Northeast Farming for Climate Resilience: Floods

NOAA Climate Services Webinar
October 31, 2023

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USDA Northeast Climate Hub

USDA U.S. DEPARTMENT OF AGRICULTURE

OUTLINE

1. Increase in extreme rain events
2. Adapting to climate change
   - landscape vulnerability, soil health, decision-support
3. A word about drought

Mission

To develop and deliver science-based, region-specific information and technologies to enable climate-informed decision-making.

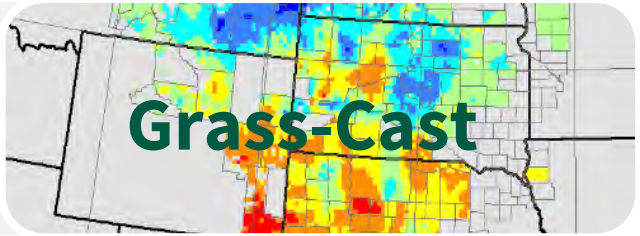
Partnerships with FS, ARS, NRCS, LGUs, NGOs and others

Science and data syntheses

Translating and delivering relevant information

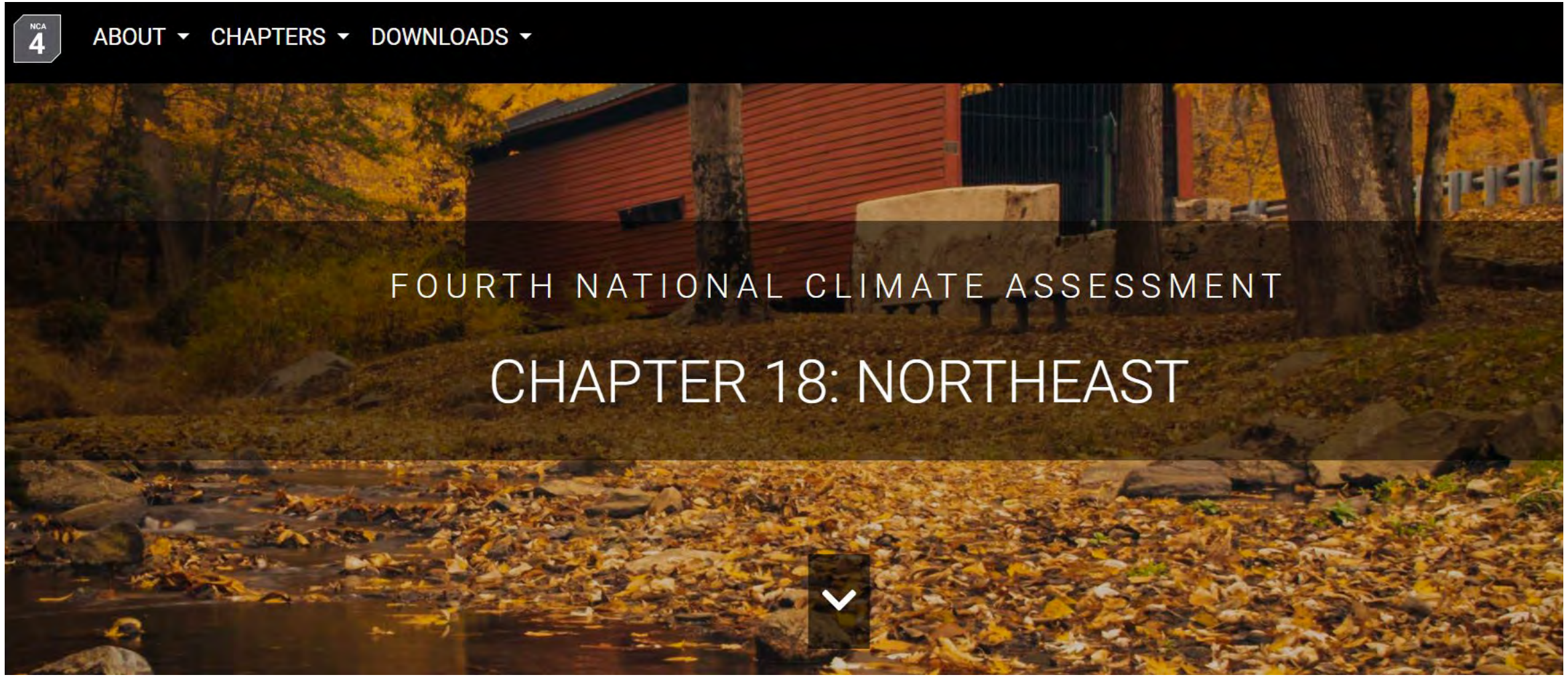
Tool/technology development and support

Supporting climate-informed planning and decision-making

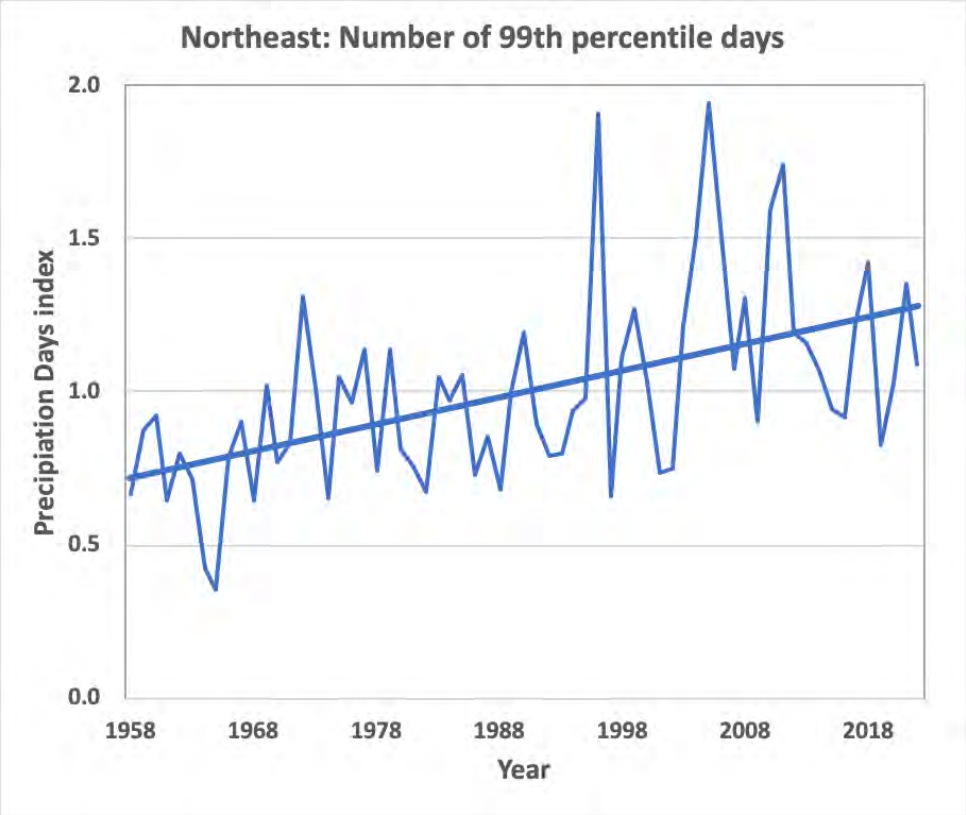


Outreach, convening, and training

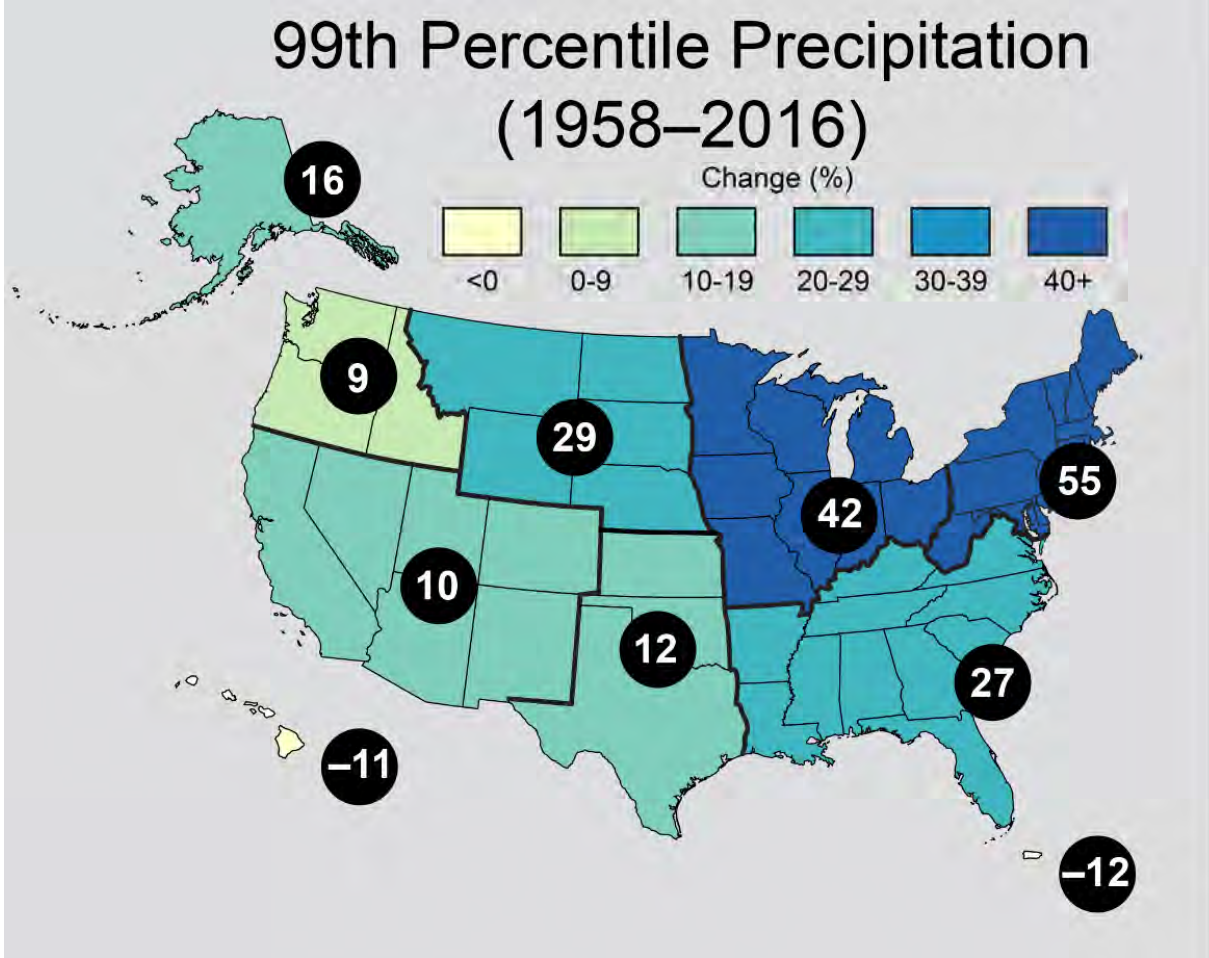
Facilitating engagement, discovery, and exchange


NCA 4
ABOUT
CHAPTERS
DOWNLOADS
FOURTH NATIONAL CLIMATE ASSESSMENT
CHAPTER 18: NORTHEAST

The Northeast has experienced a **60% increase in extreme precipitation events** since 1958



Source: in progress



Source: CSSR, NCA4 Chapter 7

↑ spring flooding

damaged infrastructure after a wind/rain event ↓

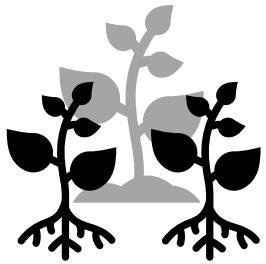
← erosion after an intense rain event

Impacts

+ Flooding
    + Crop contamination
    + Debris deposition
    + Invasive Species
+ Soil Erosion
+ Compaction
+ Crop loss
+ Delayed access (planting/harvesting)
+ Loss of seeds, fertilizer, ag chemicals
+ Nutrient runoff/Loss of nutrients
+ Risk of damage to infrastructure, equipment, and manure lagoons

Create Climate Smart Farms

Address Landscape Vulnerability



Improve Soil Health

Use Decision Support Tools

for better information faster

Address Landscape Vulnerability

- Take land out of annual production
- Establish perennial systems
- Practice erosion control

Take marginal land out of annual production

- Steep slopes
- Frequently flooded/ponded soils
- Shallow to bedrock soils
- Soils that easily compact
- Areas that are prone to saltwater intrusion

Establish Perennial Systems

Pasture or hay

Perennial crops

Pollinator or wildlife habitat

Conservation buffers

Control Erosion: Install Grassed Waterways, Diversions, Contour Buffer Strips, and Water and Sediment Control Basins

Improve Soil Health

- Increase Organic Matter
- Improve Soil Structure (Disturb Less)
- Keep Soils Covered

Soil Organic Matter

- **Enhances infiltration:** Allows more of the soil mass to hold water.

- **Reduces erosion:** Increasing SOM from 1 – 3% can reduce erosion 20-33%.

Improve soil structure

- Disturb the soil less
- Reduce compaction
- Encourage living roots and biological communities

- No-Till
- Reduced-Till
- Shallow-Till
- Zone-Till/Strip-Till
- Ridge-Till
- Strategic-Till

Reduced Till Soil Multiple Till Soil No Till Soil

Keep Soil Covered: crops, mulch, crop residue

- Buffers soil temperature and moisture
- Improves energy flow by capturing sun
- Provides living roots (food source) over a larger part of the growing season.
- Protects against erosion

Keep Soil Covered: Succession Cropping

RHODE ISLAND'S CHANGING CLIMATE CREATES NEW OPPORTUNITIES FOR SUMMER COVER CROPS

Many Rhode Island farmers plant winter cover crops, such as winter rye (*Secale cereale*). The plants help to reduce soil erosion, improve soil quality, and provide other benefits.

Summer cover crops traditionally have not been used in Rhode Island because of the short summer fallow period. However, a changing climate is creating new opportunities for summer cover crops. As the fall season becomes milder, fall cash crops are now being planted as late as the end of September. This creates an increasing gap period between the harvesting of early summer crops and the planting of fall crops. The fall cash crops are also being harvested later, which means that winter cover crops are planted later and are unable to produce as much biomass as in the past. These shifts in planting times are making traditional winter cover cropping less practical and summer cover cropping more worthwhile.

Sufficient soil organic matter is essential for healthy soils and is needed to meet crop production needs. Soil organic matter also helps ecosystems to filter water and stabilize surface water flows. Intensive farming often decreases soil organic matter levels over time. Low-residue cropping systems that rely on tillage and cultivation are especially at risk. Soil organic matter levels below the recommended value of 5 percent occur on many farms in Rhode Island and New England. Cover crops add organic matter which helps soils hold water, keeping moisture in the root zone. Crops benefit during drought periods, and runoff and leaching are reduced during wet periods. This can help farmers deal with the increased frequency of heavy rains and more frequent summer droughts predicted for the State.

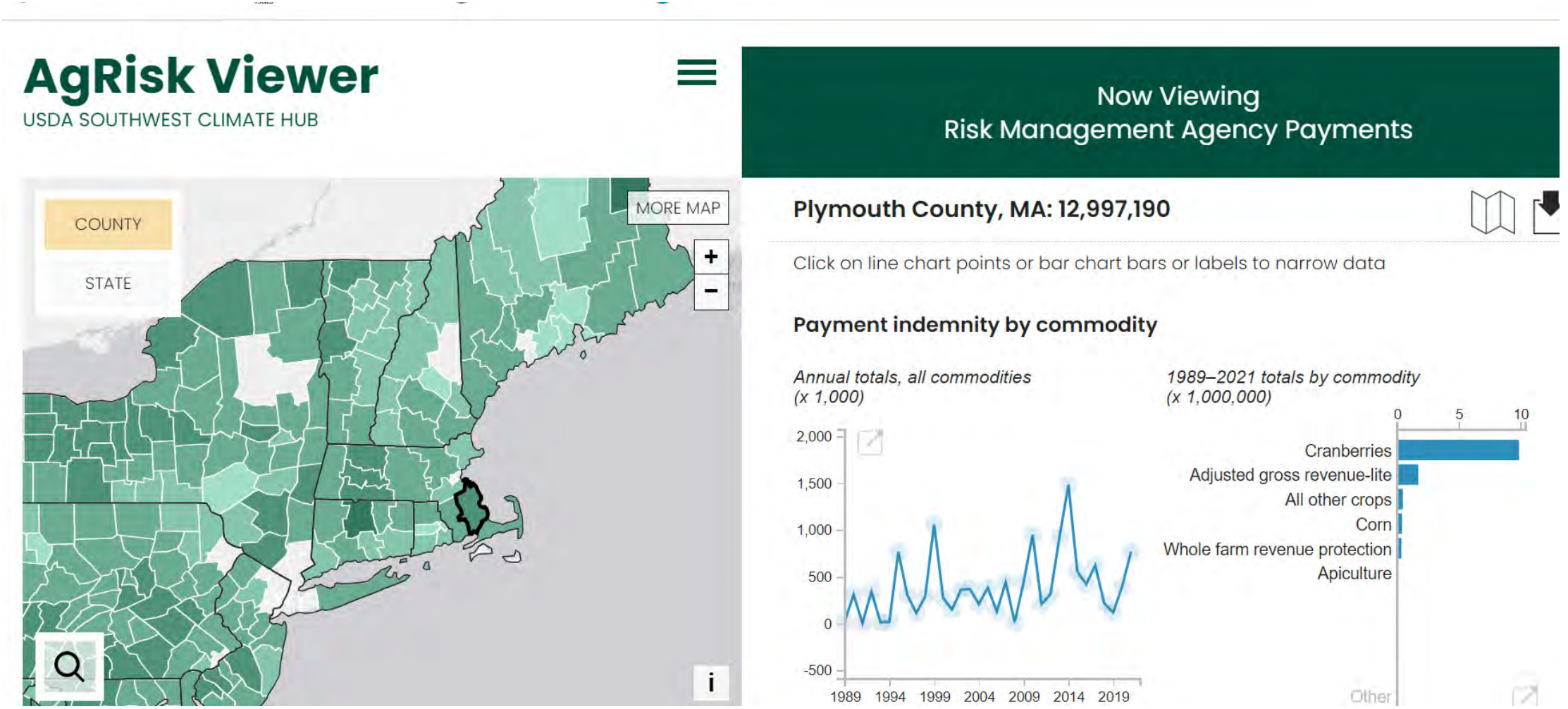
Dr. Rebecca Brown has assessed the viability of using summer cover crops to build soil health. She is an Associate Professor of Plant Sciences at the University of Rhode Island (URI). Dr. Brown's research focused on determining which summer cover crops, seeding rates, and planting windows provide the most benefits in Rhode Island. The ideal seeding rate (amount of seed planted per area) for cover crops balances seed cost, weed suppression, and biomass production. Rapid establishment of a crop canopy is key to weed suppression, so cover crop seeding rates are often higher than cash crop seeding rates for the same species.

A variety of summer cover crops were tested over three years (2015-17) to determine how they responded in Rhode Island's climate. Conventional wisdom suggested that the cool-season legumes and winter grains used as winter cover crops in the northern United States would not grow during the summer. It was thought that warm-season grasses and tropical legumes would be better choices for short-window summer cover crops. However, summers in Rhode Island are cooler than summers in the Southeast and Midwest, where most research on summer cover crops has been conducted.

The URI research found that Japanese millet (*Echinochloa esculenta*) and teff (*Eragrostis tef*) make good summer cover crops in Rhode Island's climate. Both crops effectively build soil health and meet weed suppression standards. Sunn hemp (*Crotalaria juncea*) and chickling vetch (*Lathyrus sativus*) performed poorly as cover crops under the same conditions.

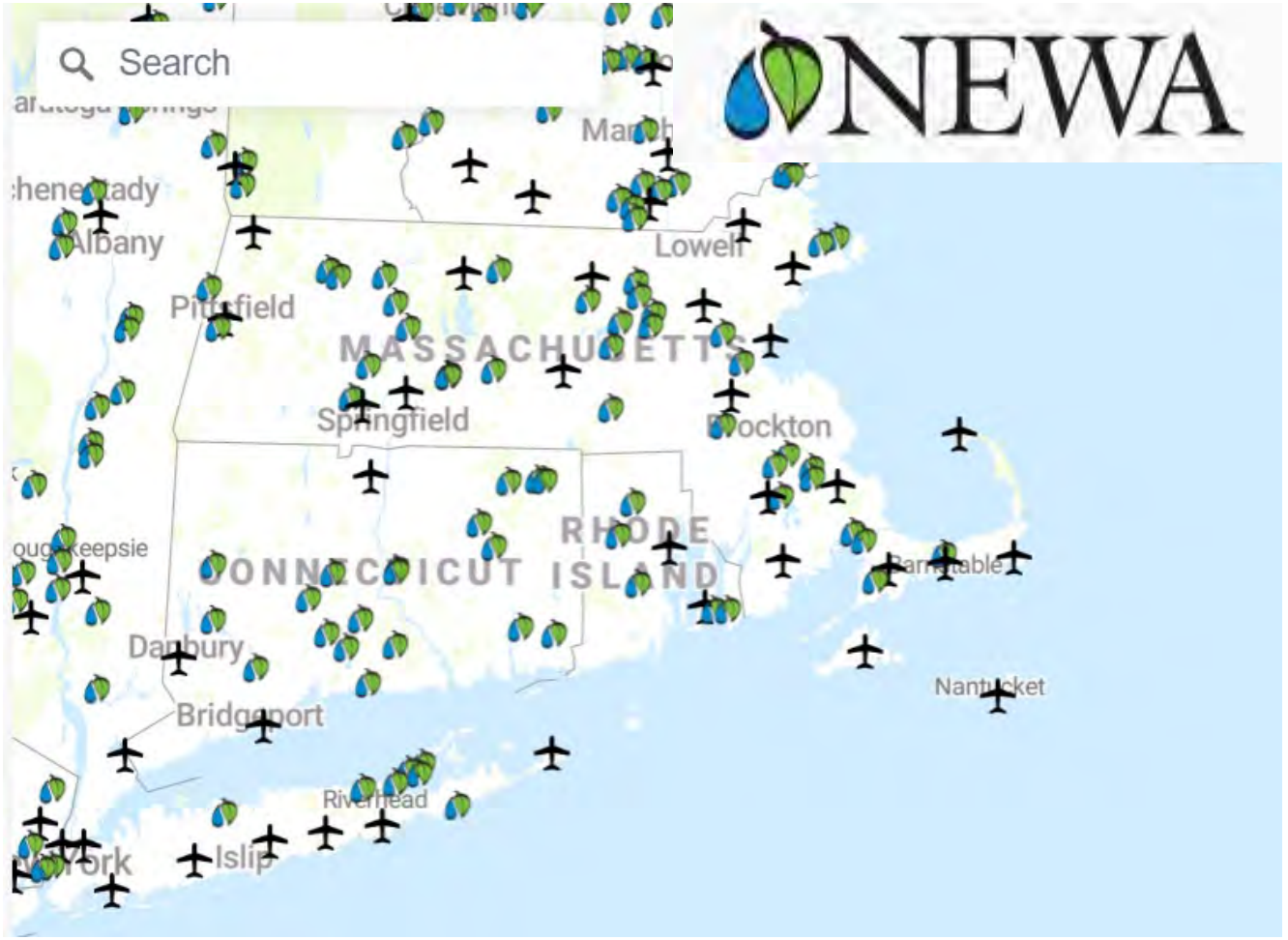
Left to Right: Triticale planted after corn harvest, red clover interseeded between wheat, and field peas and other summer annuals planted in a fallow field.

Decision Support Tools



Decision Support Tools

- Apple Scab.
- Fire Blight.
- Sooty Blotch and Fly Speck.
- Apple Maggot.
- Codling Moth.
- Oblique-banded Leafroller.
- Oriental Fruit Moth.
- Plum Curculio.
- San Jose Scale.
- Spotted Tentiform Leafminer.
- Apple Carbohydrate Thinning.
- Pollen Tube Growth Model.
- Apple Irrigation.
- Blueberry Maggot.
- Strawberry Diseases.
- Alfalfa Weevil.



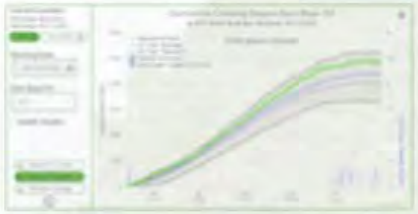
Flooding and Extreme Rainfall

Climate Smart Farming Decision Tools

Cutting-edge tools to help farmers manage climate risk.

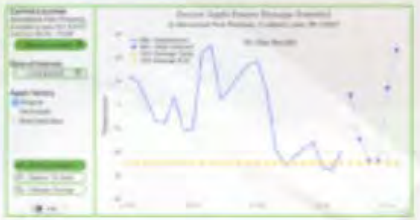
See more Tools

CSF Growing Degree Day Calculator



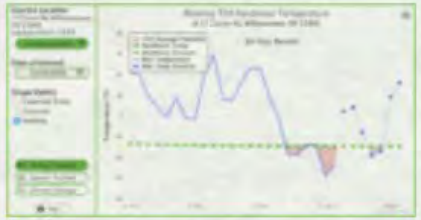
Plots Growing Degree Days (GDD) to help predict plant development and pest/disease outbreaks, and provides a climatological context.

CSF Apple Stage / Freeze Damage Probability



Charts observed/forecasted daily minimum temperatures vs. apple hardiness thresholds in order to assess potential risk for freeze damage.

CSF Grape Hardiness & Freeze Risk



Charts hardiness temperature vs. daily observed/forecast temperatures for several varieties of grapes.

CSF Climate Change in Your County

Find out how the climate has changed in your county since 1950, and what is projected over the next century.

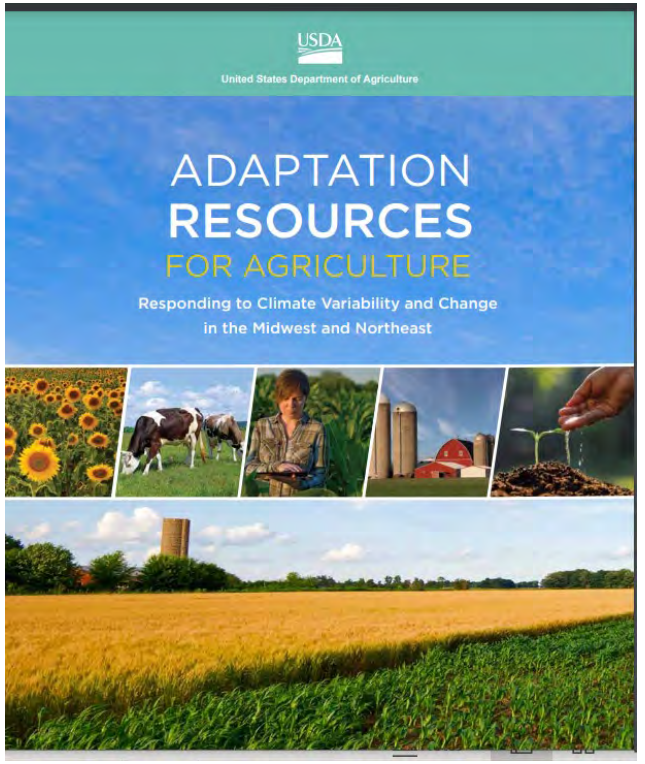
Cover Crop Species Selector

United States Department of Agriculture
Northeast Climate Hub

Weathering the Change

Adaptation Workbook

1. Understand Exposure
2. Assess Vulnerability & Risks
3. Investigate Options
4. Prioritize & Plan
5. Take Action



Trade-offs

DEC 2019

FARMING THE FLOODPLAIN

TRADE-OFFS + OPPORTUNITIES

Climate change will alter rainfall patterns in New England in the coming decades. Storms will likely become more intense, increasing the frequency of flooding.

This leaves many agricultural lands, especially those in floodplains, at risk. Farms in New England tend to

a levee, or enhancing drainage may help only the very localized area. Yet these practices may actually increase the intensity of water flow. This can exacerbate flooding downstream and degrade river ecosystems.

Interviews with floodplain stakeholders

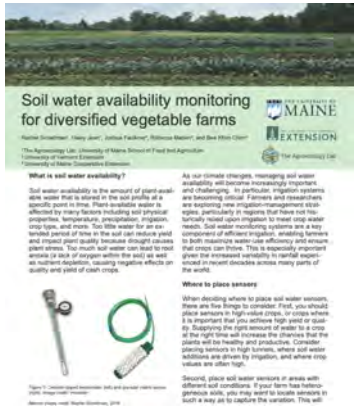
In 2014, we interviewed 36 residents and farmers in the Deerfield River watershed in western Massachusetts. This area has experienced significant flooding in recent years. Some residents proposed that all the land bor-

TABLE 1 Potential climate change adaptation practices and their trade-offs

PRACTICE	OBJECTIVE	TRADE-OFFS
Bank Stabilization / Dredging	Protect land from erosion; protect infrastructure	Increases flood impacts downstream; degrades river ecosystems
Land use change / Riparian restoration	Slow flood waters; prevent erosion	Expensive for farmers and may reduce farm area
Flood Insurance	Protect livelihood from loss	Expensive for farmers
Levee / Block flood waters	Protect croplands from flood impacts	Increases flood impacts downstream
Drainage infrastructure	reduce flooding	Increases flood impacts downstream; degrades river ecosystem
Flood debris removal	Preserve or boost cropland productivity; protect farmer's health and safety	Expensive for farmers
Regrading fields	Restore cropland productivity after deposition	Expensive for farmers

RESEARCH BRIEF OF | Warner, B. P., Schattman, R. E., & Hatch, C. (2017). Farming the floodplain: Ecological and agricultural tradeoffs and opportunities in river and stream governance in New England's changing climate. In Case Studies in the Environment. DOI: 10.1525/cse.2017.sc.512407

Factsheets and summaries of scientific studies



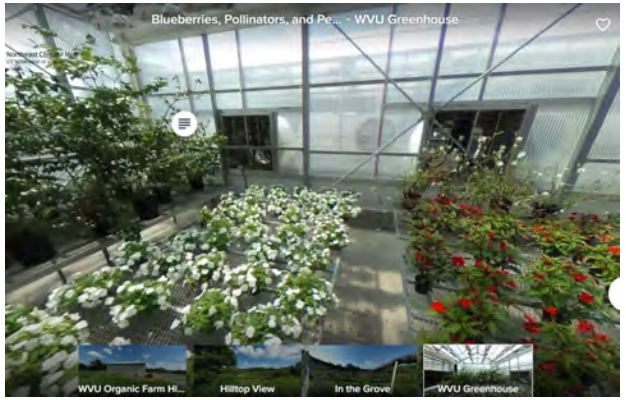
Workshops and proceedings

Economic case studies

Quarterly e-newsletters

Archived webinars

360 virtual tours demonstrating climate adaptation practices



Climate Adaptation and Mitigation Fellowship Program

- Create a peer learning program for climate communications, adaptation, and mitigation for agricultural advisors and farmers
- Support producers in learning about climate impacts, creating adaptation plans, and implementing climate smart practices

Methods

Promoting climate literacy through stakeholder education and engagement

Climate Equity

A focus on facts, understanding, empathy, and collective action

Climate Equity Fellow (ORISE)

Climate Equity Webinars

Tribal Climate Equity Fellow (NRS)

Art + Climate Equity

Our goal is to integrate climate equity into all our projects as part of 'This is who we are.'

More Rain and… More Drought?

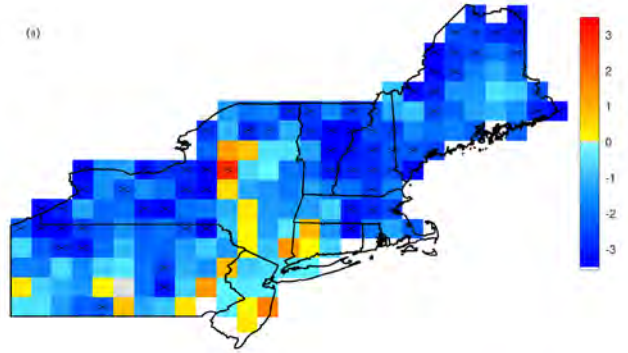
Changing Characteristics of Snow, Precipitation and Drought in the Northeast U.S.

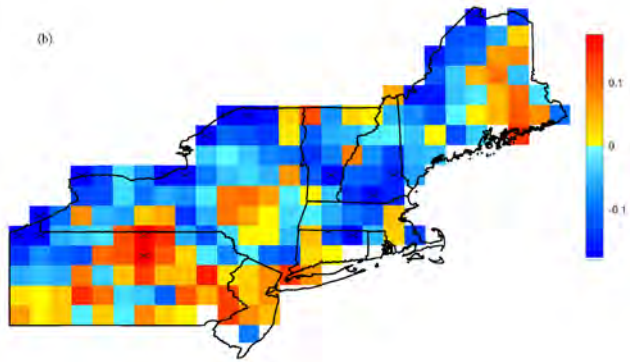
Curtis Riganti, NDMC; Lindsay Johnson, NDMC; Brian Fuchs, NDMC; Erin Lane, USDA; Anthony Buda, USDA; Lindsey Rustad, USDA

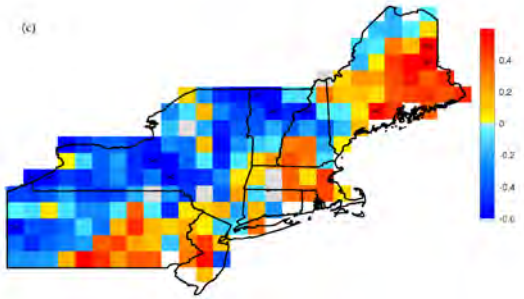
Published October 2023

Drought risk isn't decreasing as much as expected

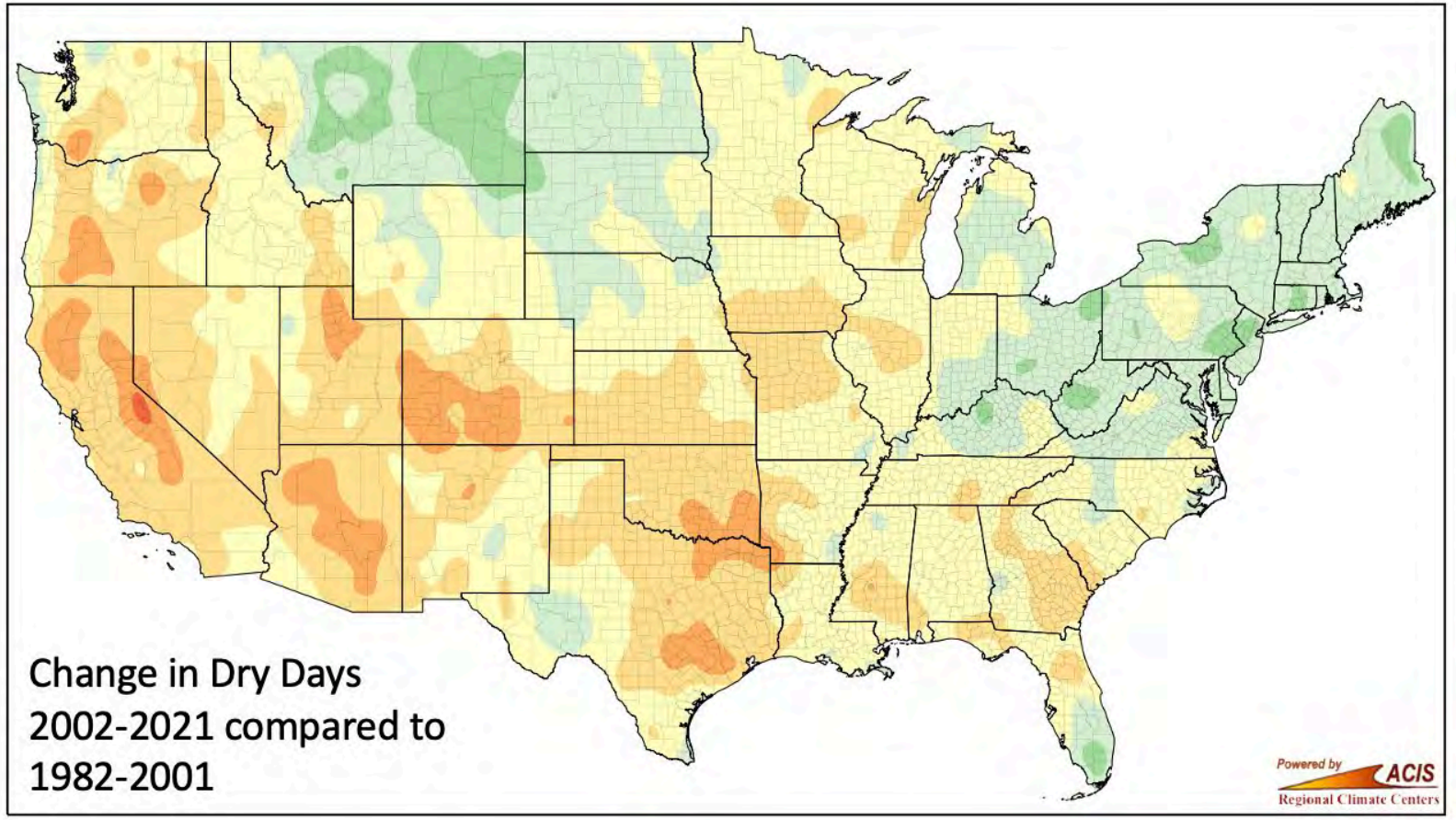
- Hydrologic intensification
- Increased variation in precipitation evaporation
- Drought frequency has decreased, but not much change in intensity or duration



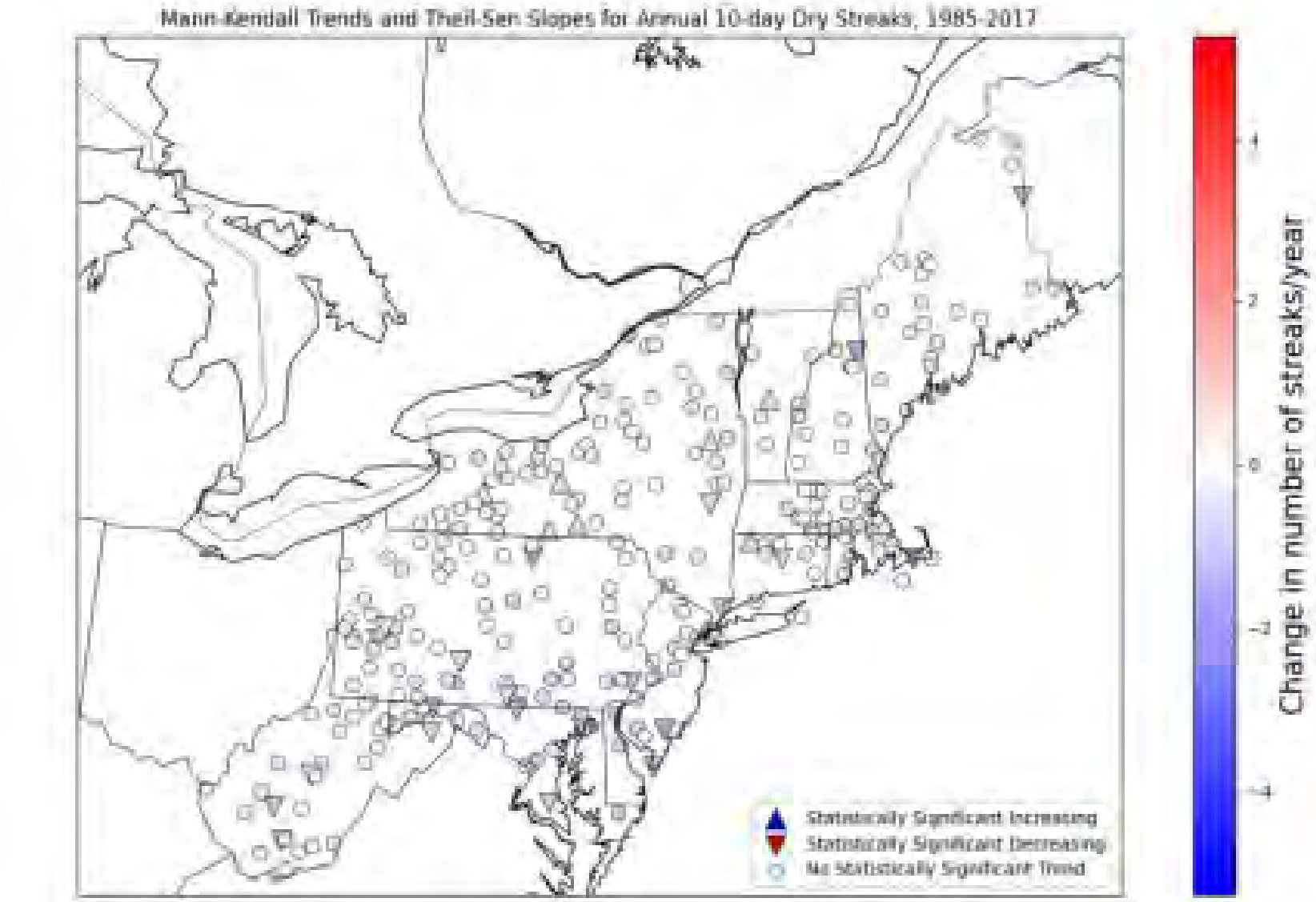




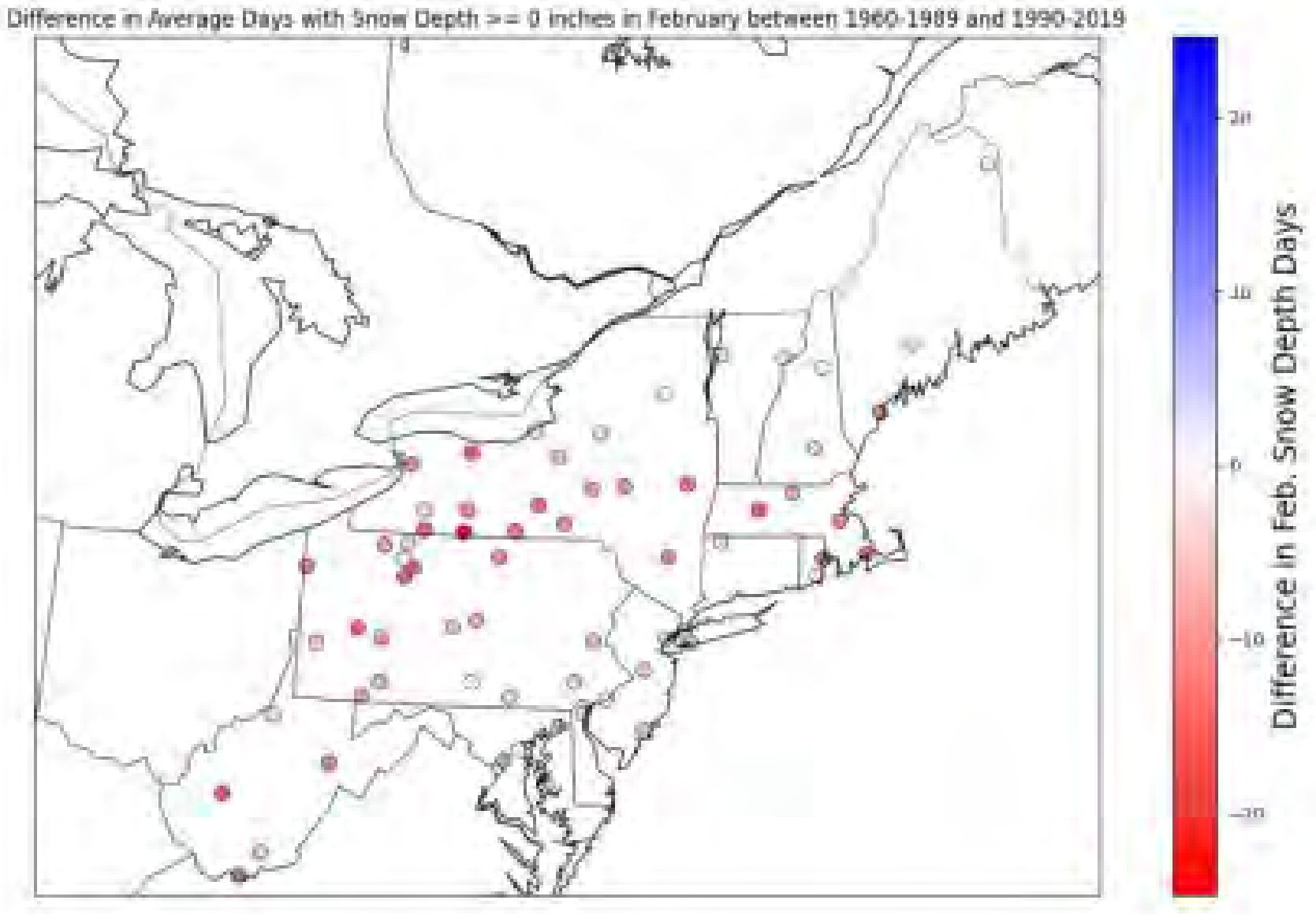
Krakauer et al 2019


Change in Dry Days
2002-2021 compared to
1982-2001
Powered by ACIS
Regional Climate Centers
−20
−15
−10
−5
0
5
10
15
20

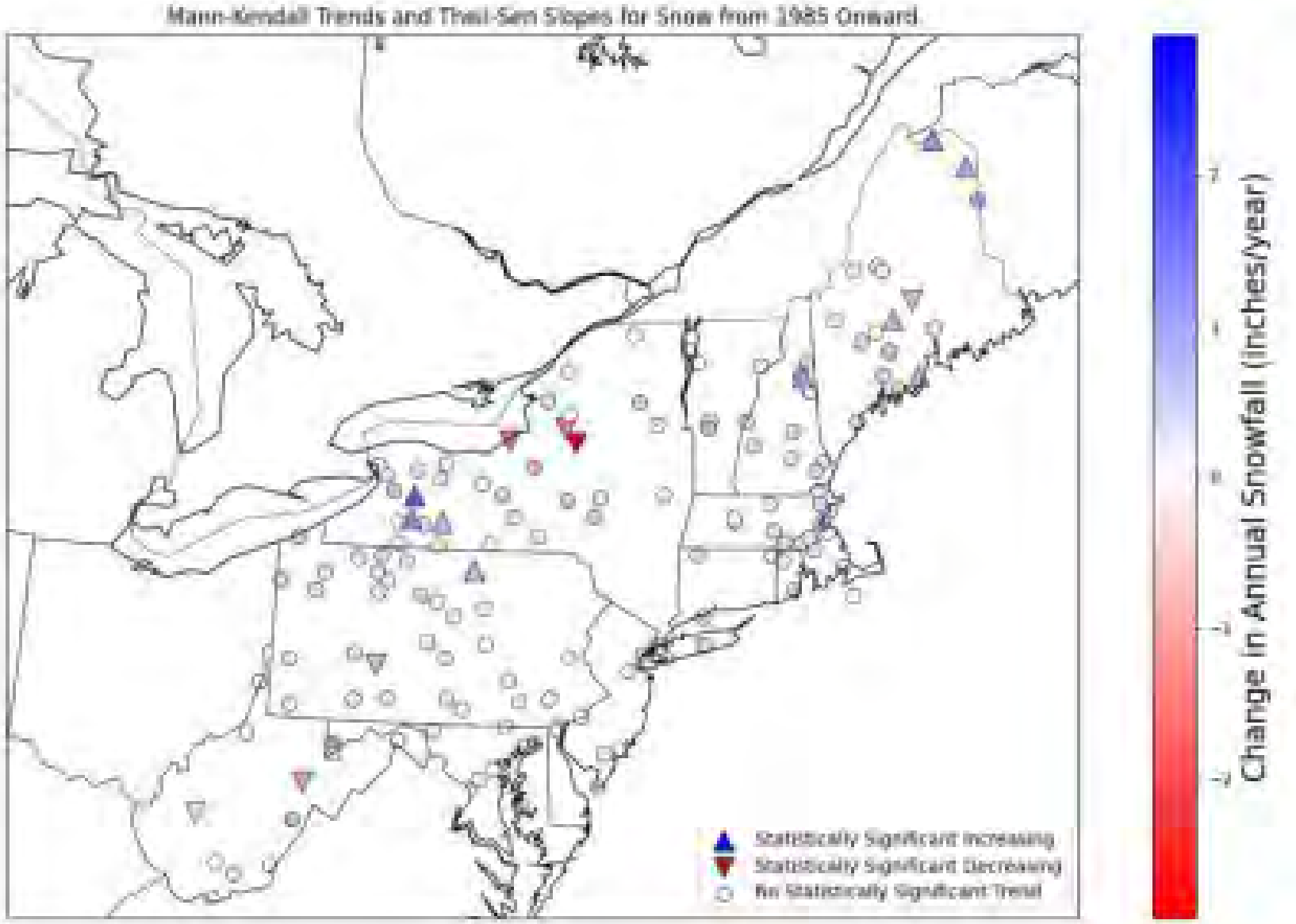
No clear signals emerged for recent changes in the number of dry periods in the NEUS.



Days with non-zero snow depth in February appear to be decreasing overall in the last 30 years when compared to the previous 30 years



Spring and annual snowfall has decreased across most of the NEUS, especially in the Appalachian regions of Pennsylvania, Maryland and West Virginia. It is possible that some increase in snowfall has occurred in northeastern parts of New England.



Changing Characteristics of Snow, Precipitation, and Drought in the Northeast U.S.

- Increase in winter and spring precipitation and heavy precipitation events
- No clear regional change in dry periods
- Days with snow on the ground in February are decreasing
- Snowfall has decreased across the region though some increase in northeastern New England

USDA Climate Hubs

Website: https://www.climatehubs.usda.gov/hubs/northeast
Quarterly Harvest:
https://www.climatehubs.usda.gov/hubs/northeast/topic/quarterly-harvest
Twitter: @USDAClimateHubs
Forest Pulse: https://www.climatehubs.usda.gov/hubs/northeast/project/pulse

Email: erin.d.lane@usda.gov

USDA U.S. DEPARTMENT OF AGRICULTURE

Cover Crop Strategies in Cold Climates: Successful Strategies

- Using winter rye or other cereals.
- Legumes grown for only part of the year (i.e. after a main crop is harvested) probably not an option as they need a longer growing season.
- Crop Planning (i.e. early crop -> over wintering cover crop -> late season crop the following year.
- Shorter day corn.
- Inter-seeding (i.e. red clover and wheat, rye in 3’ corn with High Boy seeder).
- Fallow rotation that include summer annuals or perennials.