state and local advocacy**
- 2. Educate about impacts of climate on health**
- 3. Increase resiliency and adaptation planning**
- 4. Practice sustainable health care**
- 5. Keep learning**
- 6. Join NM Health Professionals for Climate Action**

The word is out!

The image displays three overlapping screenshots of newspaper websites, each featuring an opinion article. The top-left screenshot is from the **Las Cruces Sun News**, showing a navigation bar with 'MARKETPLACE' and a search bar, and a menu with 'News', 'Sports', 'Business', 'Entertainment', and 'Lifestyle'. The article headline is 'New Mexico health professionals organizing against...'. The top-right screenshot is from the **Carlsbad Current Argus**, with a similar navigation bar including 'eNewspaper' and 'Legals'. The article headline is 'New Mexico health professionals are...'. The bottom screenshot is from the **Santa Fe New Mexican**, featuring a more detailed navigation bar with links like 'E-EDITION', 'APP', 'ARCHIVE', 'ADVERTISE', 'SUBSCRIPTIONS', 'CALENDAR', 'NEWS TIPS', 'CONTACT', and 'HELP'. The article headline is 'Health professionals organize for climate solutions' by Paul Charlton, Nathaniel Matthews-Trigg, and Shelley Mann-Lev, dated July 15, 2023. To the right of the Santa Fe New Mexican article, there are three additional opinion article teasers: 'Congratulations to...', 'It's our meat and...', and 'Remembering the county extension...'. Each teaser is preceded by the word 'OPINION' in yellow.

Las Cruces Sun News.

Carlsbad Current Argus.

SANTA FE NEW MEXICAN

MY VIEW PAUL CHARLTON, NATHANIEL MATTHEWS-TRIGG AND SHELLEY MANN-LEV
Health professionals organize for climate solutions
By Paul Charlton, Nathaniel Matthews-Trigg and Shelley Mann-Lev Jul 15, 2023 7

OPINION Dale Janw
OPINION Merilee Da
OPINION Sherry Ro

The organization is growing!



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We hope you will join us!

In the face of a rapidly changing climate, silence is a luxury we cannot afford, and inaction a choice too costly to make

www.NMHPCA.org



References

1. Reed B. Colorado Winter Wildfires Destroy Hundreds of Homes as Thousands Flee. The Guardian.
2. Jolly WM, Cochrane MA, Freeborn PH, et al. Climate-induced variations in global wildfire danger from 1979 to 2013. *Nat Commun.* 2015;6. doi:10.1038/ncomms8537
3. Short KC. Sources and implications of bias and uncertainty in a century of US wildfire activity data. *Int J Wildland Fire.* 2015;24(7). doi:10.1071/WF14190
4. Markon C, Gray S, Berman M, et al. Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II: Report-in-Brief. *Fourth National Climate Assessment.* 2018;II.
5. 15 Largest Wildfires in US History. Earth.org.
6. NOAA/NCEI's Local Climatological Data and Climate Central analysis.
7. Wotton BM, Nock CA, Flannigan MD. Forest fire occurrence and climate change in Canada. *Int J Wildland Fire.* 2010;19(3):253. doi:10.1071/WF09002
8. United Nations Environment Programme. *Spreading like Wildfire – The Rising Threat of Extraordinary Landscape Fires.*; 2022.
9. Barbero R, Abatzoglou JT, Larkin NK, Kolden CA, Stocks B. Climate change presents increased potential for very large fires in the contiguous United States. *Int J Wildland Fire.* 2015;24(7). doi:10.1071/WF15083
10. Childs ML, Li J, Wen J, et al. Daily Local-Level Estimates of Ambient Wildfire Smoke PM_{2.5} for the Contiguous US. *Environ Sci Technol.* 2022;56(19). doi:10.1021/acs.est.2c02934
11. Vargo J, Lappe B, Mirabelli MC, Conlon KC. Social Vulnerability in US Communities Affected by Wildfire Smoke, 2011 to 2021. *Am J Public Health.* 2023;113(7):759-767. doi:10.2105/AJPH.2023.307286
12. Turco M, Abatzoglou JT, Herrera S, et al. Anthropogenic climate change impacts exacerbate summer forest fires in California. *Proceedings of the National Academy of Sciences.* 2023;120(25). doi:10.1073/pnas.2213815120
13. Liu JC, Mickley LJ, Sulprizio MP, et al. Particulate air pollution from wildfires in the Western US under climate change. *Clim Change.* 2016;138(3-4). doi:10.1007/s10584-016-1762-6
14. Ambient (outdoor) air pollution. World Health Organization.
15. Fongsodsri K, Chamnanchanunt S, Desakorn V, et al. Particulate Matter 2.5 and Hematological Disorders From Dust to Diseases: A Systematic Review of Available Evidence. *Front Med (Lausanne).* 2021;8. doi:10.3389/fmed.2021.692008
16. Midjourney , accessed via Discord. June 2023 Version.



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Thank you!

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