Coordination and collaboration for effective climate risk management in Minnesota

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UNIVERSITY OF MINNESOTA
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COLLEGE OF FOOD, AGRICULTURAL AND NATURAL RESOURCE SCIENCES

University of Minnesota

Climate Adaptation Partnership

Supporting thriving communities and landscapes through collaboration, capacity-building and advancing climate-informed decision-making.

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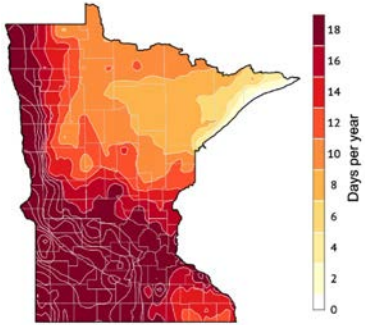
Our Work - Partnering across sectors & scales



High-resolution climate projections

Minnesota's Climate Action Framework

Adaptation indicators, metrics & monitoring

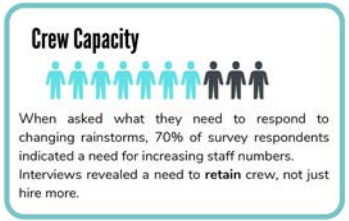
Public engagement & training

Network Analysis & Communication Research

New climate records

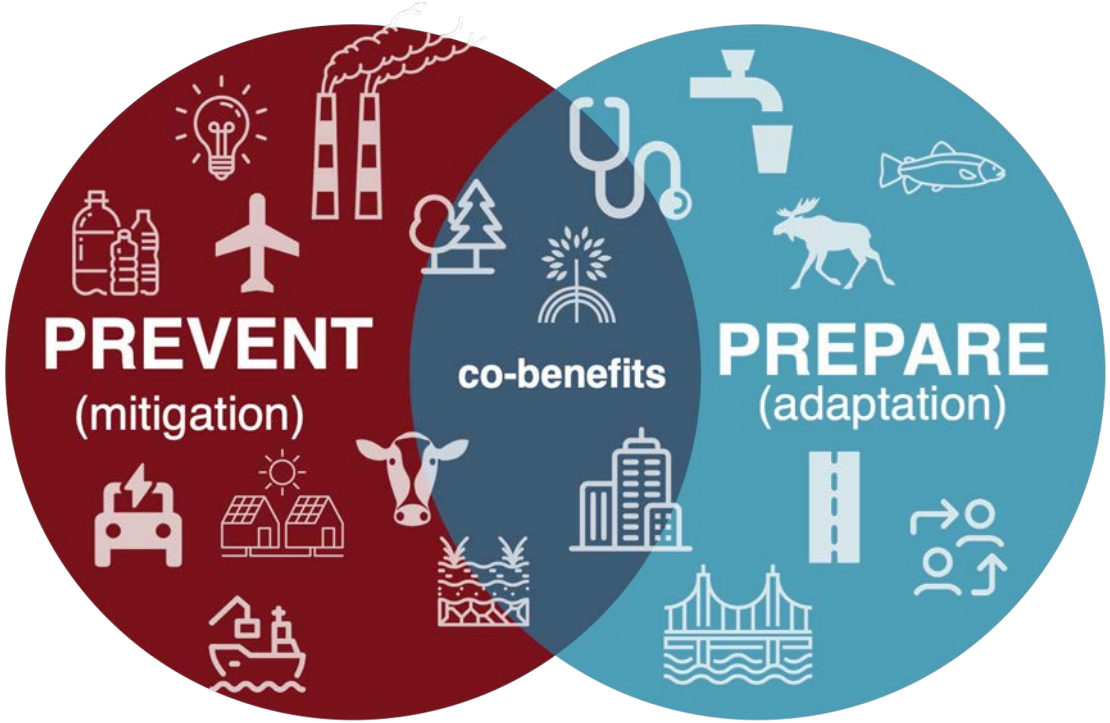
Dedicated Extension programs including adaptation & scenario planning

State & Federal Engagement



Adaptation leading practices across business lines & sectors

A Focus on Adaptation & Climate Risk Management



Adaptation comes in many forms and is needed across human & natural systems. We are **responding to the imperative to adapt** while we **also seek to mitigate climate change.**

Minnesotans are concerned & want to see action

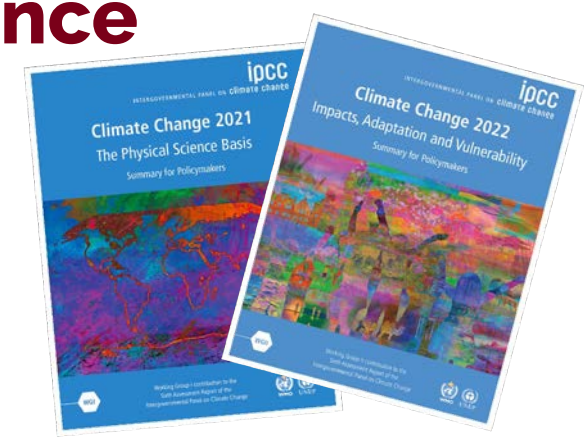
would like to see an increase in the use of wind, solar, and other renewable energy to power homes and businesses.

think we should prepare for climate change by preserving & conserving our state's grasslands, forests, and wetlands.

think local, state and municipal governments are responsible for addressing climate change in the state.

Source: UMN MCAP, CFANS, Caravan Climate Opinion Poll, Sept. 2022

Climate Change - State of the Science



It's us.

It's here.

We've committed to change.

The more we emit, the worse it gets.

We must reduce risks through adaptation.

We still choose, but there's no time to waste.

IPCC, 2021, 2022

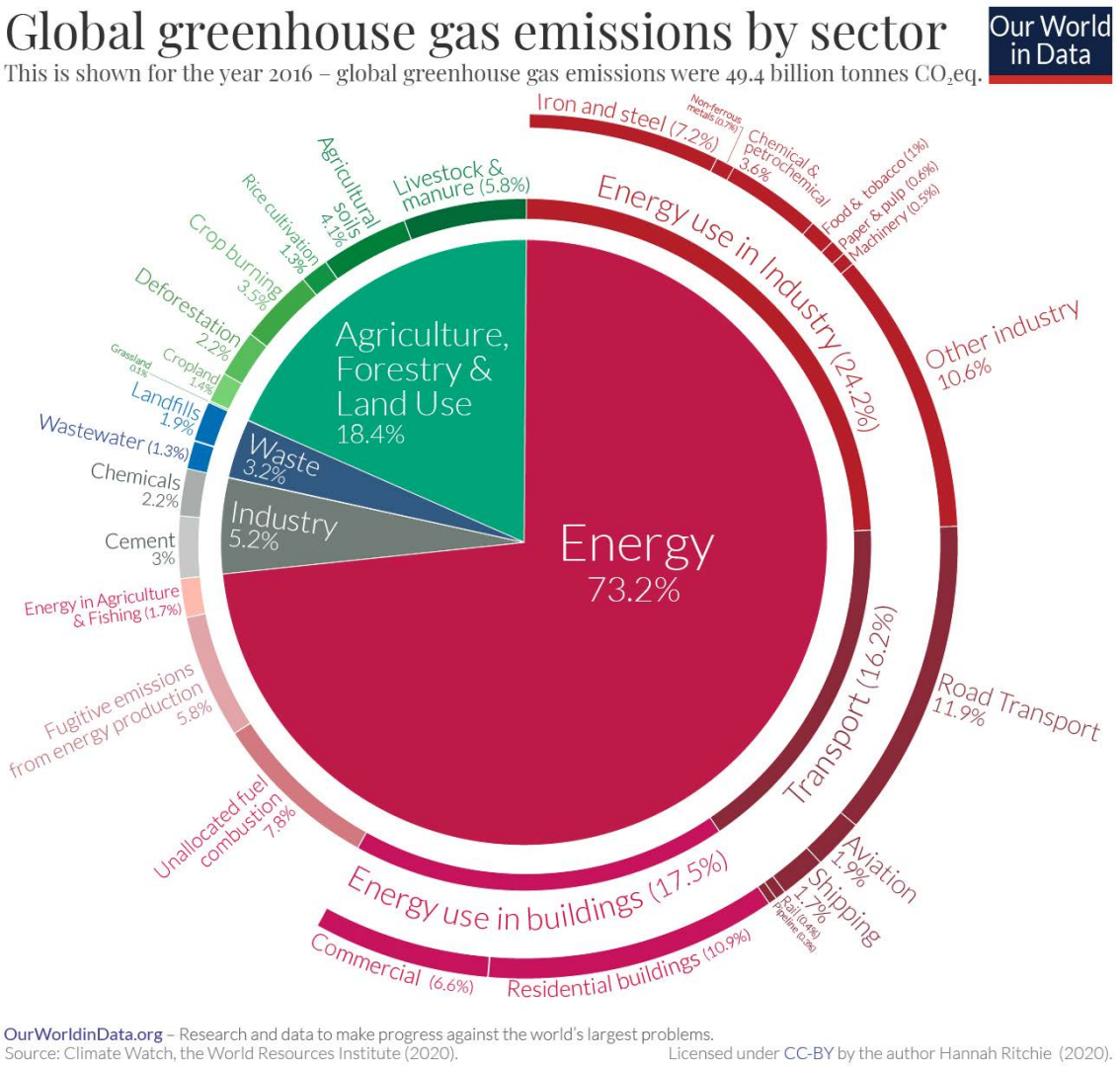
It's us.

It is unequivocal that human influence has warmed the atmosphere, ocean and land…

…and the rate of this warming is unprecedented in at least the last 2,000 years.

Data: IPCC, 2021; Photo: Mark Stone, 2019

We know the source of the problem.

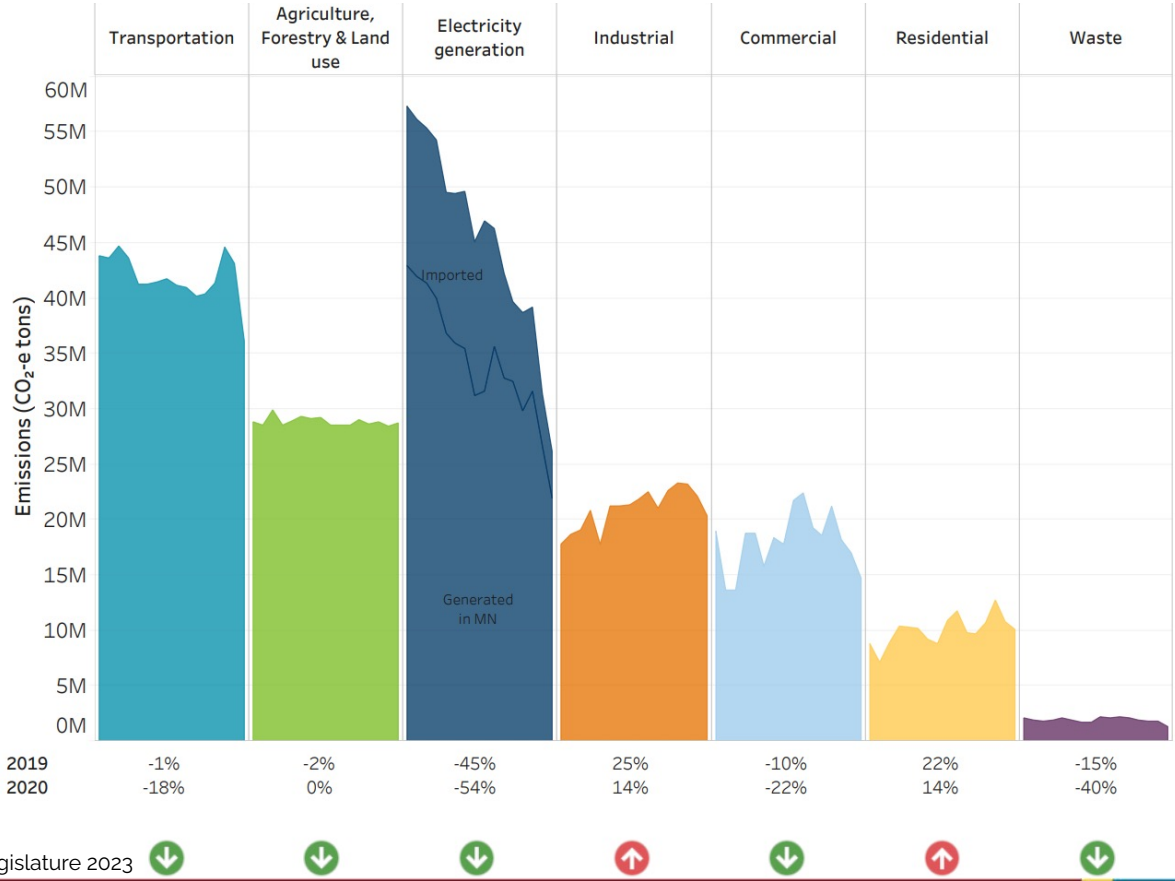


Minnesota's Emissions Reductions Story: Progress & Opportunity

Decline in GHGs across all industry sectors 2005-2020

23%

Change in Minnesota's Emissions by Sector from 2005-2020



Greenhouse gas emissions in Minnesota 2005-2020; Report to the legislature 2023

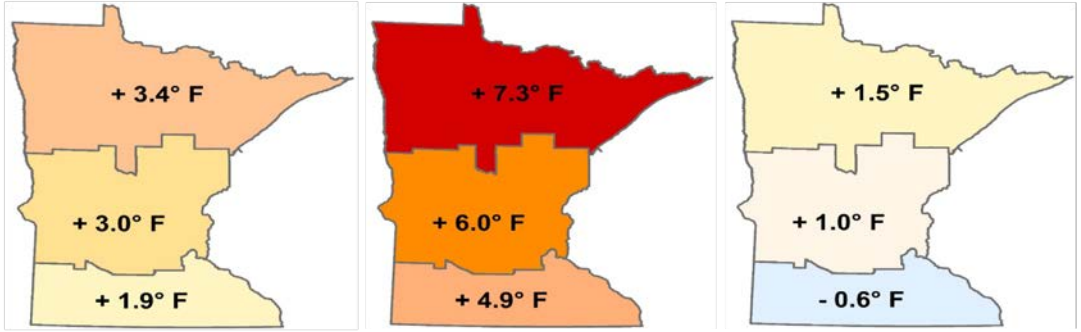
It's here.

Average global temperature has increased over 2.0°F since the late 1800's

Images: NASA; Data: NASA, 2021

Here means Minnesota.

Total Observed Temperature Change (1895-2021)



Average Annual | Winter lows | Summer highs

Minnesota's average annual temperature has increased by nearly 3°F since 1895

Images: NASA; Data: NASA, 2021 & MN DNR, 2022

2019

Last year's historic floods ruined 20 million acres of farmland

NATIONAL

Floods That Hit The Midwest In March Continue To Affect The Farm Economy

May 21, 2019 · 4:23 PM ET
Heard on All Things Considered

ALLISON MOLLENKAMP

FROM Nebraska Public Media

3-Minute Listen + PLAYLIST

Midwest Farmers are still cleaning up from record floods in March. The work may delay or even prevent planting for some, which will have ripple effects throughout the U.S. agriculture sector.

Flooded field in Percival, Iowa, 10 days after the Missouri River flooded in March 2019. *Jason Johnson Iowa NRCS*

https://www.npr.org/2019/05/21/725488412/floods-that-hit-the-midwest-in-march-continue-to-affect-the-farm-economy

https://www.popsci.com/story/environment/2019-record-floods-midwest/

2020 Derecho

"We not only lost millions of acres of corn and soybeans, but we also lost storage facilities for the farms, which is going to impact their storage capabilities in the following years."

Photo: Getty Images

https://news.unl.edu/newsrooms/today/article/supply-chain-crunches-affecting-agriculture-from-farm-to-table/

2021

KSTP.COM EYEWITNESS NEWS

38° Minneapolis

Parts of Minnesota in 'exceptional' drought for 1st time as warm, dry weather continues

North American fertilizer shortage sparks fears of higher food prices

Warning to 'get your fertilizer now' as farmers postpone nitrogen purchases, raising threat of rush on supplies before planting season

WEATHER MACHINERY CROPS TECHNOLOGY FARM MANAGEMENT LIVESTOCK FAMILY SUBSCRIBE

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DROUGHT EXPANDS IN UPPER MIDWEST

FUTURES PRICES FOR SOYBEANS FOR DELIVERY IN JULY FELL BY NEARLY $1.19 A BUSHEL, ONE OF THE

DAY DROPS IN DECADES. AND

40¢ A BUSH

ES FELL BY

TRENDING: Supply Chain Struggles Harvest Policy Updates from AgriTalk Carbon Markets Unspoken Truths About Pests

AGWEB FARM JOURNAL

News Markets Weather Opinion Topics Events Video Magazines

CROP PRODUCTION

Midwestern Drought Conditions Peak as Corn Belt Deals with Moisture Extremes

ST. PAUL MN

Mostly Cloudy 38°F

Feels Like 33°F

MinnesotaCorn GROWERS ASSOCIATION

Harvest 2021: Drought across Upper Midwest, but late rains and delayed frost produce bushels

Posted on October 22, 2021

2022

In the summer months and early fall, we were especially below average. September of 2022 was the driest September ever in the Twin Cities. From Interstate 94 on south, the story was the same.

Minnesota

Slow-moving storms cause flash flooding in parts of Minnesota

Andrew Krueger August 18, 2022 6:25 AM

CBS News, 2023

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

In the Midwest, wet extremes have increased in magnitude over the past 70 years, while dry extremes have largely remained the same.

For more information about NIDIS, visit the U.S. Drought Portal at www.drought.gov

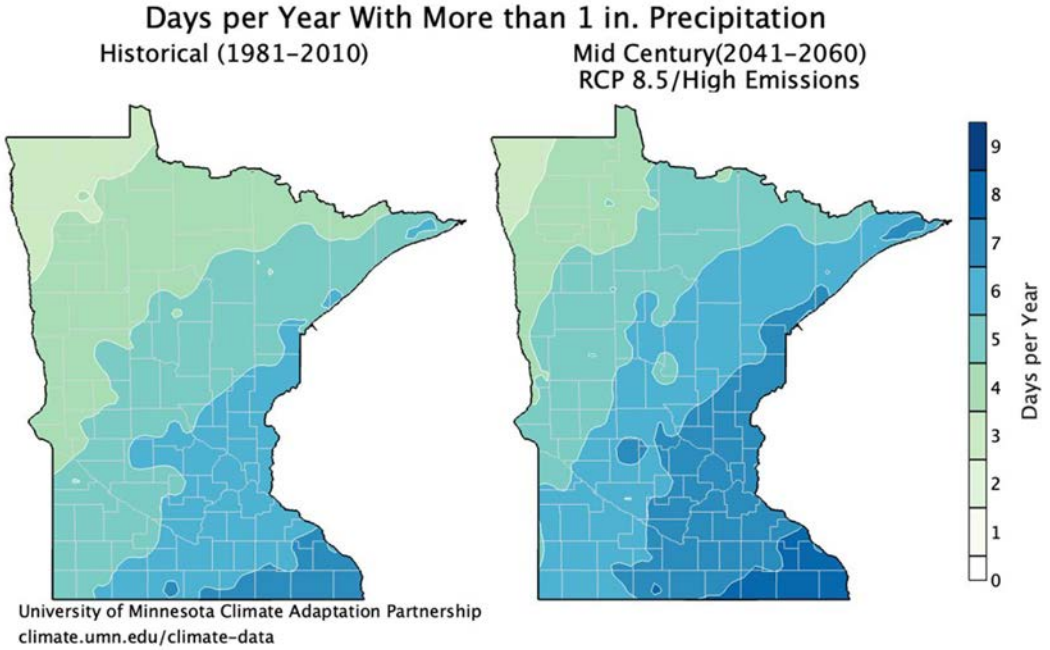
Transitions from **wet to dry extremes** are happening **more quickly** and **more frequently**.

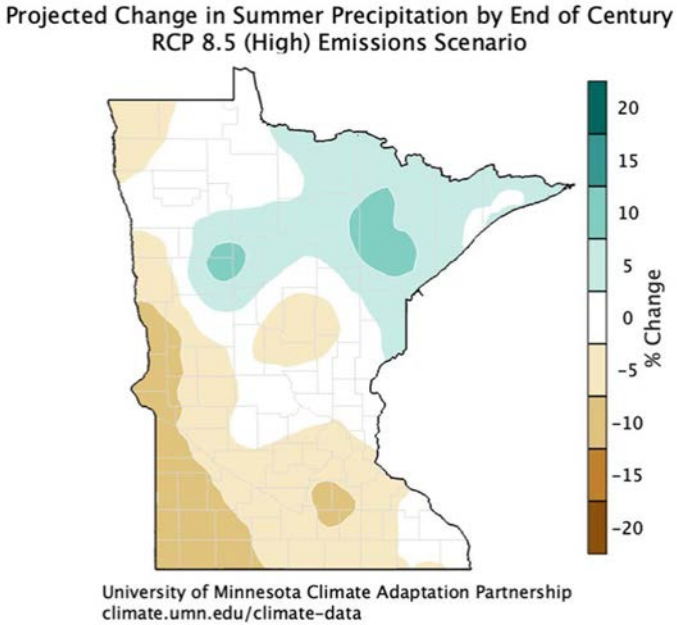
Photo: UMN Extension; for more information visit www.drought.gov

Increasing precipitation has elevated overall flood risk, causing disruption to transportation and damage to property and infrastructure.

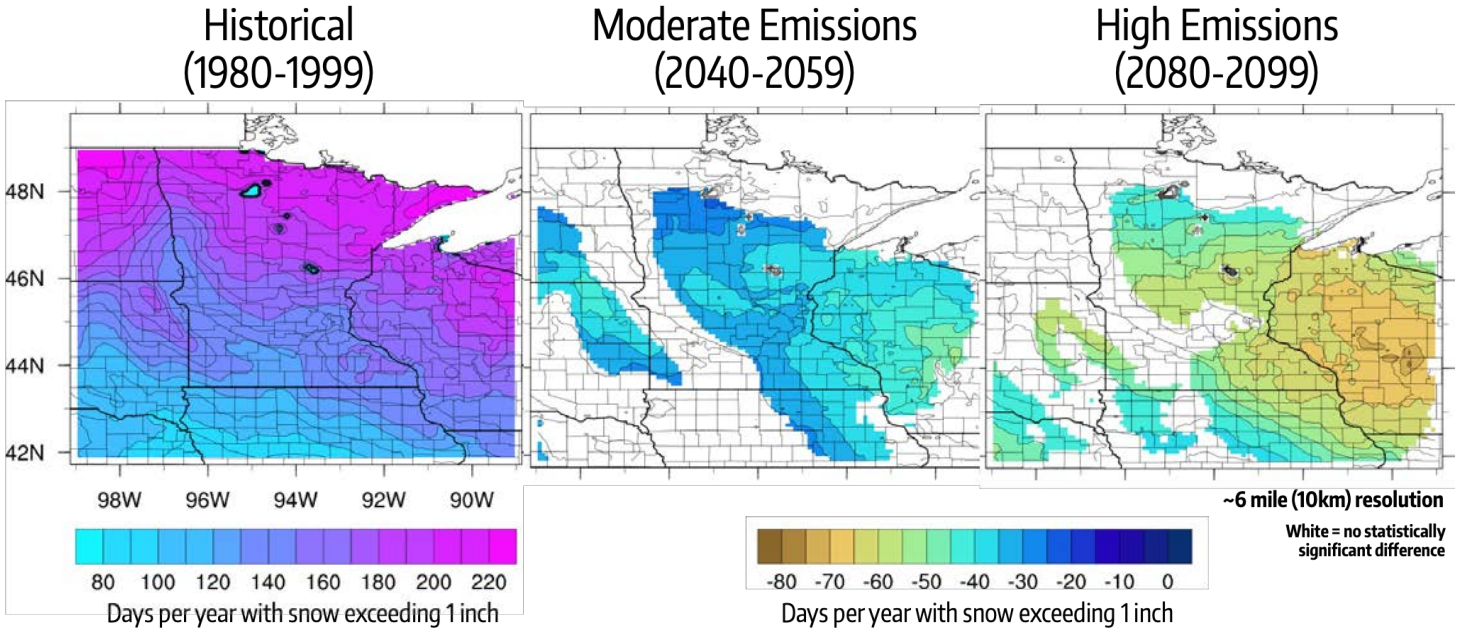
Source: Angel et al., 2018; Winters et al., 2015; Photo UMN Extension

Minnesota's changing precipitation – more management of extremes





More snow, more thaws



Light green represents ~60 days per winter with basically no snow cover.

From: Leiss et al., in review; Emissions pathways: moderate = RCP4.5, high= RCP 8.5

The Midwest is among the regions with the largest expected damages to infrastructure, including the highest estimated damages to roads.

Data: Angel, 2018; EPA, 2017; Photo: Flooding in Rushford, MN 8/07; courtesy of MN DNR Floodplain Program

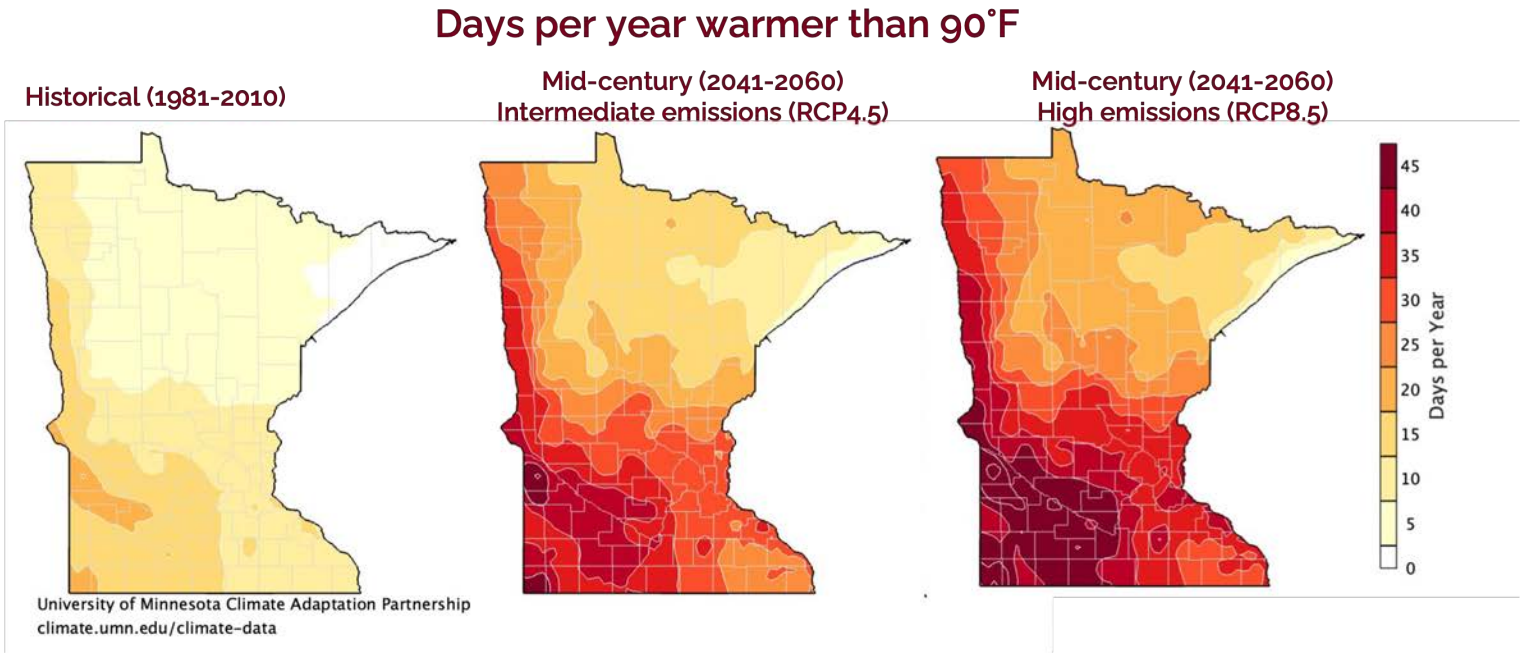
Changing soil moisture and warming have increased the risk of disease and pest infestations.

NCA, 2018 | Slide: H. Roop, UMN

Average winter temperature in Minnesota is projected to be more than 10°F warmer by 2100.

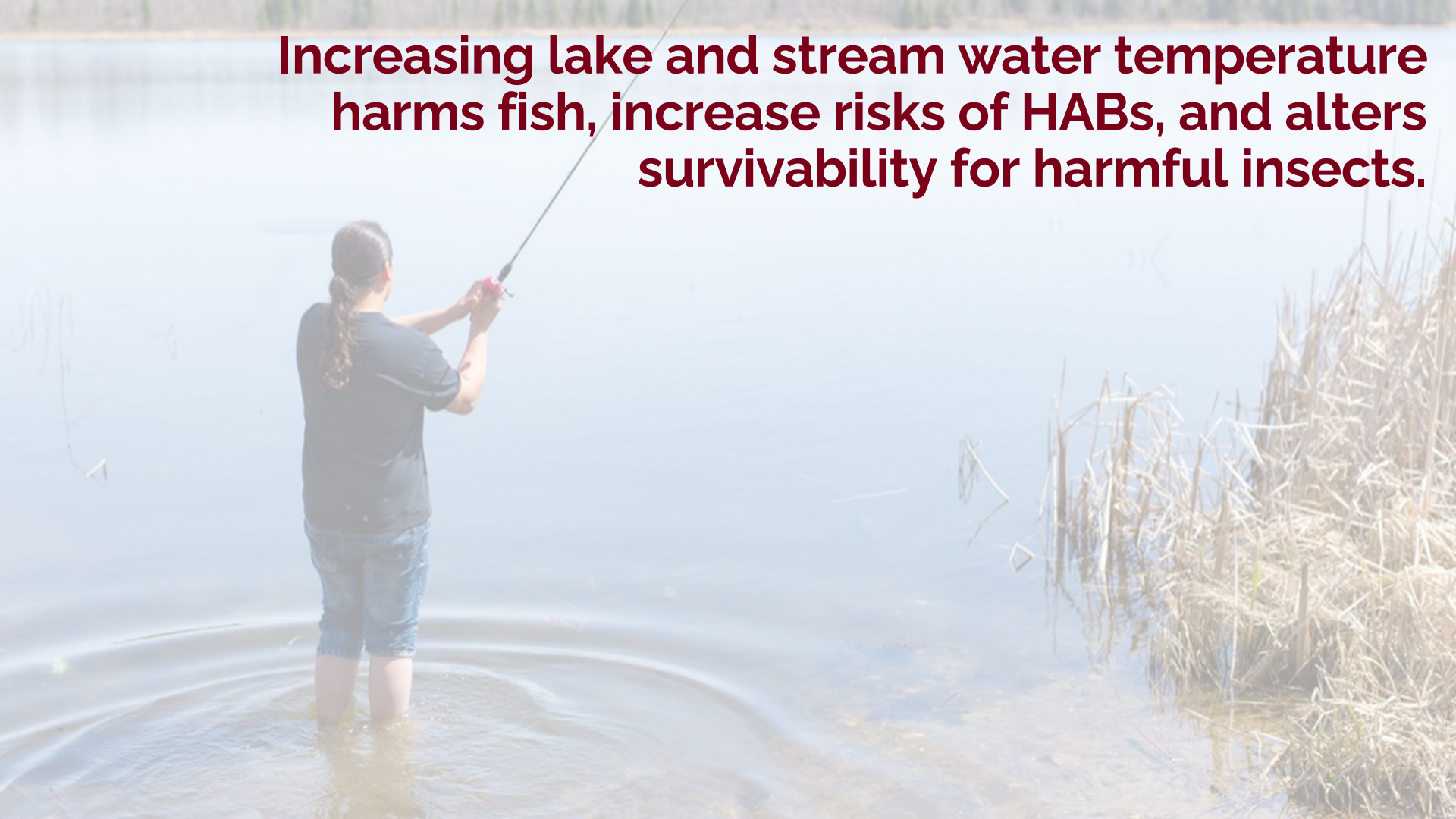
Relative to 1981-2010 for 2080-2099; RCP8.5| UMN & MN DNR

Minnesota is projected to experience 5 to 25 more days per summer with maximum temperatures above 90˚F by mid-century



Extreme heat impacts human health, the economy, and creates material stress on roads and buildings, water systems, and other critical infrastructure.

Data: Angel et al., 2018; EPA; WUCA, 2020; Photo: UMN



Increasing lake and stream water temperature harms fish, increase risks of HABs, and alters survivability for harmful insects.

Climate Change Needs No Passport

"Nearly all of the Mississippi River basin has seen below-normal rainfall since late August…The timing is bad because barges are busy carrying recently harvested corn and soybeans up and down the river." -

Associated Press, October 6th, 2022

Weather and climate extremes are causing **economic and societal impacts** across national [and state] boundaries through supply-chains, markets, and natural resource flows…**across the water, energy and food sectors.**

IPCC, 2022, Photo: AP, Thomas Berner

Climate Change is Costly. Even more so with inaction.

Under current policy pathways, climate **change could reduce U.S. GDP by 3 to 10% by the end of this century**

"The fiscal risk of climate change is immense."

Federal spending on crop insurance premium subsidies is projected to increase 3.5 to 22 percent due to climate change-induced crop losses by 2100 with an annual cost of $330 million to $2.1 billion.

OMB, 2022

U.S. 2022 Billion-Dollar Weather and Climate Disasters

*This map denotes the approximate location for each of the **18 separate billion-dollar weather and climate disasters that impacted the United States in 2022.***

Climate impacts are not experienced equally.

The more we emit, the worse it gets.

Compared to 1850–1900, global surface temperature averaged over 2081–2100 is very likely to be higher by:

Very high emissions

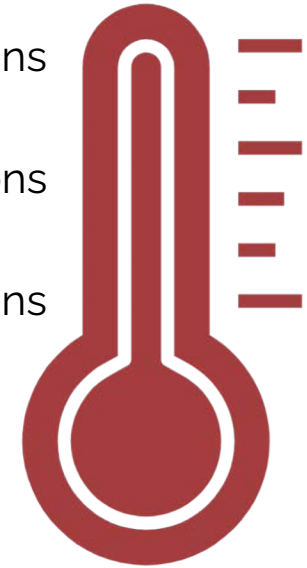
5.4˚F - 10.3˚F
(3.3˚C- 5.7˚C)

Intermediate emissions

3.8˚F - 6.3˚F
(2.1˚C- 3.5˚C)

Very low emissions

1.8˚F - 3.2˚F
(1.0˚C- 1.8˚C)



Data: IPCC, 2022

We must reduce risks through adaptation.

Adaptation can bring multiple benefits:
improved agricultural productivity, innovation, health, food security, livelihood, biodiversity conservation, and reduction of risks & damages.

Long-term planning and accelerated implementation, particularly in the next decade, is important to close adaptation gaps.

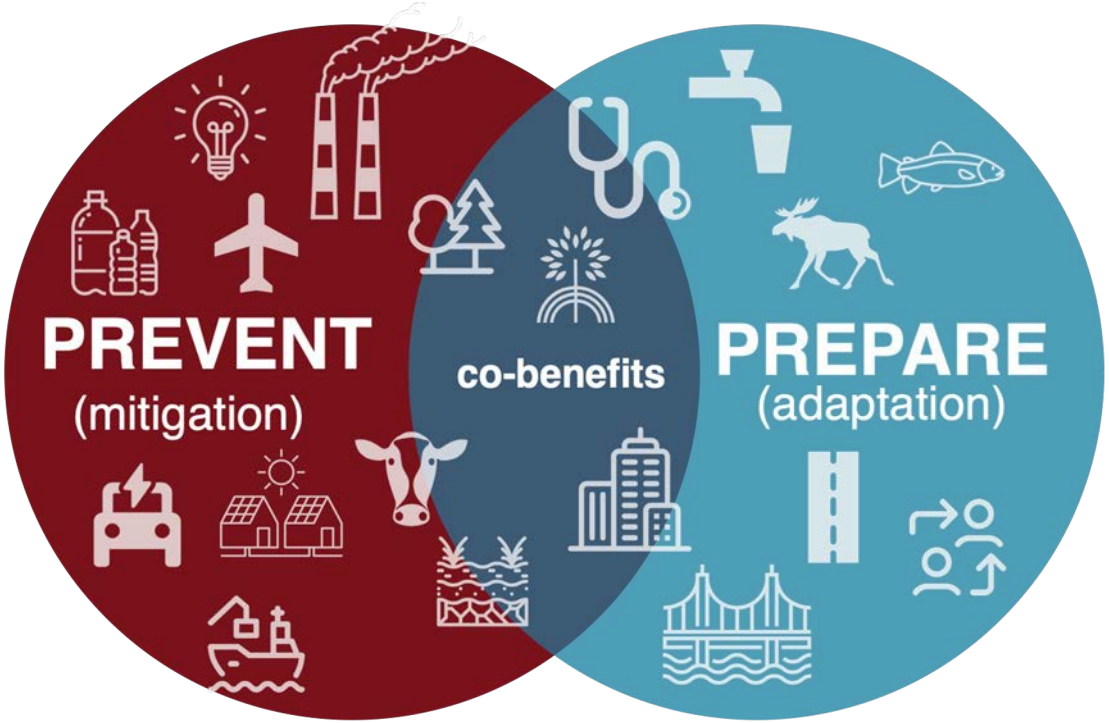
IPCC, 2022

We've committed to change.

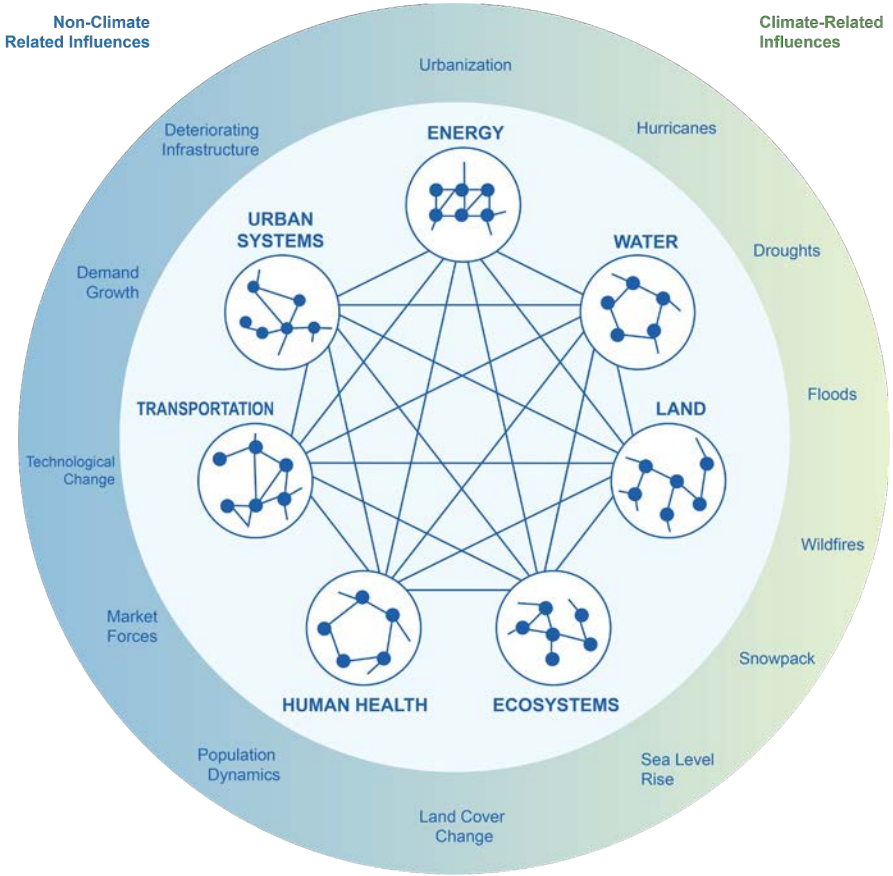
Our exposure to climate impacts is dependent upon how well we understand, prevent and manage them.

Photos: UMN Extension, H. Roop, M. Stone

Climate Risk Management - Prevention + Preparation



Effective climate risk reduction and management **requires investments & actions** that address **both mitigation and adaptation.**



NCA4, 2018

Assumptions about climate are embedded in many of our decisions.

These decisions often fail to consider our new climate context.

Where they do…these efforts tend to be fragmented and small in scale.

Climate Concerns & Action

83% of local MN government staff & other water professionals **are moderately or extremely concerned** about the effects of climate change on water issues in the communities they serve.

Fewer than half report that their organization has water plans or planning efforts underway that address climate change.

2020 State Water Plan: Water and Climate

How can we effectively partner to support investments and actions that reduce our exposure to climate risks?

“Adapting to Change: The Climate Smart Way”

The IPCC identified key investment areas with significant potential to reduce climate-related risks and enhance climate resilience.

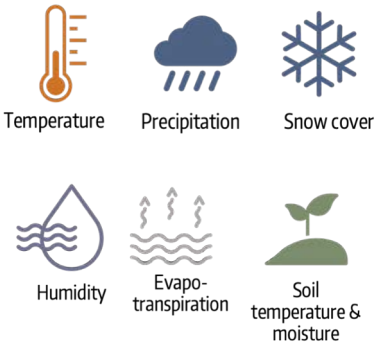
Locally-specific scientific information about projected climate-related risks and potential consequences can empower public and private entities to **characterize and manage** the risks of climate change.

Agriculture Weather Study

Develop & deliver **projected climate data**, **tools** and **training** to better manage Minnesota's changing climate risks.

Focus on **Minnesota** at ~3x3 mile scale.

High-resolution



Multiple variables

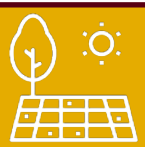
Data & tools

Training & sector-specific applications

Climate Change and Groundwater in MN

How will climate change impact groundwater reserves in Minnesota? Are there locations that are expected to see large increases in groundwater recharge from increased precipitation? Will other locations see decreases?

New climate projections for MN + updated USGS Soil-Water-Balance Model



Groundwater recharge (net infiltration), runoff, crop water demand, and actual evapotranspiration (actual ET) for 20-year periods from 1980 through 2099

Scenarios and tool for MN groundwater futures to help communities prepare for, and respond to, potential changes in groundwater reserves.

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND

USGS science for a changing world

Project leads: Jared Trost, Tracy Twine, Heidi Roop

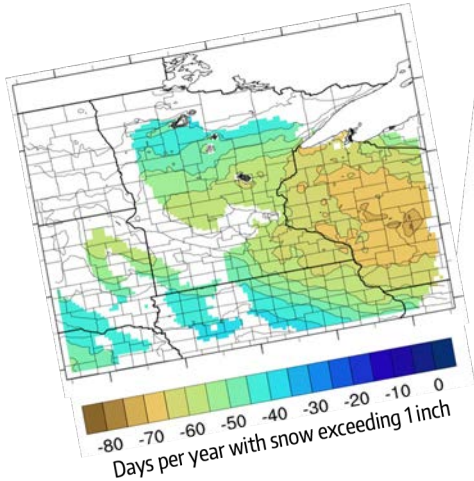
Education and capacity-building efforts about future climate risks and how they can be factored into today's decisions are key for building climate resilience.

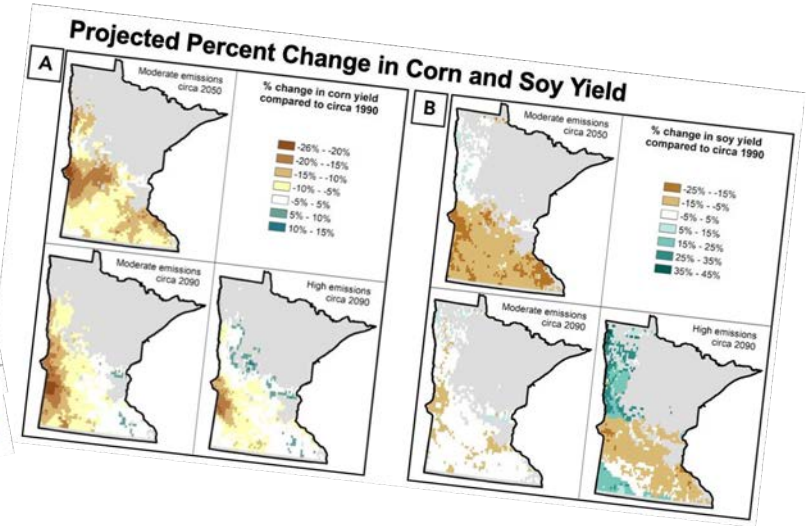
Climate Smart Agriculture Program

The Climate Smart program leverages these new data & state funding and is creating a dedicated climate resilience agriculture program.

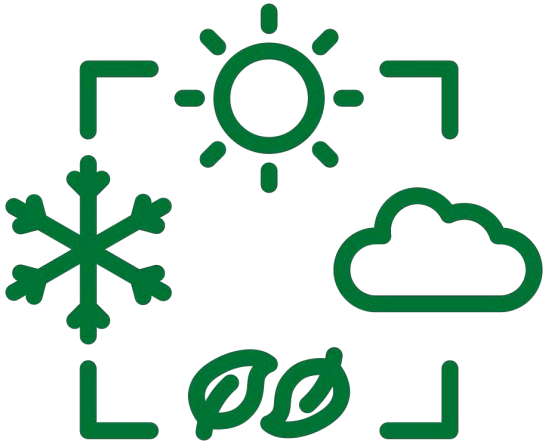
MinnesotaCorn GROWERS ASSOCIATION

COMMERCE DEPARTMENT





Potential Options for the USDA to Help Enhance Producers' Climate Resilience



- Collect data on **practices** that enhance climate resilience
- Expand **technical assistance** to prioritize and promote climate resilience
- Prioritize climate resilience in whole-farm conservation **planning**
- Develop an **agricultural climate resilience plan** that addresses regional needs
- Expand conservation **program eligibility criteria** to include & prioritize climate resilience.
- **Research feasibility** of incorporating climate resilience into crop insurance rates & offer crop insurance premium subsidies for climate-resilient operations.

(GAO, 2023)

- Associated Press, October 6th, 2022

Improved coordination & collaboration can enable integration of adaptation efforts across **sectors, jurisdictions** and **geographic** and **geopolitical boundaries**.

Climate Adaptation in Action:

Updating and expanding Tribal climate adaptation tools & resources across the 1854 Ceded Territory

A collaborative project led by the 1854 Treaty Authority & the University of Minnesota

Nature-based adaptation approaches can enhance climate resilience for both ecosystems and the built environment (e.g., transportation, water, wastewater and energy systems).

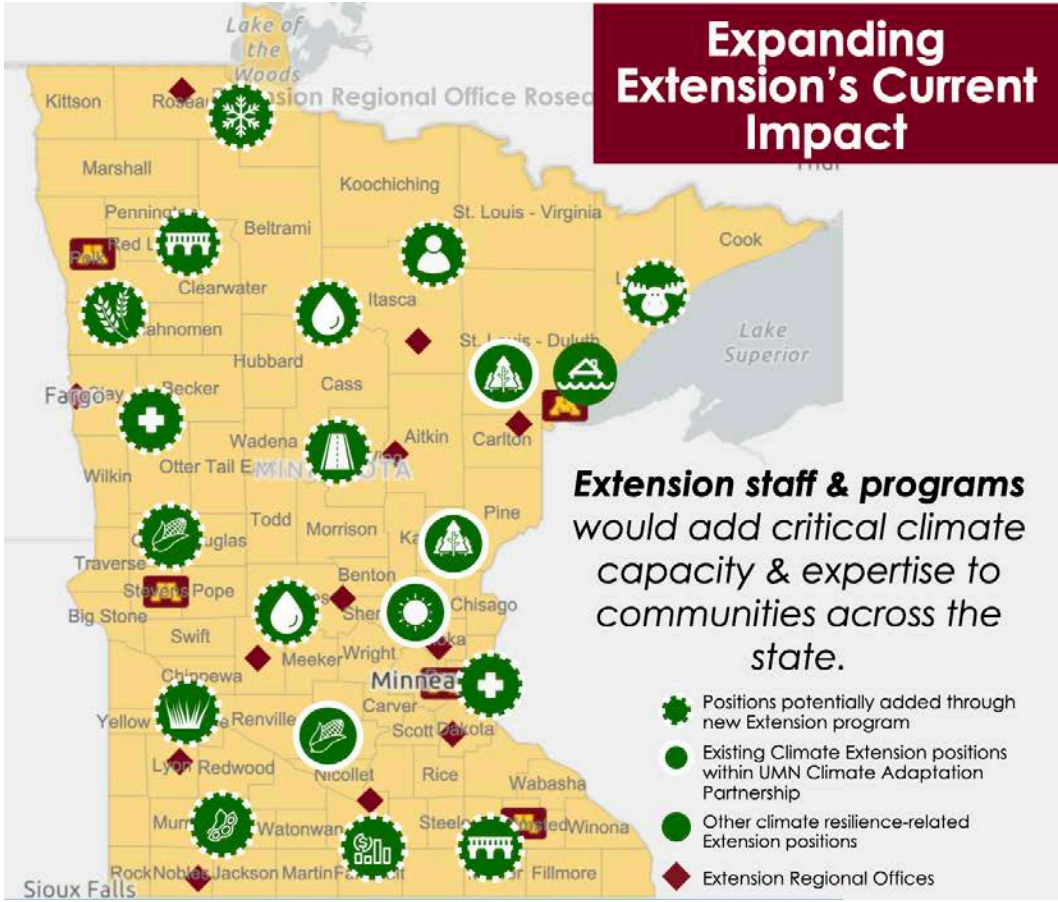
“Sustainable water management must go beyond a purely technical approach and consider human beliefs and behaviors, including social norms, emotional connections to people and places, and beliefs about one’s ability to make change.”

– EQB State Water Plan, 2020

Climate change is an all-hands-on-deck situation, and what we shape and create together needs to include a rich diversity of perspectives and approaches. Critically, we don't want to stay siloed or stagnant in our work.

Where is the Climate Adaptation Partnership headed?

We need to enhance the capacity of the State's land & resource managers, businesses & communities to understand and secure the needed resources to manage their unique climate risks & reduce vulnerabilities.



Minnesota's Climate Action Framework

The climate vision for our state

The vision for our state embodied in this framework is:

Carbon-neutral

By 2050, Minnesota substantially reduces greenhouse gas (GHG) emissions and balances any GHG emissions with carbon storage, especially in our landscapes.

Resilient

Minnesota communities, businesses, and the natural environment can prepare, respond to, and recover from the impacts of climate change so all Minnesotans can thrive in the face of these challenges.

Equitable

Minnesotans acknowledge and address inequitable and inaccessible systems that contribute to some communities experiencing disproportionate climate change impacts; ensure fair distribution of the costs and benefits of action now and to future generations; and ensure meaningful participation in planning.

Source: climate.state.mn.us/minnesotas-climate-action-framework

Minnesota's Climate Action Framework

Opportunity Abounds for Climate-related Collaboration…

Clean transportation

Climate-smart natural and working lands

Resilient communities

Clean energy and efficient buildings

Healthy lives and communities

Clean economy

What role will you play?

There's no time to waste.

"Any further delay in concerted anticipatory global action **on adaptation *and* mitigation** will miss a brief and rapidly closing window of opportunity to secure a liveable and sustainable future for all."

Source: IPCC, 2022; Photo: UMN Extension

Interested in partnering or accessing relevant climate resources?

Climate Adaptation Partnership

University of Minnesota

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