

CLIMATE ADAPTATION IN ACTION

Hensley's SEED CO. – DENVER · COLORADO –

American Farmland Trust
SAVING THE LAND THAT SUSTAINS US

Copyright © 2024 Hensley's Seed Co. and American Farmland Trust. All rights reserved

OUR PRESENTERS



SARA KELEMEN



JULIE FINE



SAL DAGGETT



KYLE BURNS

Hensley's SEED CO. DENVER · COLORADO

American Farmland Trust
SAVING THE LAND THAT SUSTAINS US

Copyright © 2024 Hensley's Seed Co. and American Farmland Trust. All rights reserved.

Today's Agenda

- Climate change impacts
- Climate adaptation planning
- Grower experiences
  - Sal Daggett - Adaptation planning
  - Kyle Burns – Adaptation strategies
- Inspiration
- Q & A



Hensley's SEED CO. DENVER · COLORADO

American Farmland Trust
SAVING THE LAND THAT SUSTAINS US

Copyright © 2024 Hensley's Seed Co. and American Farmland Trust. All rights reserved

Part 1—Impacts

Climate change impacts on farms in the U.S.



Copyright © 2024 Hensley's Seed Co. and American Farmland Trust. All rights reserved

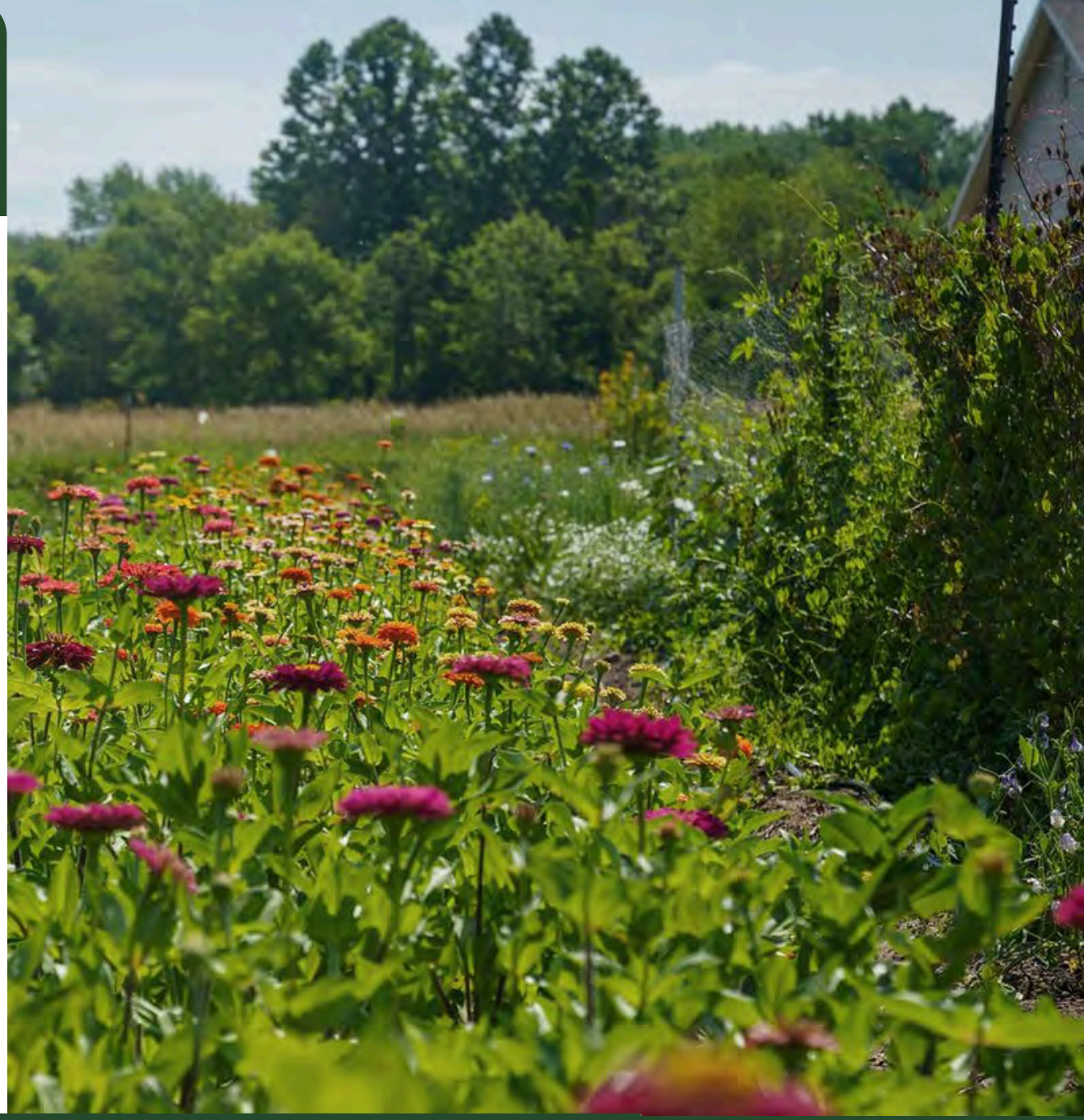
Climate Change & Agriculture
The Basics

Increasing temperatures across **all seasons**

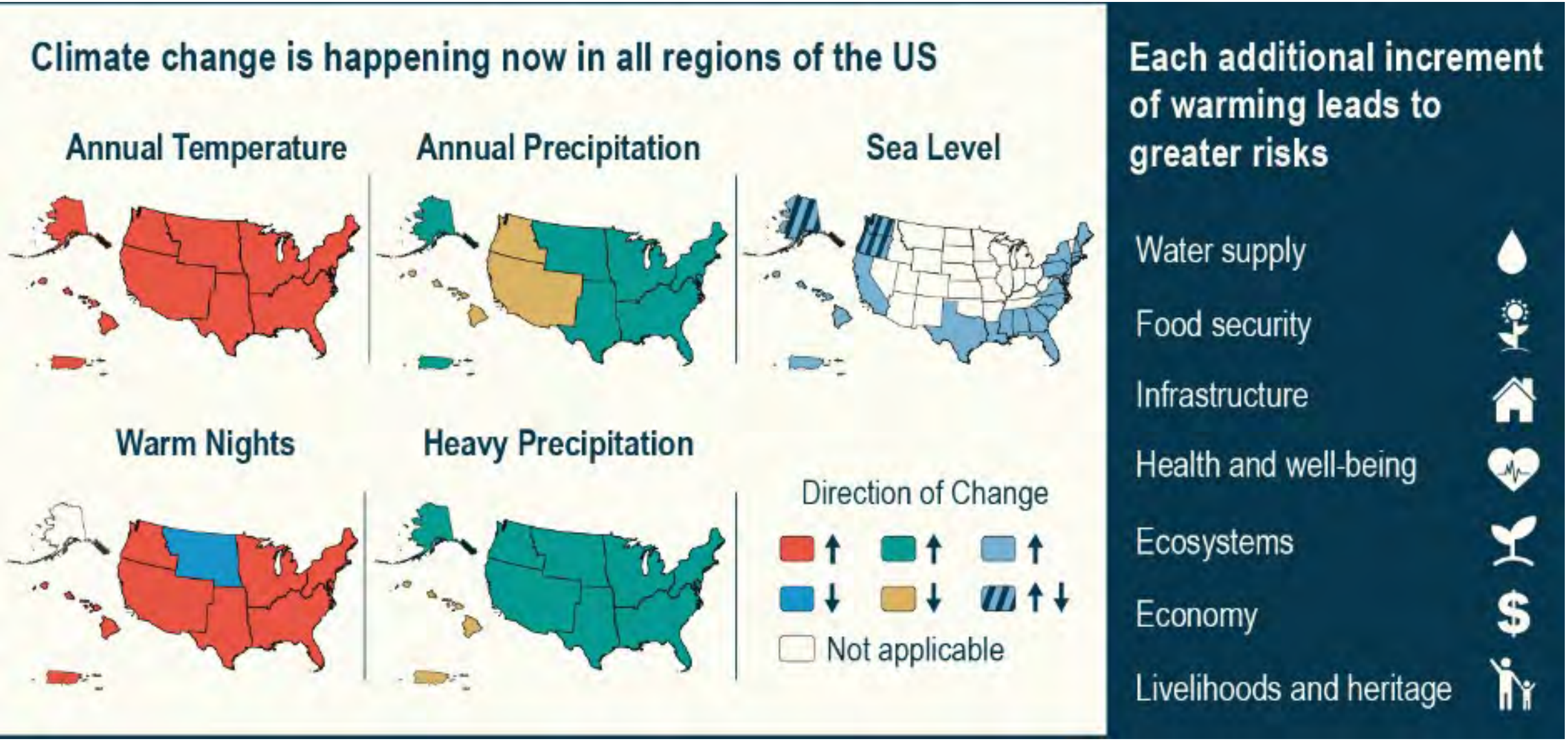
Causes **shifts in precipitation patterns** which:

- Create extreme weather events
- Change water availability
- Alter pest and weed lifecycles
- Increase wildfire risk
- Affect farmworker health and safety
- Reduce property values

And the list goes on…



Copyright © 2024 Hensley's Seed Co. and American Farmland Trust. All rights reserved.



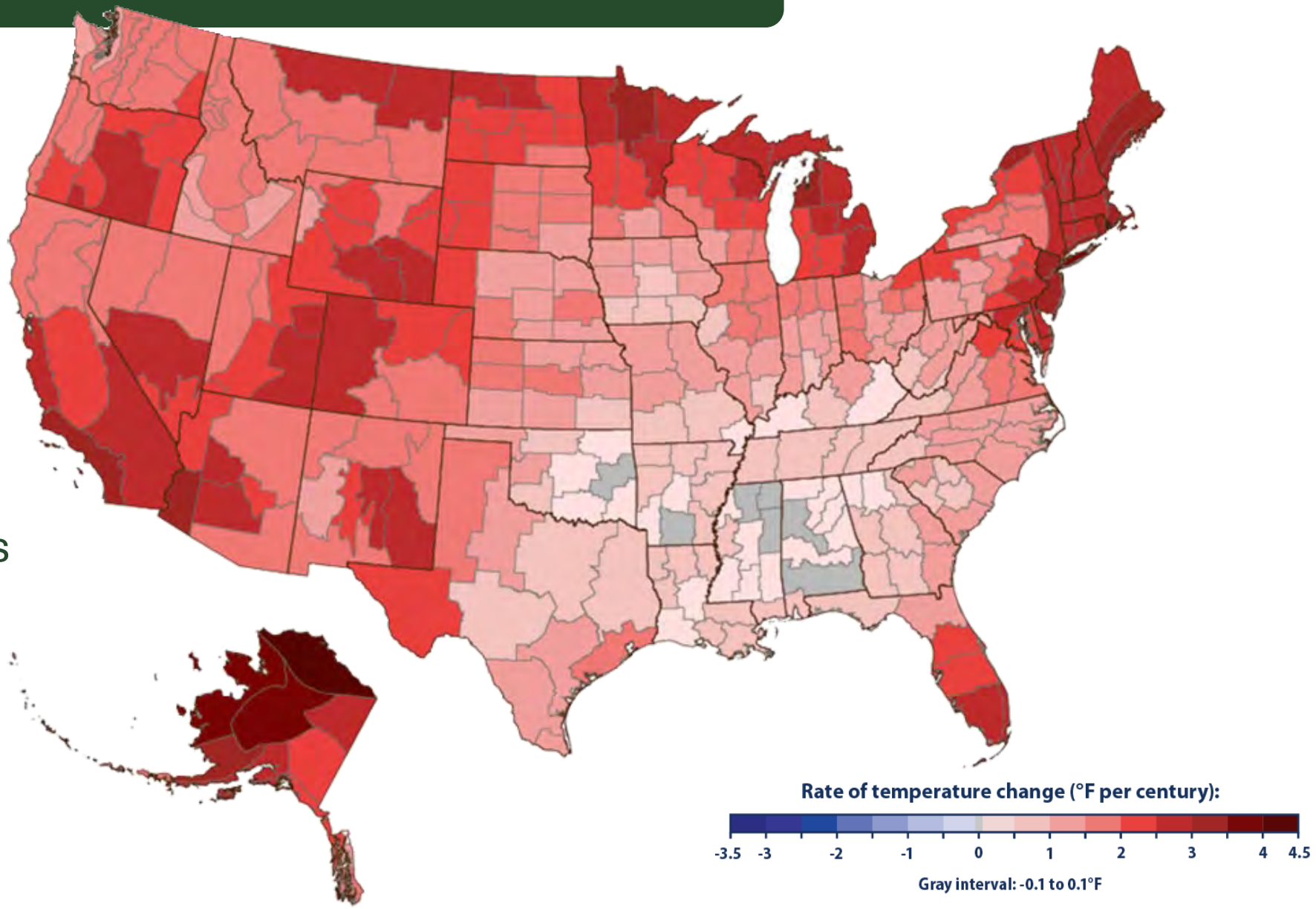
Source: NCA5, 2023

Copyright © 2024 Hensley's Seed Co. and American Farmland Trust. All rights reserved

Rate of Temperature Change in the U.S., 1901–2023

Temperatures nationwide have warmed unevenly across the country since the beginning of the 20th century.

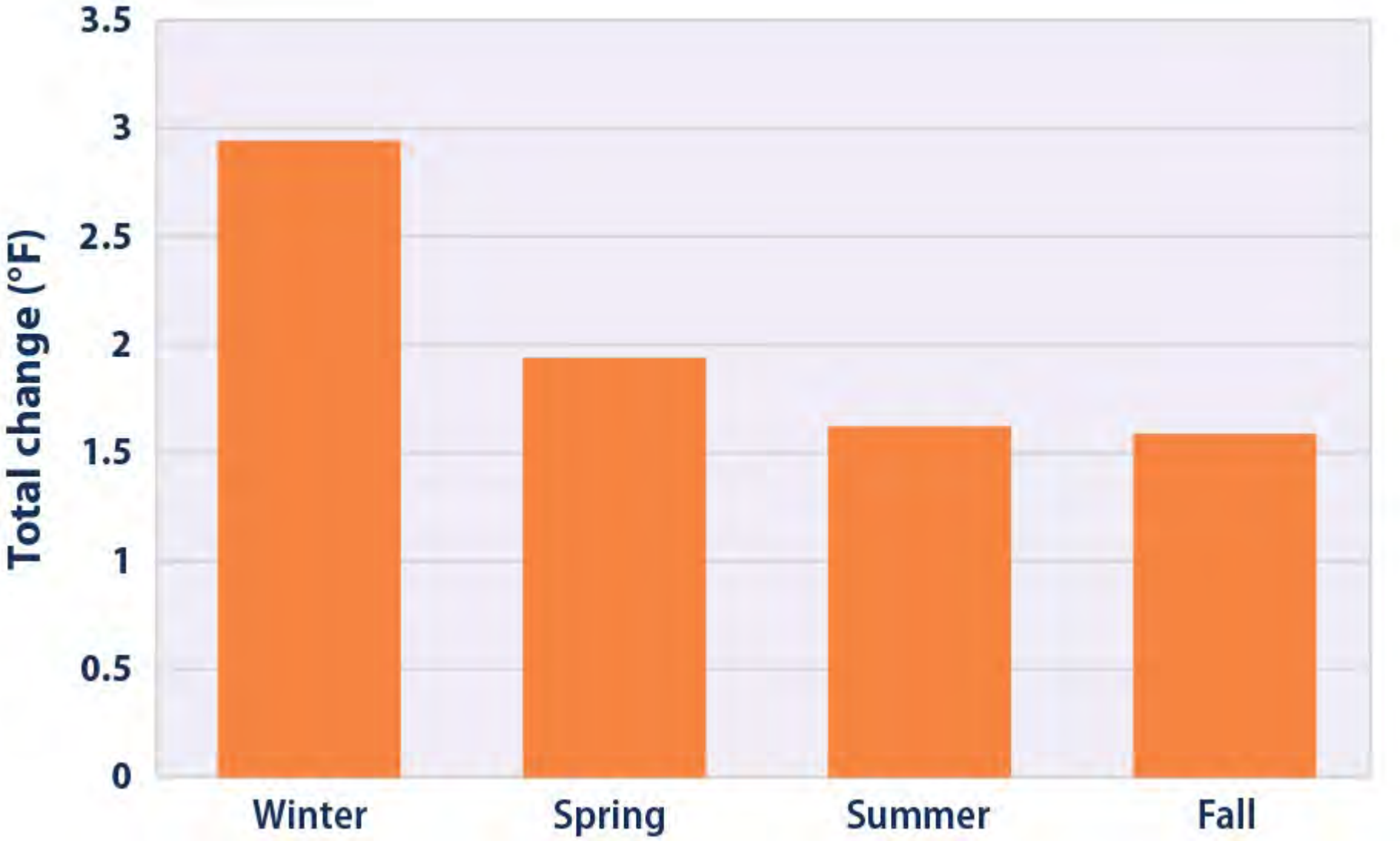
The rate of change has **increased since the 1960s.**



Source: NOAA, 2024

Copyright © 2024 Hensley's Seed Co. and American Farmland Trust. All rights reserved.

Temperature Change by Season in the Contiguous U.S. 1896–2023



Winters are warming faster than any other season

Source: NOAA, 2024

Copyright © 2024 Hensley's Seed Co. and American Farmland Trust. All rights reserved.

Impacts of Increased Temperatures





Source: Mark Dreiling (moth), Alton N. Sparks, Jr., University of Georgia (caterpillar), Bugwood.org



Source: Master Gardeners of Northern Virginia



Source: Oregon State University Extension



Source: Veronica White





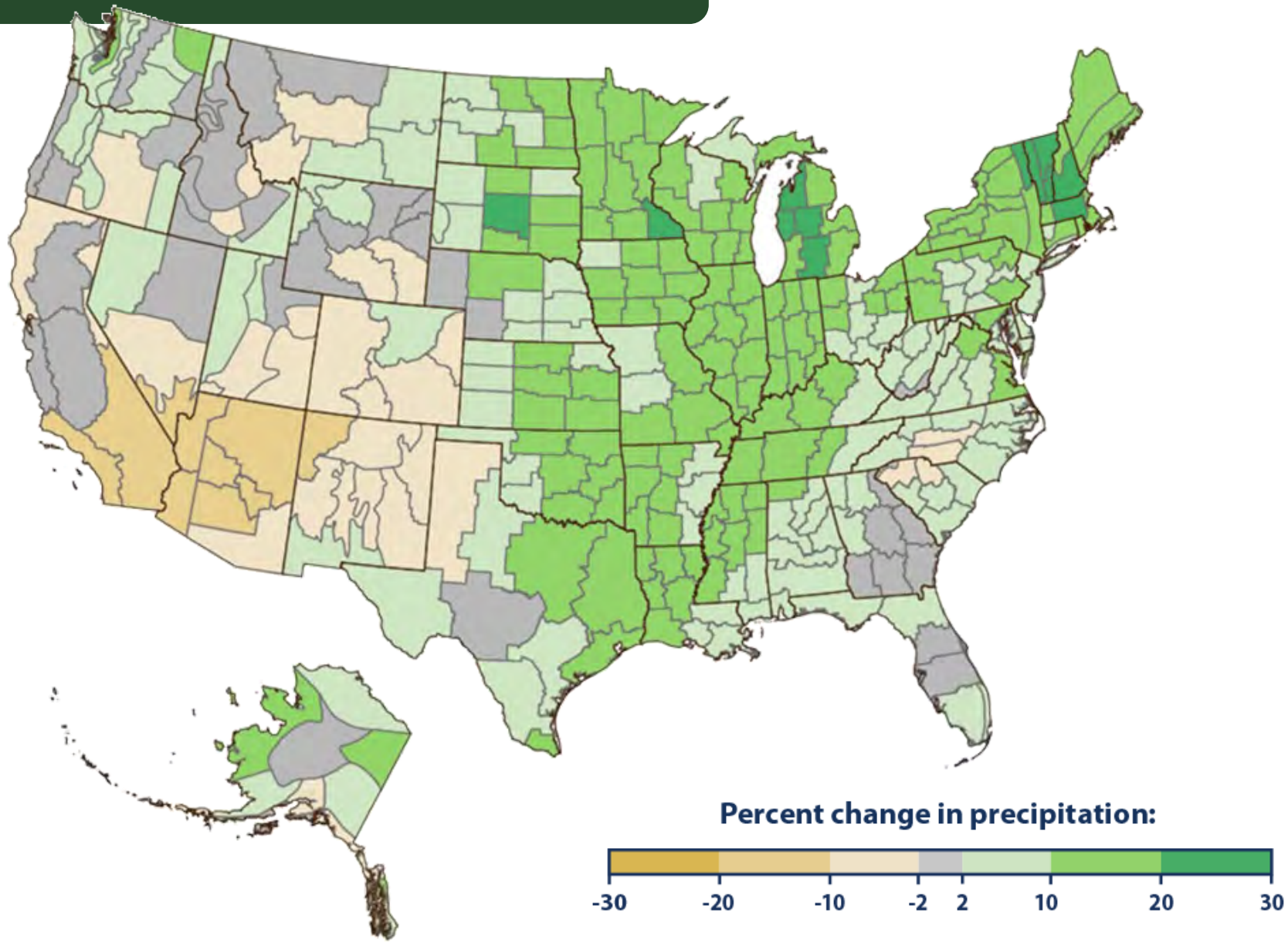
Source: Master Gardeners of Northern Virginia

Copyright © 2024 Hensley's Seed Co. and American Farmland Trust. All rights reserved.

Change in Precipitation in the U.S., 1901–2023

Wet areas of the country are becoming wetter.

Dry areas are becoming drier.



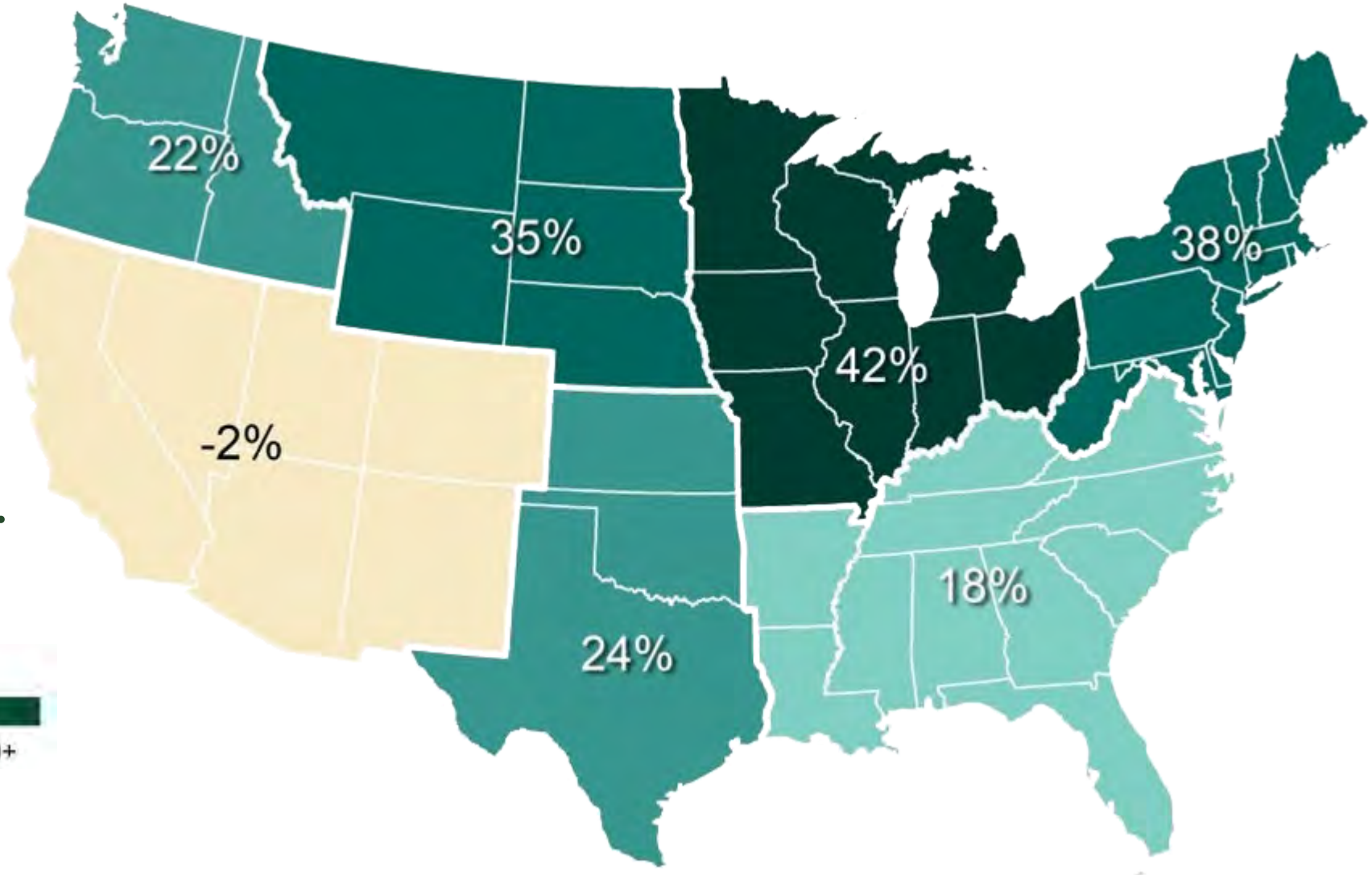
Source: NOAA, 2024

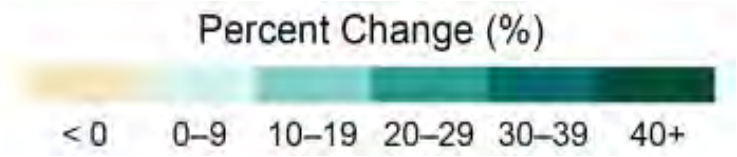
Copyright © 2024 Hensley's Seed Co. and American Farmland Trust. All rights reserved.

Observed Change in Total Annual Precipitation Falling in Heaviest 1% of Events (1901 – 2016)

When it rains, it pours.

Many parts of the country are experiencing more extreme precipitation events.

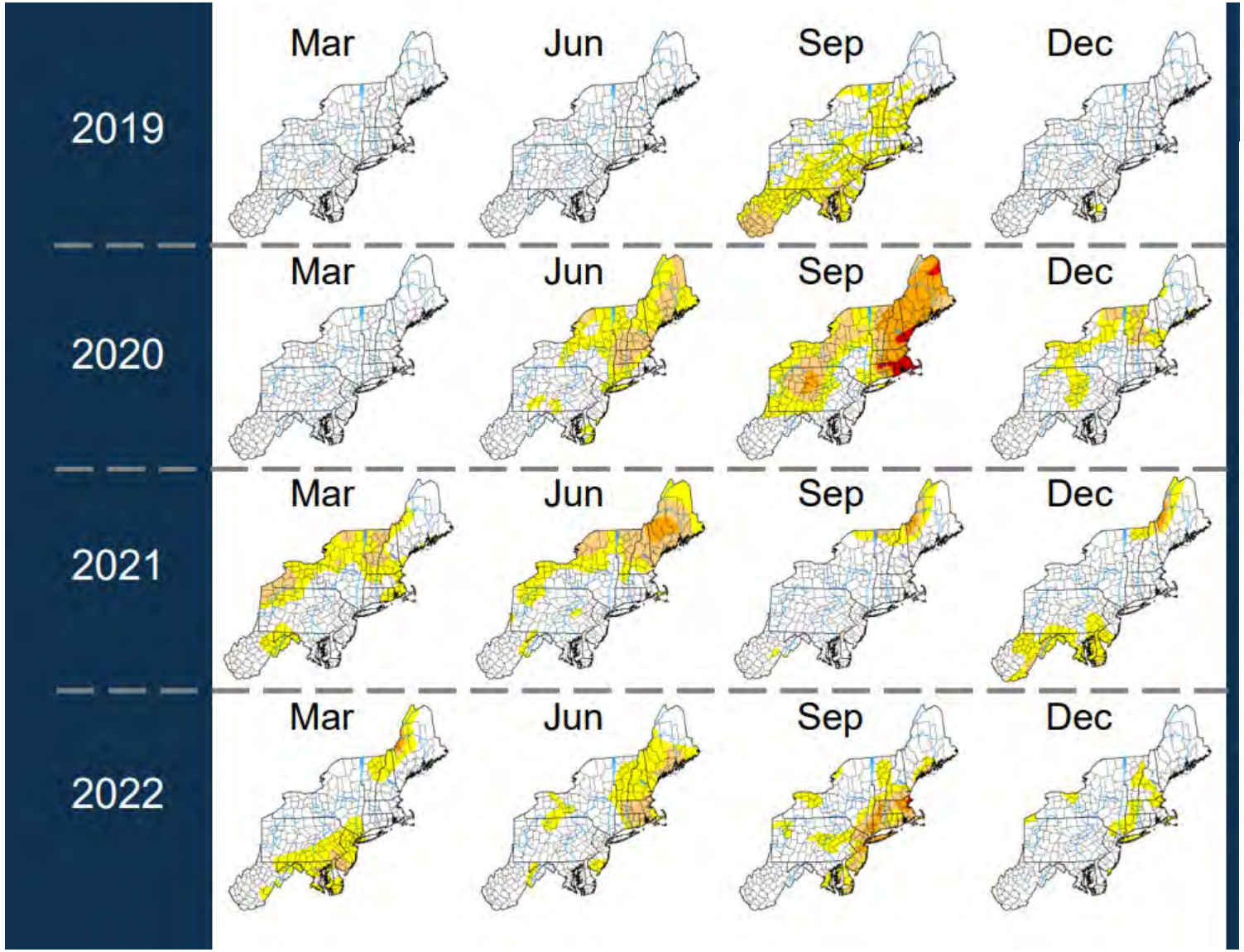




Source: NOAA, 2024

Copyright © 2024 Hensley's Seed Co. and American Farmland Trust. All rights reserved.

Drought can still affect even the wettest regions of the country.



Intensity:

- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

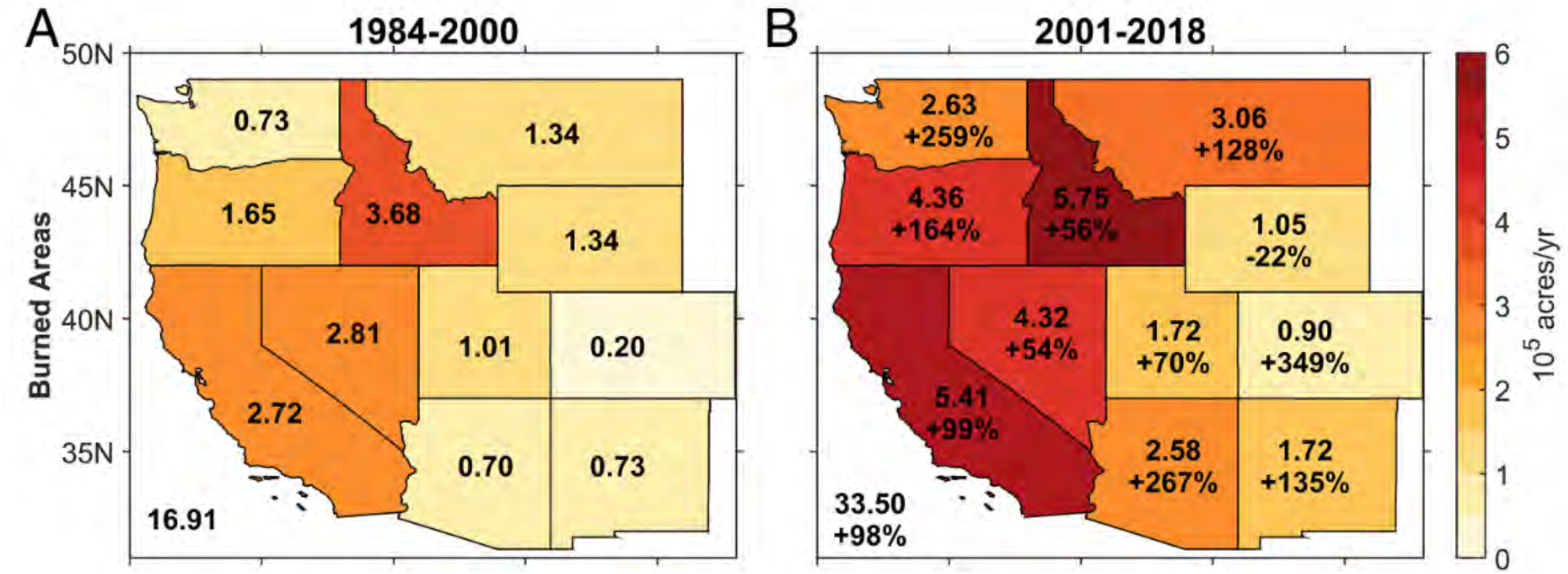
Author:

Brian Fuchs
National Drought Mitigation Center

droughtmonitor.unl.edu

Copyright © 2024 Hensley's Seed Co. and American Farmland Trust. All rights reserved

Climate change contributes to increased fire risk due to dry fuels and fire weather.



Source: Zhuang et al., 2021

Copyright © 2024 Hensley's Seed Co. and American Farmland Trust. All rights reserved

Impacts of Changes in Precipitation



Flash flood damage in Jay, Maine, after heavy rainfall in summer 2023. Photo courtesy of Murray Carpenter, Maine Public Broadcasting Network



Photo credit Vern Grubinger (UVM Extension)



A small stream runs through the dried, cracked earth of a former wetland near Tulelake, Calif., on June 9, 2021. Nathan Howard/AP



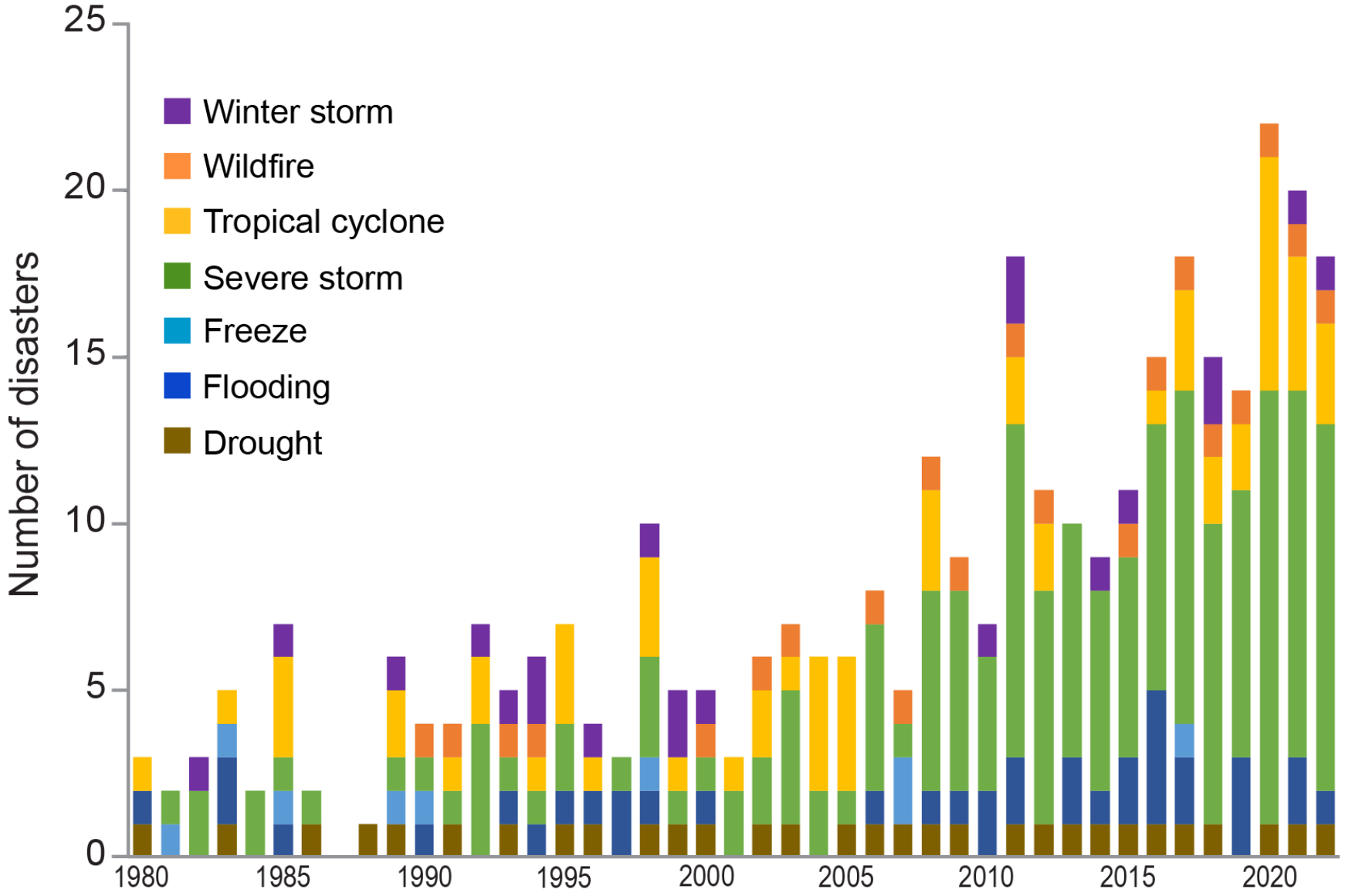
Intervale Community Farm, Vermont, 2023, UVM Spatial Analysis Lab



Photo credit Sarah Ficken

Copyright © 2024 Hensley's Seed Co. and American Farmland Trust. All rights reserved.

Billion-Dollar Disasters



Source: NCA5, 2023

Copyright © 2024 Hensley's Seed Co. and American Farmland Trust. All rights reserved.

Intensity & Frequency of Rainfall



- Flooding
- Topsoil loss
- Unpredictable irrigation
- Nutrient loss
- Soil damage

Changes in temperature



- Temperature fluctuations
- Plant stress
- Irrigation demands
- Dangerous heat
- Yield losses

Shifting seasons



- Pests, weeds, & disease
- Delayed planting or harvest
- Plant stress
- Fluctuations in temperature

Extreme weather



- Infrastructure damage
- Drought
- Wildfires & smoke
- Erosion

Copyright © 2024 Hensley's Seed Co. and American Farmland Trust. All rights reserved.

Part 2—Planning

Climate Adaptation for Farms

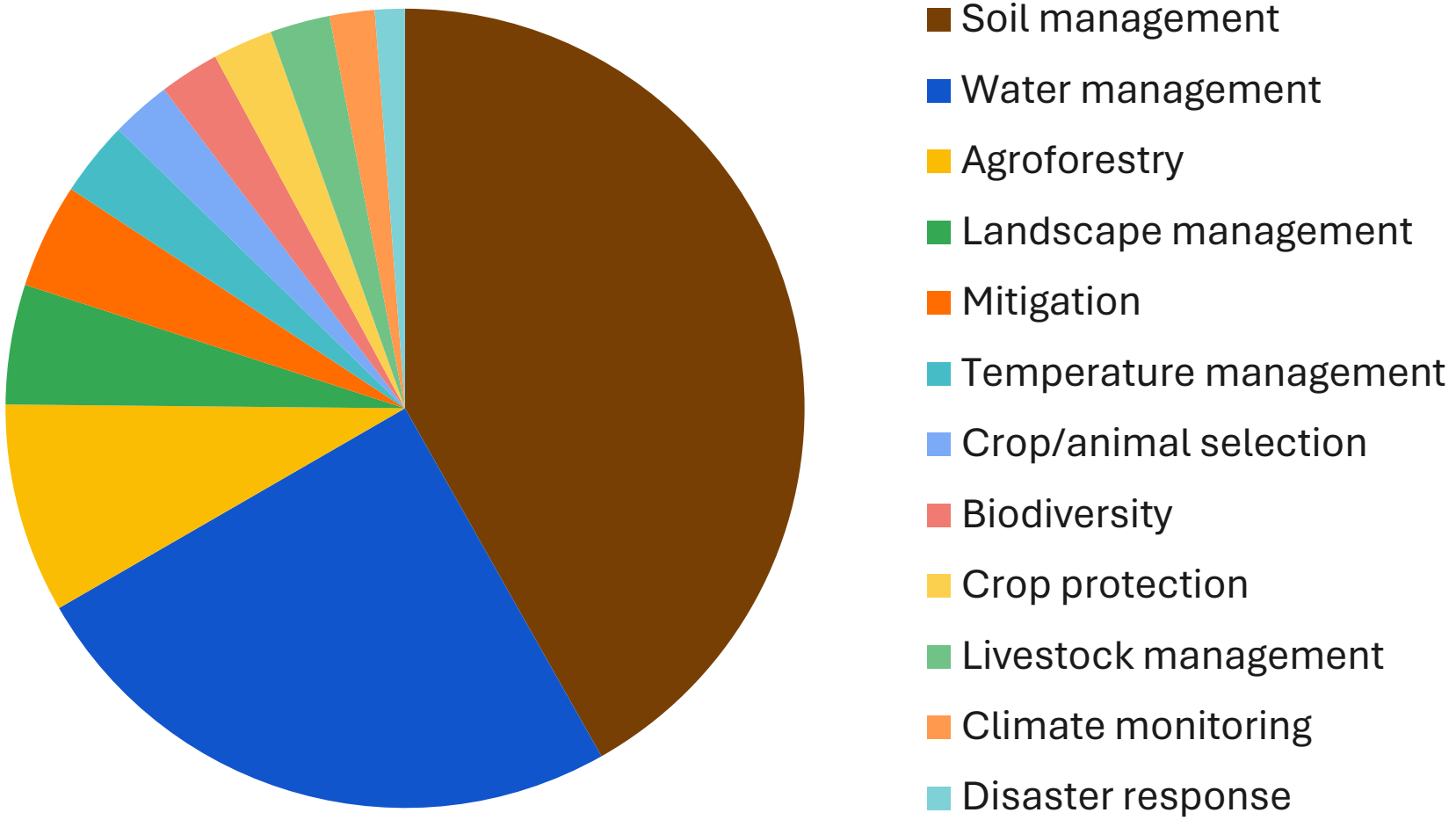
- Adaptation is inherent
- Creating a process & structure
- Matter of fact assessment
- Finding support & resources



Copyright © 2024 Hensley's Seed Co. and American Farmland Trust. All rights reserved.

What Does Climate Adaptation Look Like?

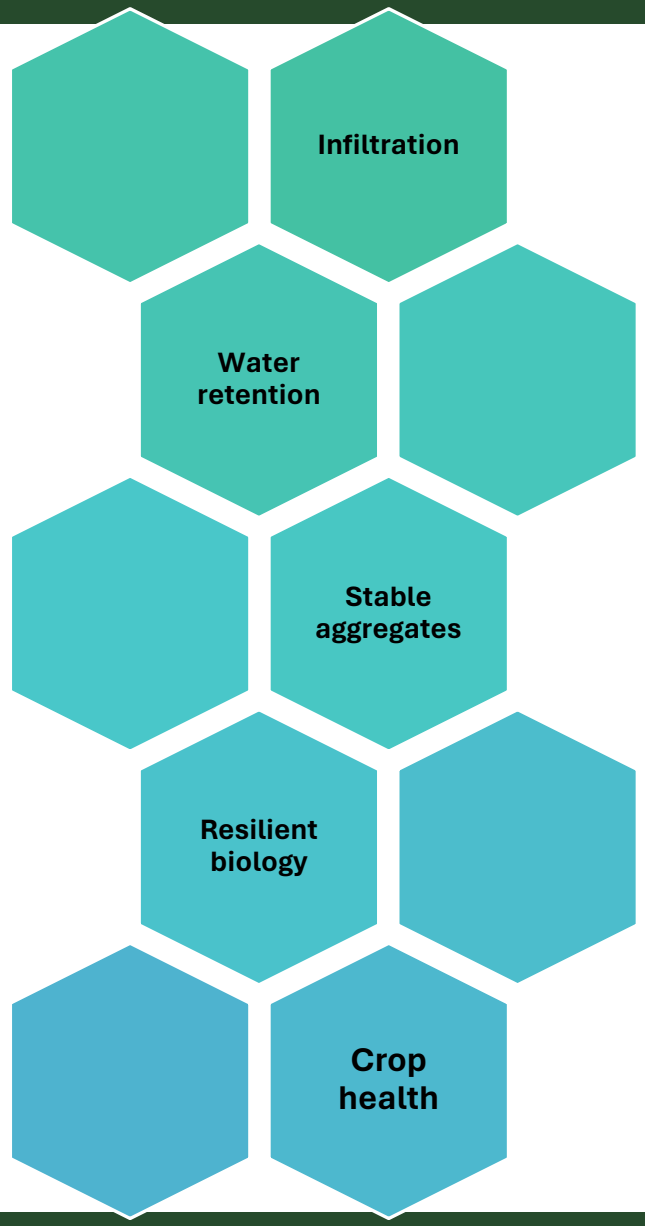
Climate Adaptation and Mitigation Fellowship, practices by category 2021-2024



Source: Sara Delaney, Univ. of Maine, 2024

Copyright © 2024 Hensley's Seed Co. and American Farmland Trust. All rights reserved.

Healthy Soil is a Universal Strategy





Copyright © 2024 Hensley's Seed Co. and American Farmland Trust. All rights reserved

Soil Health Adaptation Practices

- Cover crops and living roots
- Mulch or cover soil
- Find carbon sources to increase organic matter
- Permanent beds to reduce compaction
- Reduce tillage
- Prevent ponding, run off, erosion
- Convert marginal cropland to conservation buffer

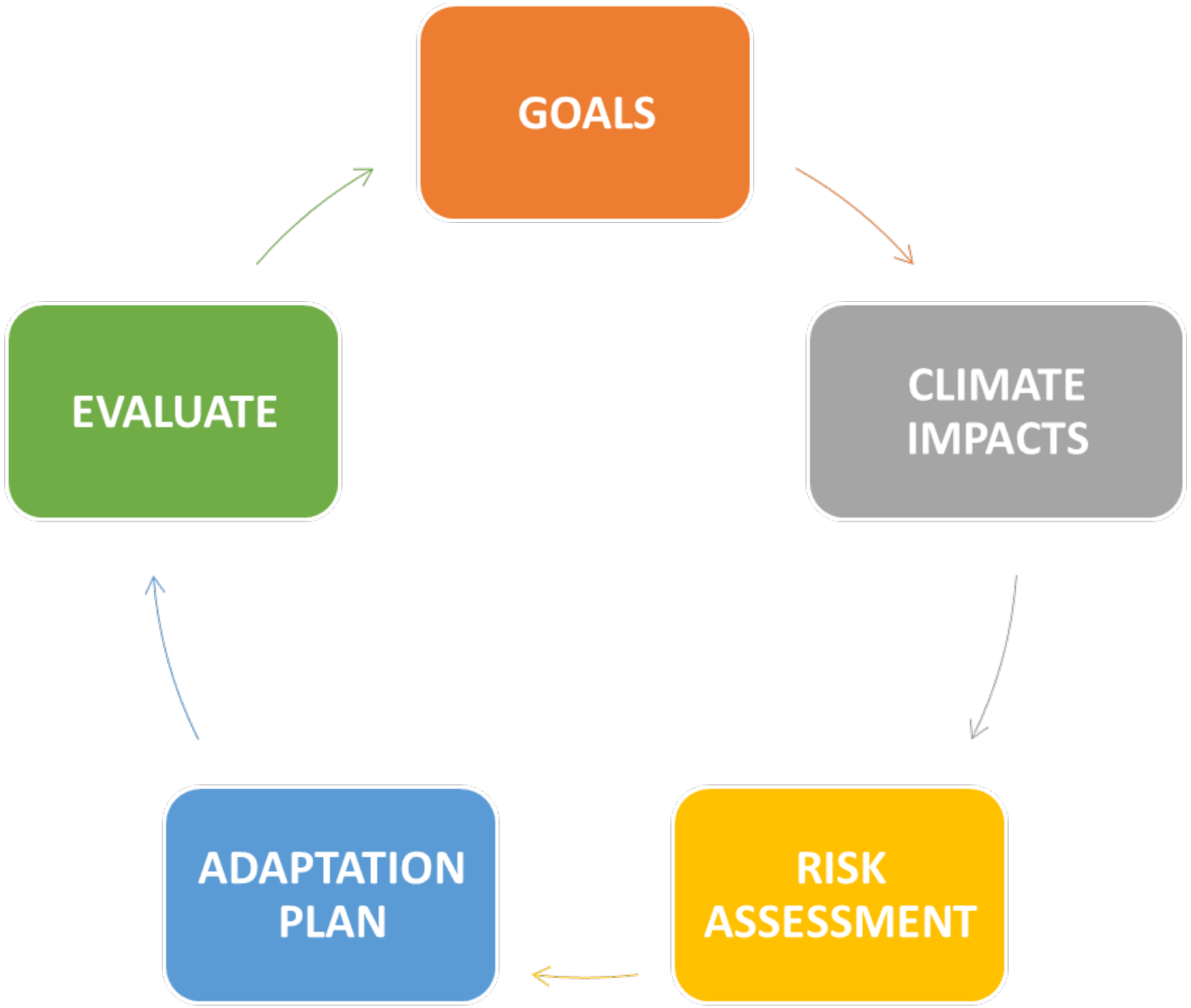


Copyright © 2024 Hensley's Seed Co. and American Farmland Trust. All rights reserved

Climate Adaptation Planning Process

1. GOALS
2. CLIMATE IMPACTS
3. RISK ASSESSMENT
4. ADAPTATION PRACTICES & PLAN
5. EVALUATE

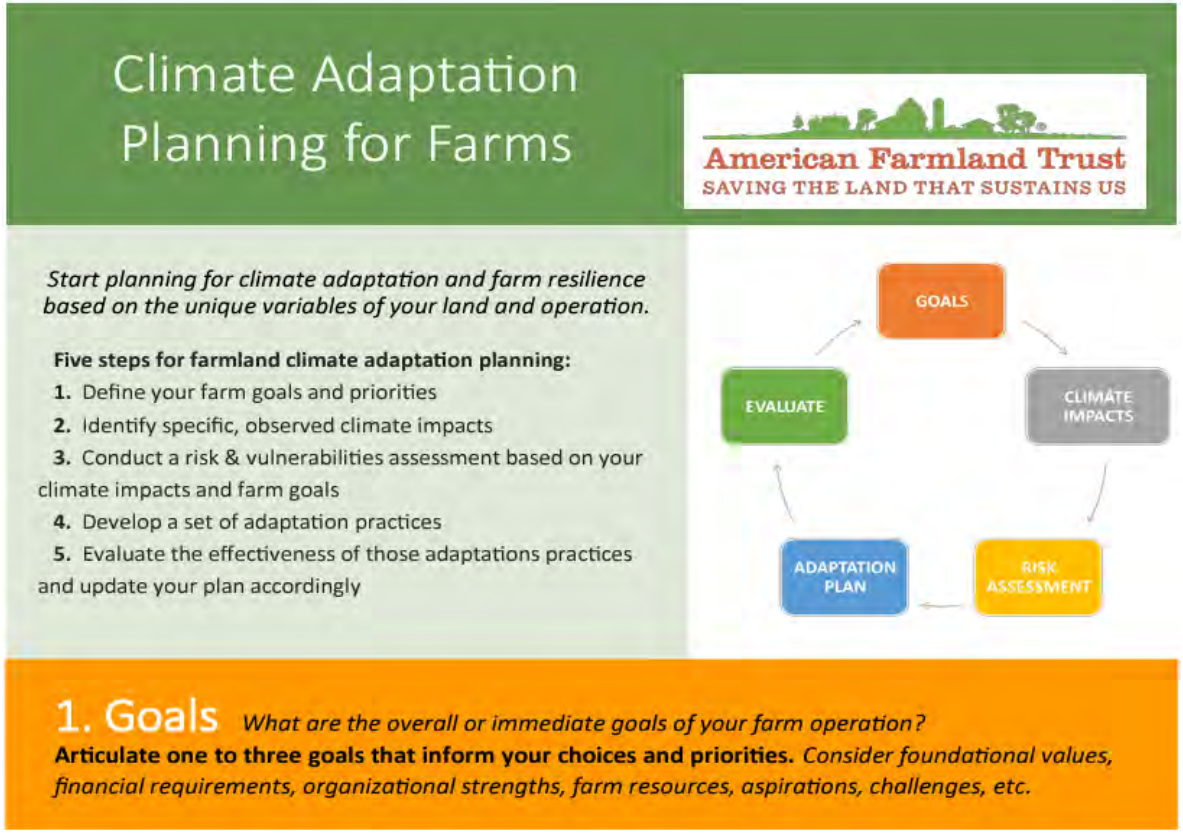
and repeat....



Copyright © 2024 Hensley's Seed Co. and American Farmland Trust. All rights reserved.

1. **GOALS**
2. CLIMATE IMPACTS
3. RISK ASSESSMENT
4. ADAPTATION PRACTICES & PLAN
5. EVALUATE

and repeat....



Committed to reducing carbon footprint, being an ecological model of food production.

Financial stability (health insurance, savings buffer).

Have enough free time to play with kids (and rock climb once a month in the summer).

Copyright © 2024 Hensley's Seed Co. and American Farmland Trust. All rights reserved.

1. GOALS
2. **CLIMATE IMPACTS**
3. RISK ASSESSMENT
4. ADAPTATION PRACTICES & PLAN
5. EVALUATE

and repeat....

Projected Changes in Weather in the Northeast for mid-century (2041-2070 average)

ANNUAL TEMP	ANNUAL PRECIPITATION	GROWING SEASON	HOT DAYS	HOT SPELLS	COLD DAYS	EXTREME PRECIPITATION
+ 4 to 8 F	**+ 1 to 7 inches**	**+ 19 to 27 days**	**+ 3 to 21 days**	**+ 1 to 7 days**	**- 6 to 24 days**	**+ 2 to 4 days**
Avg temp increases, and increases in each season. Milder winters	Seasonal increase greatest in winter Decrease in summer	Warmer, wetter springs	Least change in northernmost areas	Increase in consecutive days over 95	Greatest decrease in the north	More days of precipitation exceeding 1"

Copyright © 2024 Hensley's Seed Co. and American Farmland Trust. All rights reserved.

1. GOALS
2. CLIMATE IMPACTS
3. **RISK ASSESSMENT**
4. ADAPTATION PRACTICES & PLAN
5. EVALUATE

and repeat....

3. Risks Assessment

Based on your observations of climate impacts, and taking into account projected changes in climate, **what are 4 major vulnerabilities of your farm operation?** *What areas of land, important crops, animals, or essential infrastructure are a priority to protect? What is at most risk? Where do the identified climate impacts directly impact your top farm goals?*

- Flooding in east fields along river: loss of crops, erosion, possible loss of equipment
- Heat stress for plants and people: harvesting mostly greens, must be done early, can't harvest stressed greens
- Small margins overall: doesn't provide financial buffer in case of disaster
- Reliance on heirloom tomatoes for 40% of summer income: increasing disease, inconsistent pollination, hail damage

Copyright © 2024 Hensley's Seed Co. and American Farmland Trust. All rights reserved.

1. GOALS
2. CLIMATE IMPACTS
3. RISK ASSESSMENT
4. **ADAPTATION PRACTICES & PLAN**
5. EVALUATE

and repeat....

Reliance on heirloom tomatoes for 40% of summer income: increasing disease, inconsistent pollination, hail damage

Risk:

Strategy:

Practice:

Risk:

Strategy:

Practice:

4. Adaptation Practices

1: Write down what you identified as your **most significant risks** to climate impacts.

2: Using ideas on the previous page, **note what strategies might be used** to mitigate these risks?

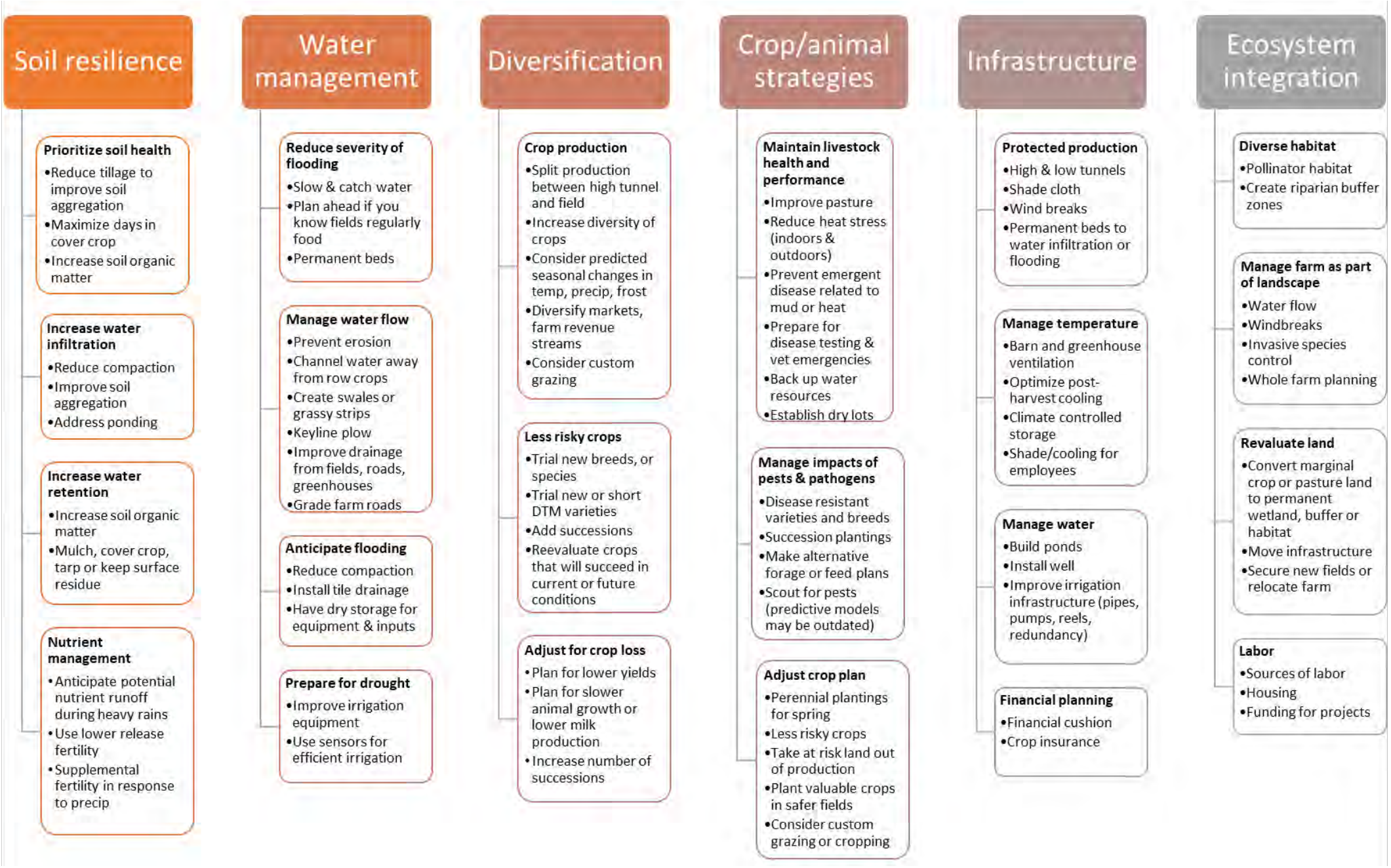
3: Consider **what specific practices** could serve to increase the resilience of your farm?

Remember that adaptive practices should include:

- Considerations of feasibility and potential effectiveness
- Flexible management that can adapt with new information
- "No regrets" decisions that will create broad benefits with little risk
- Resources that are available and supported in your network
- A specific, practical timeline

Copyright © 2024 Hensley's Seed Co. and American Farmland Trust. All rights reserved.

Adaptation Strategies & Practices



Copyright © 2024 Hensley's Seed Co. and American Farmland Trust. All rights reserved

1. GOALS
2. CLIMATE IMPACTS
3. RISK ASSESSMENT
4. **ADAPTATION PRACTICES & PLAN**
5. EVALUATE

and repeat....

Risk: Reliance on heirloom tomatoes for 40% of summer income: increasing disease, inconsistent pollination, hail damage

Strategy: Diversification, Infrastructure, Crop Strategies

Practice:

Diversification: Explore alternative high-grossing crops to add to income stream
Infrastructure: Dedicate one high tunnel to late season heirloom tomatoes
Cropping: Trial heirloom hybrids with disease resistance, invest in fan to reduce HT humidity

4. Adaptation Practices

1: Write down what you identified as your **most significant risks** to climate impacts.

2: Using ideas on the previous page, **note what strategies might be used** to mitigate these risks?

3: Consider **what specific practices** could serve to increase the resilience of your farm?

Remember that adaptive practices should include:

- Considerations of feasibility and potential effectiveness
- Flexible management that can adapt with new information
- "No regrets" decisions that will create broad benefits with little risk
- Resources that are available and supported in your network
- A specific, practical timeline

Copyright © 2024 Hensley's Seed Co. and American Farmland Trust. All rights reserved.

1. GOALS
2. CLIMATE IMPACTS
3. RISK ASSESSMENT
4. ADAPTATION PRACTICES & PLAN
5. **EVALUATE**

and repeat....

5. Evaluate

Use tools like the NRCS In-Field Soil Health Assessment, financial analysis, soil health tests, forage yields, or other data to measure success.

Choose one or two criteria to measure the effectiveness of your climate adaptation practices.

What will indicate success? How often will you take that measurement?

- ☐ Measure income from heirloom tomatoes as percent of total, decrease to 30%
- ☐ Increase percentage of heirloom production in HT to 20% of total, trial 4 hybrid heirloom varieties and track yield



In Summary:

This climate adaptation planning cycle should be repeated over time as new practices yield results, information is gathered, and new challenges emerge. Congratulations on getting started, and good luck with your climate resilience planning!

Copyright © 2024 Hensley's Seed Co. and American Farmland Trust. All rights reserved.

Prioritization and Triage



Flexible and Adaptive Mgt



“No Regrets” Decisions



Precautionary Actions



Support Mitigation



Emergency Plan



Copyright © 2024 Hensley’s Seed Co. and American Farmland Trust. All rights reserved.

Planning Tools

FIVE STEPS TO YOUR REGENERATIVE CLIMATE RESILIENCE PLAN

A Workbook for Farmers

Version 1.0 | November 2023

For use alongside the companion website:
RegenerativeFarmResilienceGuide.org



GLYNWOOD
Center for Regional Food and Farming

Laura Lengnick,
Director of Agriculture
The Glynwood Center for Regional Food and Farming

CAMF | THE UNIVERSITY OF MAINE Cooperative Extension | USDA Northeast Climate Hub, U.S. DEPARTMENT OF AGRICULTURE | V2.0

Welcome to the Climate Adaptation and Mitigation Planning Tool

For a printable version of this tool, visit https://www.adaptationfellows.net/planningtool

This tool was developed to help farmers and agricultural advisors complete climate adaptation and mitigation planning. It was designed to be general enough to use with a wide range of agricultural operations. To use the tool, please complete the tabs in order from 1 to 5. The amount of time required to complete the planning process will vary depending on the risks your farm faces, the number of strategies you are able to use, your record keeping practices, and more. The tool supports the 7-step adaptation and mitigation planning process described in the figure below:

Step 1. On-Farm Risk Assessment

last updated June 2024

Instructions: Start by considering the various climate change effects that could influence your farm. Choose climate risk factors from the "climate risk factor bank" in **row 12**, or add your own. Fill in **column B** with these risk factors. Use **column C** to consider the specific ways in which these risk factors will influence your operation or team. For example "winds from the southeast put high tunnels at risk on a regular basis." Use **column D** to brainstorm any *benefits* these changes may have. Use **column E** to note any resources you may have that can be used to address the risk. Finally, in **column F** rank these climate risk factors (**column B**) from the highest to lower risk to your farm.

Who is filling out this assessment:	
Farm name:	
Date:	
Climate risk factor bank	High temperatures, low temperatures, temperature swings, high precipitation, low precipitation, wind, extreme weather events, wildfire, flooding, pests and/or disease, supply chain disruptions, land prices, other climate risk factors that pertain to your farm

B	C	D	E	F
Climate Risk Factor	What concerns or problems does this create on the farm?	What benefits could we gain from this risk factor, if any?	What resources do we already have to address this risk?	Ranking of Risks (1 = highest risk; 7 = lowest risk). *Use each value only once, only list as many risks as you feel are important for your farm.*

Copyright © 2024 Hensley's Seed Co. and American Farmland Trust. All rights reserved.

Grower Experiences



PLANNING

Sal Daggett

Stubborn Oak Farmstead

PRACTICE

Kyle Burns

Burns Blossom Farm



Copyright © 2024 Hensley's Seed Co. and American Farmland Trust. All rights reserved.

Stubborn Oak Farmstead







Copyright © 2024 Hensley’s Seed Co. and American Farmland Trust. All rights reserved

Climate Impacts







Copyright © 2024 Hensley's Seed Co. and American Farmland Trust. All rights reserved

Burns Blossom Farm





Copyright © 2024 Hensley's Seed Co. and American Farmland Trust. All rights reserved.

Climate Impacts





Copyright © 2024 Hensley’s Seed Co. and American Farmland Trust. All rights reserved

Keeping soil covered





Copyright © 2024 Hensley’s Seed Co. and American Farmland Trust. All rights reserved

Keeping soil covered







Copyright © 2024 Hensley's Seed Co. and American Farmland Trust. All rights reserved

Season Extension





Copyright © 2024 Hensley’s Seed Co. and American Farmland Trust. All rights reserved.

Diversifying revenue streams





Copyright © 2024 Hensley's Seed Co. and American Farmland Trust. All rights reserved.

Inspiration!





Copyright © 2024 Hensley's Seed Co. and American Farmland Trust. All rights reserved

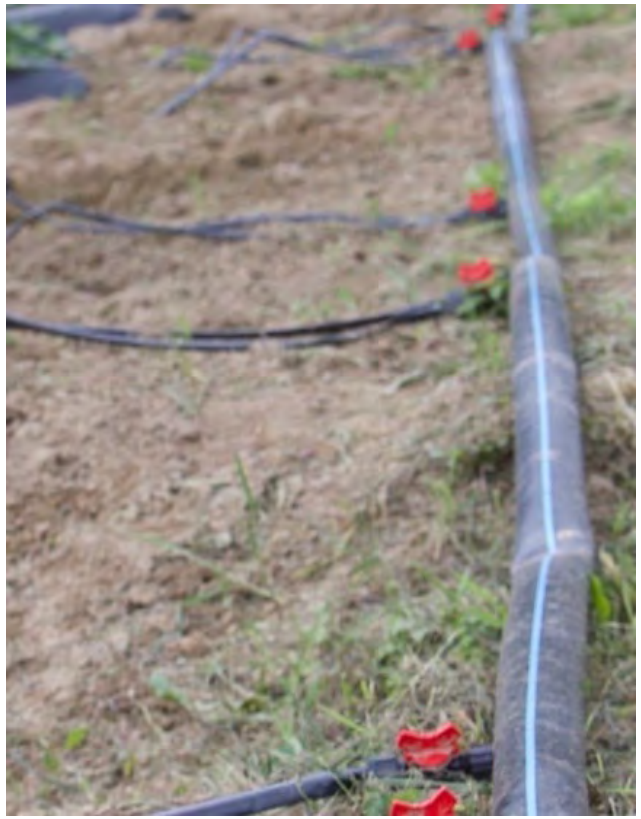
Promising Climate Adaptation Strategies

- Whole systems planning
- Protective structures
- Diversification
- Water source development & storage
- Financial planning
- Emergency plan
- Raised beds & controlled traffic
- Storm water management
- Living mulch in pathways









Slide credit: Alissa White

Copyright © 2024 Hensley's Seed Co. and American Farmland Trust. All rights reserved.

Permanent beds, raised bed, reduced tillage







Photos: Spencer Blackwell, Elmer Farm

Flexible Irrigation Strategy







Storm Water Management





Mulch, Tarping, Rotation







Photos: Jeremy Barker Plotkin

Interseeding Cover Crops



Photos: Ryan Fitzbeauchamp, Evening Song Farm



Funky Zone Till







Living Mulch Pathways











Climate Resilience

=

Prevention



+

Adaptation



+

Assistance



Copyright © 2024 Hensley's Seed Co. and American Farmland Trust. All rights reserved

Primary Resources

Climate Adaptation Worksheet for Farms
https://farmland.org/climate-adaptation-worksheet

Climate Adaptation and Mitigation Fellowship Planning Tool
https://www.adaptationfellows.net/planningtool

Five Step Guide to Farm Resilience
https://regenerativefarmresilienceguide.org

Adaptation Resources for Agriculture:
Responding to Climate Variability and Change in the Midwest and Northeast
https://www.climatehubs.usda.gov/sites/default/files/adaptation_resources_workbook_ne_mw.pdf



Cultivating Climate Resilience on Farms and Ranches
https://www.sare.org/wp-content/uploads/Cultivating-Climate-Resilience-on-Farms-and-Ranches.pdf?inlinedownload=1

Adaptation Resources for Agriculture: Case Studies
https://www.climatehubs.usda.gov/hubs/topic/adaptation-resources-agriculture-case-studies-using-adaptation-workbook

Soil Health and Organic Farming: Organic Practices for Climate Mitigation, Adaptation and Carbon Sequestration
https://ofrf.org/soil-health-and-organic-farming-reports/

Copyright © 2024 Hensley's Seed Co. and American Farmland Trust. All rights reserved.



Thank You

We hope you enjoyed our presentation

Copyright © 2024 Hensley’s Seed Co. and American Farmland Trust. All rights reserved.