

Connecting the Dots: Climate Change and Extreme Weather

PRESENTATION FOR THE

Jaffrey Public Library
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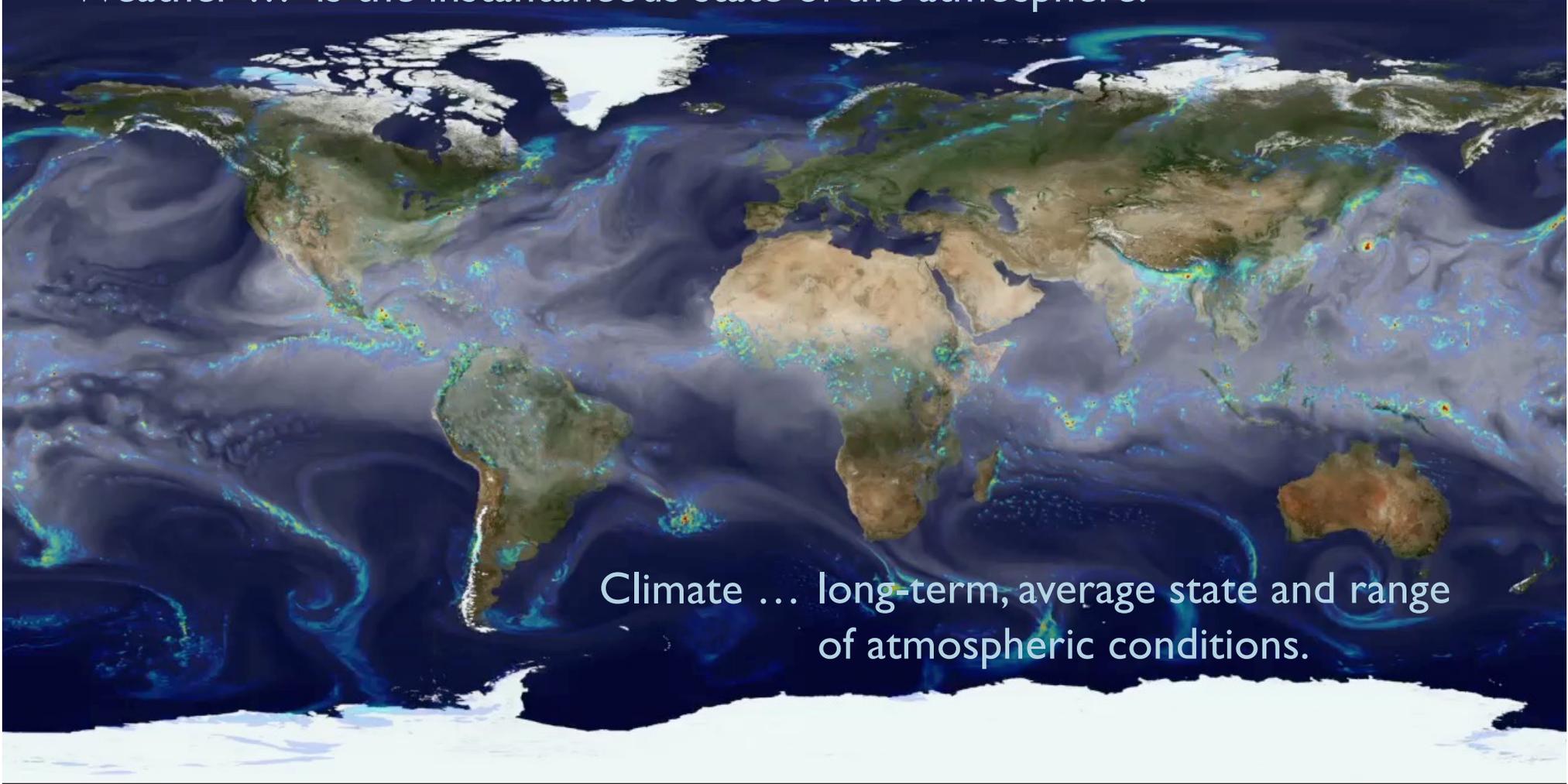
Department of Geography

College of Liberal Arts

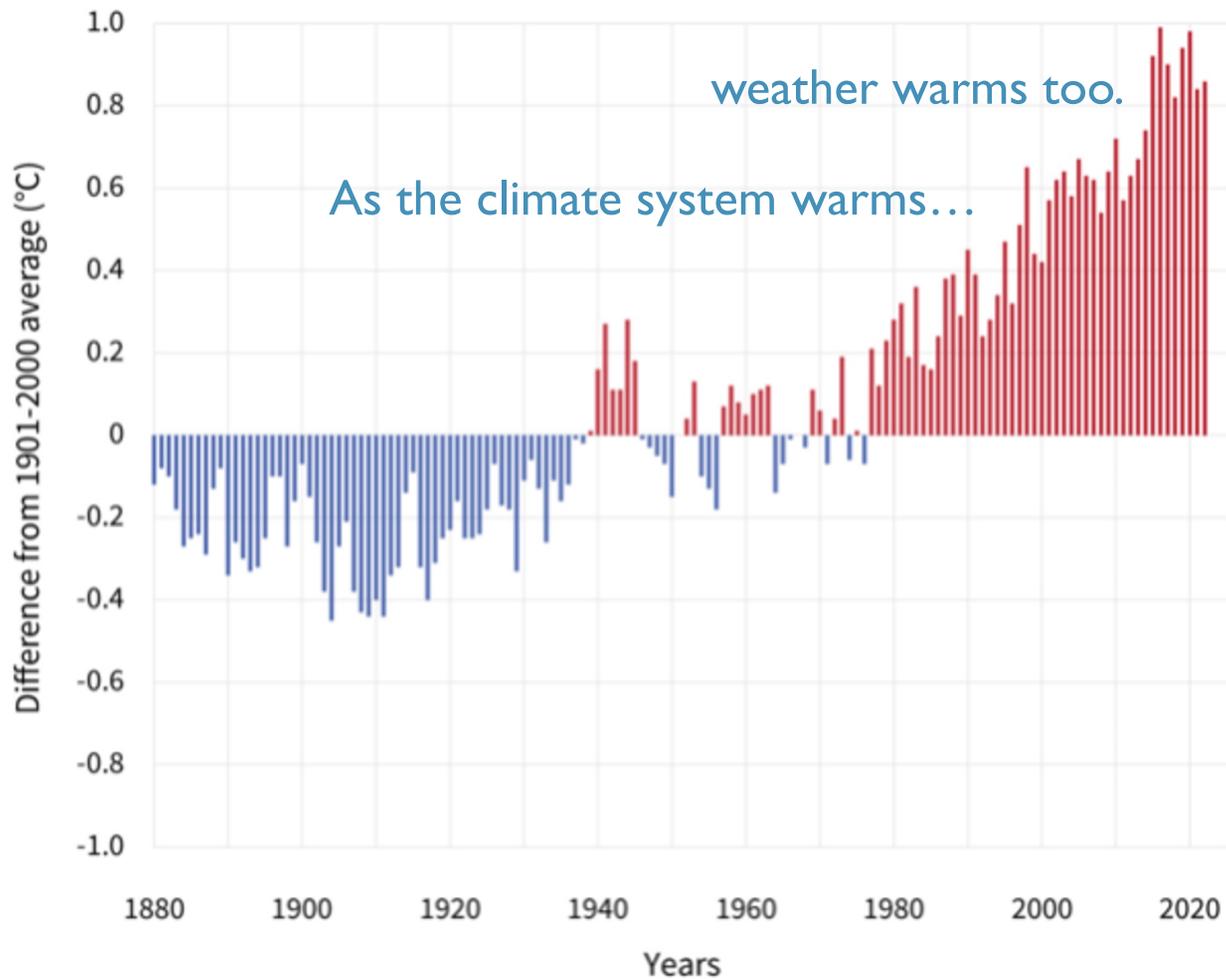


University of
New Hampshire

Weather ... is the instantaneous state of the atmosphere.

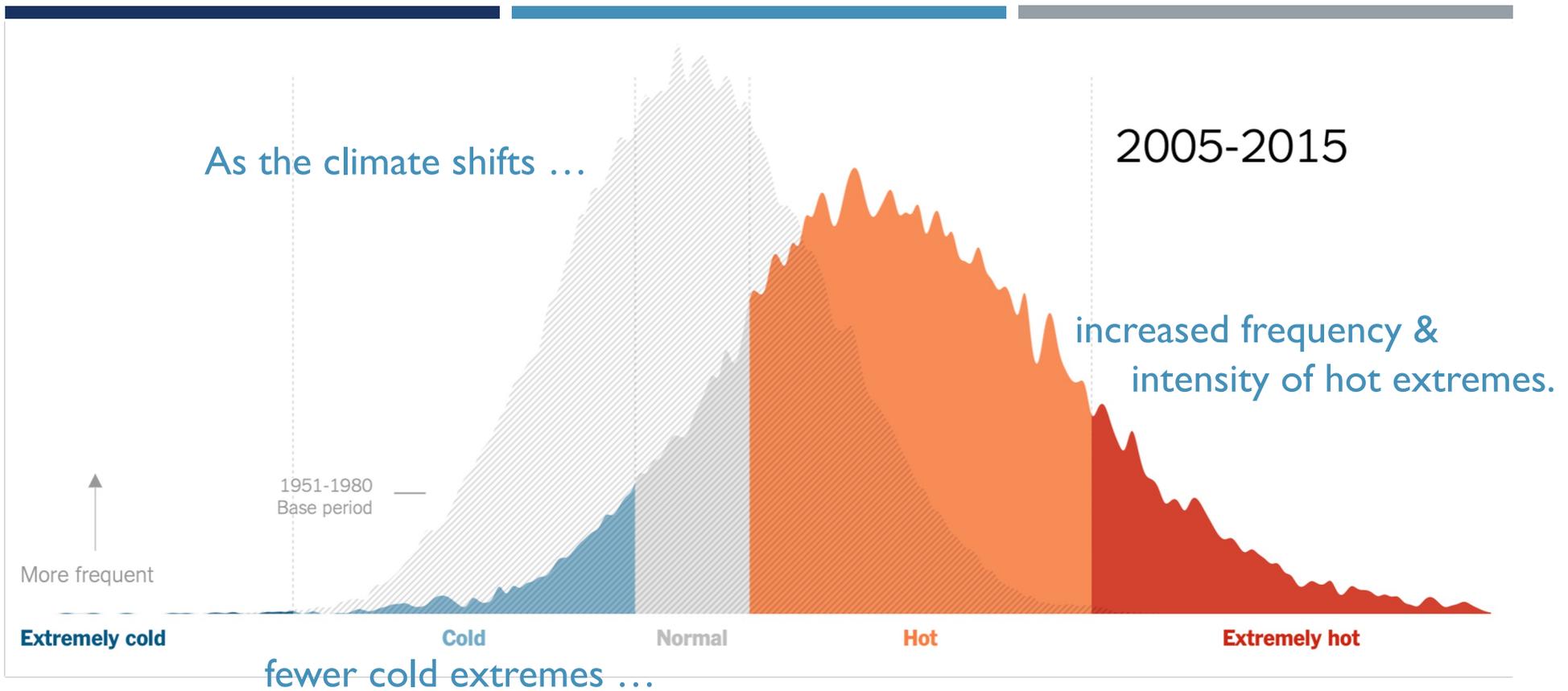


Climate ... long-term, average state and range of atmospheric conditions.



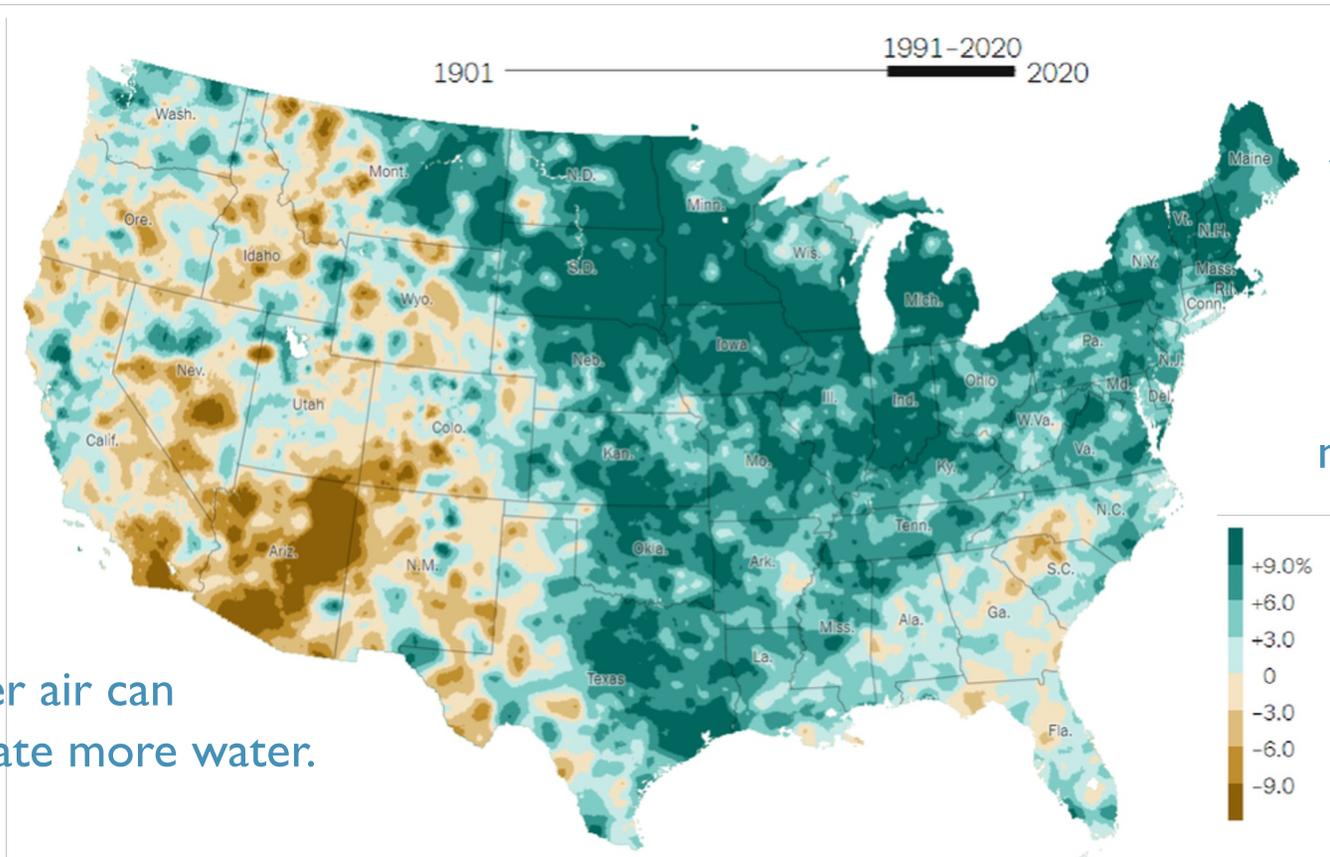
Global average temperature increased in response to the increases in human-sourced GHGs in the atmosphere since the industrial revolution

Image Source: NOAA Climate Change: Global Temperature (<https://www.climate.gov/news-features/understanding-climate/climate-change-global-temperature>)



Summer Temperatures in the Northern Hemisphere

Image source: *The New York Times* (<https://www.nytimes.com/2019/02/28/learning/teach-about-climate-change-with-these-24-new-york-times-graphs.html>)



The U.S. warmed 2.6°F since 1970.

Our air can hold ~10% more moisture on average.

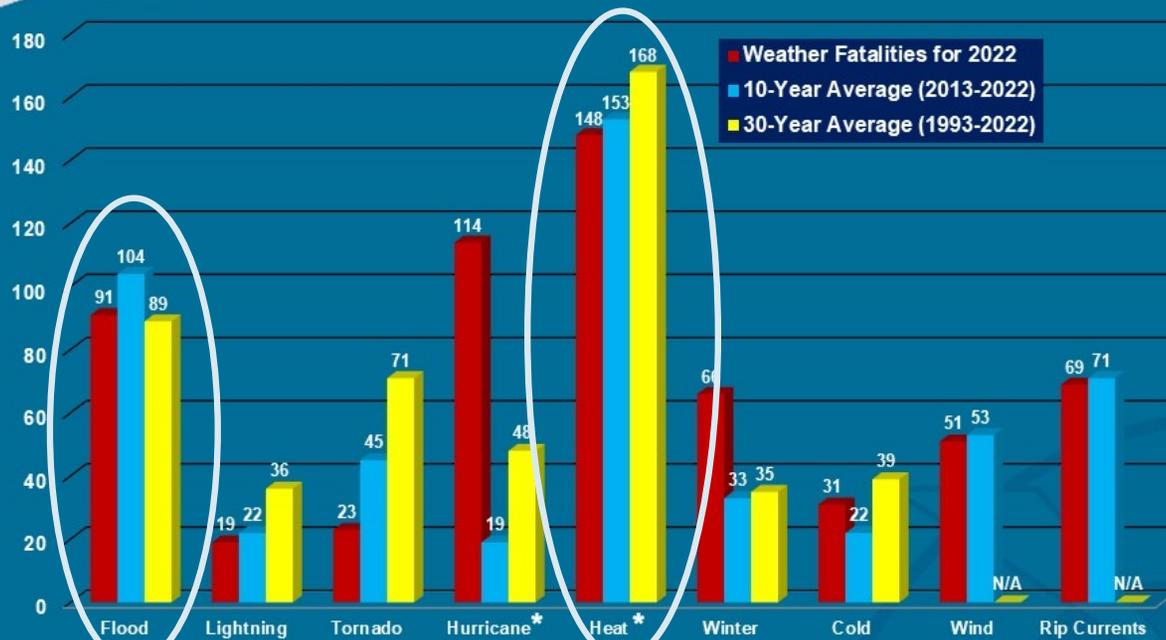
Warmer air can evaporate more water.

30-year Precipitation Compared with 20th Century Average

Image source: *The New York Times* (<https://www.nytimes.com/2021/09/16/learning/whats-going-on-in-this-graph-new-normal-us-precipitation.html>)



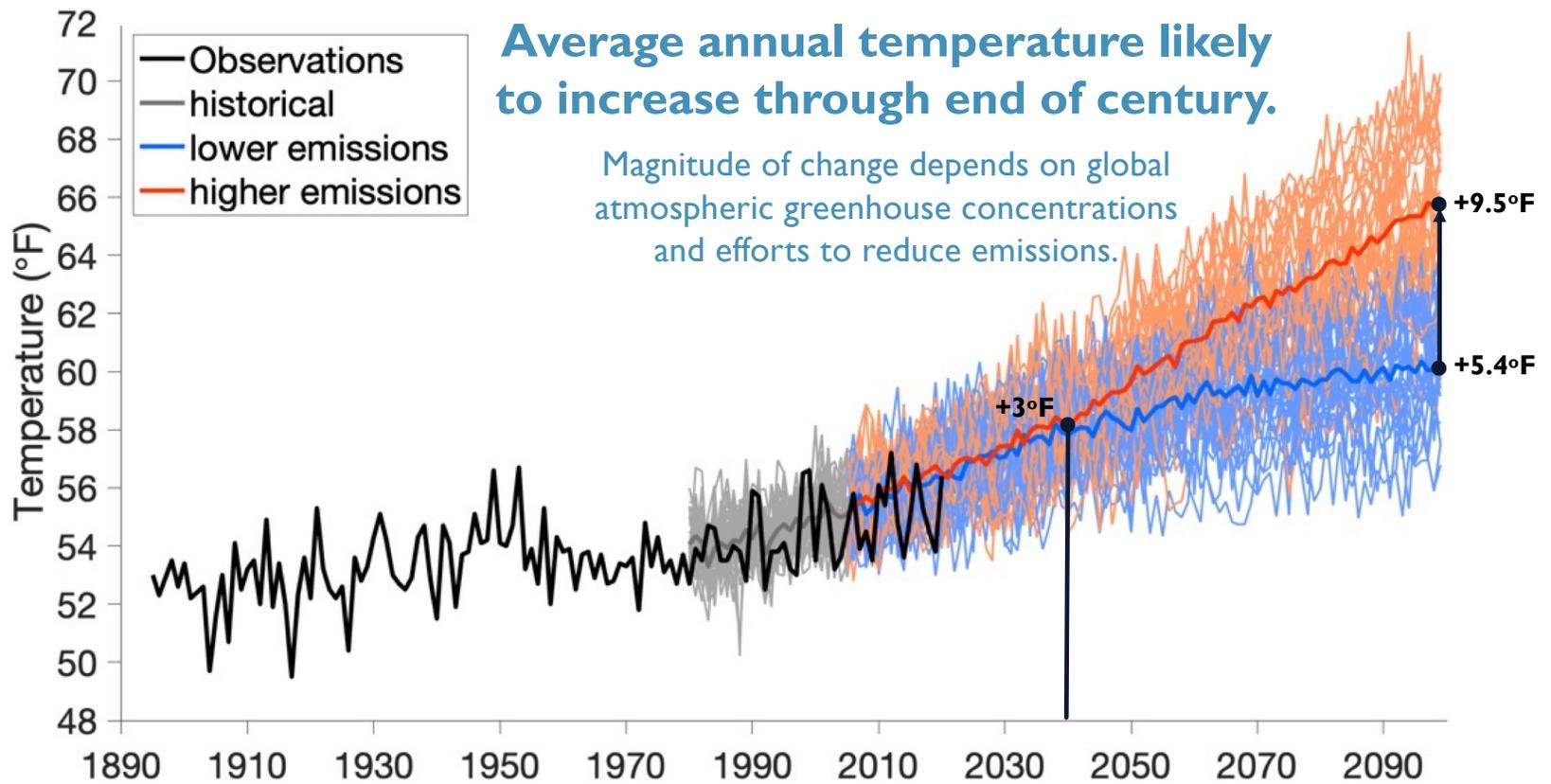
Weather Fatalities 2022



*Due to an inherent delay in the reporting of official heat fatalities in some jurisdictions, this number will likely rise in subsequent updates.
*The fatalities, injuries, and damage estimates found under Hurricane/Tropical Cyclone events are attributed only to the wind.

Image Source: NOAA-NWS Weather Fatalities 2022 (<https://www.weather.gov/hazstat/>)

Heat and flooding are the deadliest weather hazards in the U.S.



NH Average Annual Maximum Temperatures – 1895 to 2099

Image source: Lemcke-Stampone et al., 2022

Median Risk Ratings for New Hampshire

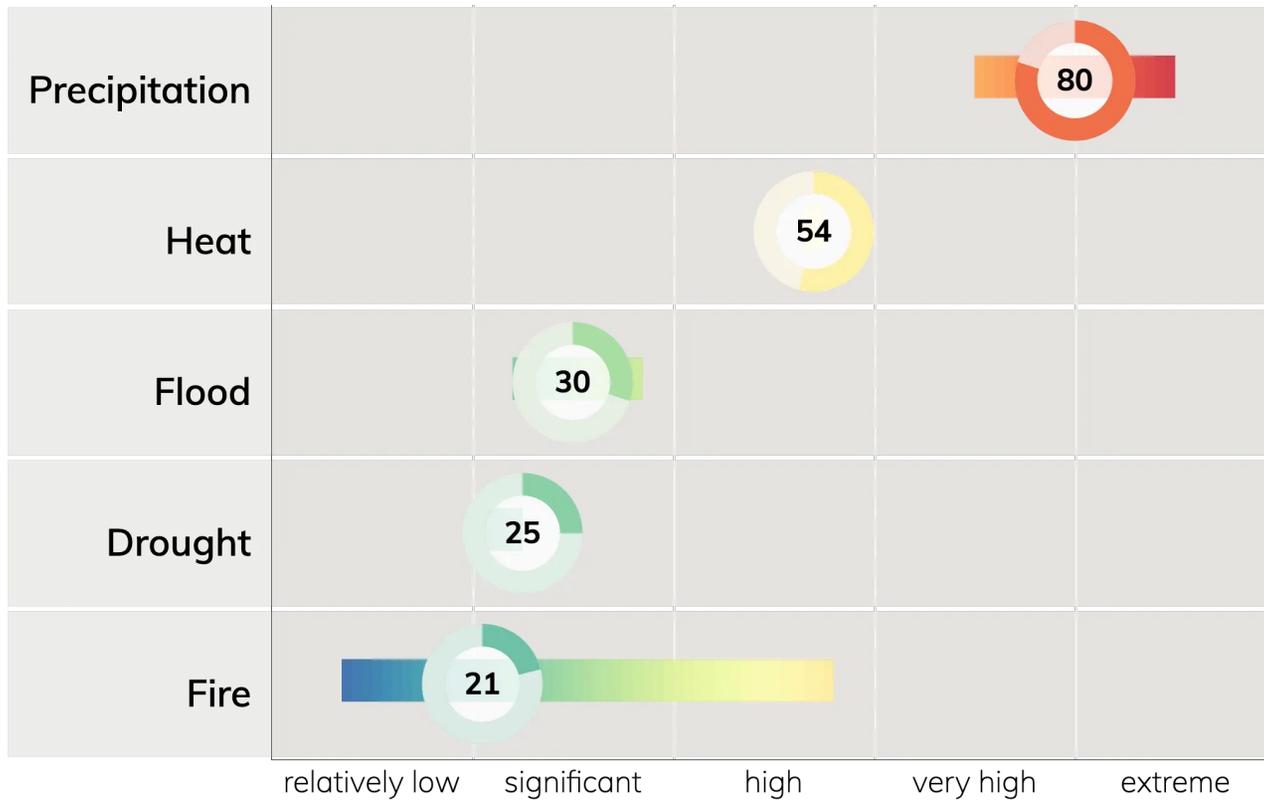


Image Source: Climate Check New Hampshire (<https://climatecheck.com/newhampshire>)

New Hampshire residents are at increased risks from **precipitation, heat, and flood** due to climate change by 2050.

Largest increases in seasonal precipitation are expected during winter and spring.
 Warmer summer with little change in rainfall increases drought risk.

Indicators	Historical 1980-2009	Change from historical (+ or -)					
		2010-2039		2040-2069		2070-2099	
		Low Emissions	High Emissions	Low Emissions	High Emissions	Low Emissions	High Emissions
Precipitation (inches)							
Annual	45.4	4%	4%	7%	9%	8%	12%
Winter (DJF)	10.3	6%	6%	9%	14%	13%	22%
Spring (MAM)	11.2	4%	6%	7%	10%	8%	16%
Summer (JJA)	11.8	4%	4%	6%	6%	7%	9%
Fall (SON)	12.1	2%	2%	5%	5%	4%	4%

Projected Change in New Hampshire Precipitation (1980-2099)

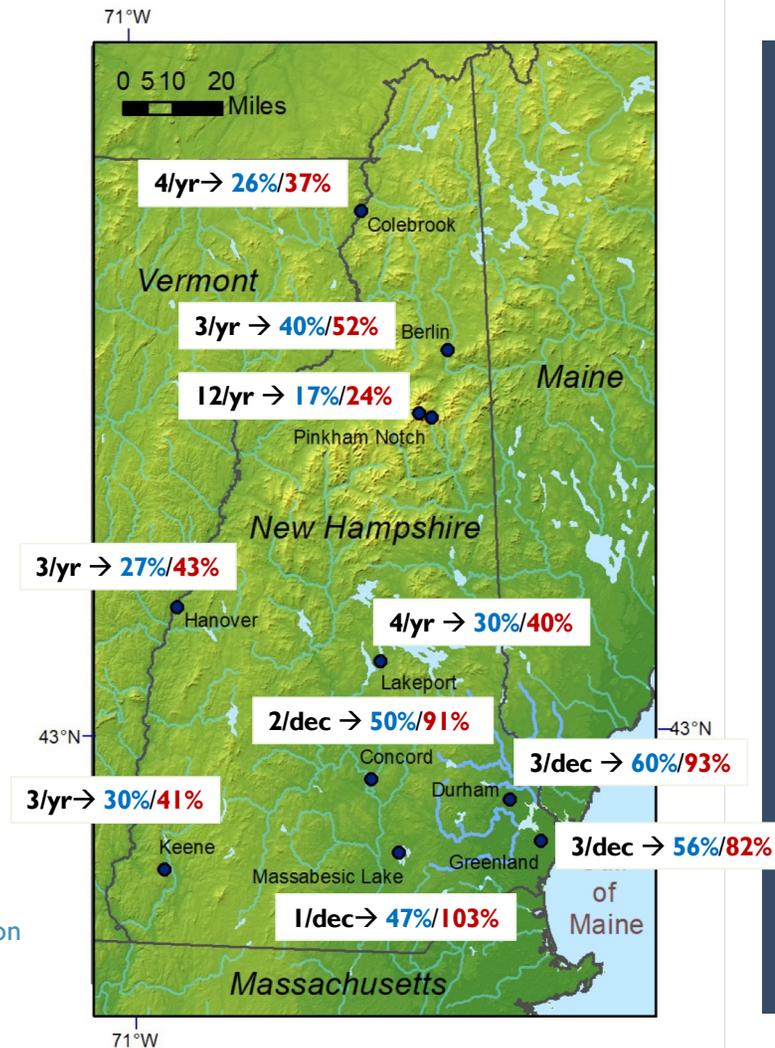
Image Source: Lemcke-Stampone et al., 2022: Table 6B, page 27.

Extreme Precipitation

Historical → low/high (2050)

- Largest increases for winter and spring.
- Frequency of daily events over 1-inch increases inland.
- Storm events over 4-inches will continue to increase in frequency near the coast.

Projected (2040-2069) change precipitation
(Source: Lemcke-Stampone et al., 2022:
Appendix 3).



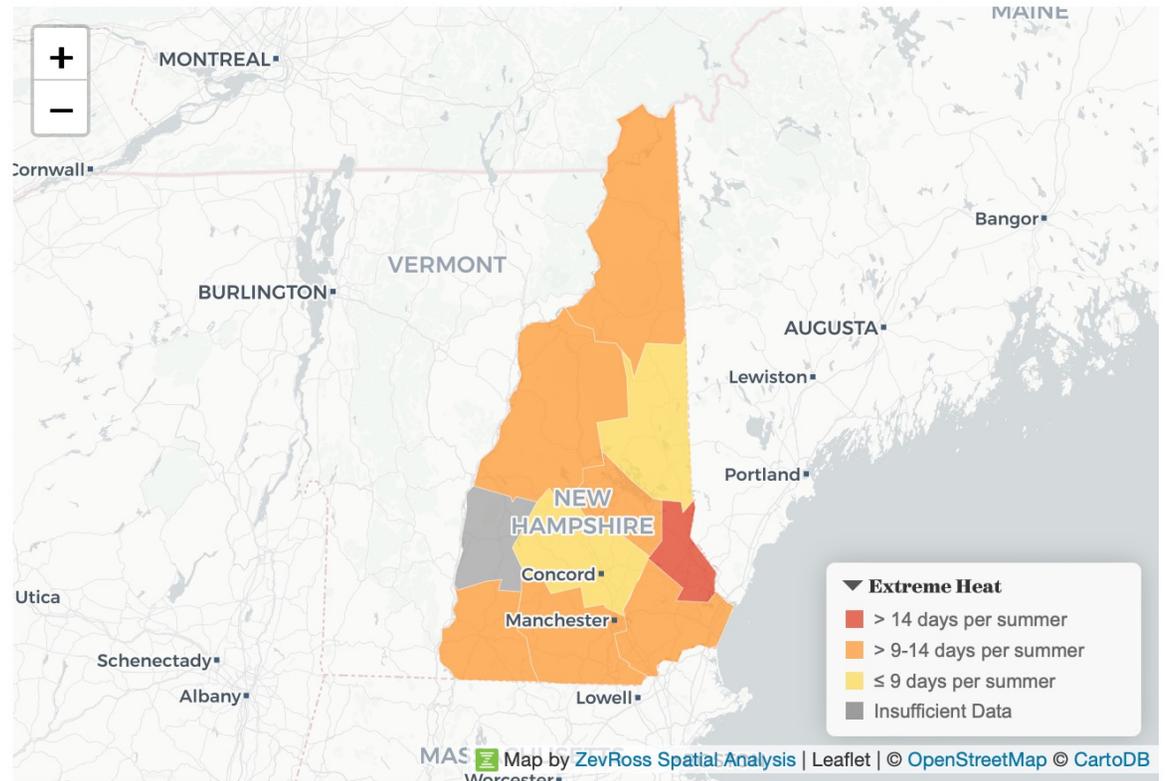
Projected increases in total annual precipitation are largely due to increases in the frequency of and intensity of extreme precipitation.

82%

live in counties with a summer average of more than 9 extreme heat days

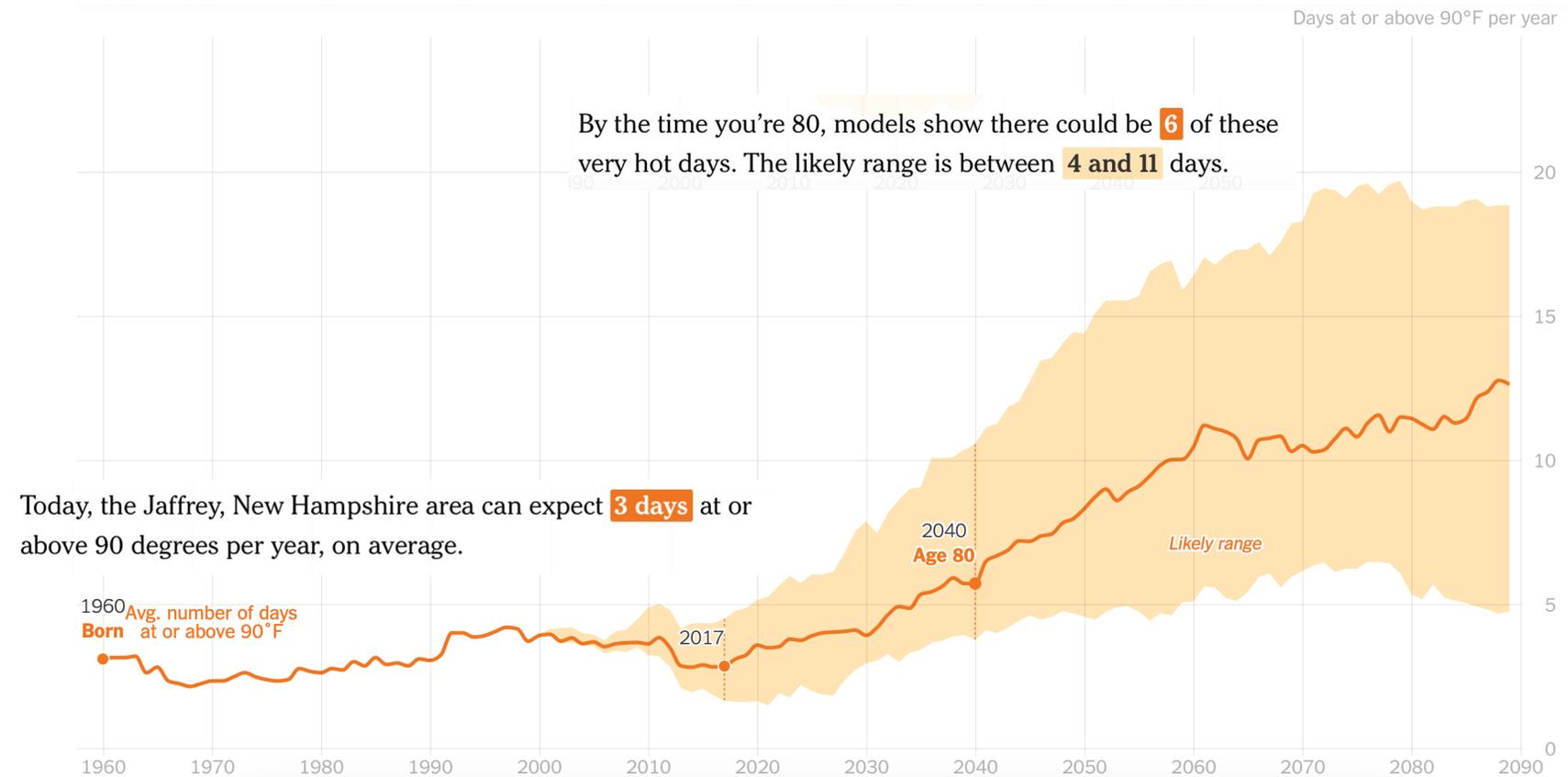
16°F

increase from historical averages projected by 2100 if emissions remain high



Exposure to Extreme Heat – New Hampshire

Image Source: National Resource Defense Council (<https://www.nrdc.org/resources/climate-change-and-health-extreme-heat#/map/detail/NH>)



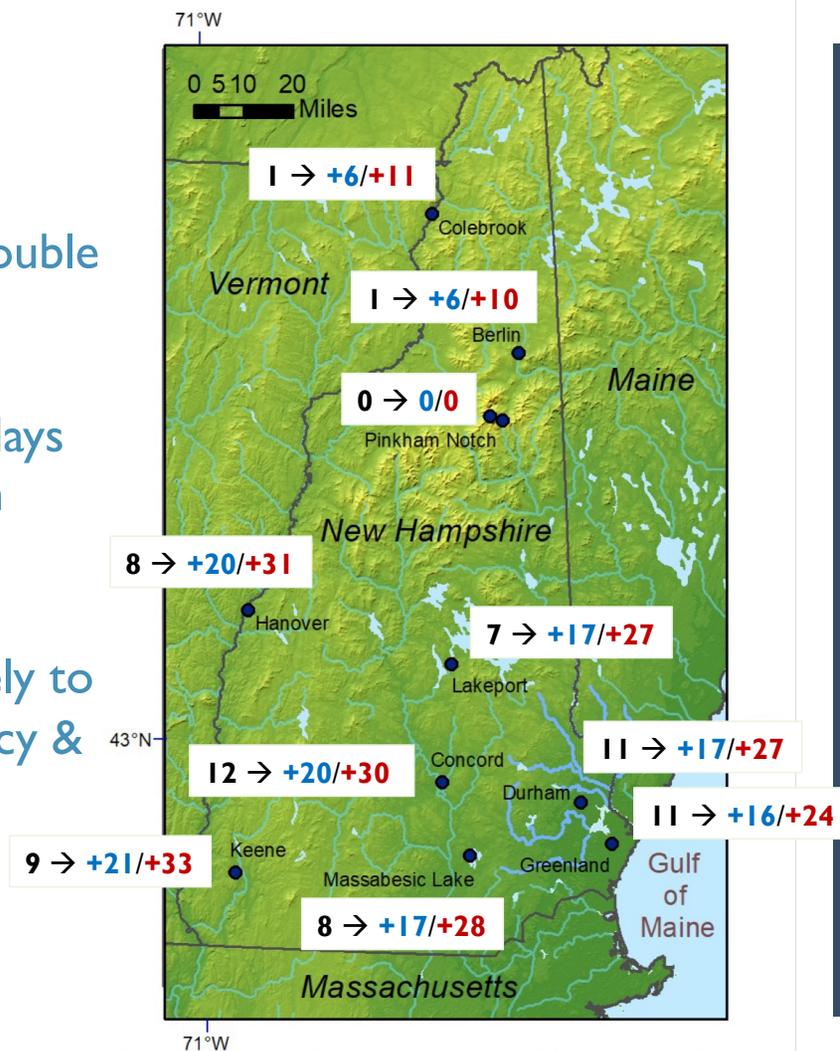
Days at or above 90°F at Jaffrey New Hampshire

Image Source: NYT Climate Impact Lab (<https://www.nrdc.org/resources/climate-change-and-health-extreme-heat#/map/detail/NH>)

Days Above 90°F

Historical → low/high (2050)

- Days above 90°F double by 2050.
- Expect ~10 more days above 90°F for high emissions.
- Heat waves are likely to increase in frequency & intensity.



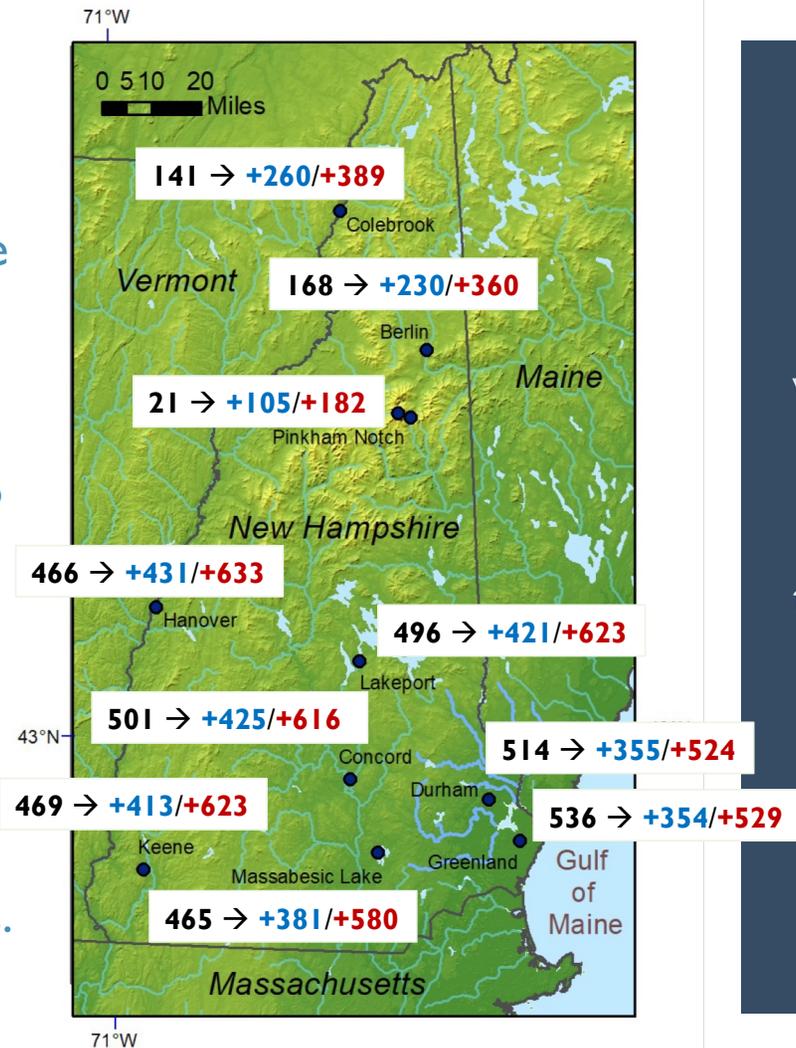
Continued warming will likely result in an increase in the warmest daily temperatures and the frequency of hot extremes.

Projected (2040-2069) change extreme heat (Source: Lemcke-Stampone et al., 2022:Appendix 3).

Cooling Degree Days

Historical → low/high (2050)

- Days above 90°F double each 30-year period for unregulated emissions.
- Heat waves are likely to increase in frequency & intensity.
- Energy required for cooling increases 90 to 148 % by mid-century depending on emissions.



Continued warming will likely result in an increase in the warmest daily temperatures and the frequency of hot extremes.

Projected (2040-2069) change extreme heat (Source: Lemcke-Stampone et al., 2022:Appendix 3).



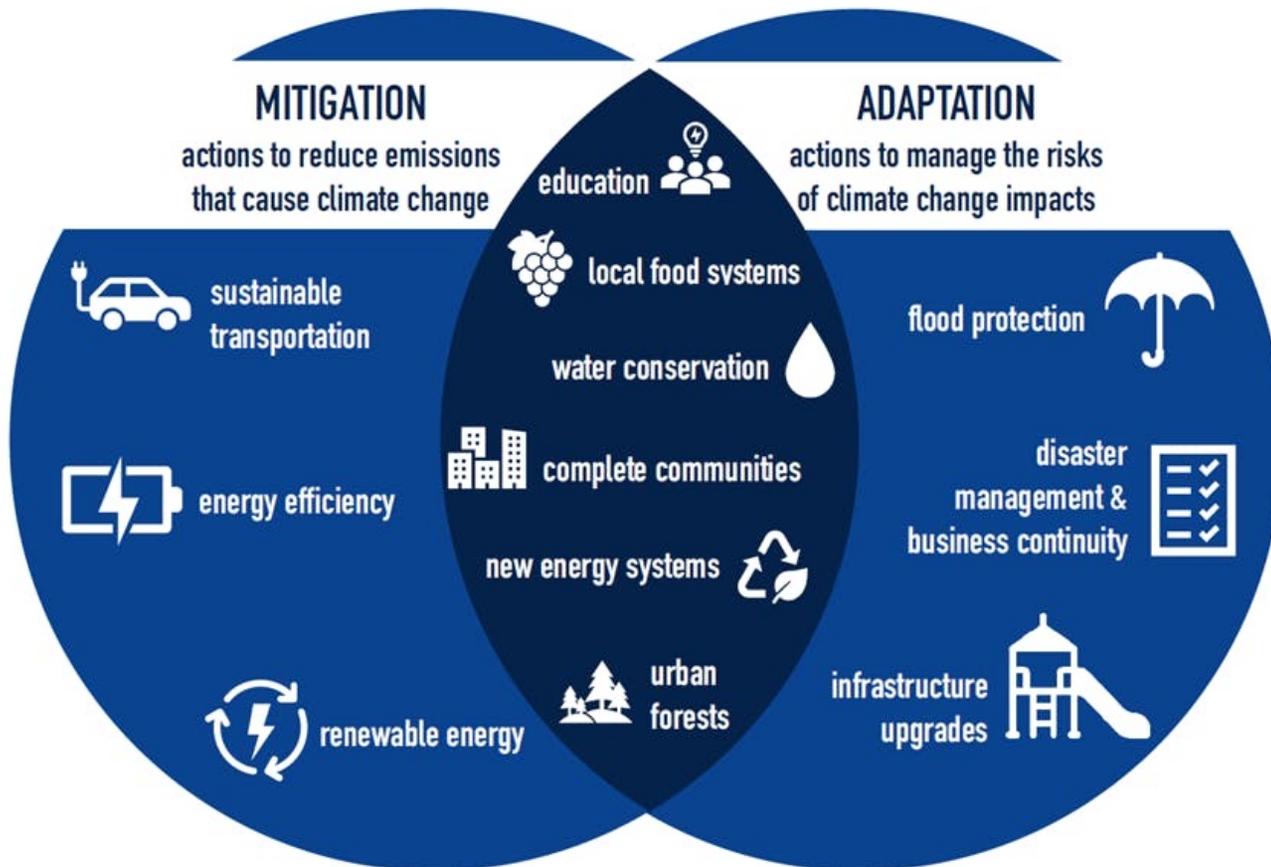
(Photo Courtesy of Denise Erway)

Climate change is already impacting NH and these changes will likely continue.

- **Stronger storms** with heavy rain over impervious surface cover increases run off and flood risk.
- **Infrastructure is not designed** for current & projected future climate conditions.
- **Services and resources at risk** for disruption during severe weather.

Damage to Route 10 in Winchester on July 9 and 10, 2023

Image Source: NH Bulletin (<https://newhampshirebulletin.com/2023/07/12/what-the-monadnock-region-flood-mayhem-signals-about-the-future-of-rain-in-nh/>)



The amount of change depends on our ability to reduce greenhouse gas emission over the next few decades.

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