# Minnesota's Changing Climate: Risks & Impacts


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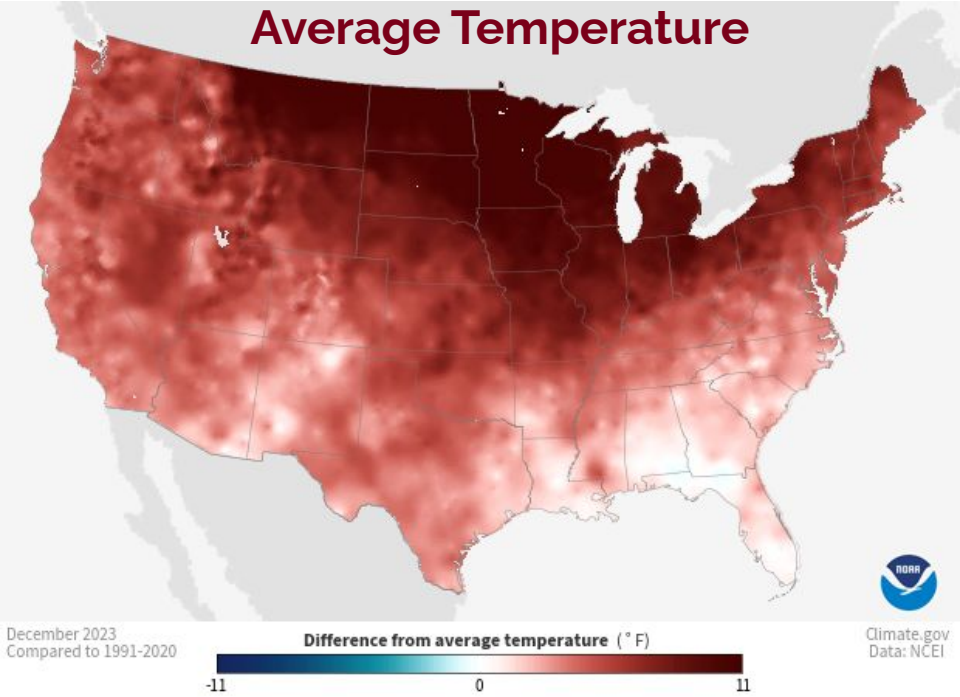
University of Minnesota Climate Adaptation Partnership

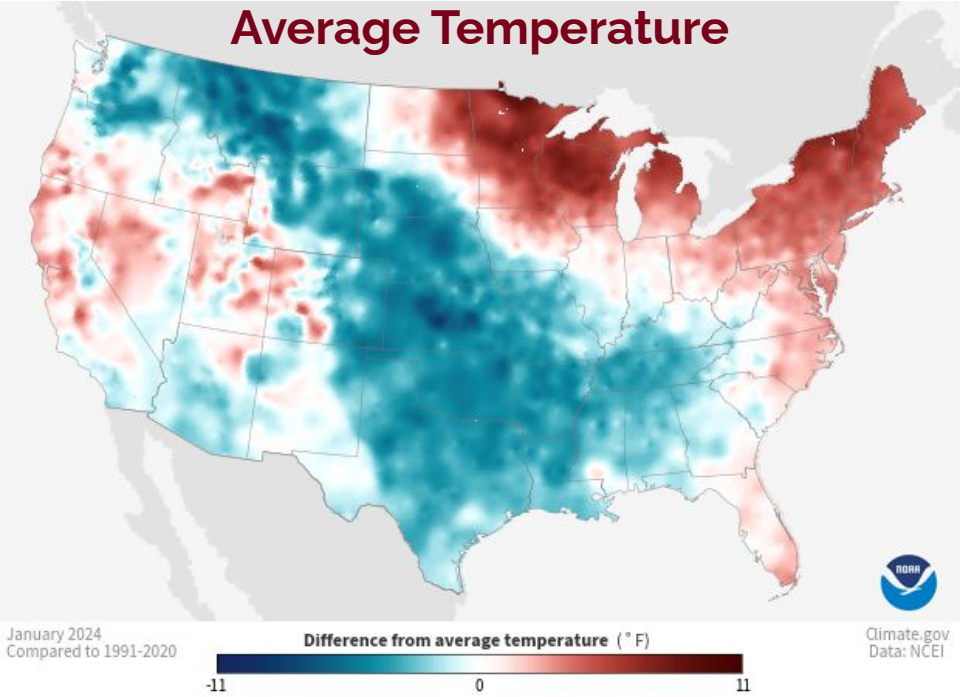
Photos: UMN Extension & H. Roop

# 2023-2024: An Exceptionally Warm Winter

## December 2023 Difference from Average Temperature



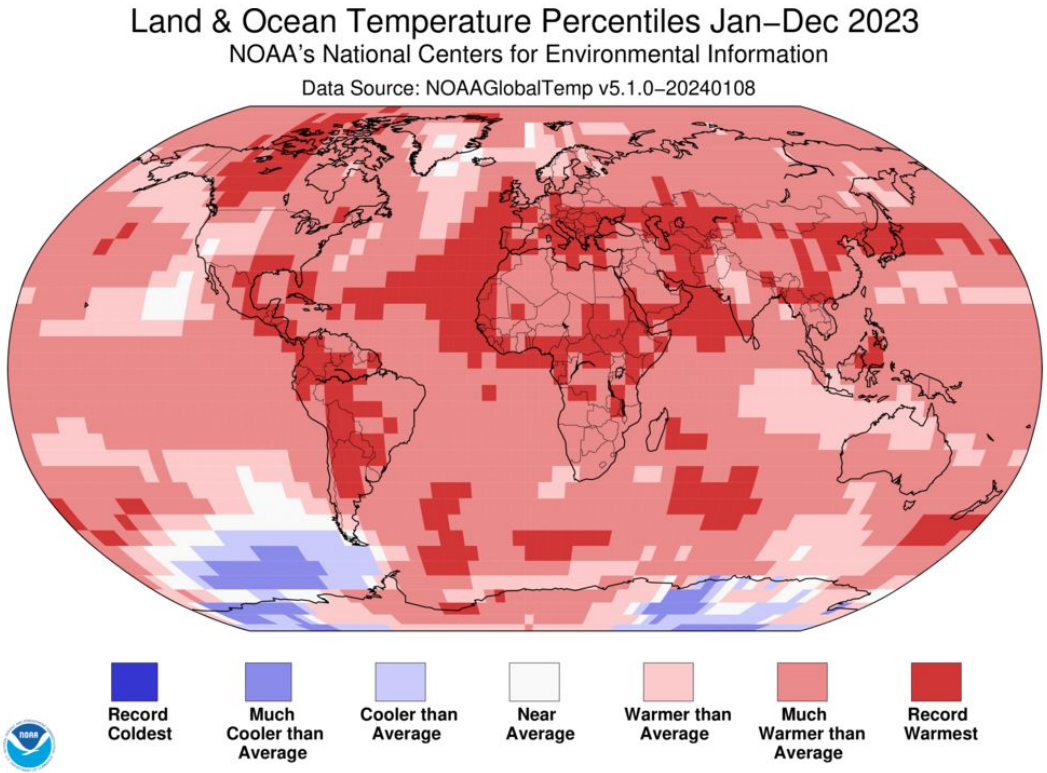

## January 2024 Difference from Average Temperature




## Compared to 1991-2020

Data & Maps: NOAA NCEI, 2024

# 2023 - An Exceptional Year



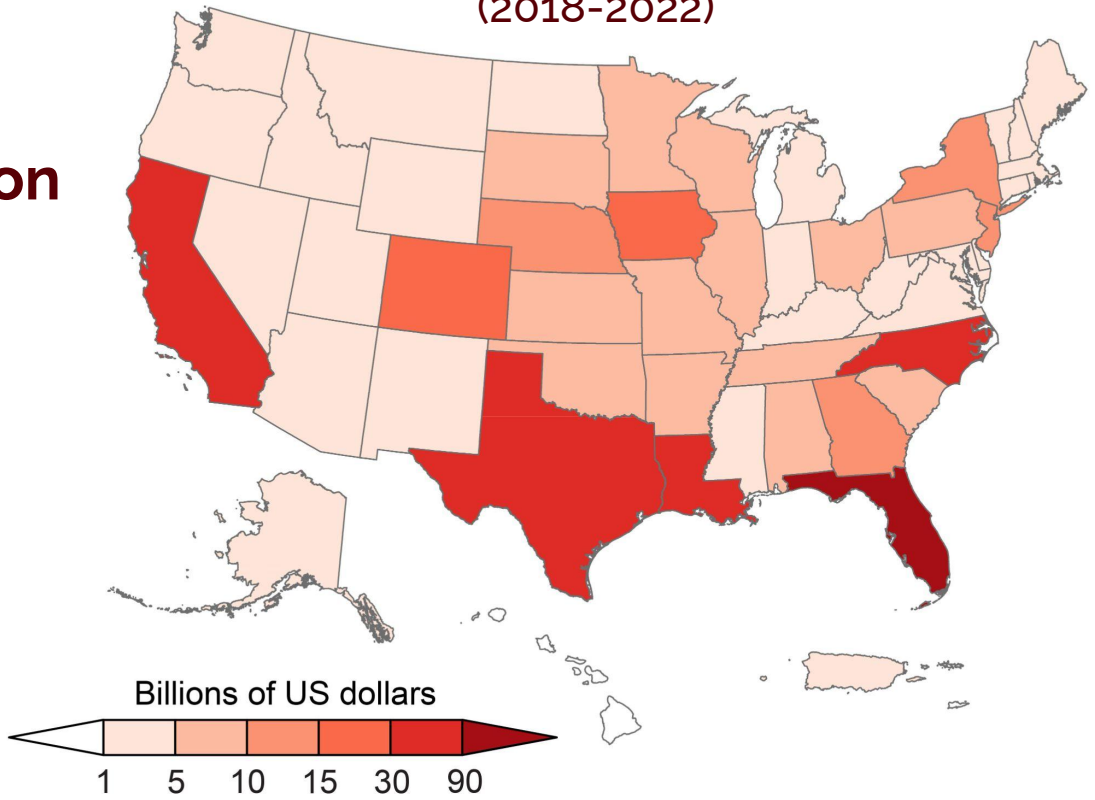

- Globally, 2023 was **the warmest year** since records began in 1850
- In the U.S., **2023 was the 5th warmest year** on record
- A record of **28 billion-dollar disasters** occurred in the U.S.

Source: NOAA, 2024

**“The U.S. now experiences, on average, a billion-dollar weather or climate disaster every three weeks.”**

- U.S. 5th National Climate Assessment

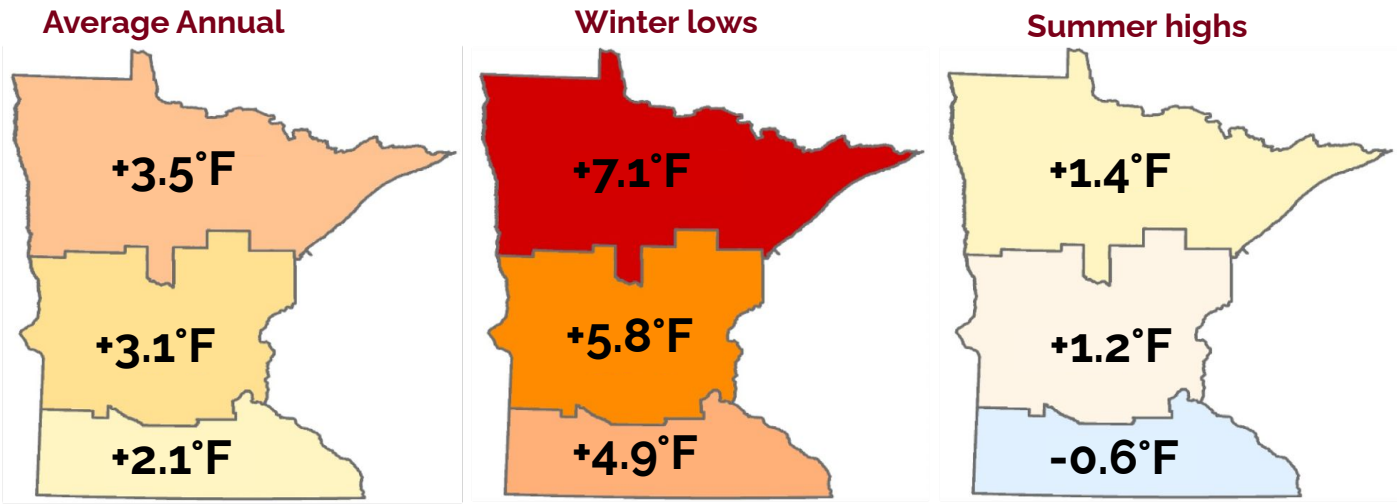
## Damages by State from Billion-Dollar Disasters (2018-2022)




NOAA NCEI, 2024; NCA5, 2023

# A Warming Minnesota

## Observed Temperature Change (1895-2023)




**Minnesota's average annual temperature has increased by 2.9°F since 1895**

Data: MN DNR, 2024

# Minnesota is getting warmer & wetter

10 wettest & warmest years on record all occurred after 1997

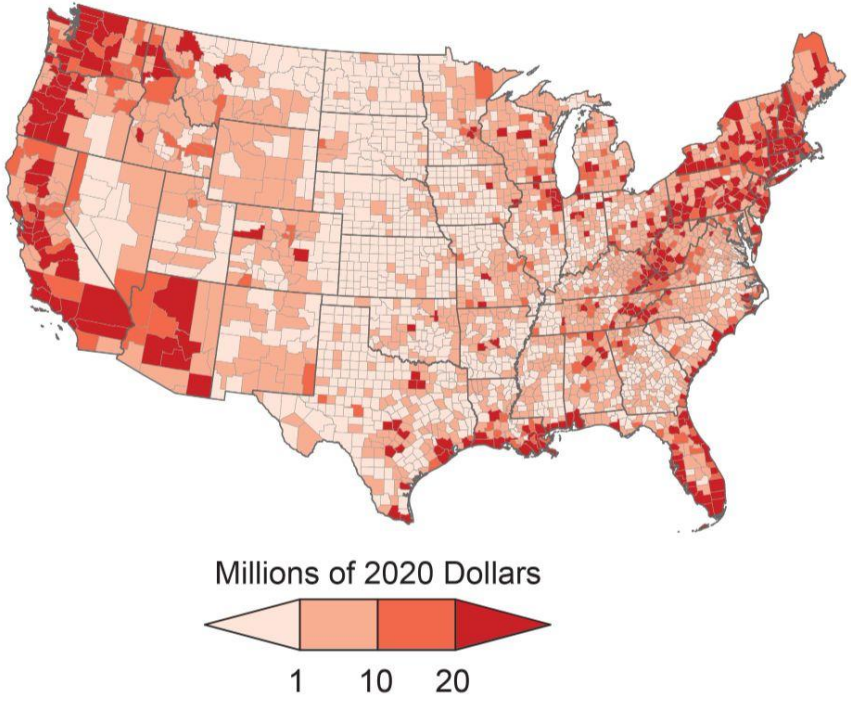
Observed 13% increase in the heaviest rainfall of the year

Growing season has lengthened by ~2 weeks since 1950

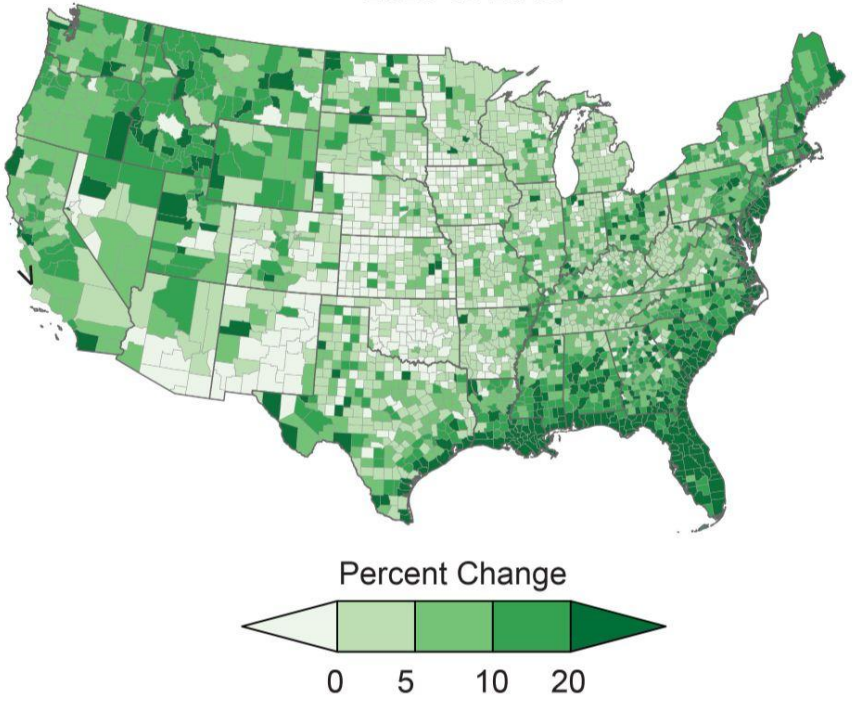
Data: MN DNR, NCA4 Midwest Chapter

# Increasing Flooding Puts More People and Assets at Risk

c) Annual average loss from all types of flooding, 2020



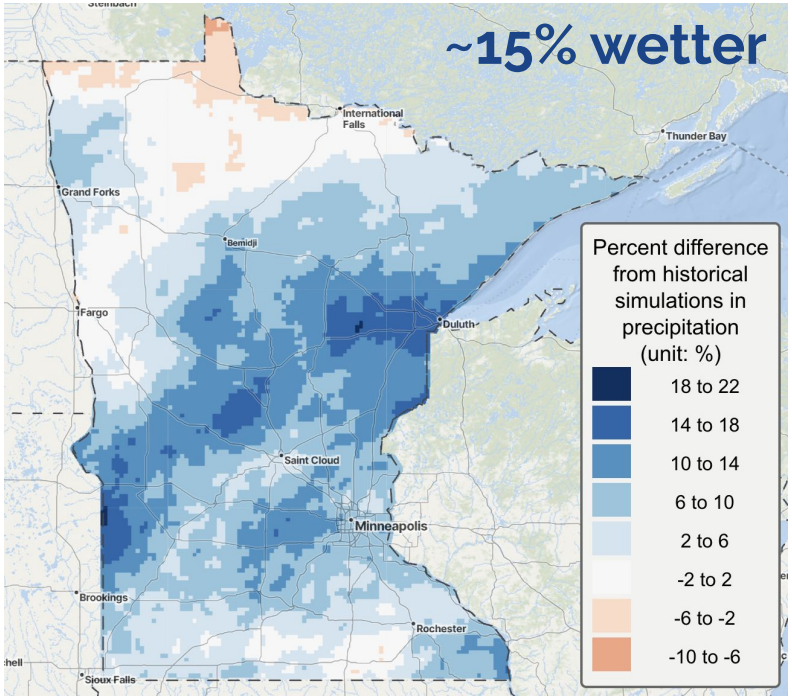

d) Projected percent change in average annual loss, 2020 to 2050



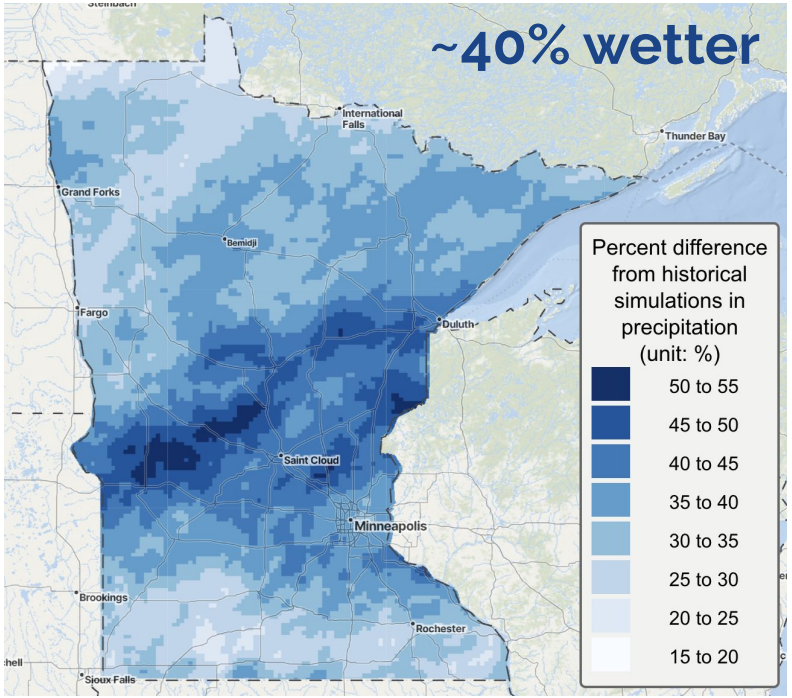

NCA5, 2023

# Average percent change in spring precipitation

## Mid-century (2040-2059)




## End-of-century (2080-2099)

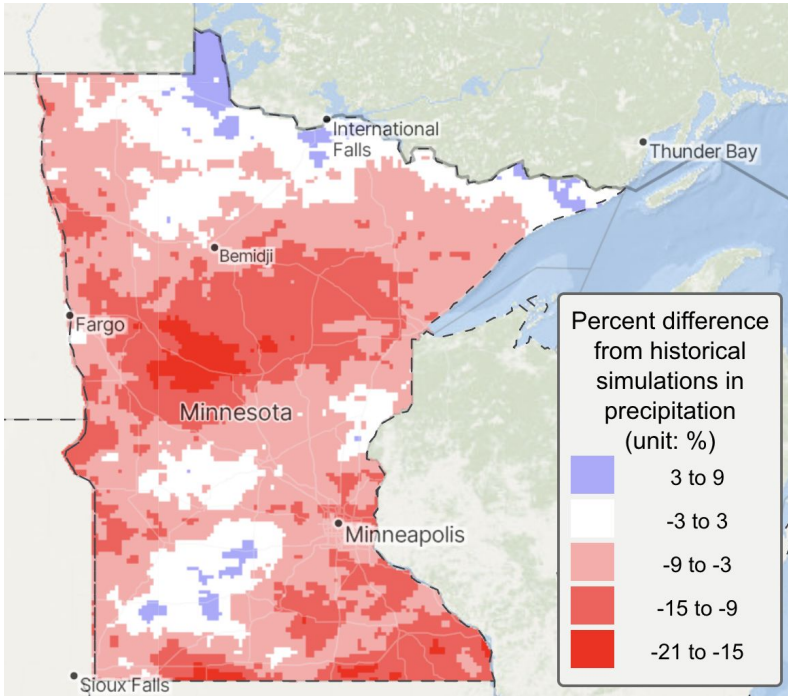



**very high emissions (SSP585); relative to 1995-2014**

Data: UMN Climate Adaptation Partnership, 2024

# Average percent change in summer precipitation

## Mid-century (2040-2059)

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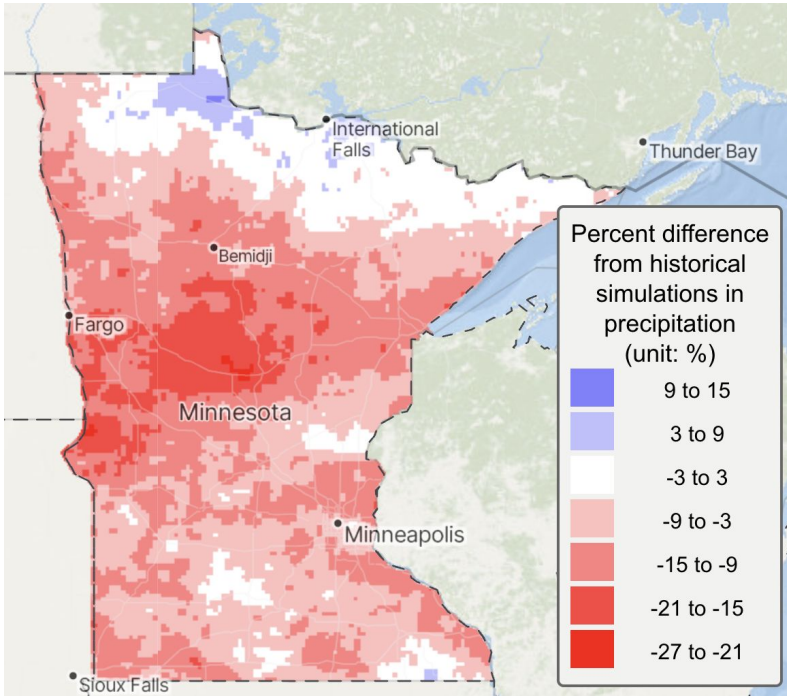



**very high emissions (SSP585); relative to 1995-2014**

Data: UMN Climate Adaptation Partnership, 2024

Across the Midwest,

**transitions from wet to dry extremes**

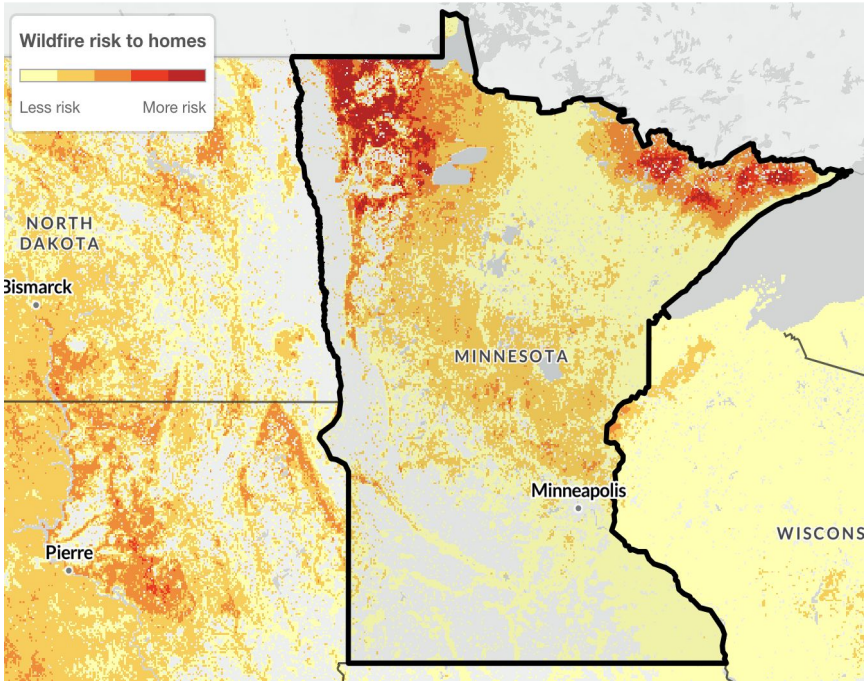

are happening **more quickly** and

**more frequently.**

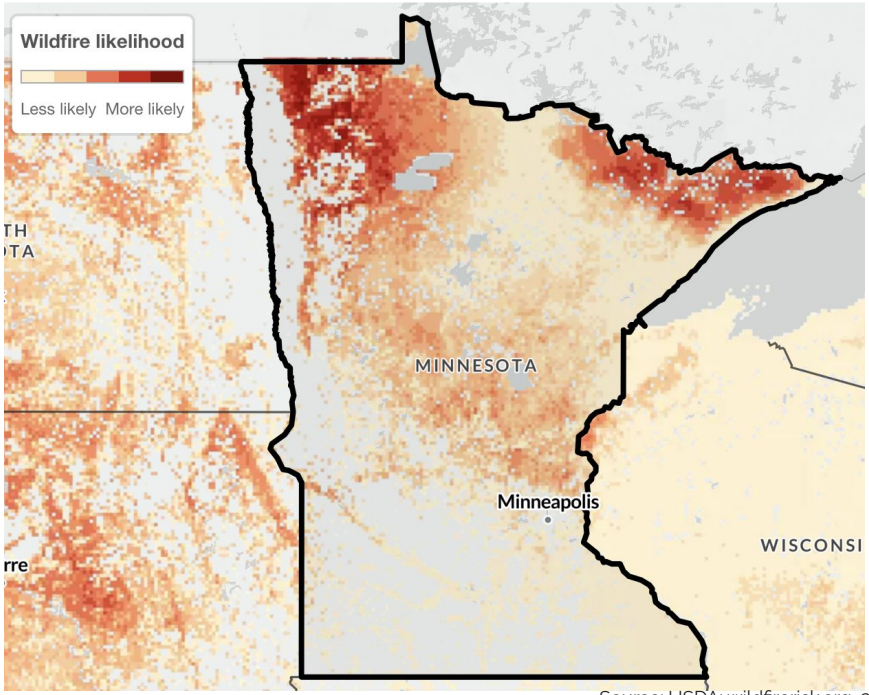
Photos: UMN Extension; Data: www.drought.gov

# Wildfire Risk - Not Only a West Coast Challenge

**Populated areas in Minnesota have, on average, greater risk than 45% of states in the US.**



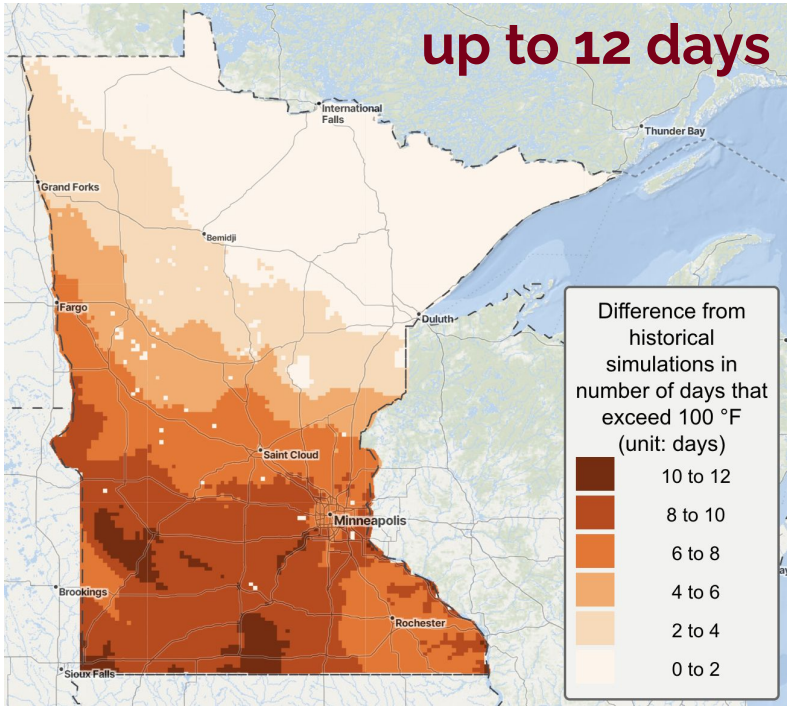

**Populated areas in Minnesota have, on average, greater wildfire likelihood than 41% of states in the US.**




Source: USDA; wildfirerisk.org, 2024

# Number of days per year exceeding 100˚F

## Mid-century (2040-2059)

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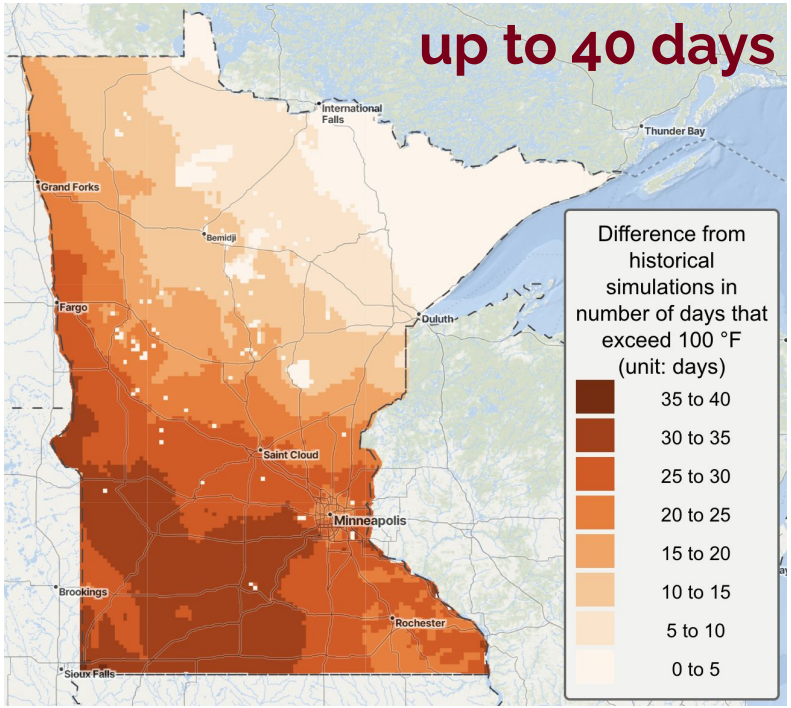
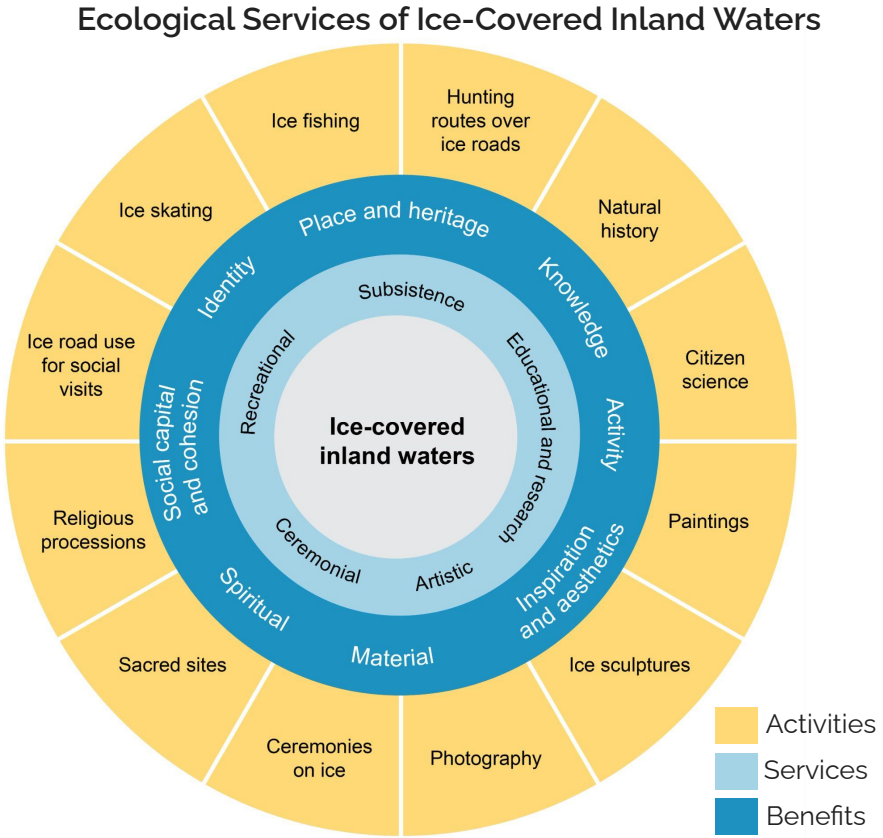



**high emissions (SSP585); relative to 1995-2014**

Data: UMN Climate Adaptation Partnership, 2024

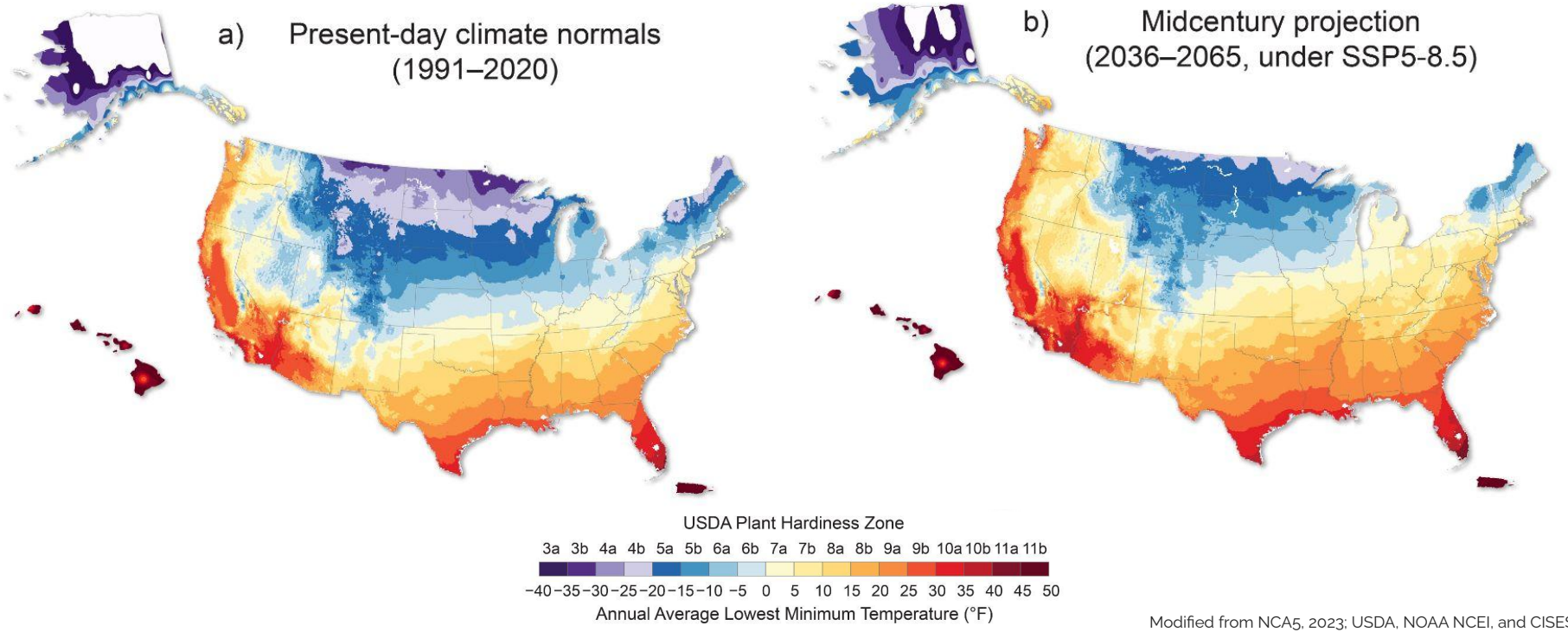
# Warming Impacts Lives & Livelihoods

- Nature-based **recreation is transitioning**, affecting **opportunity, economy, and safety**.
- Climate change accelerates the **loss of beings, connections, and access to the land** for Indigenous peoples.




NCA5, 2023

# Plant hardiness zones are projected to shift northward throughout this century altering our working & natural lands

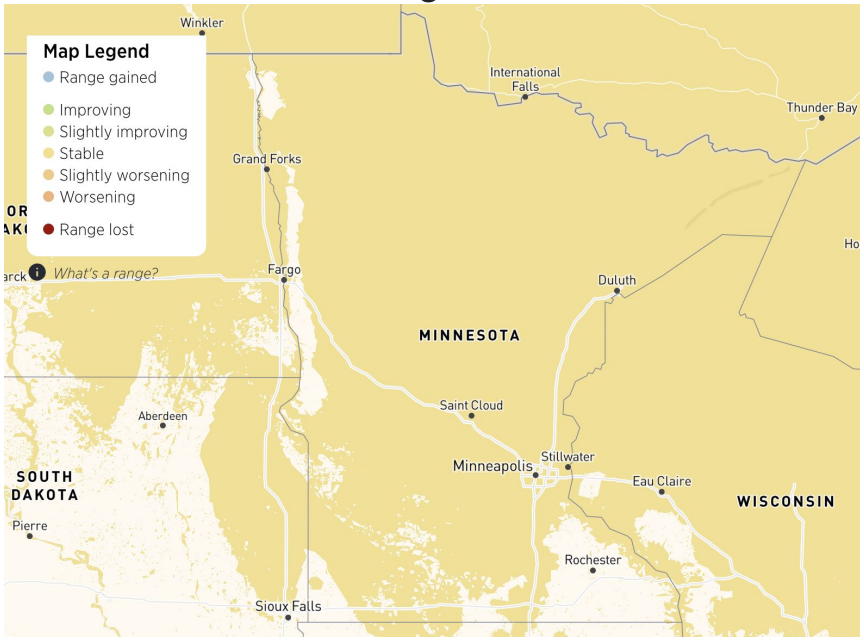



Modified from NCA5, 2023; USDA, NOAA NCEI, and CISESS NC.

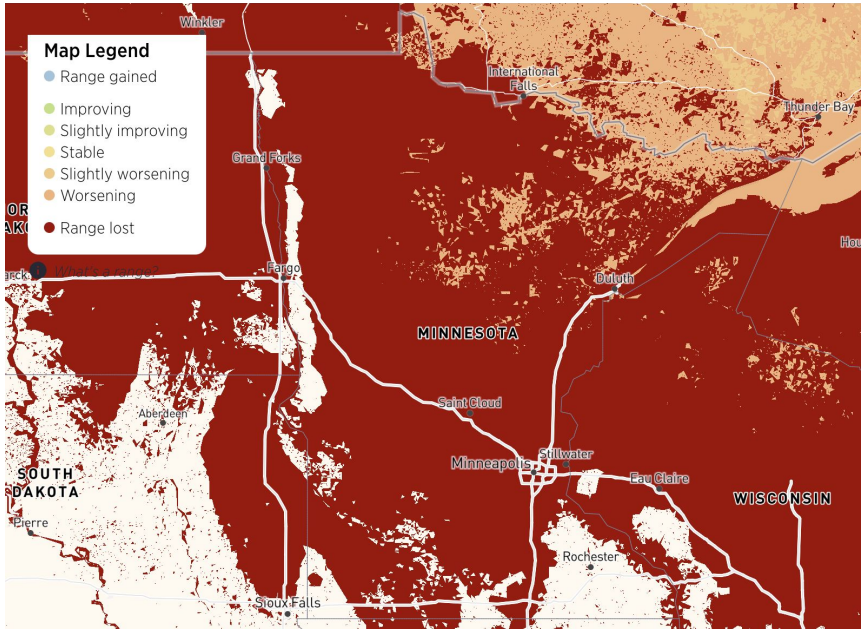
# Changing Landscapes & Ecosystems

**"..it looks all but certain that Minnesota will lose its iconic loons in summer by the end of the century."**

## Current Summer Range of Common Loon




## Summer Range of Common Loon with 3°C of warming



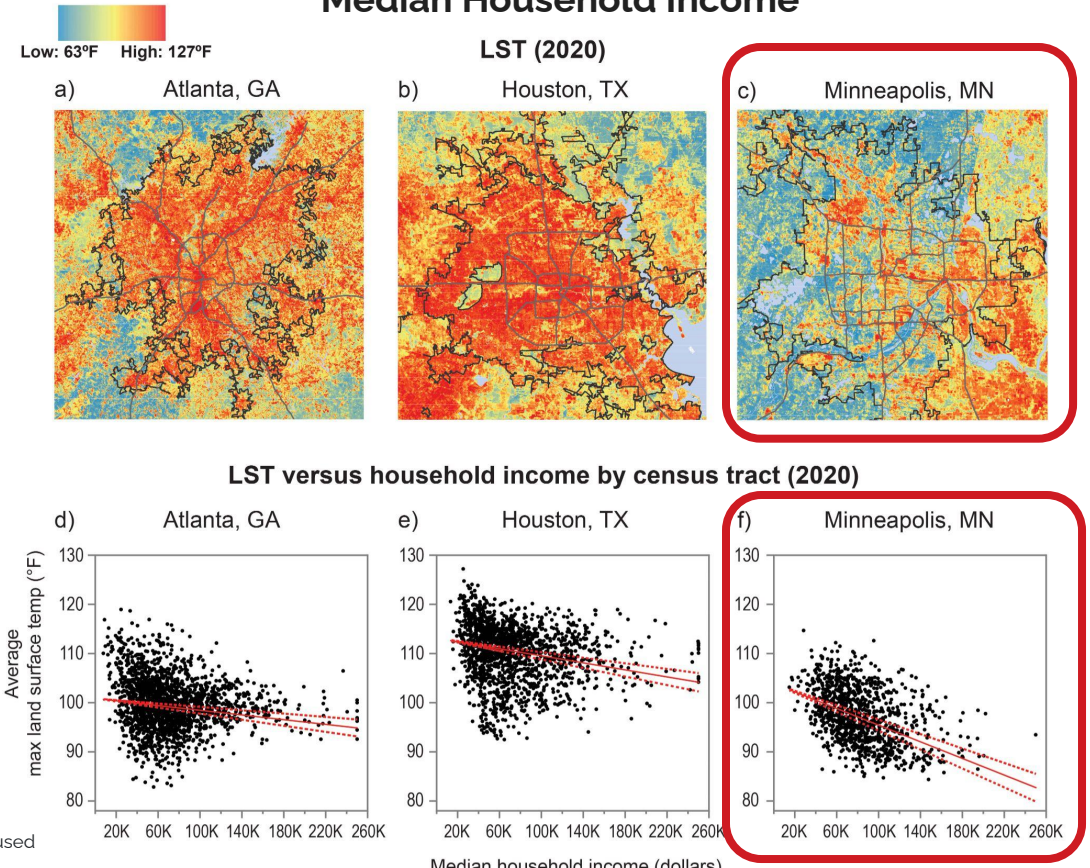

Audubon, 2014 & 2019

# Climate Change Exacerbates Inequities

Lower-income urban neighborhoods, **including those in Minneapolis,** experience higher surface temperatures.

**91%** of communities of color in Minnesota have air-pollution-related risks **above health guidelines.**

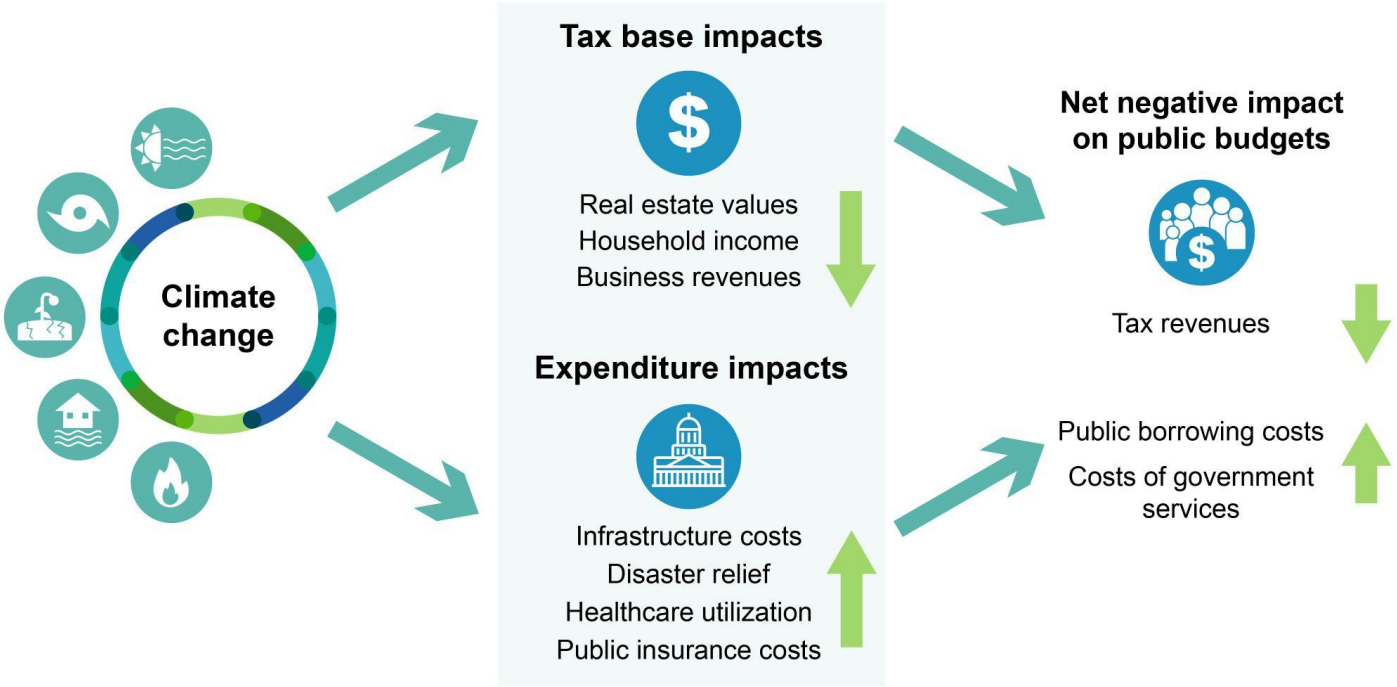
## Land Surface Temperature (LST) and Its Relationship to Median Household Income




NCA5, 2023; Portions of this figure include intellectual property of Esri and its licensors and are used under license. Copyright © 2020 Esri and its licensors. All rights reserved.; MPCA, 2024

# Public Budgets Under Pressure From Climate Change

## Fiscal Risks of Climate Change




Current estimate to upgrade Midwest infrastructure* is ***$7,547 per capita*** across the Midwest

*dams, bridges, wastewater, energy generation & distribution

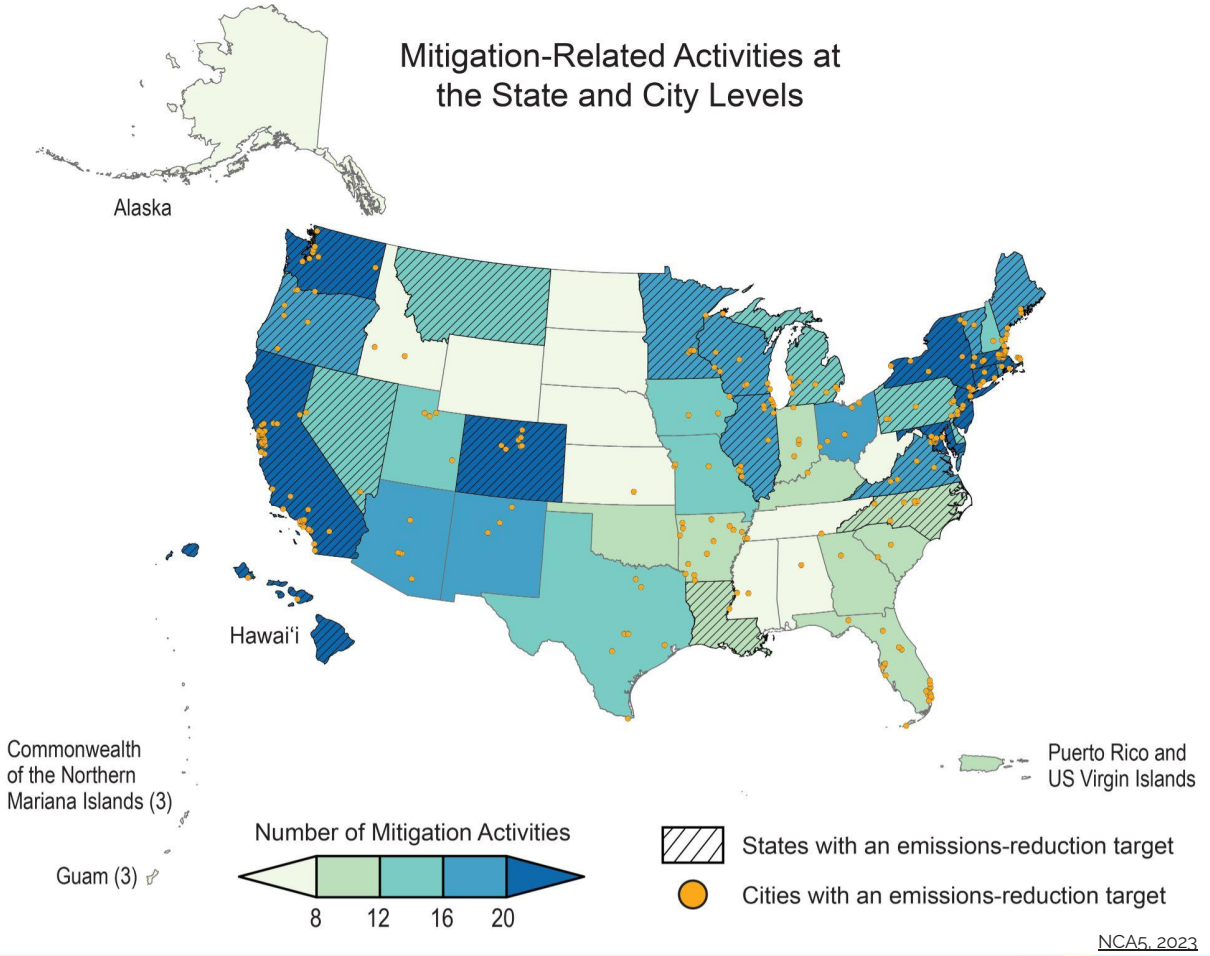
NCA5, 2023

# Risk Reduction & Management With Climate Change


Effective climate risk reduction **requires investments in mitigation *and* adaptation.** It also requires **consideration of climate risk** in planning & policy.

Resiliency gap modified from UCS, 2016

# Action is underway across the U.S. & Minnesota to reduce greenhouse gas emissions, but more is needed.




NCA5, 2023

# Adaptation Is Essential. Many Actions Bring Co-Benefits.

***For every dollar*** **invested in natural climate solutions practices, Minnesota would receive**

**$8.55**

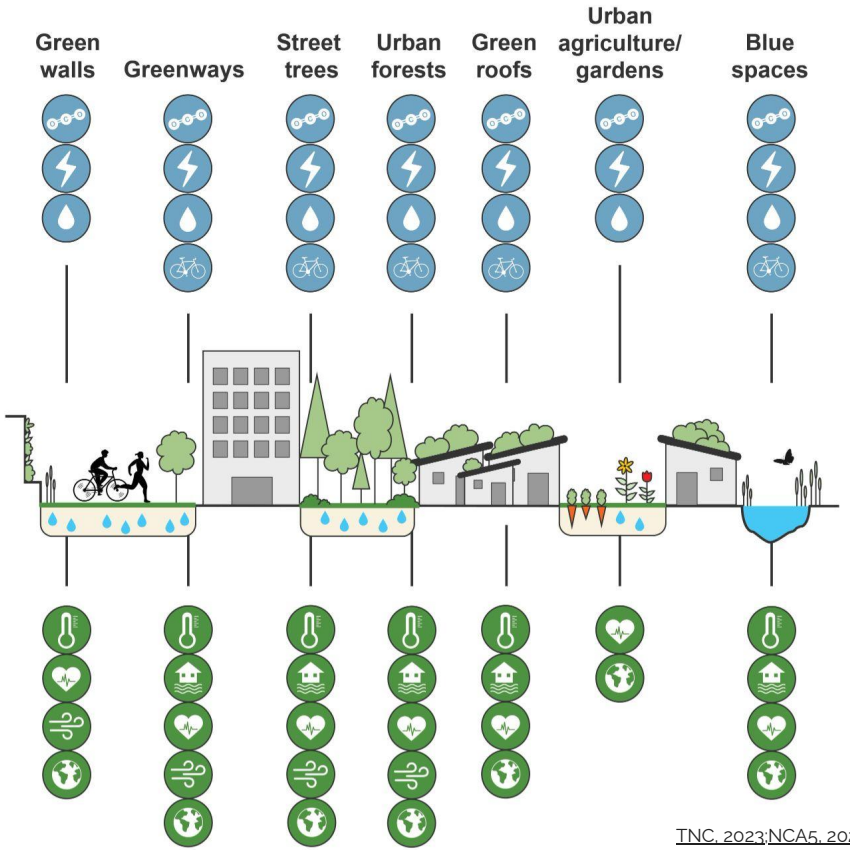
**in public benefits by 2050**

**Mitigation benefits**

- Sequester and store carbon
- Reduce building energy use
- Reduce municipal water use
- Facilitate active mobility

**Adaptation co-benefits**

- Reduce heat stress
- Reduce flooding
- Improve health
- Improve air quality
- Promote biodiversity

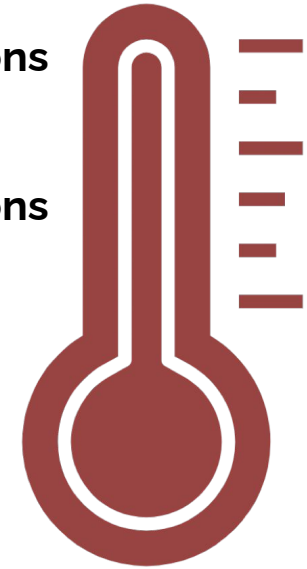



TNC, 2023;NCA5, 2023

# The Choice is Ours.

Compared to 1995–2014, Minnesota's average daily temperature at the end of the century is very likely to be higher by:

Very high emissions **+10.5 - 13.3˚F**



Moderate emissions **+6.2 - 7.6˚F**

Data: UMN Climate Adaptation Partnership, 2024

# Every increment of warming matters.


# Every action matters.

NCA5, 2023; Photos: UMN Extension & H. Roop