

# Building community and climate resilience with the USDA Climate Hubs

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**Julian Reyes, PhD**

National Coordinator, USDA Climate Hubs

Office of the Chief Economist



U.S. DEPARTMENT OF AGRICULTURE





Climate Hubs

# Translating climate science into action



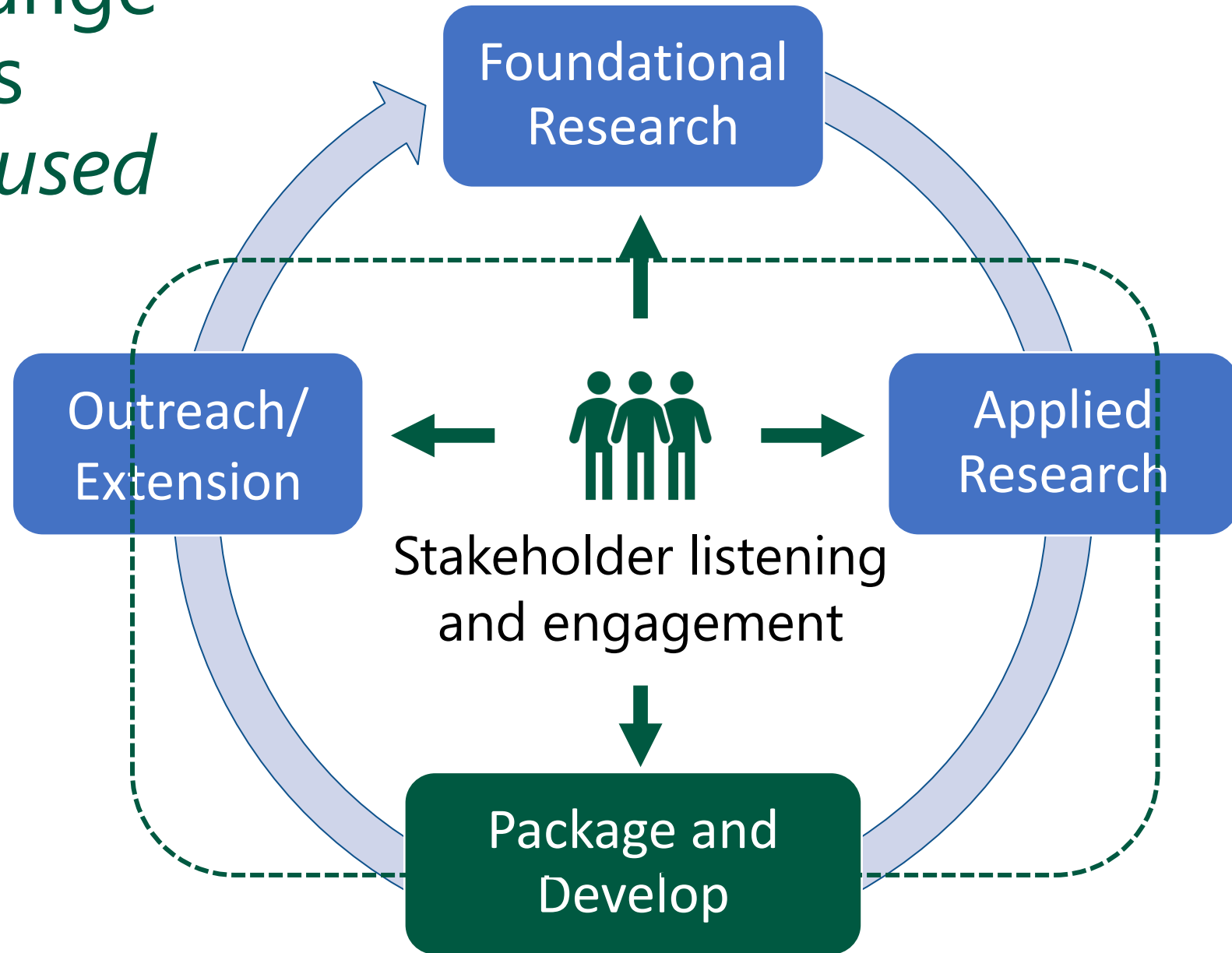
**Mission:** Develop and deliver science-based, region-specific information and technologies to agricultural and natural resource managers to support climate-informed decision making, reduce agricultural risk, and build resilience.



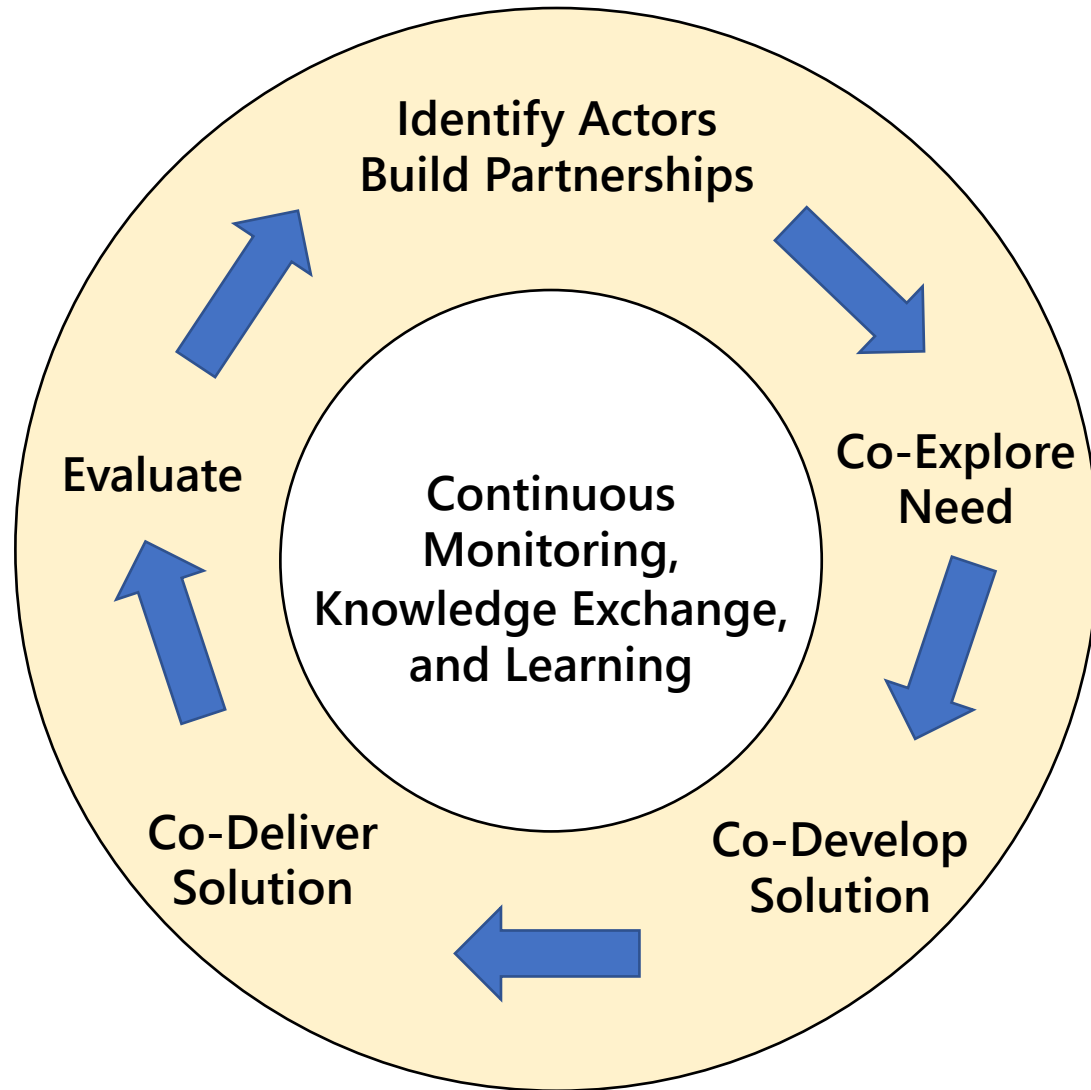
# Making climate change science + resources *useful, usable, and used*

## Partners/Stakeholders

- USDA Service Agencies
- Federal Agencies
- Cooperative Extension
- Land Grant Universities
- Farmers
- Ranchers
- Foresters
- Rural communities



# How we work



Science and data syntheses



Technology/tool  
development and support



Outreach, convening, and  
training

# Partnerships

- We *connect* a wide range of USDA partners including federal and state agencies, extension, and Tribes.
- We *coordinate* with other regional climate change organizations.
- We *collaborate* and *co-produce* climate information and resources to support resilient landscapes and resilient communities.

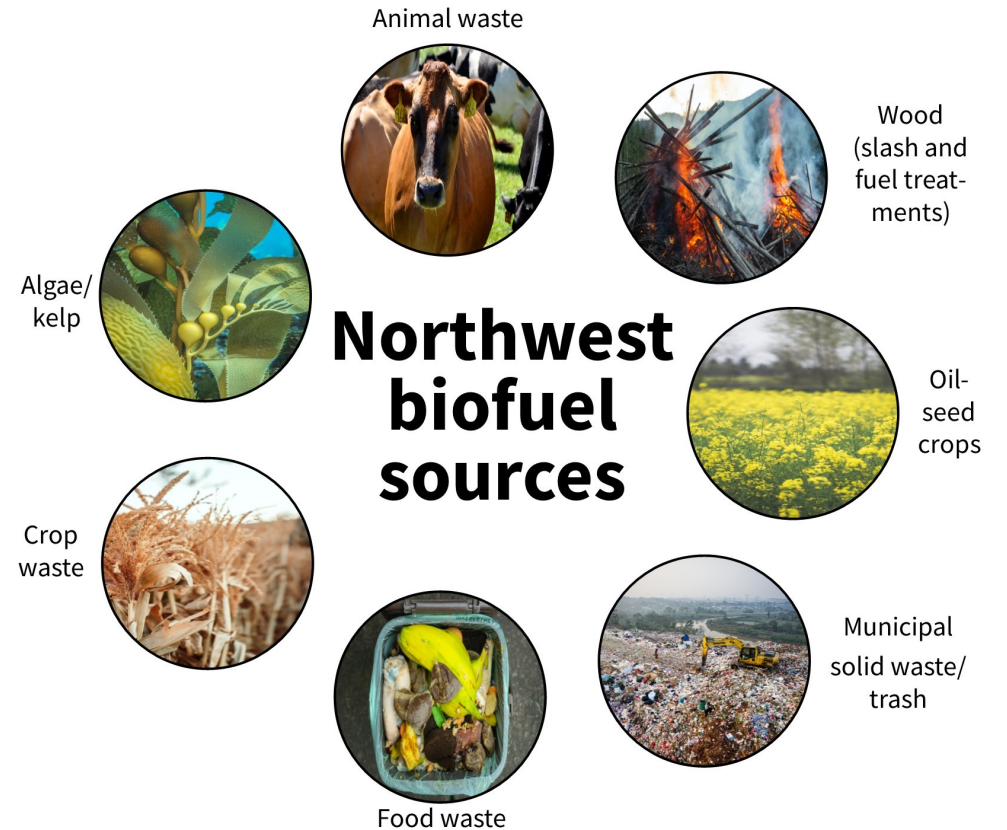
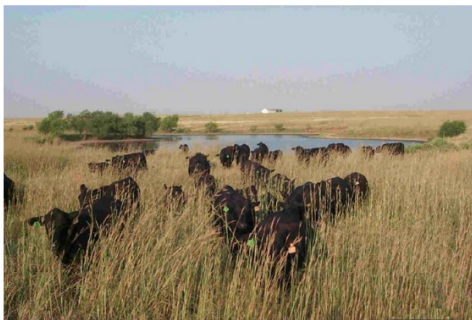


# Regionally-specific science and data synthesis



- The Climate Hubs assess and synthesize climate risks and vulnerabilities based on regional needs and input.
- *These [syntheses](#) provide foundational knowledge on climate risks, as well adaptation and mitigation, efforts, which can help promote conservation and climate-smart practices that build resilience.*

Southern Plains Assessment of Vulnerability and Preliminary Adaptation and Mitigation Strategies for Farmers, Ranchers and Forest Land Owners



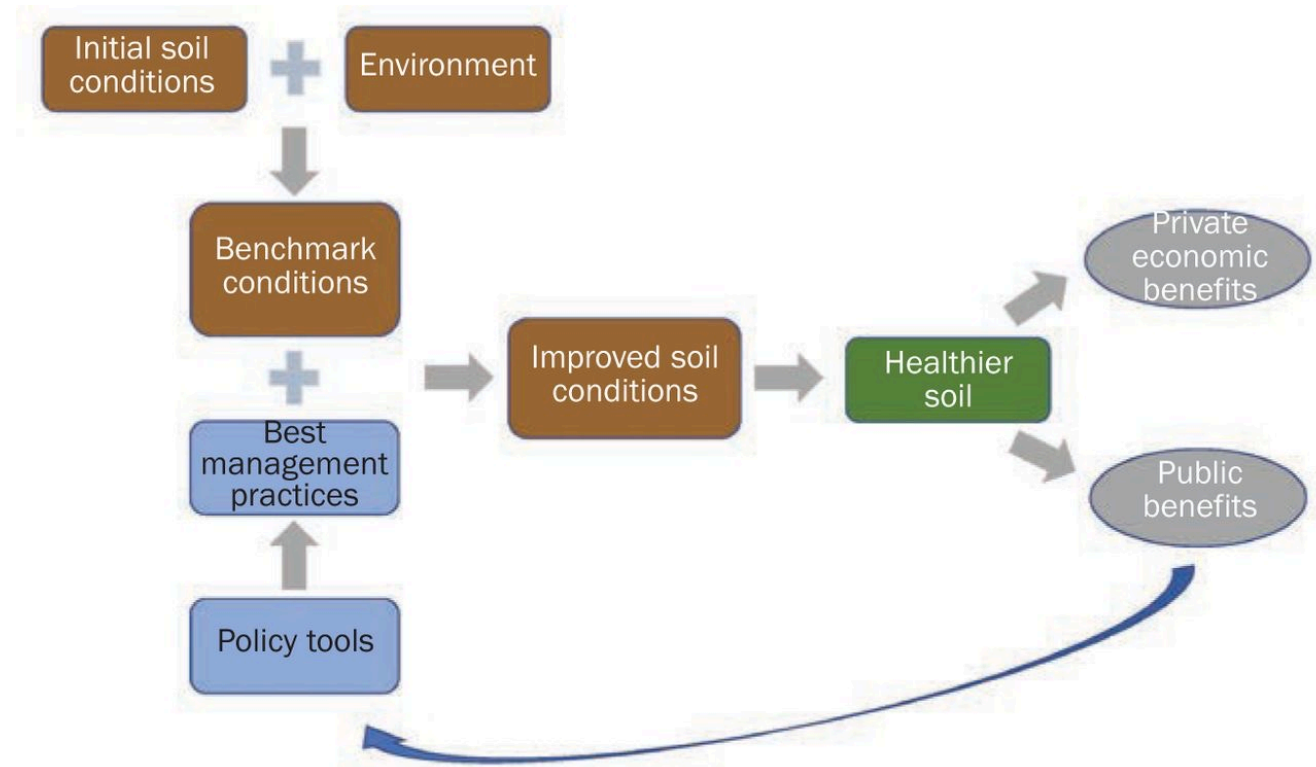
## Economic dimensions of soil health practices that sequester carbon: Promising research directions

Roderick M. Rejesus, Serkan Aglasan, Lynn G. Knight, Michel A. Cavigelli, Curtis J. Dell, Erin D. Lane, and David Y. Hollinger



# Economic dimensions of soil health

- Led by the Northeast Climate Hub using long-term data from LTAR and others to evaluate the economics of both no-till and cover crops.
- This type of long-term economic outcome data can help determine potential incentives for farmers.
- Understanding the motivations for adopting proper soil health management strategies could increase adoption.



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

Roderick M. Rejesus, Serkan Aglasan, Lynn G. Knight, Michel A. Cavigelli, Curtis J. Dell, Erin D. Lane, and David Y. Hollinger

# Economic dimensions of soil health



- For cover crops, long-term use is needed for farmers to realize a positive net economic return.
  - Moreover, research on the economic value with potential external benefits of cover crop use is limited.
- Future research directions
  - Interdisciplinary collaborations engaging economists, soil conservation experts, agronomists, and/or other scientists
  - More aggregate datasets such as county-level, satellite-based data to cover a wider geographical area
  - Nonmarket valuation techniques to estimate societal external contributions (e.g., ecosystem services)

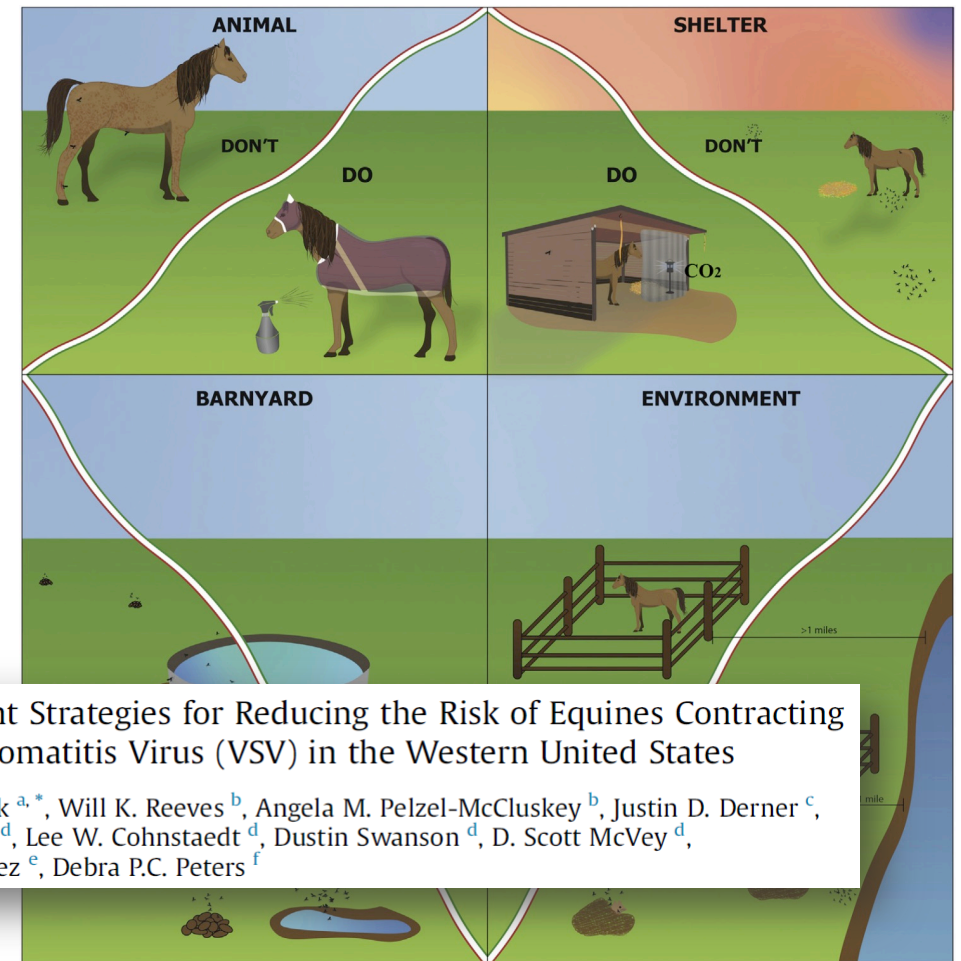




# Science synthesis and translation work to reduce risk of VSV

The Climate Hubs have worked with the Animal and Plant Health Inspection Service (APHIS) the vesicular stomatis virus (VSV), an insect-borne disease that causes painful lesions in hooved animals:

- Synthesis of management strategies and science to reduce VSV delivering useful and usable information to equine veterinarians and owners.
- Integration of climate and hydrology into VSV analyses finding temperature was associated with incidents of VS in the Western US.



Management Strategies for Reducing the Risk of Equines Contracting Vesicular Stomatitis Virus (VSV) in the Western United States

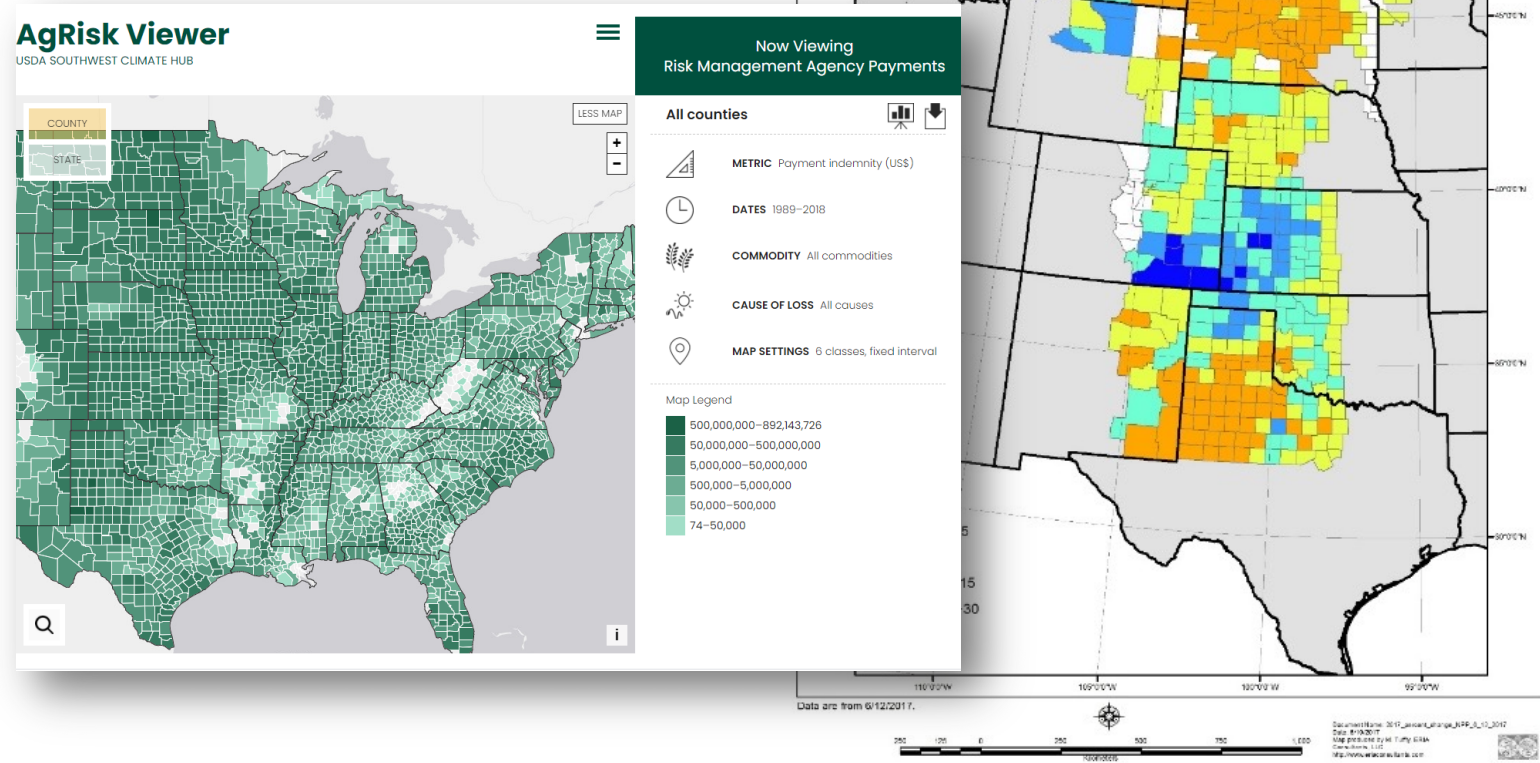
Dannele E. Peck<sup>a,\*</sup>, Will K. Reeves<sup>b</sup>, Angela M. Pelzel-McCluskey<sup>b</sup>, Justin D. Derner<sup>c</sup>, Barbara Drolet<sup>d</sup>, Lee W. Cohnstaedt<sup>d</sup>, Dustin Swanson<sup>d</sup>, D. Scott McVey<sup>d</sup>, Luis L. Rodriguez<sup>e</sup>, Debra P.C. Peters<sup>f</sup>

## Contributions of Hydrology to Vesicular Stomatitis Virus Emergence in the Western USA

Emile Elias,<sup>1\*</sup> D. Scott McVey,<sup>2</sup> Debra Peters,<sup>1</sup> Justin D. Derner,<sup>3</sup> Angela Pelzel-McCluskey,<sup>4</sup> T. Scott Schrader,<sup>1</sup> and Luis Rodriguez<sup>5</sup>

# Tools and technology

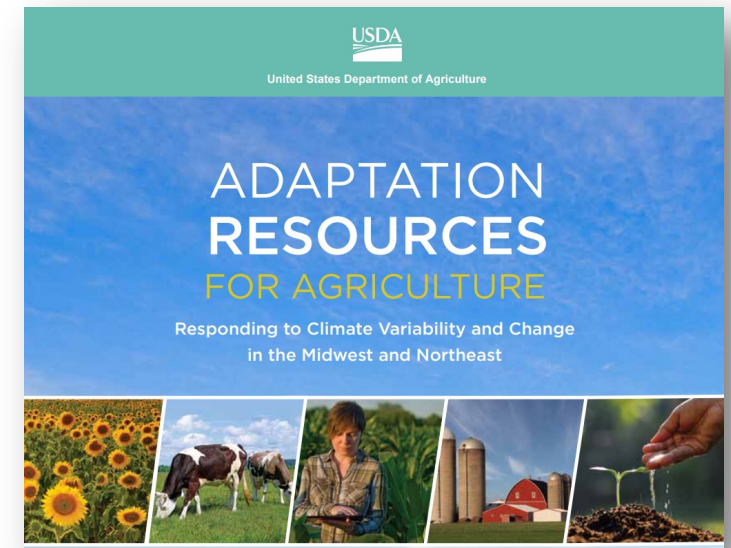
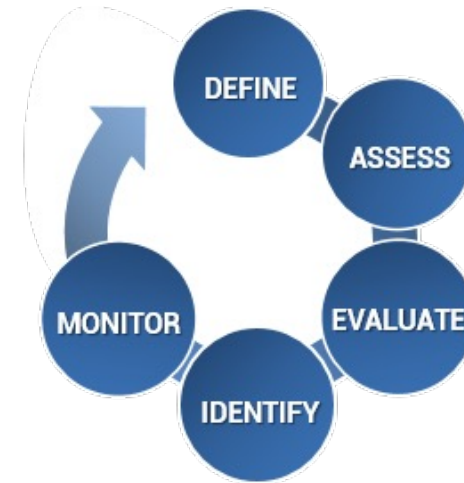
- The Climate Hubs and their partners develop decision support tools to help track and respond to climate change and its impacts
- Over 25 web-based tools have been developed by the Hubs and partners.
  - **Adaptation Workbook**, a structured adaptation planning process w/ menus
  - **Grass-Cast**, a rangeland forage forecast system, and
  - **AgRisk Viewer**, which provides visually accessible crop insurance loss data.



*LTAR Initiative #3, Strategic Action c: Expand partnership opportunities to develop place-based planning tools and logistical support ... via the USDA Climate Hubs*

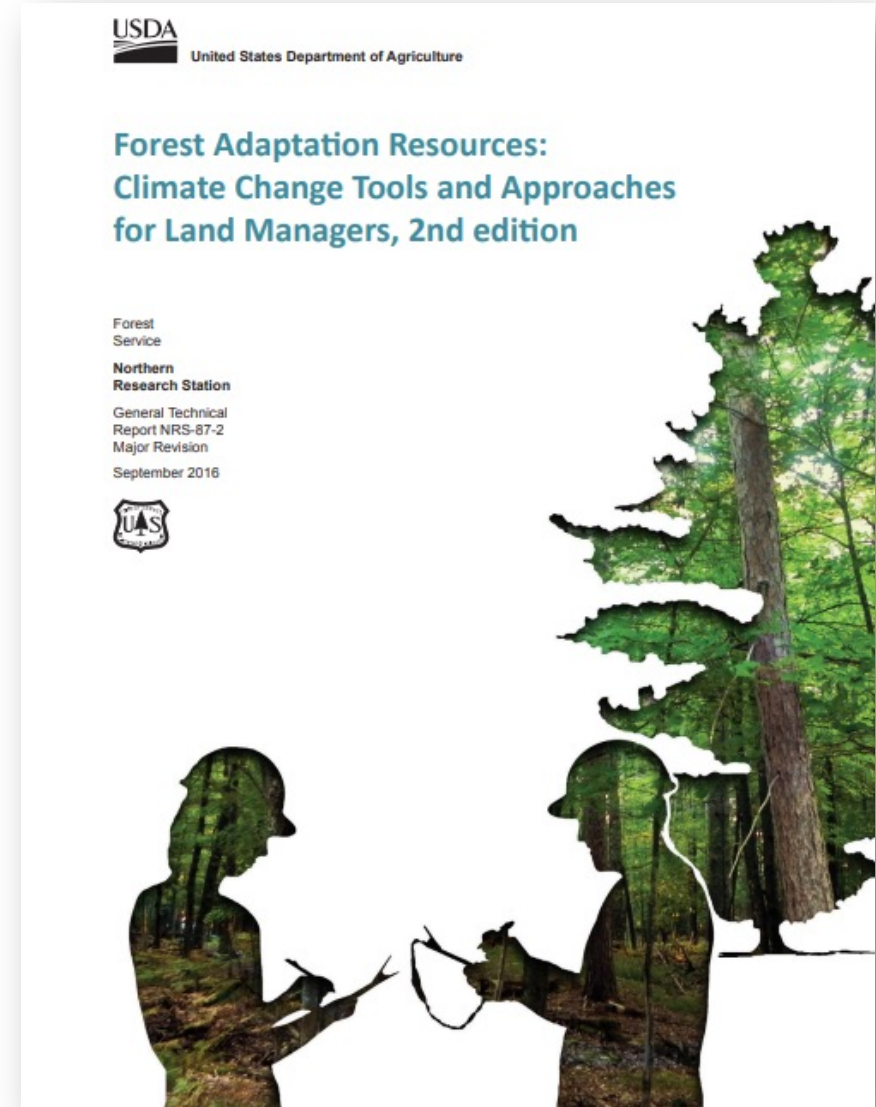
# Adaptation Workbook

- A **structured adaptation planning process** w/ menus
- Offers management scenarios to help land managers respond to climate change risks
- Covers sectors important to forestry and rural communities and their resilience
  - Forest, Forested Watersheds, Forest Carbon Management, Fire, Non-forested Wetland Conservation, Recreation, Agriculture, and Wildlife Management
- *Adaptation Resources for Agriculture* helps producers consider both short-term adaptive management actions and long-range strategic plans

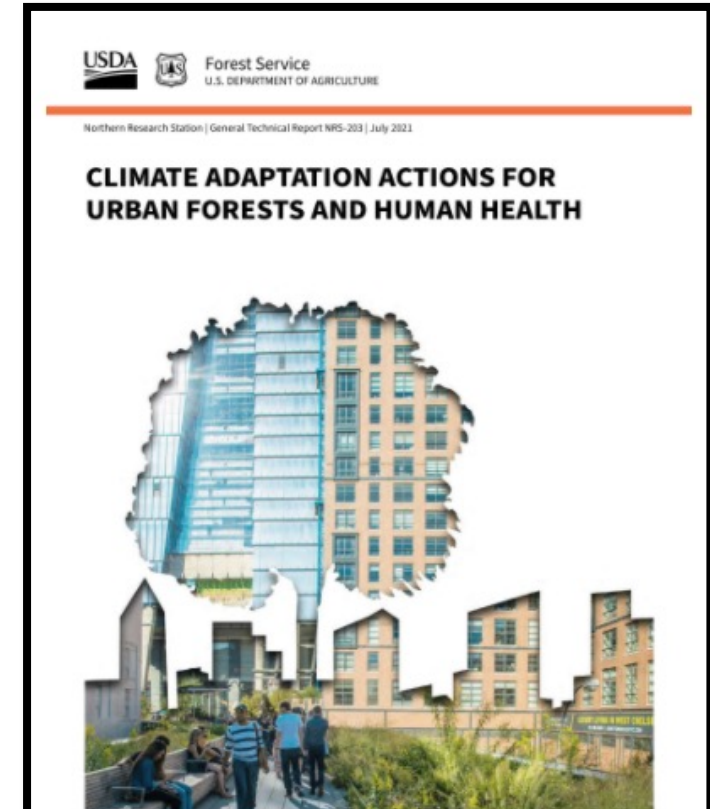


# Forest carbon management

- Designed to help natural resource professionals devise actions that can maintain existing carbon stocks or enhance sequestration capacity while providing co-benefits for other sustainable resource management objectives.
- Strategy #6: Maintain or enhance existing carbon stocks while retaining forest character
- Example tactics:
  - Increase stocking on well-stocked or understocked forest lands
  - Increase harvest frequency or intensity due to greater risk of tree mortality
  - Disfavor species that are distinctly maladapted
  - Manage for species and genotypes with wide moisture and temperature tolerances



# Urban Forest Climate and Health Adaptation Menu



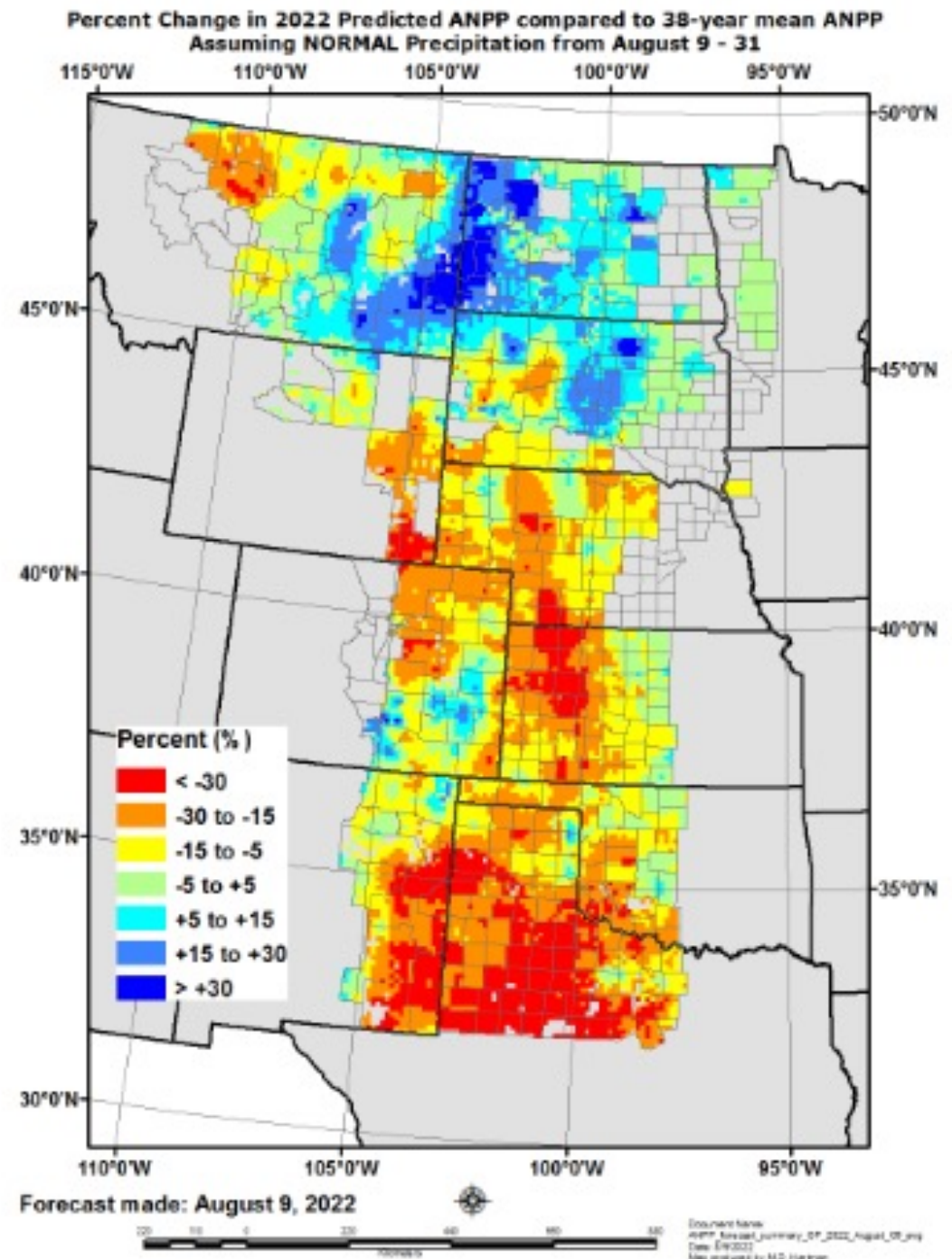
 VIBRANT CITIES LAB 

 **Climate & Health  
Action Guide**

Maximize the benefits of trees to address climate change and improve human health.

# Grass-Cast

- The Northern Plains Climate Hub led development of Grass-Cast, an innovative decision support tool for rangeland managers and ranchers.
  - Grass-Cast forecasts how much grassland vegetation will be available during the upcoming growing season.
  - Grass-Cast uses over 30 years of historical data about weather and vegetation growth—combined with seasonal precipitation forecasts—to predict if rangelands in individual counties are likely to produce *above-normal*, *near-normal*, or *below-normal* amounts of vegetation for grazing.



<https://grasscast.unl.edu>

# Overview of “Grass-Cast” Procedure

## 1. Observed weather + Forecasted weather



DayCent  
ecological model  
predicts



## 2. ET for the growing season



Evapotranspiration

Correlates to:



Healthy Vegetation  
Reflectance

50%  
NIR

8%  
Red



NDVI = 0.72

Stressed Vegetation  
Reflectance

40%  
NIR

30%  
Red



NDVI = 0.14

$$\text{NDVI} = \frac{\text{NIR} - \text{Red}}{\text{NIR} + \text{Red}}$$



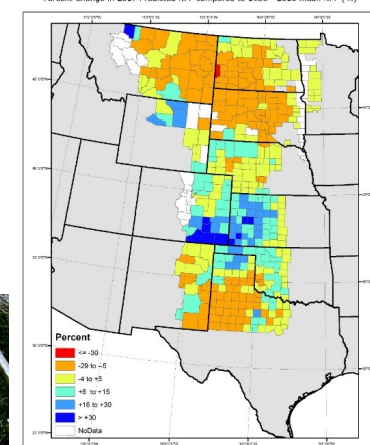
## 3. Greenness for the season

Correlates to:



## 4. Lbs/Acre of Veg for season

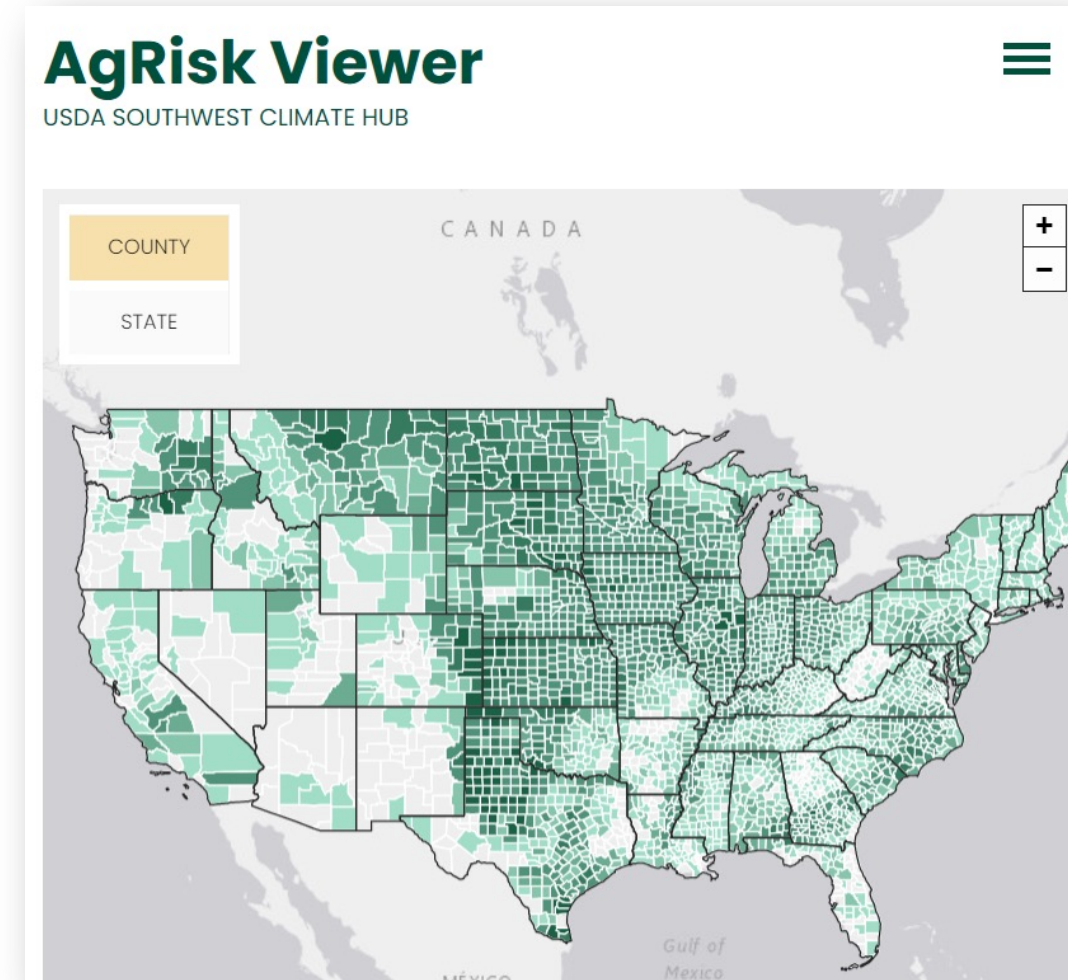
Percent Change in 2017 Predicted NPP compared to 1986 - 2016 mean NPP (%)



# Agricultural risk management

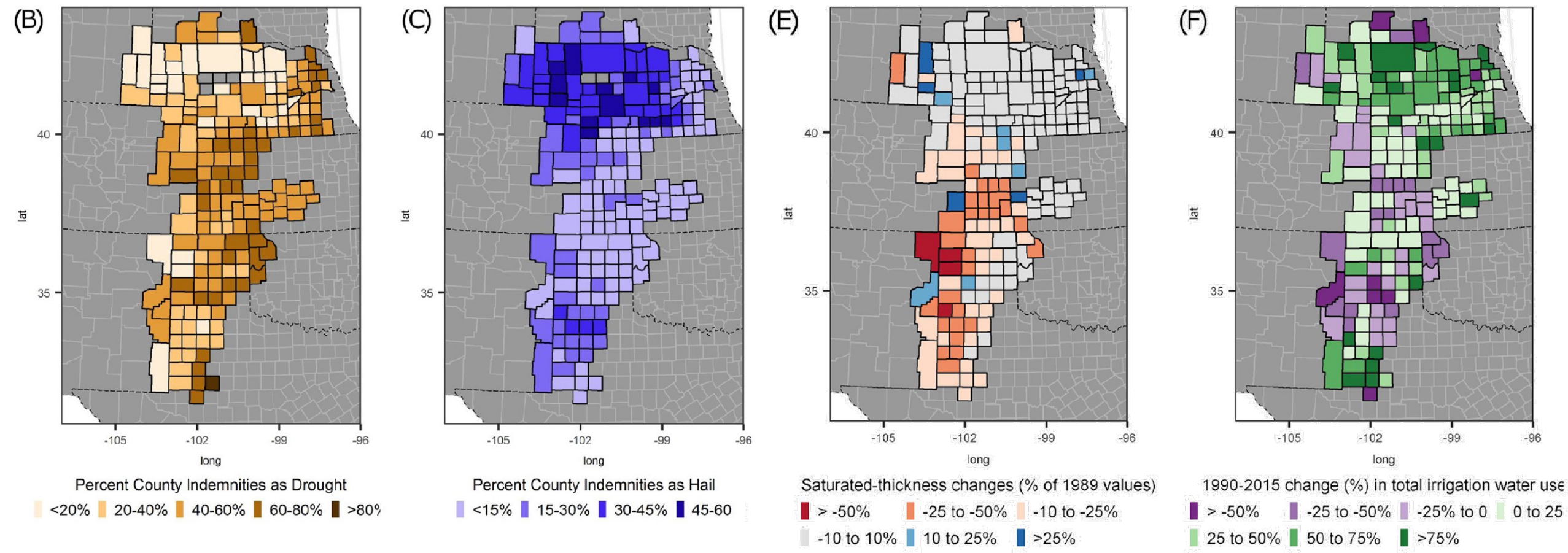


- **AgRisk Viewer** is an accessible and discoverable web platform for crop insurance loss data from the USDA Risk Management Agency.
- AgRisk Viewer empowers producers and decision makers to assess their climate risks using commodity-specific, and county-level data over the last 30 years.
- More publicly accessible crop insurance data promotes adaptation and resilience – in both agricultural systems and rural communities.



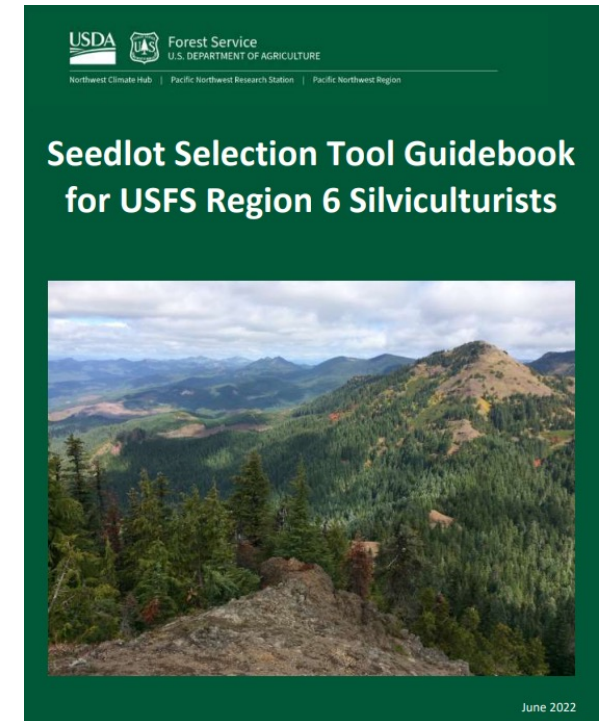
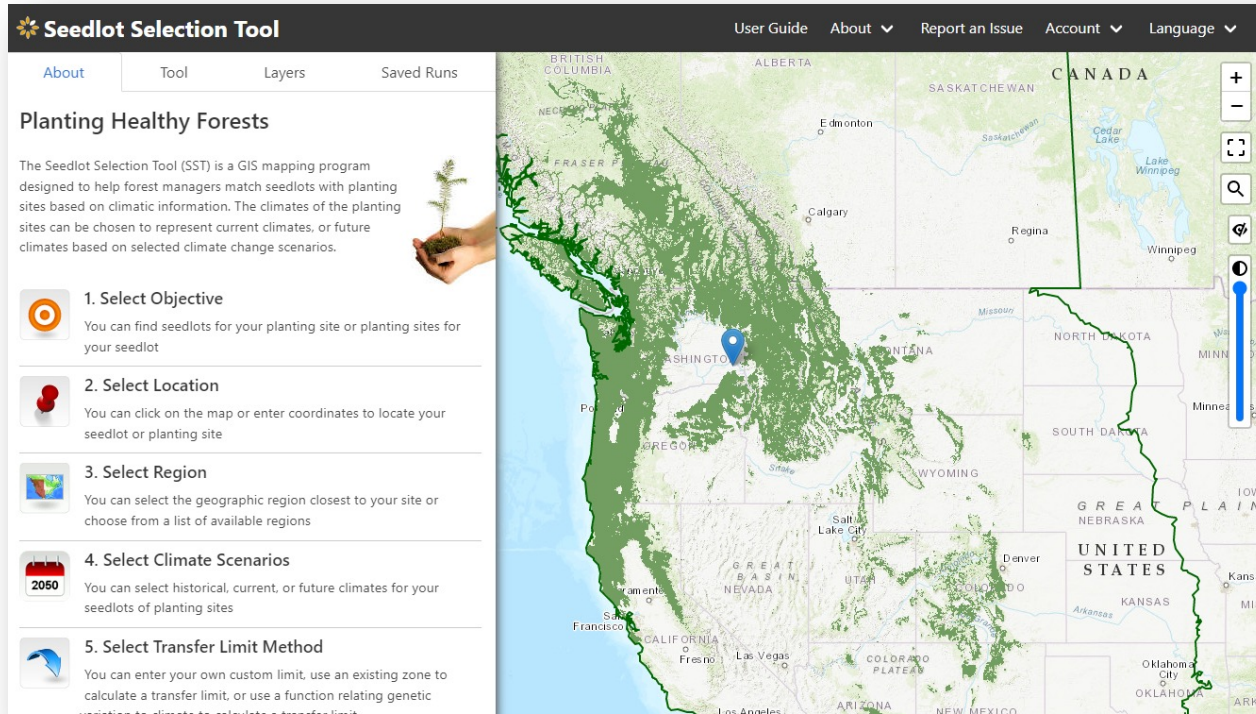


# Assessing agricultural risk management with crop insurance data



# Seedlot Selection Tool

- The [Seedlot Selection Tool](https://seedlotsselectiontool.org/) helps foresters, landowners, and land managers to consider climate change when planning reforestation and afforestation projects.
- The tool helps managers match planting materials with planting sites based on climate variables that are important to tree growth, reproduction, and survival.



# Supporting forest management at-scale



Our Northwest and California Climate Hubs have produced forest management + climate resilience handbooks for small forest landowners to help them:

- Determine appropriate land management actions,
- Find technical support, and
- Understand opportunities to build forest health and resilience.

## A CLIMATE RESILIENCE GUIDE FOR SMALL FOREST LANDOWNERS IN WESTERN WASHINGTON



## Forest Management Handbook for Small-Parcel Landowners in the Sierra Nevada and Southern Cascade Range

Peter A. Stine, Steven M. Ostoja, and Stewart McMorrow



**W** EARTHLAB  
UNIVERSITY of WASHINGTON



**USDA** Northwest Climate Hub  
U.S. DEPARTMENT OF AGRICULTURE



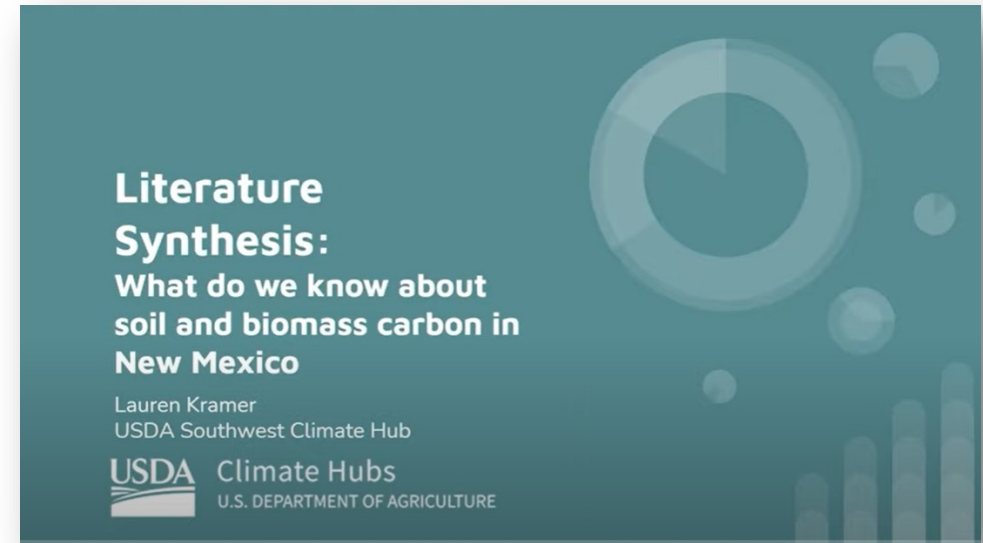
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# Carbon pools and decision-support tools in New Mexico

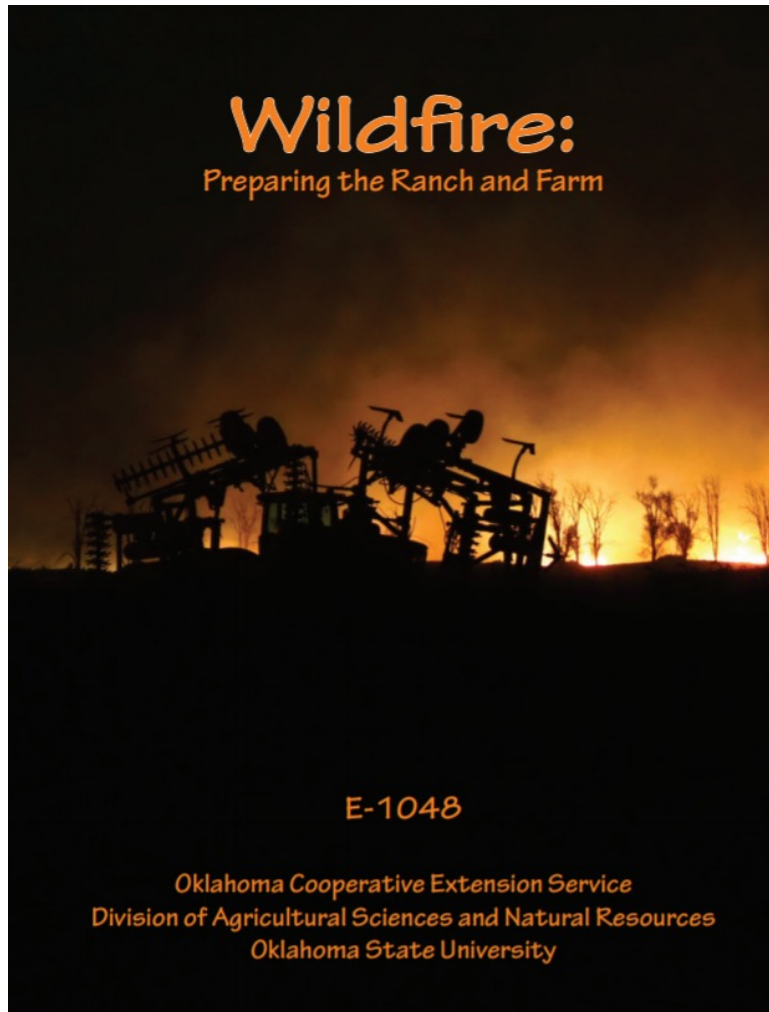


The Southwest Climate Hub partnered with the NM Department of Agriculture to investigate if a carbon market could serve as a value-added financial option for NM producers.

- **Science synthesis:** Baseline carbon stores across NM landscapes and what conservation practices and land management impart C storage
- **Tool evaluation:** Out of 73 decision-support tools, only five are easy to use and provide adequate carbon estimates for NM.
- **Producer listening sessions:** Virtual scientist-stakeholder conversations and in-person at NM Cattle Growers meeting



# Disaster preparedness



- The [Southern Plains Climate Hub](#) co-developed a farmstead wildfire preparedness factsheet.

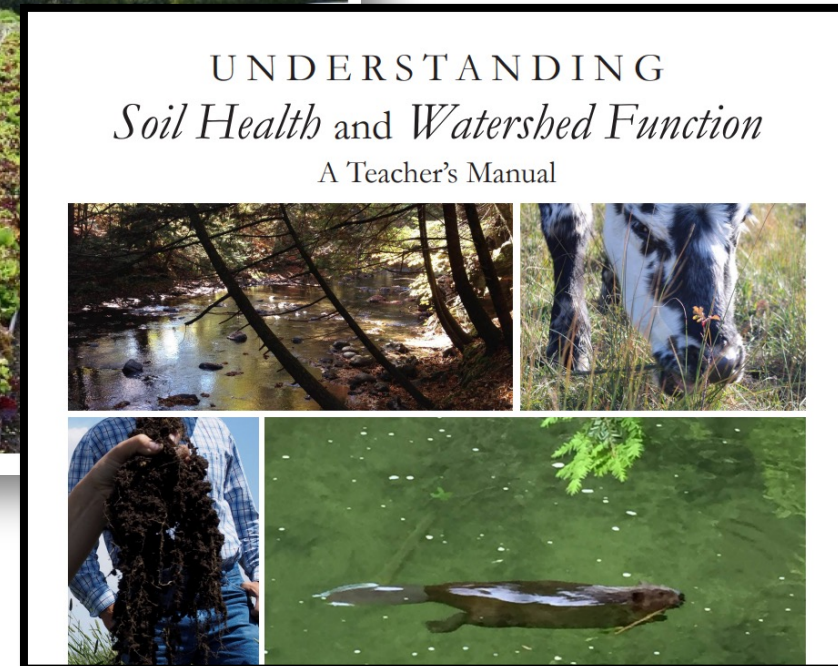
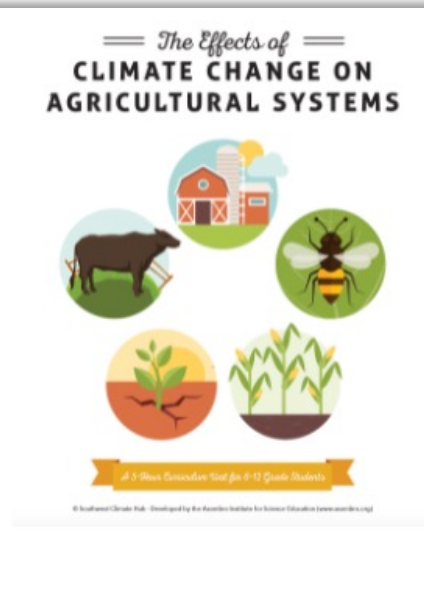
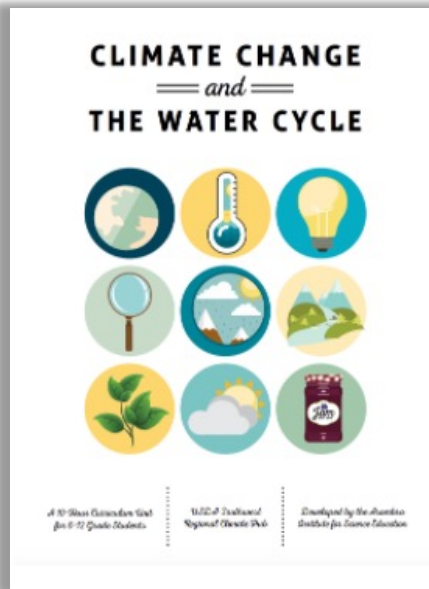
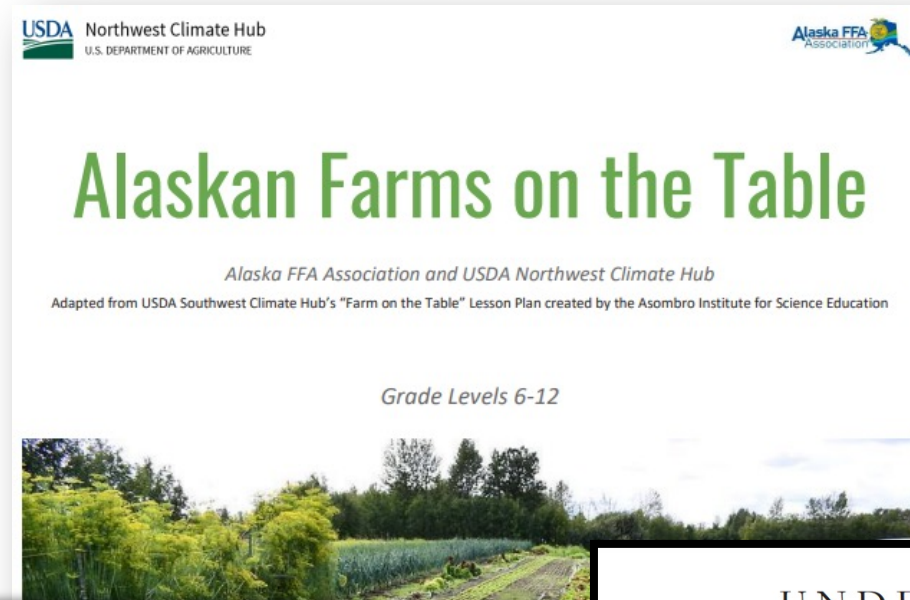
- The [Southwest Climate Hub](#) developed a toolkit for assessing and preventing potential damage due to post-fire flooding and related events.



- The [Southeast Climate Hub](#) developed **23 commodity guides** to help producers prepare for and recover from hurricane events.

# Education and outreach

- Our Climate Hubs have produced [education modules](#) to support climate literacy efforts understanding that children can be effective agents of change.
- The Climate Hubs' efforts provide "off-the-shelf", flexible products that can be used in classrooms across the Nation.

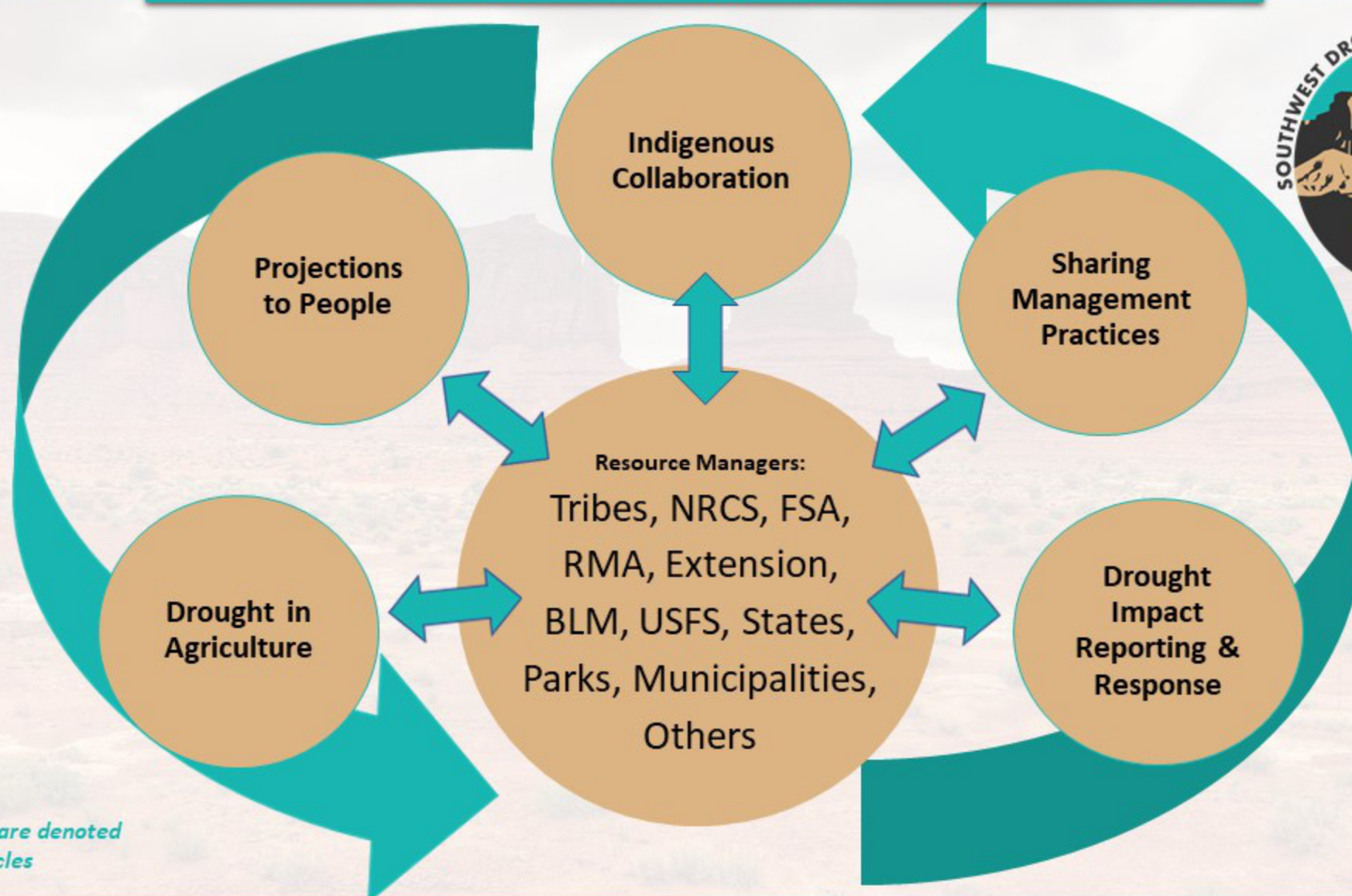


# Drought Learning Network

- The Drought Learning Network is a peer-to-peer knowledge exchange between climate service providers and resource managers.
- The main goal of the DLN is to gather and share lessons learned from drought events to improve responses to future droughts.
- The DLN was conceptualized as a framework for stakeholders to share experiences in preparing for, responding to, and recovering from drought to inform current and future response and mitigation actions.



# Climate service providers support peer-to-peer learning



2021 DLN Teams are denoted in the outside circles



# Climate Adaptation Fellowship

- The [Climate Adaptation Fellowship](#) developed by the [Northeast Climate Hub](#) is designed to help farmers, foresters, and service providers in the Northeast improve their knowledge about climate change impacts, and their ability to make good planning decisions related to climate change adaptation.



# Peer-to-peer learning networks

- Peer-to-peer learning model can allow communities, scientists, and decision makers to share their successes with each other ensuring strategies, policies, and programs meet local needs.
  - P2P can scale and implement climate-smart solutions and agricultural innovations.
  - This explicitly allows for cross-sectoral and cross-jurisdictional collaboration and coordination.





# 360 virtual demonstrations

- Field tours are a powerful teacher because they are an ideal way to see how farm and forestry practices work in the real world.
- These innovative photography and videos offer an interactive experience to consider experiences of others who are adapting to climate change.
- While focused on the Northeastern U.S., these virtual tours may inform and inspire similar efforts in other regions to share practical strategies.
- Relevant topics: Agroforestry, urban forestry, prescribed burning, timber management, and extreme weather/climate impacts on forest ecosystems

# *Delmarva and the Ground for Change*

- This film follows three different family-owned farming operations on the Delmarva Peninsula who all care about and depend on soil.
- Practices span no-till farming, cover crops, subsurface irrigation, rotational grazing, and soil carbon sequestration.
- These practices protect and promote healthy soils, and safeguard operations against extremes posed by climate change.



# Reaching diverse communities

- Through the Hubs' assessments, tools, and technologies, they can **identify opportunities to ensure equitable access** to USDA research and programs.
- Justice 40 initiative a key priority
- NIFA \$9 million investment for FY21 in Hub and extension partnerships including expanding engagement in underserved areas
  - "Native Climate: Strengthening the role of Climate Hubs in Indian Country"



# NIFA AFRI Climate Hubs-extension partnerships

- Extension, education, and USDA Climate Hubs Partnership (A1721)
- Support projects that provide effective, translatable, and scalable approach to address climate change through regional partnerships including the Climate Hubs and extension.
- Example emphasis areas:
  - Innovative stakeholder engagement and participatory program design;
  - Climate Hub Fellowships;
  - Training in climate science and CSAF for: K-12 teacher, extension educators, and/or public/private sector technical service providers;
  - Training in Climate-Smart Commodities and related food systems;
  - Targeted programming for historically underserved groups.



# Climate-smart agriculture and forestry

## What is **Climate Smart Agriculture**?

- **Sustainably increasing agricultural productivity** and incomes;
  - **Adapting and building resilience**; and
  - Reducing and/or **removing greenhouse gas emissions**
- *“The Climate Hubs should continue to lower barriers and increase the rate of adoption of CSAF practices. They should also help identify opportunities for collaboration with partners to develop necessary innovations or curate tools and technologies to moderate stressors.”*



# Climate adaptation at USDA

## USDA's Adaptation Actions

**#1** Build resilience to climate change with investments in soil and forest health



**#3** Broaden access and availability of climate data



**#4** Increase support for research and development of climate-smart practices and technologies



**#2** Increase outreach and education to promote adoption of climate-smart strategies



**#5** Leverage the USDA Climate Hubs to support USDA Mission Areas





# Climate Hubs play a central role in USDA's Climate Adaptation Plan

## Action #2



- Outward-facing role for Hubs: Expand USDA's reach with farmers, ranchers, forest landowners, including underserved communities
- Work with NIFA to strengthen cooperative extension as a force multiplier to deliver climate-smart practices

## Action #4

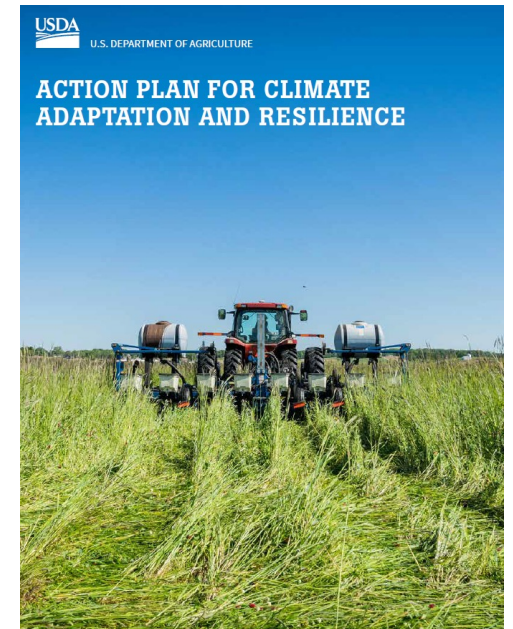


- USDA will work through the Climate Hubs, extension, and other means to understand stakeholder needs and deploy new information, data, practices, tools, and technologies to private landowners and managers for implementation.

## Action #5



- Inward-facing: Provide connection across USDA and USG on climate change.



# Climate Hubs' value-add

- Linking science to programs and managers
  - Serving as “connectors”
- Building mutual literacy in climate science and working lands
- Assessing climate vulnerabilities pre and post disaster
- Providing tested and effective adaptation planning and implementation
- Building relationships and networks
  - Convening interdisciplinary research teams linking biophysical and socioeconomic expertise, and integrating community/producer perspectives



# Opportunities

- USDA Climate Hubs provide syntheses, assessments, tools, and outreach that build climate awareness and knowledge.
- Climate Hubs are connectors. They also convene and bring partners to the table to promote collaboration and coproduction, and importantly *listen* and *learn*.
- Enhancing partnerships and collaborative capacity in timely and relevant areas (e.g., soil carbon, agroforestry).
- Expanding tool and technology development and implementation.



# Lessons learned



Meet them [stakeholders] where they are, not where you want them to be.



Listen first, and lead with what's important to *them*.



Find your value-add, and leverage partnerships to deliver efficient and effective programming and resources.

# Connect with us!



[climatehubs.usda.gov](https://climatehubs.usda.gov)

[@USDAClimateHubs](https://twitter.com/USDAClimateHubs)

Julian Reyes  
[julian.reyes@usda.gov](mailto:julian.reyes@usda.gov)