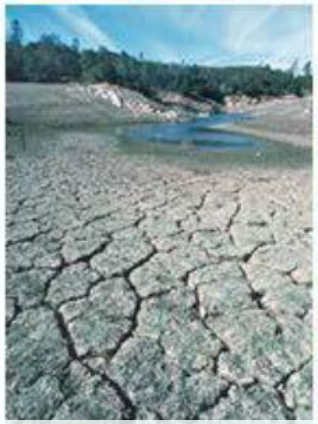
United States Department of Agriculture
Climate Hubs

MONTANA STATE UNIVERSITY

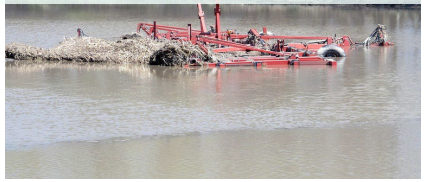
USDA Climate Hubs

Climate Resilience for Diverse Landscapes






LEE SCHMELZER, AG RISK OUTREACH, MONTANA STATE UNIVERSITY
DANNELE PECK, DIRECTOR, USDA NORTHERN PLAINS CLIMATE HUB

United States Department of Agriculture
Climate Hubs

10 YEARS OF CLIMATE HUBS

Mission

Co-develop & deliver **science-based, region-specific** information, technologies, outreach & convening, to enable **climate-informed** *decision-making*

Translating climate science into action!

How do the Climate Hubs work?

Climate ↔ Working Lands

Science ↔ Practice

We are **Bridge-Builders** between worlds

So, **Networks & Partnerships** are Key!

What do the Climate Hubs really *do*?

10 YEARS OF CLIMATE HUBS

Goals

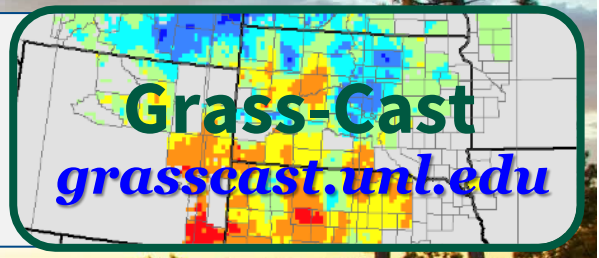
- Climate awareness
- Resilient, productive working lands
  (farms, ranches, and forests)

Science and data synthesis

Translating and delivering relevant information

Tool/tech co-development

Supporting climate-informed decision-making

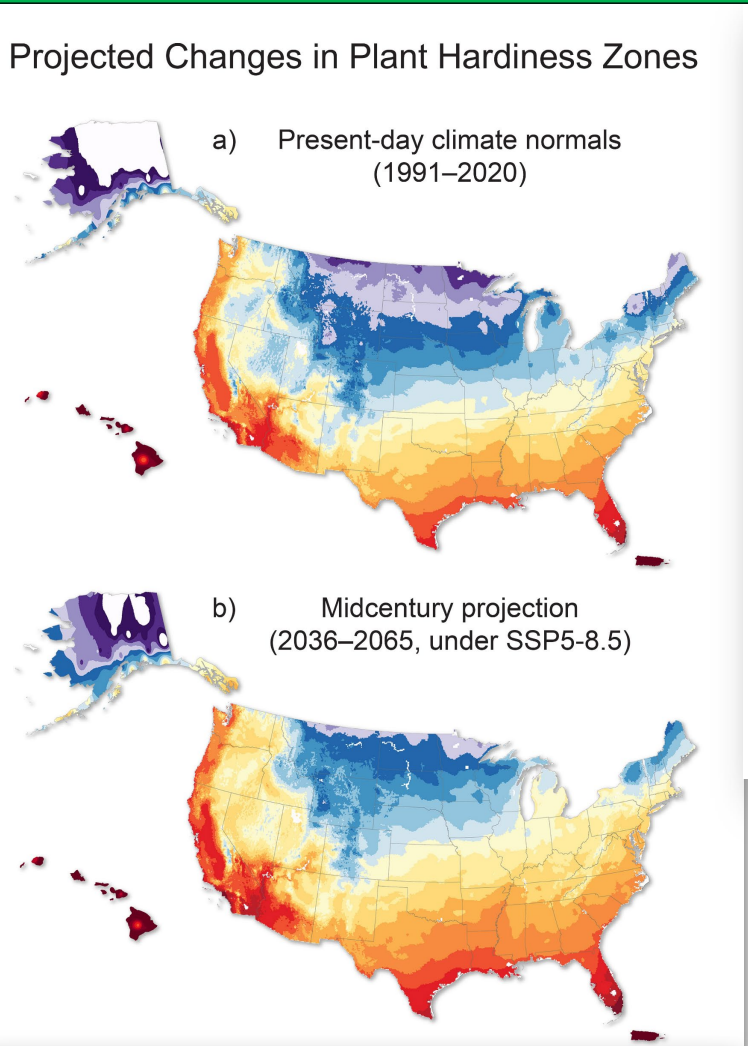


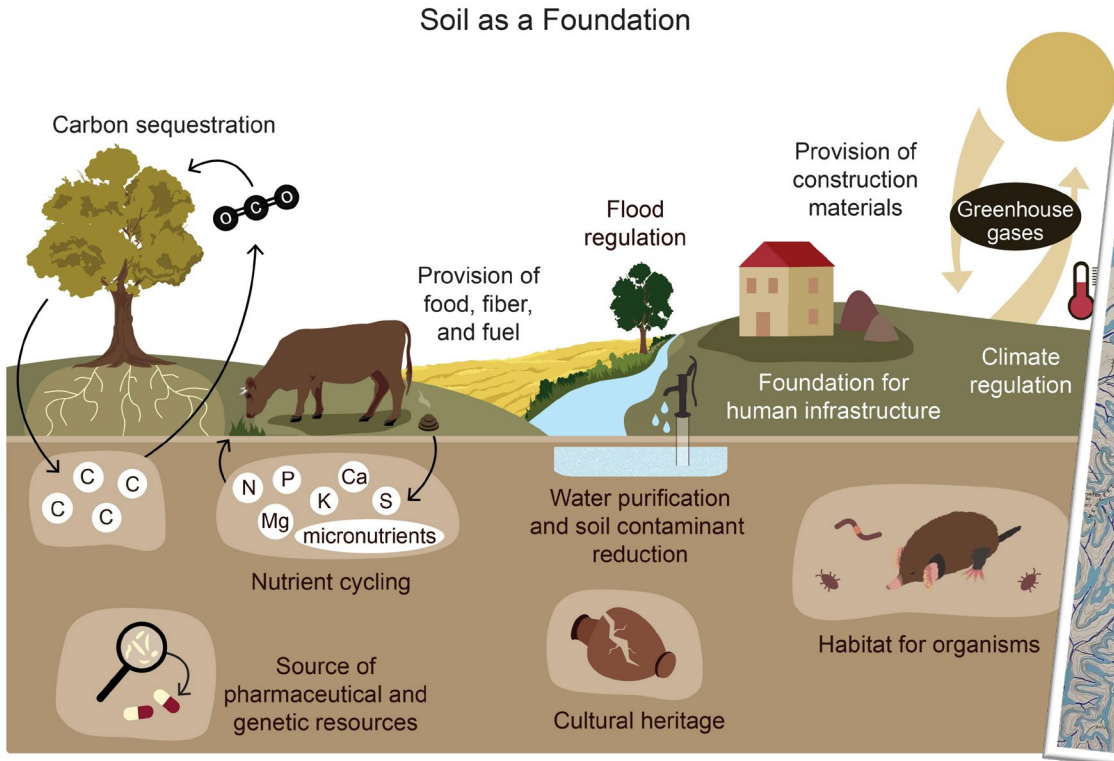
Outreach, convening, and training

Facilitating engagement and exchange

Examples…

Science & Data Synthesis





MEREDITH NEMIROV: RIVERS FEED THE TREES #467 (AQUIFERS)

Fifth National Climate Assessment

- ✓ Chapter 11: Ag, Food Systems & Rural Communities
- ✓ Chapters 21-30: Regional Chapters
- ✓ https://nca2023.globalchange.gov/

NCA5 webinars

Climate Quick Reference Guides

*(For **every** state & county!)*

Scan me

https://bit.ly/3JfGj3w

USDA Natural Resources Conservation Service
U.S. DEPARTMENT OF AGRICULTURE
Southwest Climate Hub

North Dakota
Burleigh County
2022

Climate Quick Reference Guide:

Historic Changes 1900 - 2020

- Over the past 126 years, winter temperatures have increased by 4.5°F per century, more than three times the summer trend of 1.5°F per century.
- The first two decades of this century represent one of the warmest periods on record for North Dakota, with several years (2006, 2012, 2015, and 2016) meeting or exceeding the extreme heat of many of the 1930s Dust Bowl years.
- The frequency of 2-inch extreme precipitation events has increased and been above average since 1990.

Projected Changes 2041 - 2070

- Although the frequency of hot summer temperatures has not increased, continued overall warming is expected to intensify heat waves, while cold waves are projected to decrease in intensity.
- Increases in evaporation rates due to rising temperatures may increase the rate of soil moisture loss and the intensity of naturally occurring droughts. Wildfires may also become more common from mid-summer through early fall.
- Winter precipitation for North Dakota is projected to increase in the range of 10% to more than 15% by 2050. Spring precipitation is also projected to increase.

Climate and Weather Information Resources

Maps and graphs that show climate changes and projections for your location:

https://climatetoolbox.org or
https://www.ncdc.noaa.gov/cag/

Climate Change Adaptation and Information:

https://www.climatehubs.usda.gov/

Current and predicted drought conditions and resources:

https://www.drought.gov

NOAA State summaries of past and projected climate by State:

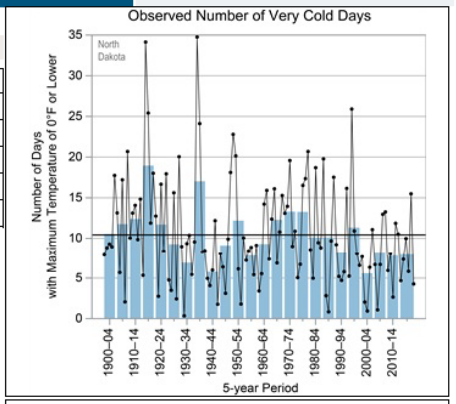
https://statesummaries.ncics.org
https://www.usda.gov/oce/energy-and-environment/climate

Data for: Burleigh County

	Max Temperature (Farenheit)			Max Precipitation (inches)		
Season	Current	Future	Change	Current	Future	Change
Spring	53.8	59.5	5.7	4.5	5.5	1.0
Summer	80.7	87.8	7.1	7.9	7.2	-0.7
Fall	55.0	61.4	6.5	3.7	4.1	0.4
Winter	23.2	29.7	6.5	1.3	1.6	0.3
Annual	53.2	59.6	6.4	17.4	18.4	0.9

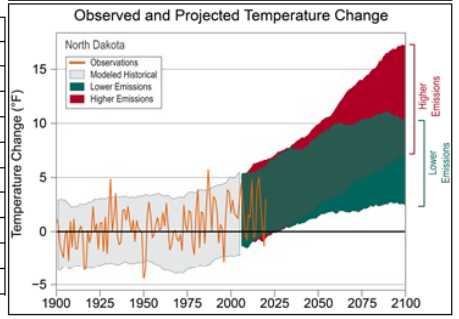
https://swclimatehub.info/data/interactive-maps

Seasonal and annual data was calculated using mean maximum temperature and precipitation to provide broad seasonal changes at the county scale to aid planning and management amid uncertainty. Current data comes from PRISM Climate Group 30 year normal data for the 1971-2000 time period. Future is derived from the CMIP5 data using the mid-century time period and higher emissions scenario (RCP 8.5)



Top causes of crop loss for this county:

Cause of Loss	Indemnity	Acres
Drought	$43,310,747	683,616
Excess Moisture/Precip/Rain	$28,509,487	296,291
Hail	$16,105,731	165,196
Frost	$3,719,021	29,353
Cold Wet Weather	$3,681,002	40,496
Wind/Excess Wind	$3,471,913	34,538
Heat	$3,453,970	54,360
Plant Disease	$1,861,772	23,261
Other	$1,836,839	14,826
Freeze	$1,717,887	15,639



Source: AgRisk Viewer. RMA summary crop loss data by county (1989-2020):
https://swclimatehub.info/rma/rma-data-viewer.html

Source for Graphs: https://statesummaries.ncics.org

nrcs.usda.gov

USDA Northeast Climate Hub
U.S. DEPARTMENT OF AGRICULTURE

Economics of farming practices for soil health & C sequestration

doi:10.2489/jswc.2021.0324A

Economic dimensions of soil health practices that sequester carbon: Promising research directions

SOIL HEALTH PRACTICES THROUGH AN ECONOMIC LENS

Economic considerations are one of the main elements that an individual farmer typically assesses when making decisions to adopt soil health management practices. Therefore, it is important to provide an economic framework as a lens for understanding how one assesses the various factors influencing the decision to adopt soil health practices and how one evaluates the overall economic impacts of these practices.

Journal of Soil and Water Conservation 76(3):55A-60A www.swcs.org

MAY/JUNE 2021—VOL. 76, NO. 3 | 55A

Outreach:

Full length film of **3 farmers** showcasing their experiences **improving soil health**

https://www.youtube.com/watch?v=aEtjJPr8RAA

OFFICIAL SELECTION
Chesapeake Film Festival
2023

USDA California Climate Hub
U.S. DEPARTMENT OF AGRICULTURE

Accelerating Solutions through **Research on Soil Amendments**

Pulverized rock as a soil amendment?

For centuries farmers have been amending the soil with rock minerals to improve fertility. Rock minerals are rich in many of the nutrients that are needed to support healthy soils and can benefit soil water availability for crops. Some of the vital nutrients found naturally in rocks include calcium, magnesium, potassium and phosphorus, and micronutrients like zinc and iron. Recently, farmers have been exploring how different rock minerals can be applied to the soil to improve soil health, boost crop yields, and sequester CO_2. The breakdown of rock, referred to as weathering, naturally consumes CO_2 from the atmosphere through the weathering reactions of silicate minerals in the rock. When rock is pulverized into a powder, the reactive surface area increases which effectively speeds up the natural weathering process, leading to greater CO_2 drawdown. Limited studies show that when some types of pulverized silicate rocks are applied to agricultural soils as amendments, they can provide co-benefits to growers in addition to sequestering carbon.[1] Rock amendments may help mitigate climate change and provide a way for California to reduce greenhouse gas emissions.[2] See this article for more information on current research trials.

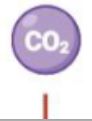
doi.org/mpb2

Rock amendment application on California fields. Images: Maya Almaraz and Iris Holzer, 2019

Enhanced weathering refers to increasing the rate of rock breakdown by using higher surface area material, typically created by pulverizing rock into a powder. It is considered a carbon dioxide removal strategy.

Silicate rocks are crushed to facilitate greater weathering rates, and then applied

When rock weathers, it uses CO_2 from the atmosphere



How might rock amendments benefit growers?

Nutrients are released into the soil when rock weathers. Silicate rocks such as basalt release nutrients like magnesium, calcium, and silicon which enhance soil fertility and support plant growth.[1,3] By releasing nutrients into the soil and promoting plant growth, rock amendments may

What is biochar?

There is growing excitement about biochar use as an agricultural amendment to improve soil health and sequester carbon. Biochar is a carbon-rich material, similar to charcoal, made under low oxygen conditions with high temperature conversion of biomass feedstocks such [illegible] hulls, or manure. In addition to promoting soil [illegible] benefits to growers such as [illegible] effic[illegible] the [illegible] cro[illegible] be [illegible] as [illegible] b[illegible]

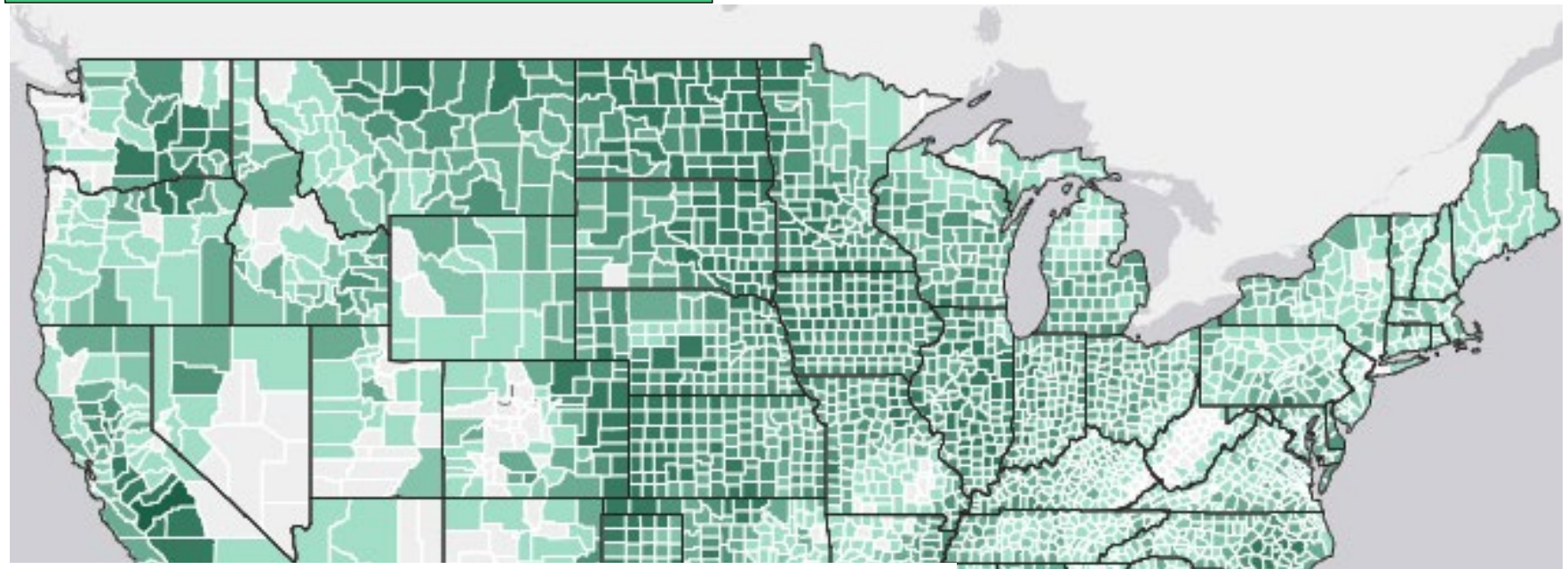
doi.org/mpb3

Fields amended with biochar. Image: Maya Almaraz, 2019

Tools

AgRisk Viewer

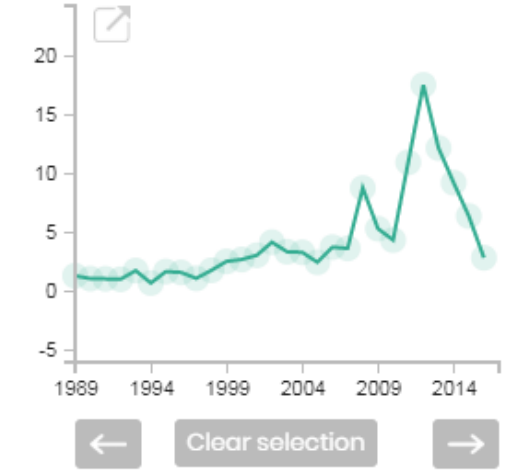
USDA SOUTHWEST CLIMATE HUB



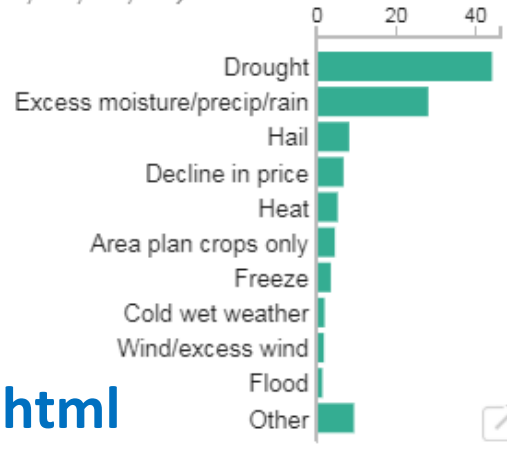
Now Viewing
Risk Management Agency Payments

Payment indemnity by cause of loss

All causes of loss
(x 1,000,000,000)



1989–2016 totals by cause of loss
(x 1,000,000,000)



Interactive crop-loss data viewer

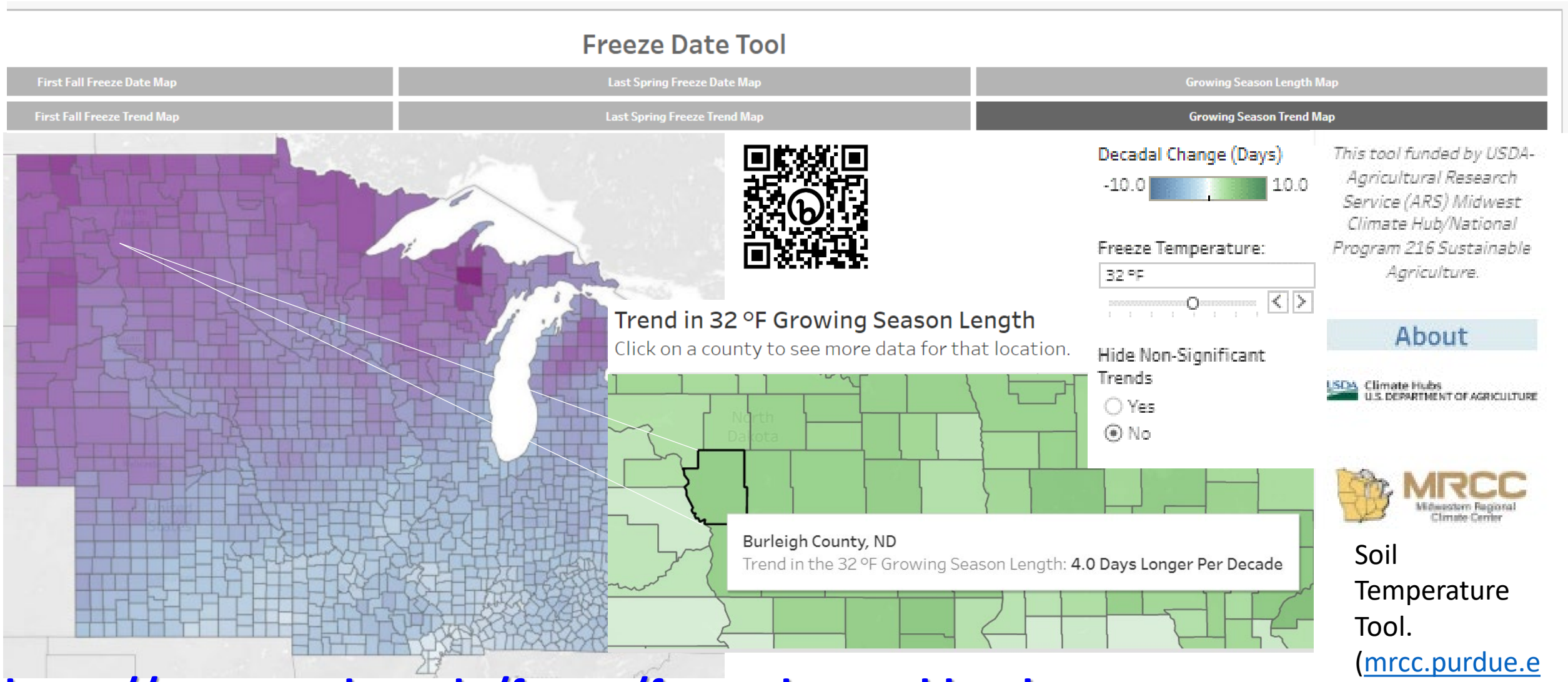
- Crop insurance payments & acres
- Cause of loss (e.g., drought, hail)
- By crop, month, or year, at the county, state, or national level

Climate Programs grant
#2022-69014-36369

https://swclimatehub.info/rma/rma-data-viewer.html

USDA Midwest Climate Hub
U.S. DEPARTMENT OF AGRICULTURE

Freeze Date Tool: Trends in Growing Season Length



https://mrcc.purdue.edu/freeze/freezedatetool.html

Soil Temperature Tool. (mrcc.purdue.edu/clim/Soil-T)

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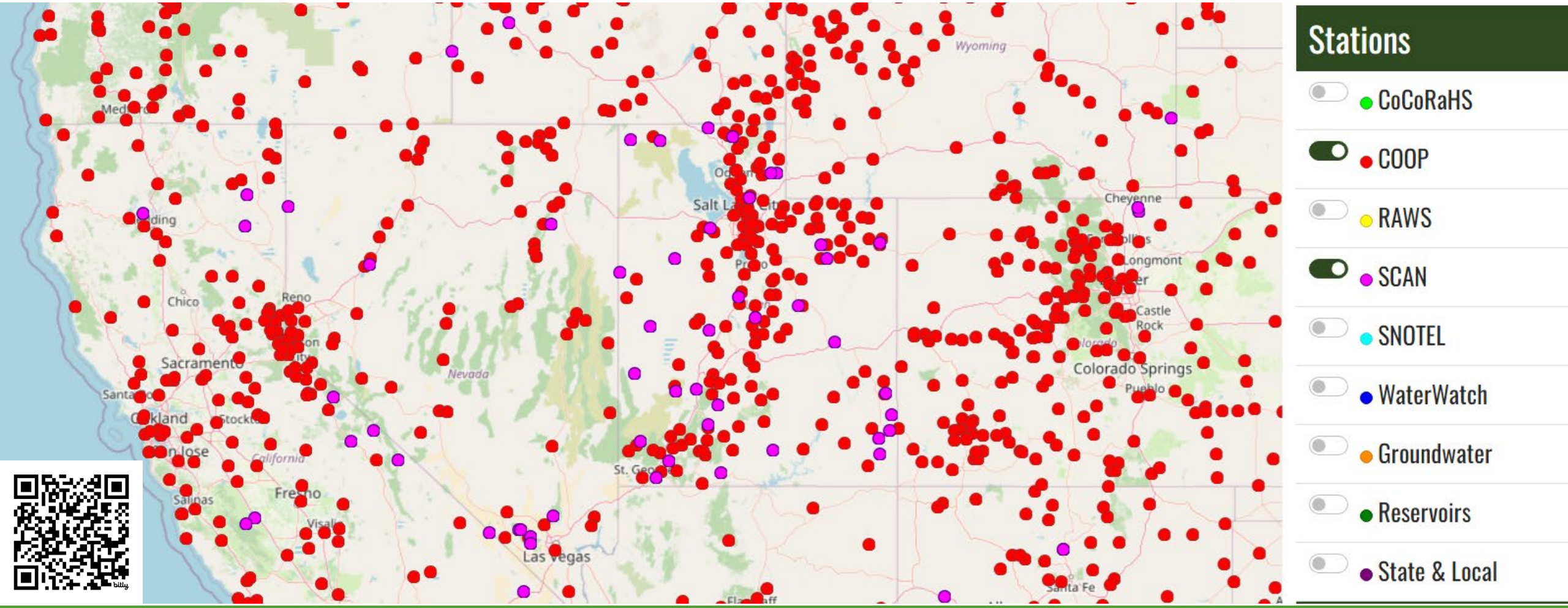
U.S. DEPARTMENT OF AGRICULTURE

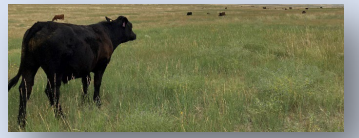
Overview of Weather Water Land Sites (OWWLS)

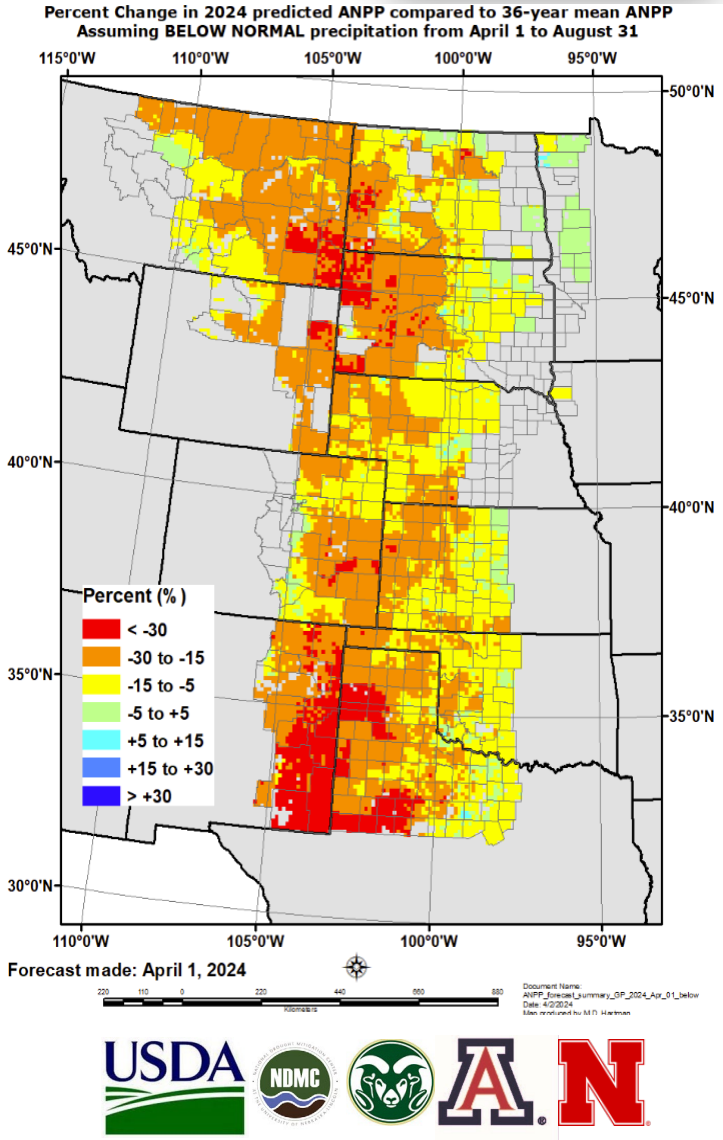


https://www.climatehubs.usda.gov/hubs/northwest/tools/overview-weather-water-land-sites-owwls

Grassland Productivity Forecast

"Grass-Cast"





"Using **observed** + **future weather**... we expect **lbs. of grassland production** in *your* area... to be **X% higher** or **lower** than your area's long-term average."

https://grasscast.unl.edu

California Climate Hub
U.S. DEPARTMENT OF AGRICULTURE

CalAgroClimate
Decision Support Tools for Managing Risks

Home | Tools | External Resources | About

Decision Support Tools for Managing Risks

https://calagroclimate.org/

Heat Advisory

Maximum temperature forecast.

Frost Advisory

Minimum temperature forecast.

Crop Phenology

Calculate growing degree days.

Pest Advisory

Tool to predict crop pest life stage.

Agroclimate Indicators

Historical data aggregated by county.

Outreach, Convening, Training

USDA Climate Hubs
U.S. DEPARTMENT OF AGRICULTURE

NCAT NATIONAL CENTER FOR APPROPRIATE TECHNOLOGY

MONTANA STATE UNIVERSITY

UCDAVIS

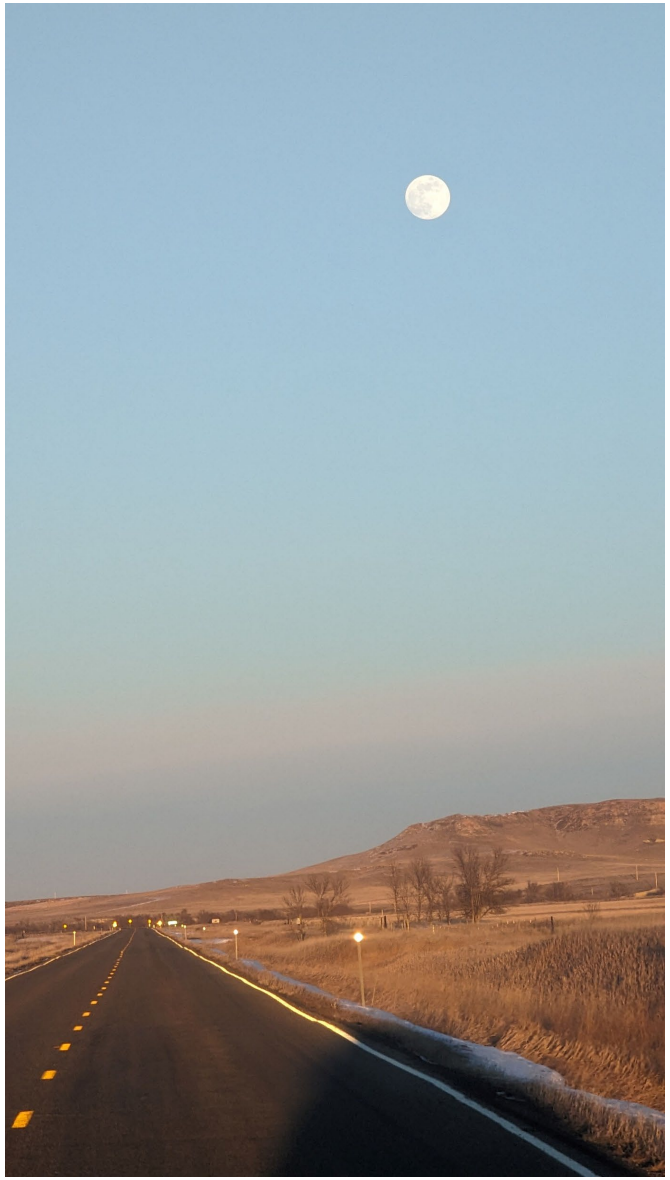
Ag Risk Project:
Assisting farmers and ranchers
with insurable weather and climate risks
in the Northern Plains and Southwest

Develop improved educational/outreach materials and approaches to help farmers and ranchers more easily assess weather and climate-related sources of crop and livestock production losses.

NIFA

Made possible through funding from USDA NIFA Grant # 2022-69014-36369

Outreach, Convening, Training

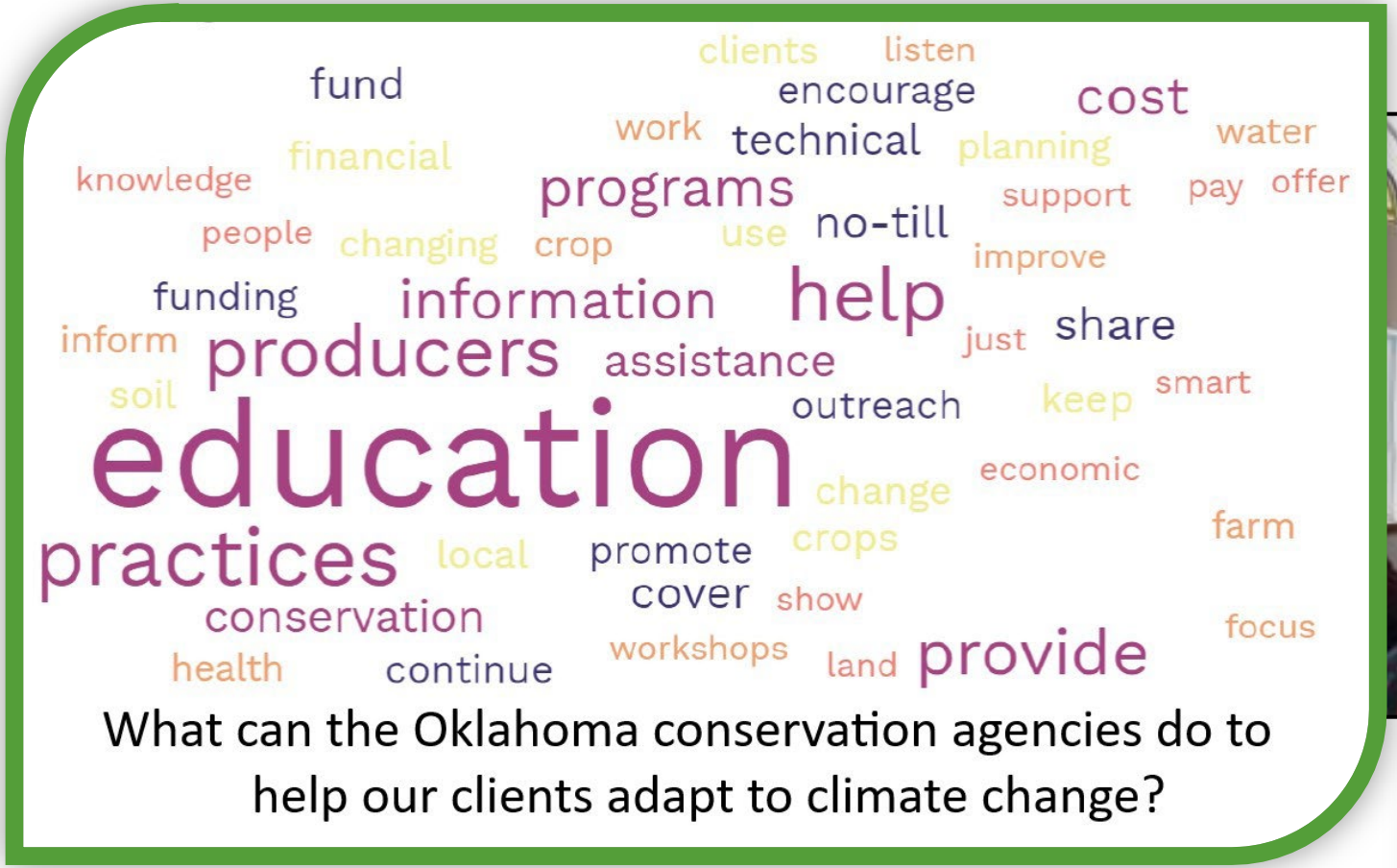


Ag Risk Project:

- ✓ deliver climate data, tools, and information 17 presentations to 400 Ag producers in 15 counties.
- ✓ Surveyed 500 Montana ag producers
- ✓ Delivered Education on Ag risk and resiliency
- ✓ Data, tools, and information to help farmers and ranchers manage risk around extreme weather and climate -5 Counties
- ✓ Drought Management -2 counties
- ✓ Irrigation scheduling Project with the Flathead FRTEP Extension Agent

USDA Southern Plains Climate Hub
U.S. DEPARTMENT OF AGRICULTURE

Surveyed Ag Producers & Service Providers in Oklahoma about Climate Change



bitly

See survey results here!

https://www.climatehubs.usda.gov/hubs/southern-plains/topic/climate-conversations-oklahoma-conservation-district-staff

USDA Southeast Climate Hub
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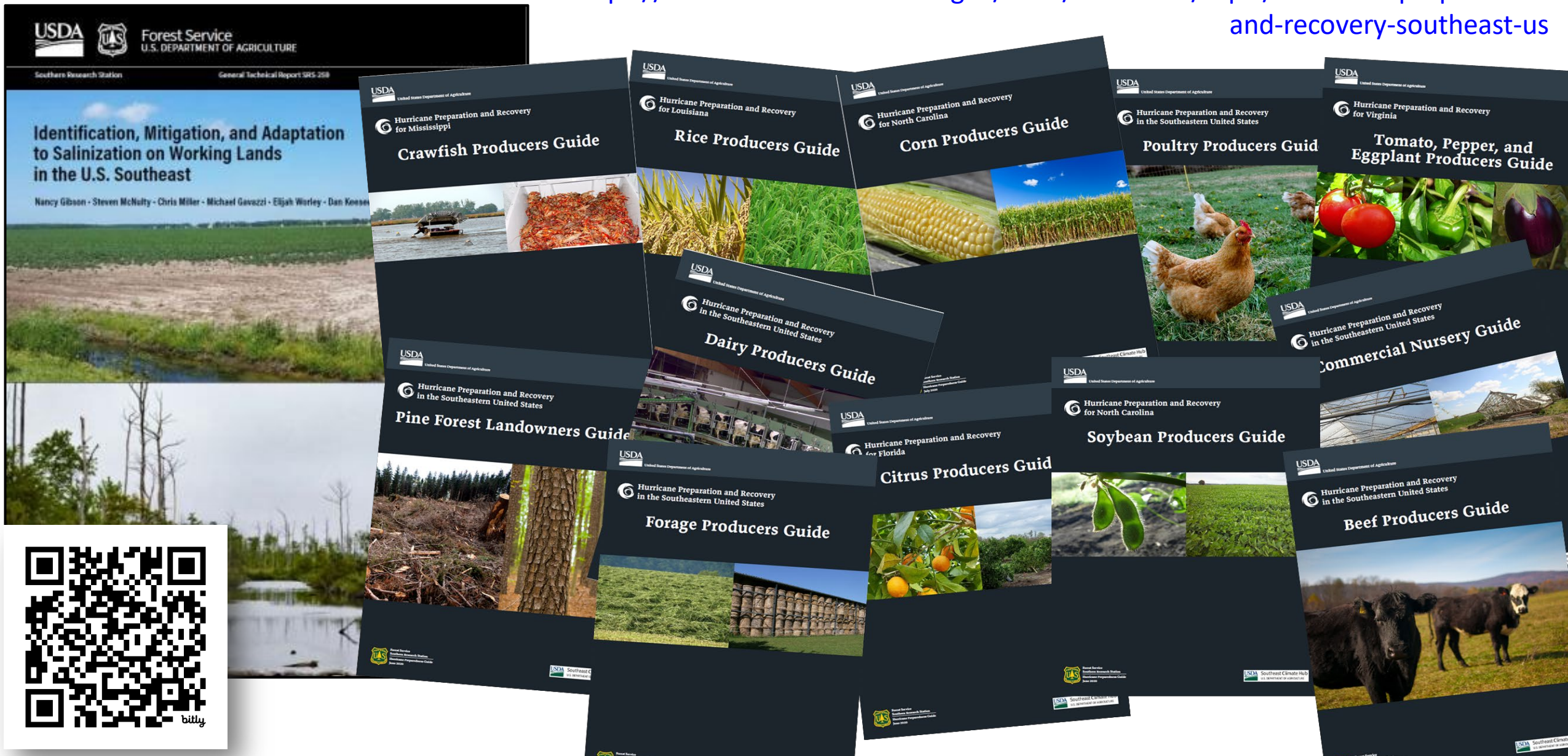
Producer Guides – Hurricane Prep & Recovery

https://www.climatehubs.usda.gov/hubs/southeast/topic/hurricane-preparation-and-recovery-southeast-us



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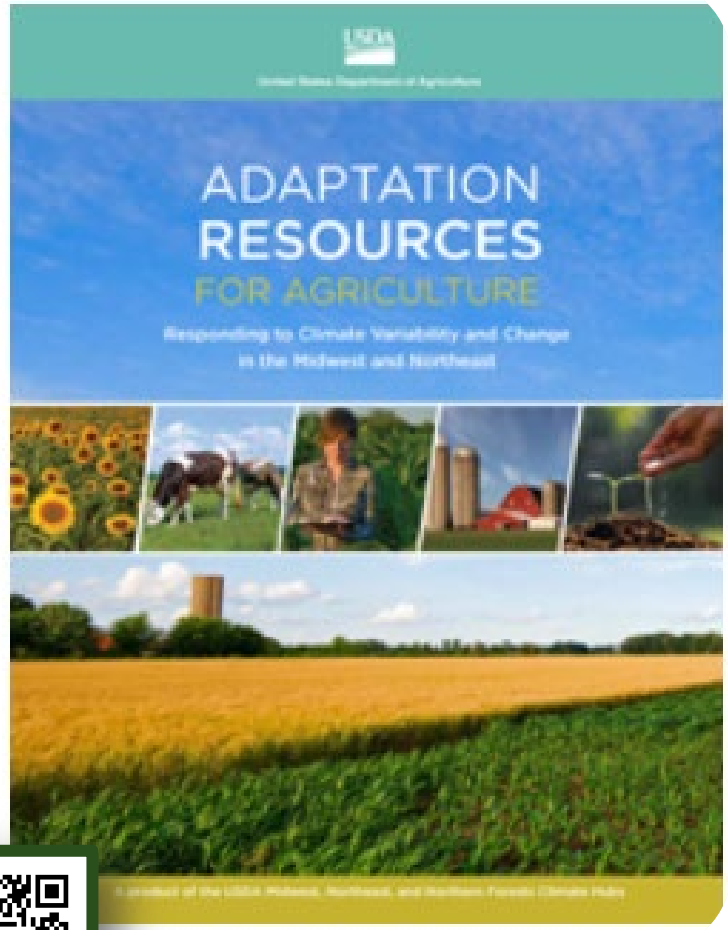
Adaptation Workbooks

USDA Northern Forests Climate Hub
U.S. DEPARTMENT OF AGRICULTURE



USDA California Climate Hub
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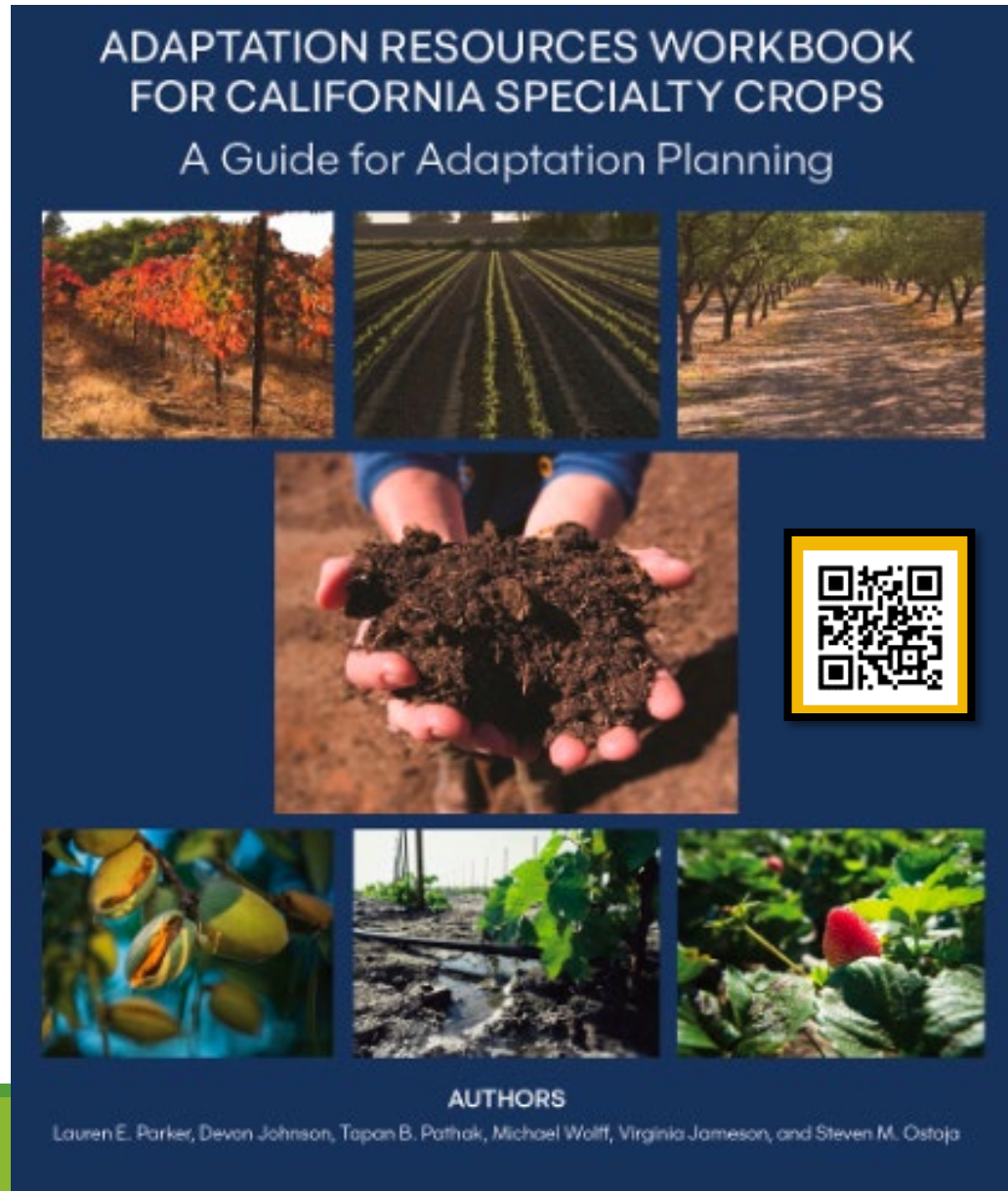


USDA Caribbean Climate Hub

U.S. DEPARTMENT OF AGRICULTURE

Atención Atención ACADEMY

Contenido

Lecciones

Actividades para descargar

Videos

Climate Change

Introduction

Global Warming

The importance of trees

Impact of climate change on farming and agriculture

Contenido, lecciones y actividades que le gustan y motivan a los niños.

Ejercicios, manualidades, hojas de colorear.

https://www.climatehubs.usda.gov/hubs/caribbean/project/what-sr-sapos-new-hobby

Bilingual web-based learning modules for kids (and adults) about climate, forests, and agriculture

USDA Climate Hubs
U.S. DEPARTMENT OF AGRICULTURE


Dannele Peck


Dennis Todey


Maria Janowiak


Jessica Halofsky

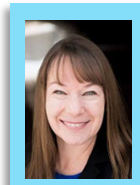

Lindsey Rustad

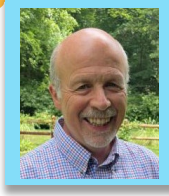

Steven Ostoja


Barbara Bennett

climatehubs.usda.gov


Steven McNulty


Emile Elias


Andrés Cibils


Bill Gould

Northwest Hub
Northwest Region
Northern Plains Region
Northern Plains Hub
California Hub
California Region
Southwest Region
Southwest Hub
Northern Forests Hub
Midwest Hub
Midwest Region
Northeast Hub
Northeast Region
Southeast Hub
Southeast Region
Southern Plains Hub
Southern Plains Region
International Hub
Northwest Region
Southwest Region
Caribbean Hub
Caribbean Region

Regional Contacts - Directors

First.Last@usda.gov

What can we achieve *together* as *partners*?

National Contacts

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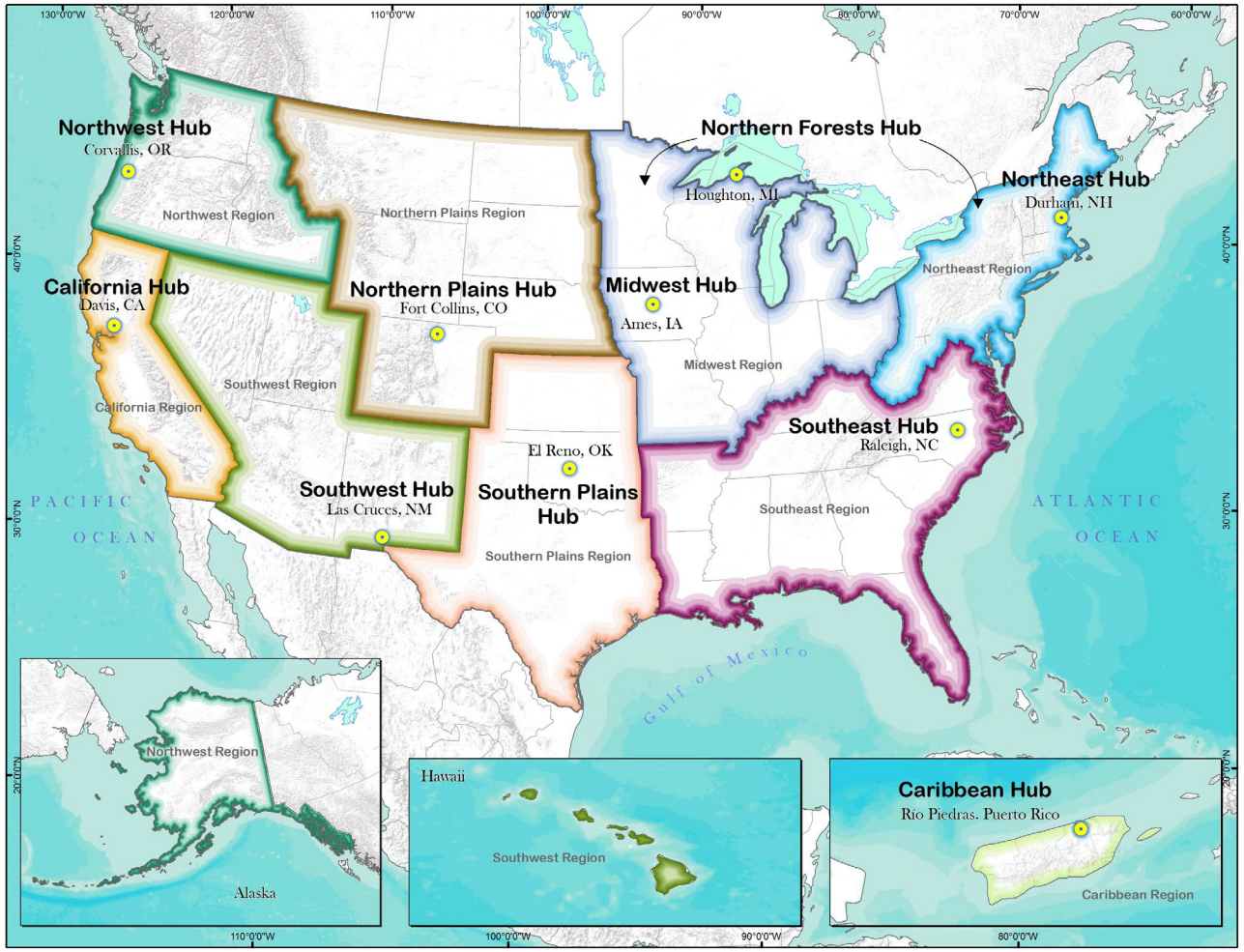
USDA Climate Hub Coordinator
Chris.Miller@usda.gov (interim)
Julian.Reyes@usda.gov (away on detail)

Sign up for the Climate Hub Newsletter here:
https://www.climatehubs.usda.gov/newsletter-signup

Website: **www.climatehubs.usda.gov**
X (Twitter): **@USDAClimateHubs**



Thanks for your time! **My contact info: lees@montana.edu**

Questions?

Thank you for your time!

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