

# WEATHERING THE CHANGE:

*Helping Farmers Help the Land Through Climate Smart Farming*



Natural  
Resources  
Conservation  
Service

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



# Elizabeth Marks

Biologist, NRCS NY

NRCS Liaison to Northeast Climate Hub  
2020

[elizabeth.marks@usda.gov](mailto:elizabeth.marks@usda.gov)

(518) 267-3310



# USDA Climate Hubs



**Factsheets and summaries of scientific studies**



**Workshops and proceedings**



**Economic case studies**



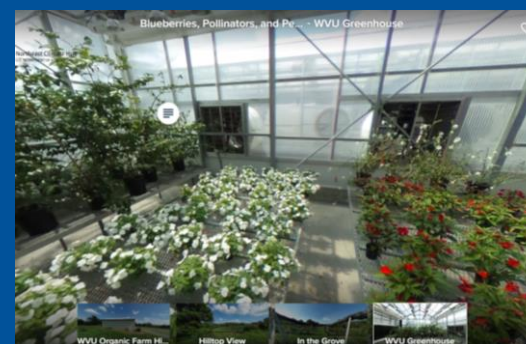
**Quarterly e-newsletters**



**Archived webinars**



**360 virtual tours demonstrating climate adaptation practices**





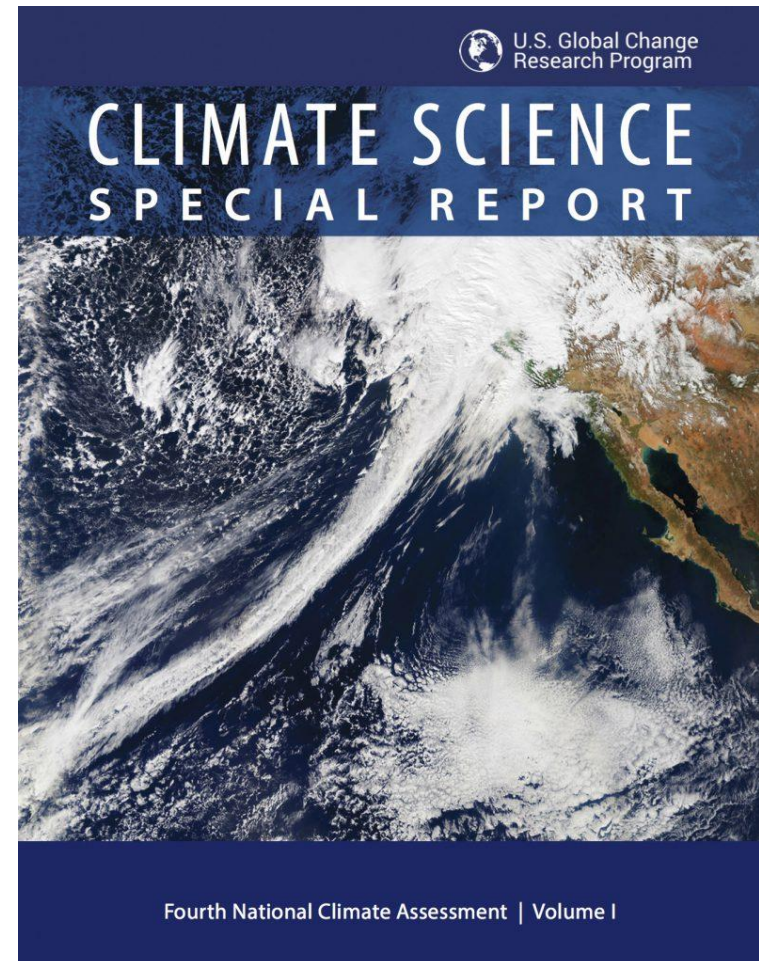


# *Climate Change Over the Last Century*

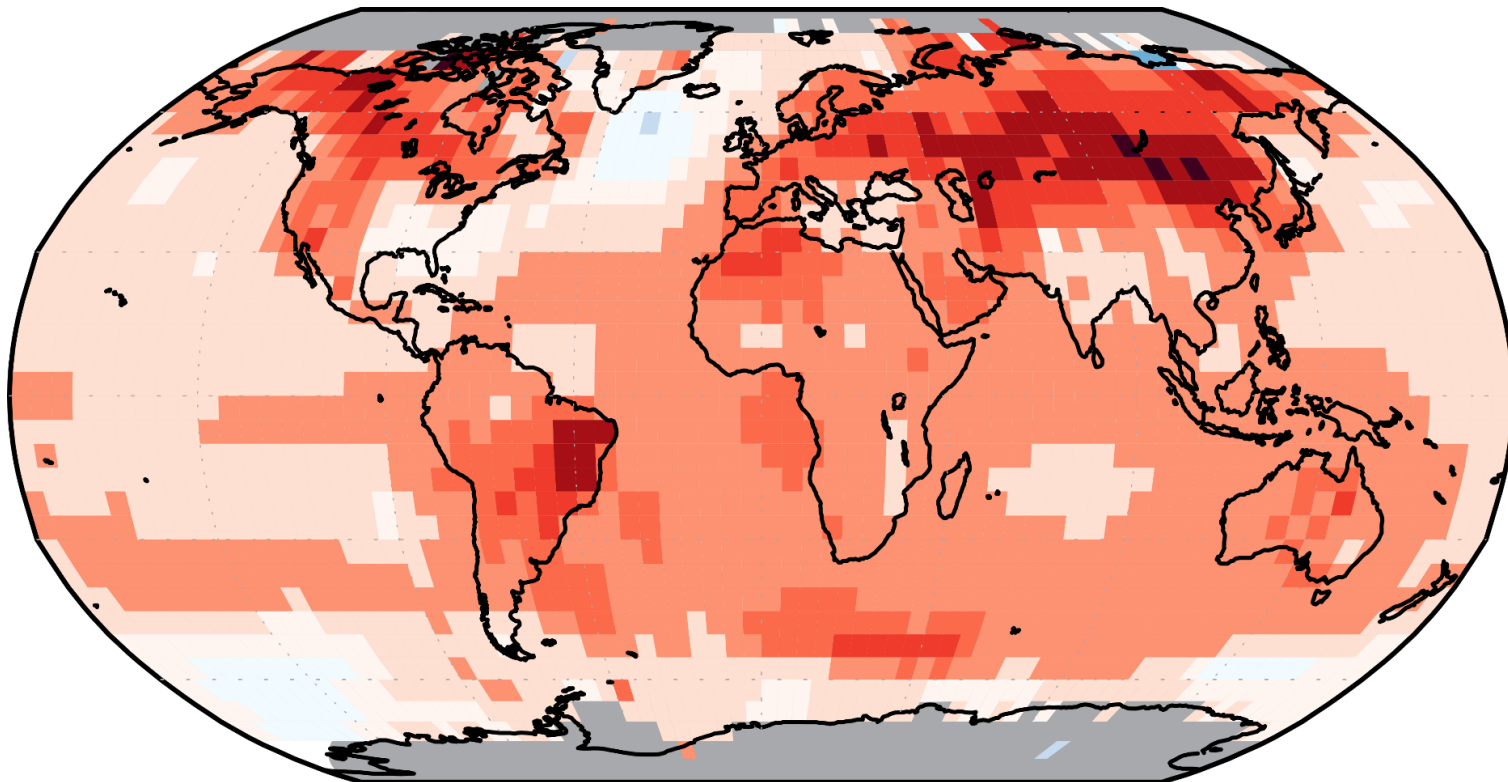


# Fourth National Climate Assessment 2018

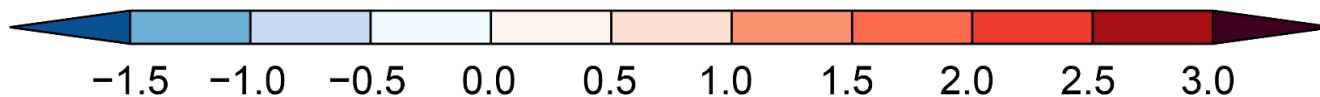
- **1,500 page congressionally mandated report done every four years by the US Global Change Research Program (federally funded).**
- **Lead agency: National Oceanic and Atmospheric Association, many other partner contributors including USDA**



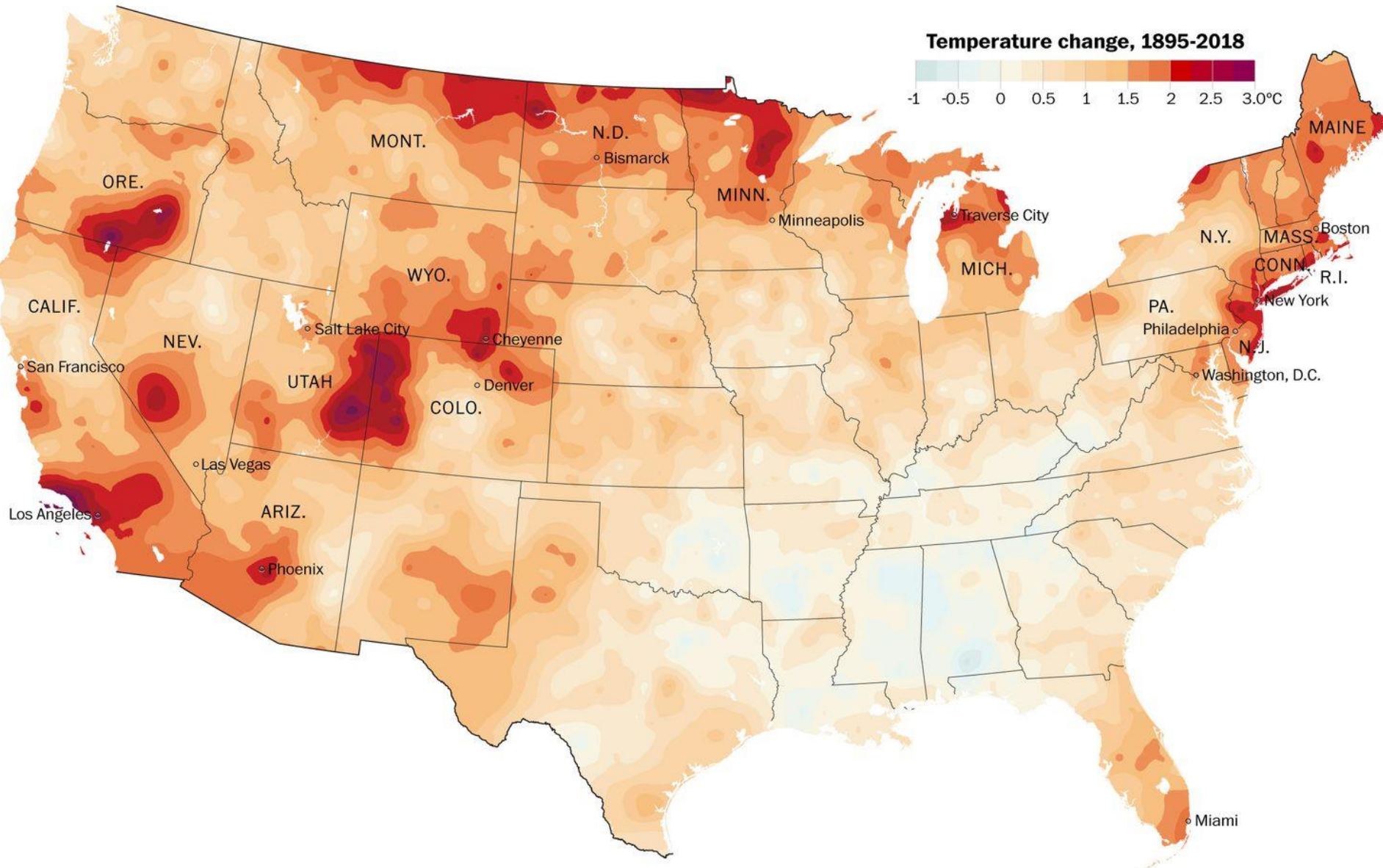
# Average Global Rise in Temperature: 2.1° F (1° C) since 1880



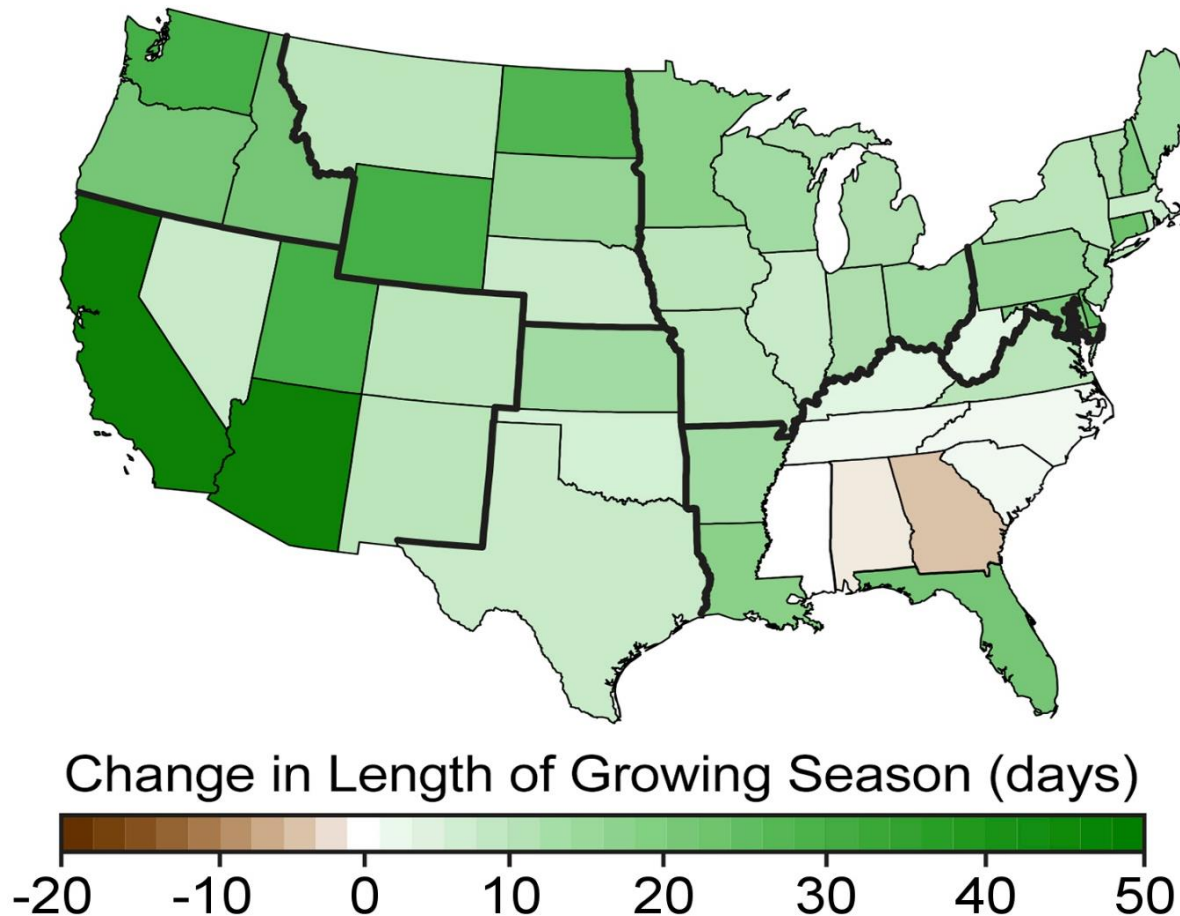
Change in Temperature (°F)







# Change in Growing Season Length Since 1895





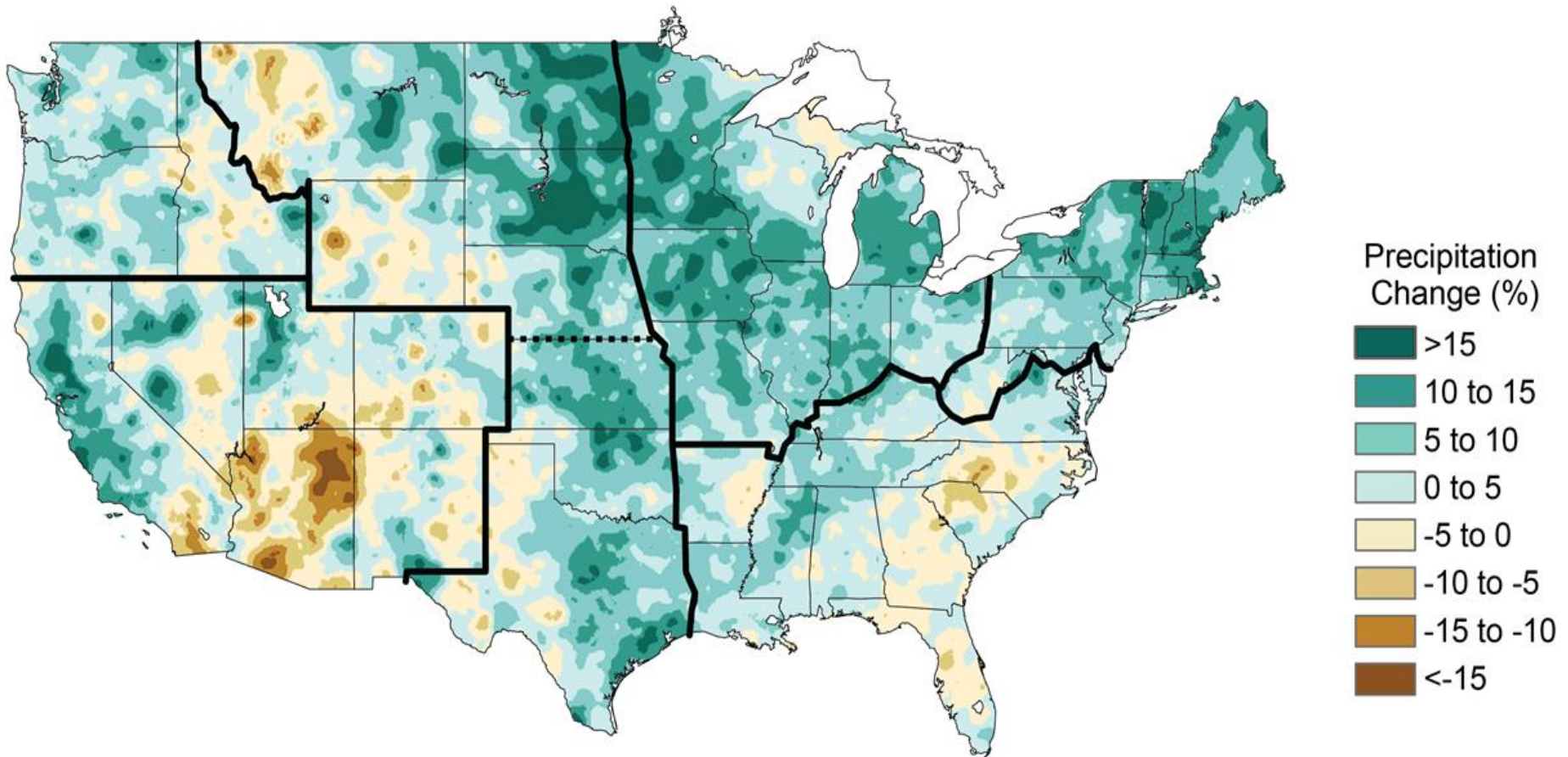
# Increased Mosquito Season

## Much Longer Mosquito Seasons

Top 25 cities with the largest increase in annual average days with ideal climate conditions since 1980 (days)

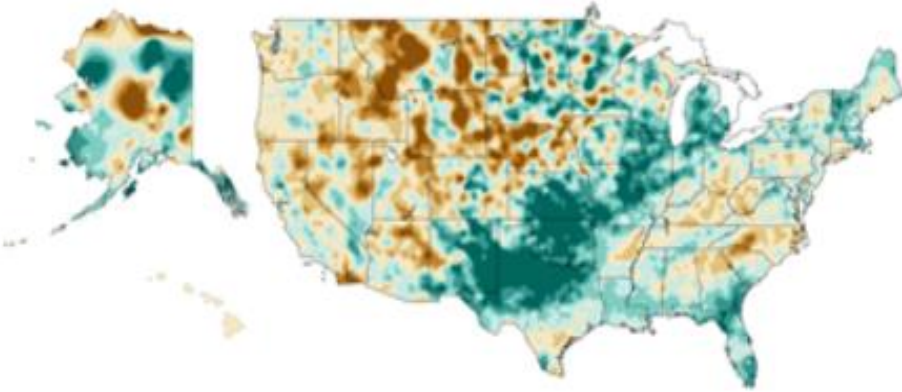
1.	Baltimore	37	14.	Springfield, Mass.	27
2.	Durham, N.C.	37	15.	Louisville, Ky.	26
3.	Minneapolis	34	16.	Atlantic City, N.J.	26
4.	Myrtle Beach, S.C.	34	17.	Syracuse, N.Y.	25
5.	Raleigh, N.C.	33	18.	Daytona Beach, Fla.	25
6.	Portland, Maine	32	19.	Cleveland	25
7.	St. Louis	31	20.	Salisbury, Md.	25
8.	Pittsburgh	30	21.	Bridgeport, Conn.	25
9.	Worcester, Mass	30	22.	Davenport, Iowa	25
10.	Albany, N.Y.	30	23.	Greenville, S.C.	24
11.	Washington, D.C.	29	24.	Norwich, Conn.	24
12.	Hartford, Conn.	28	25.	Trenton, N.J.	24
13.	Fargo, N.D.	27			

# Observed US Rainfall Change Since 1895

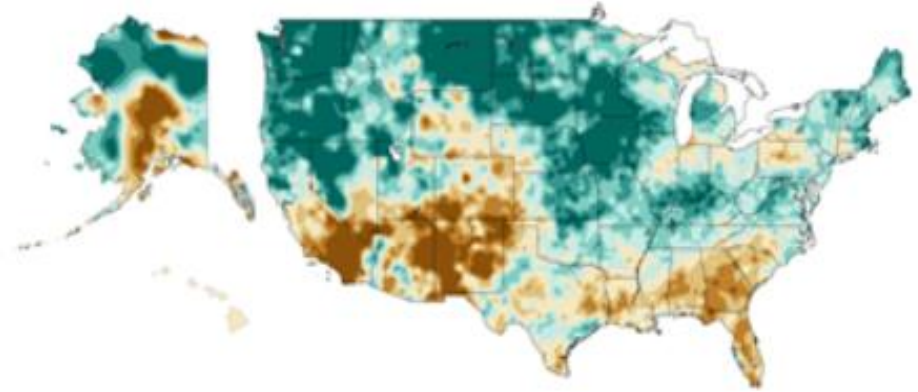


# Observed US Rainfall Change Since 1895

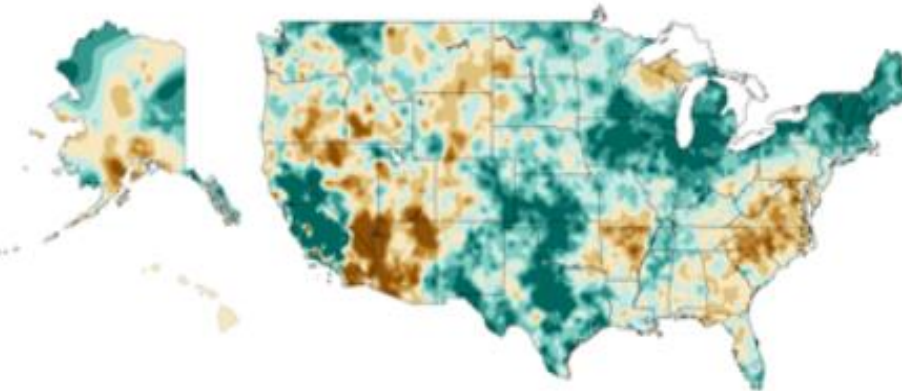
**Winter Precipitation**



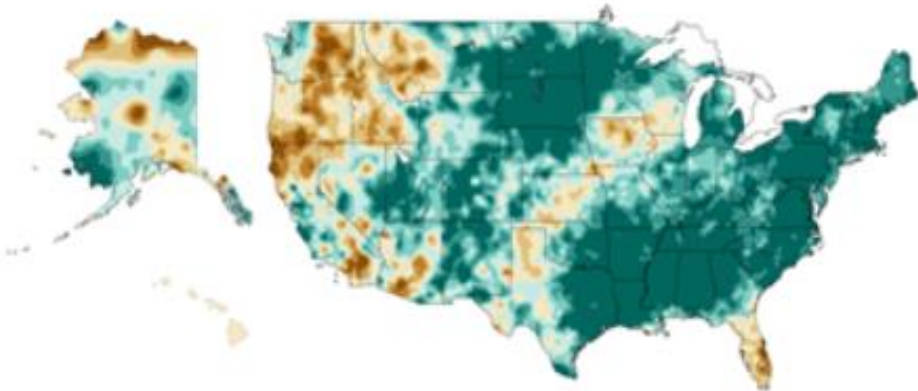
**Spring Precipitation**



**Summer Precipitation**

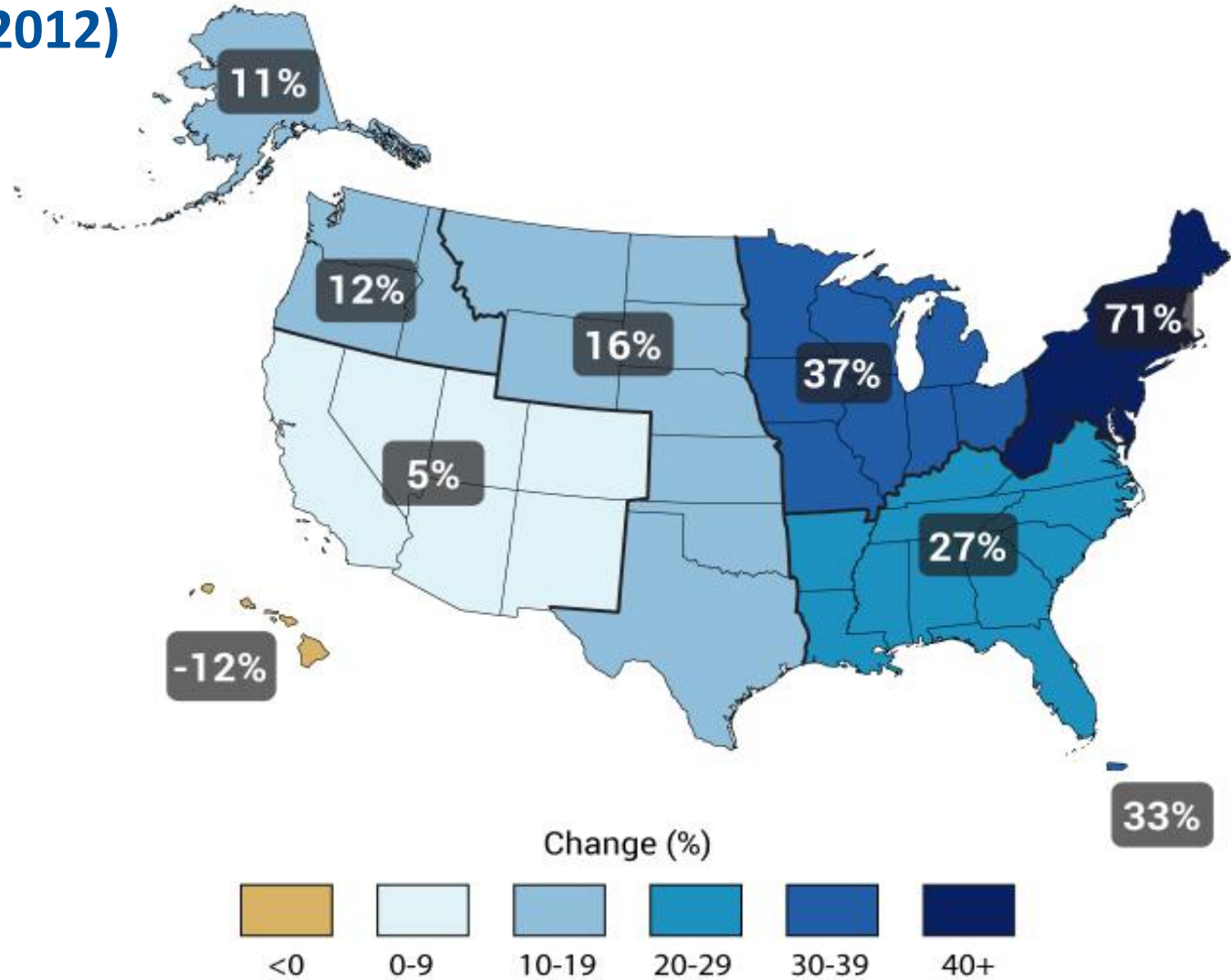


**Fall Precipitation**





# Percent Increase in Very High Precipitation (1958-2012)





# *Changes at the State Level*





# NOAA State Climate Summaries

**Excellent 4-5 page fact sheets for each state summarizing climate trends that are occurring.**



**Visit: [statesummaries.ncics.org](https://statesummaries.ncics.org)**

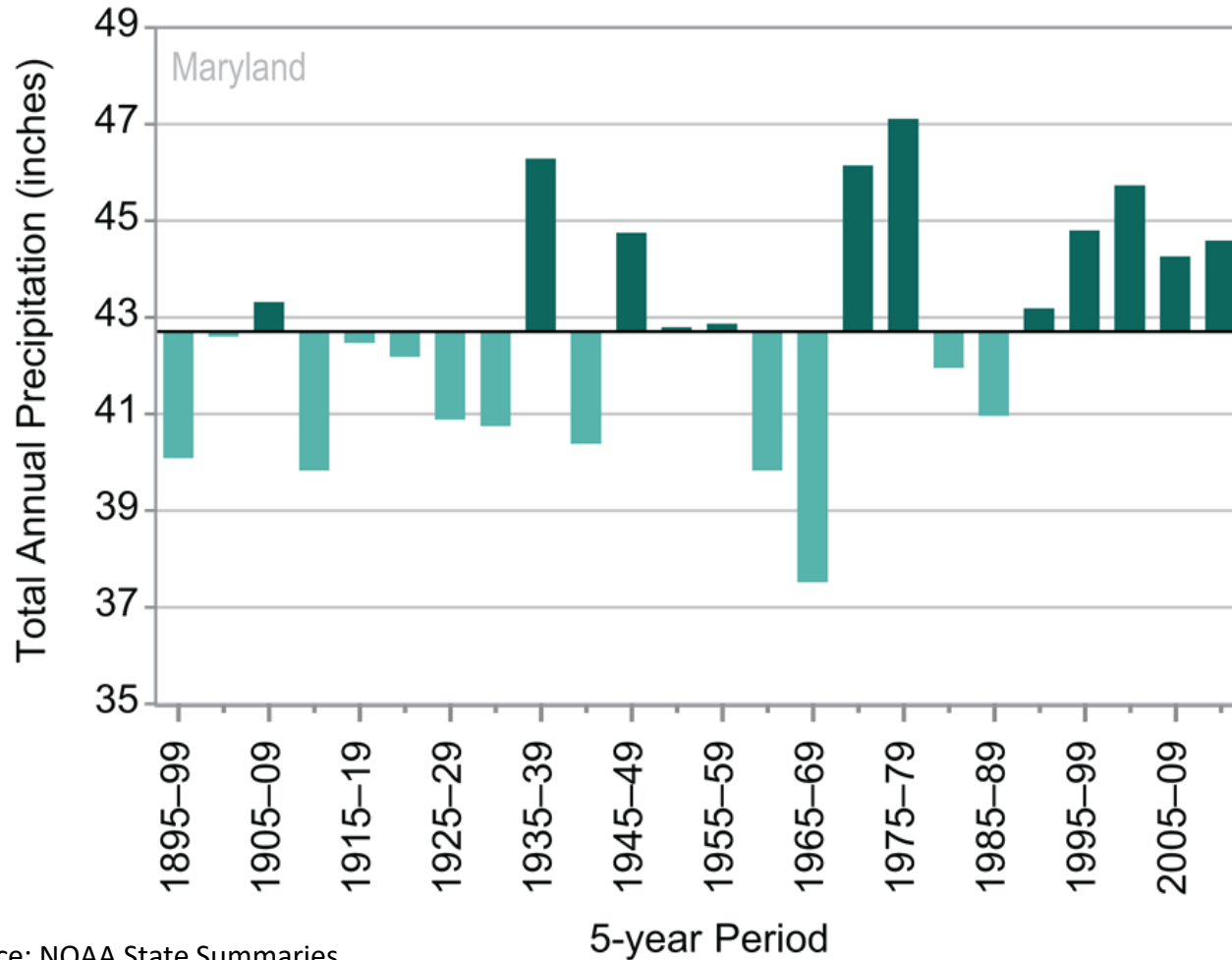


# Maryland

- **Average temperatures have increased 1.5° F since 1900.**
- **Warmer winters and increased rain in winter and spring means longer mud season and delayed planting.**
- **Average rainfall has increased 10% since 1895.**
- **Extreme rain events (over 2") has increased 15% since 1950 (236% since 1980).**
- **The Chesapeake Bay is the third most vulnerable area of the US to sea level rise, behind Louisiana and South Florida. Sea level rise since 1880 is approximately 12-14", greater than the 8" global average.**

# Maryland

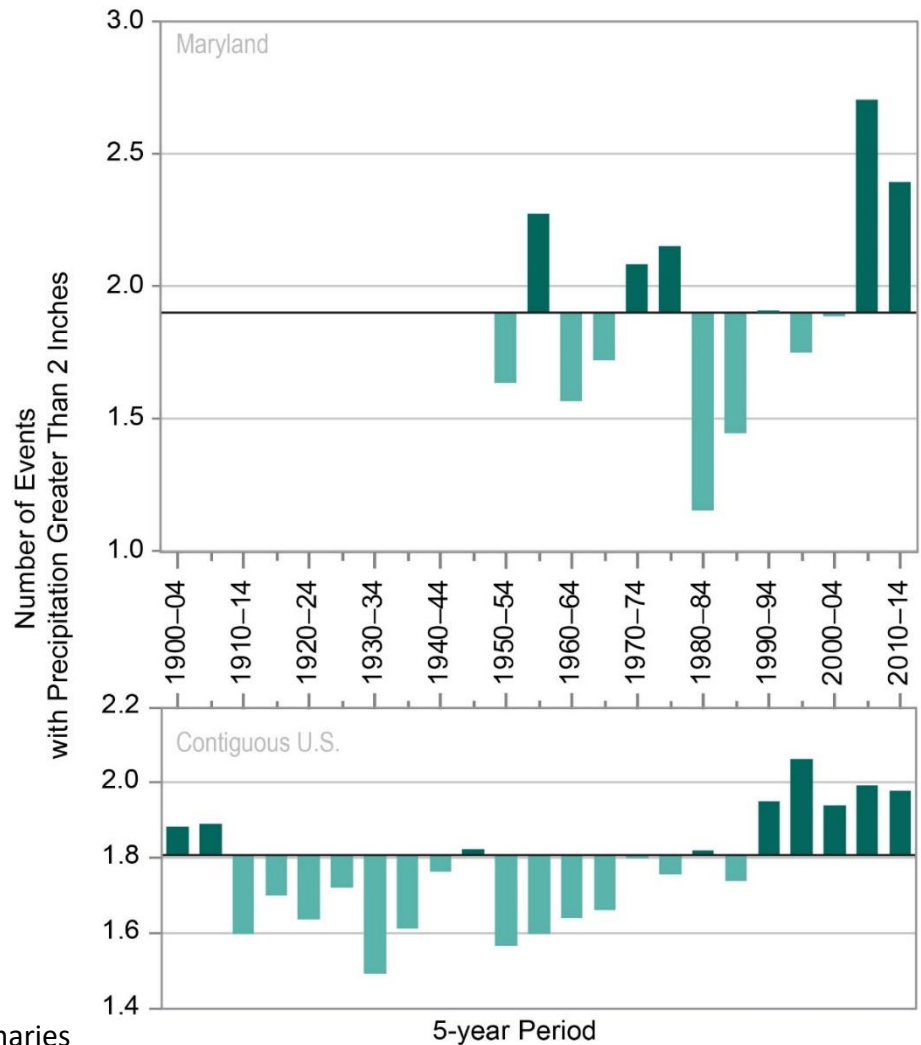
## Observed Annual Precipitation



Source: NOAA State Summaries

# Maryland

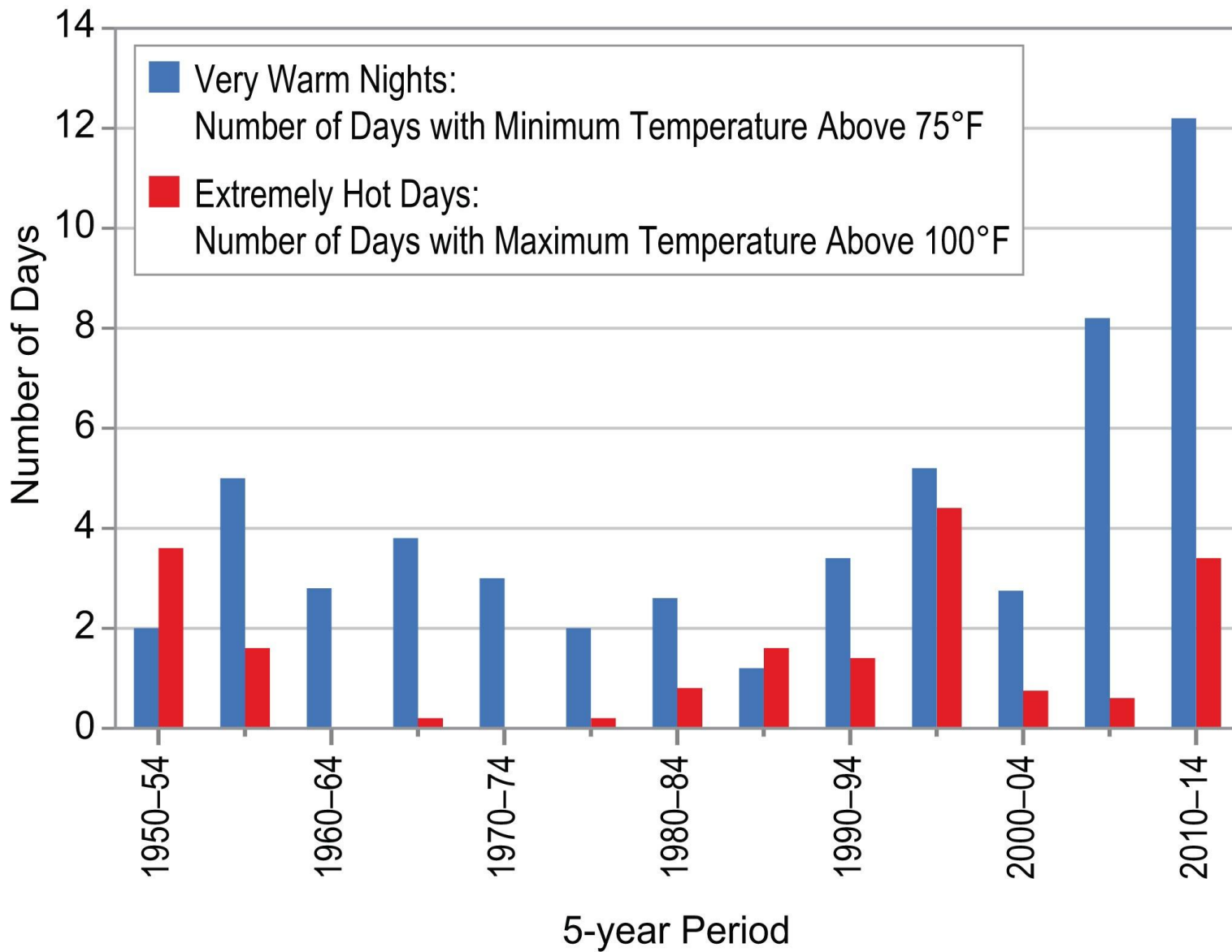
Observed Number of Extreme Precipitation Events



Source: NOAA State Summaries



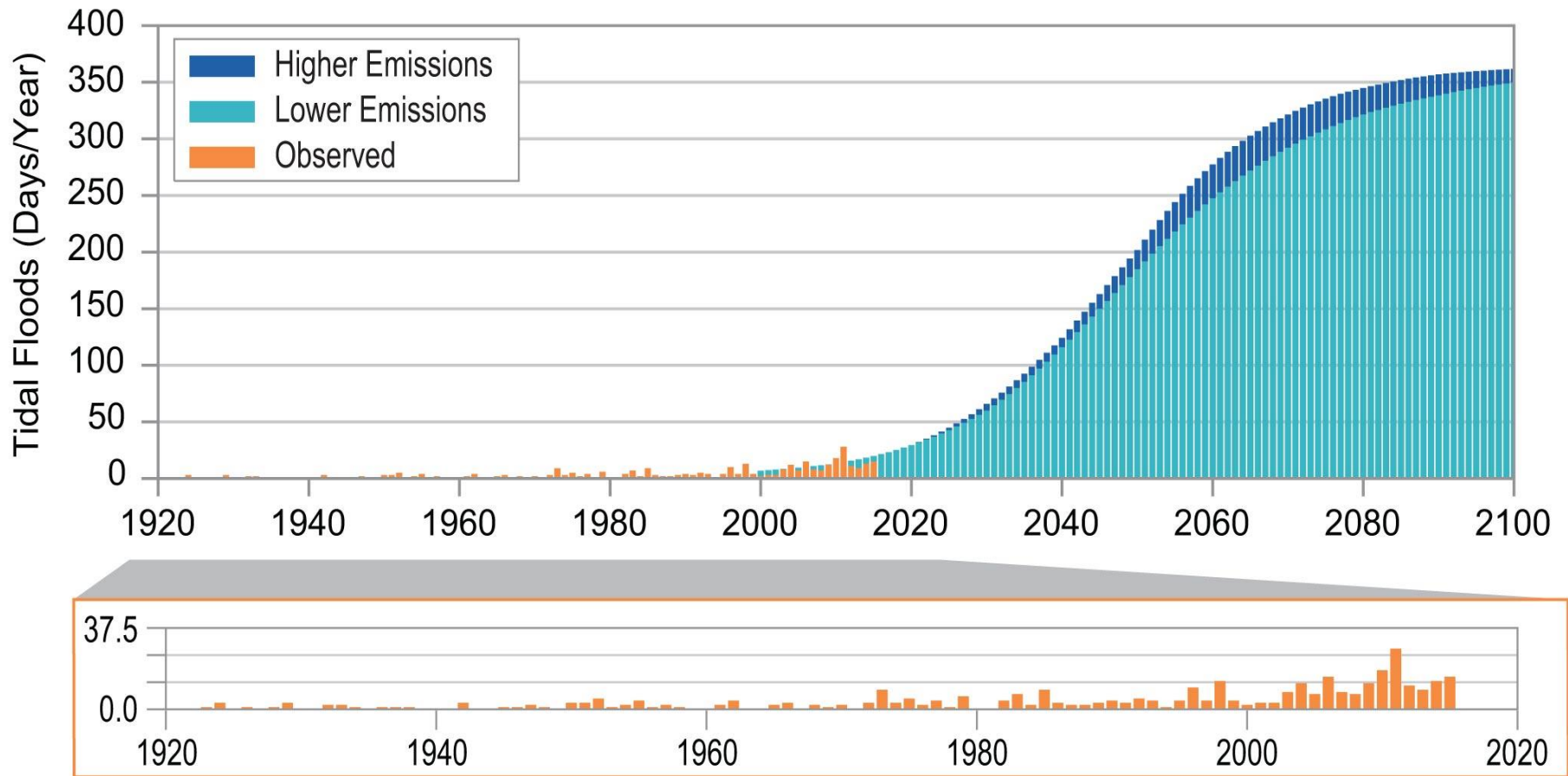
# Washington, D.C.



Source: NOAA State Summaries

# Maryland

## Observed and Projected Annual Number of Tidal Floods for Baltimore, MD



Source: NOAA State Summaries

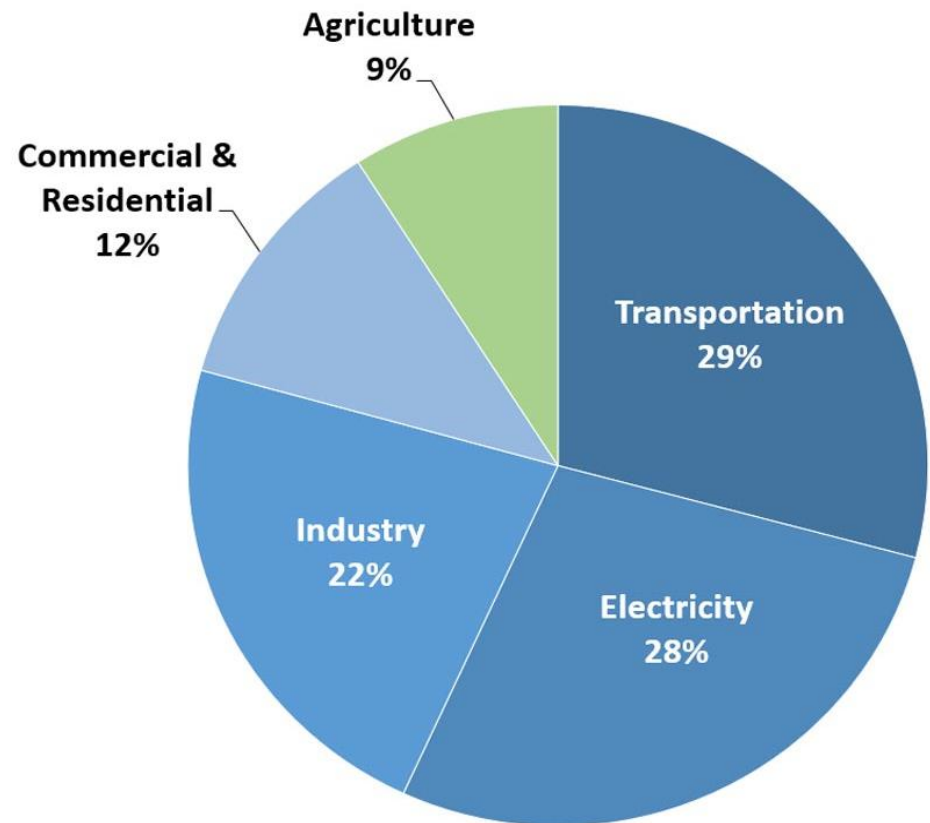


# *Why Are These Changes Happening?*



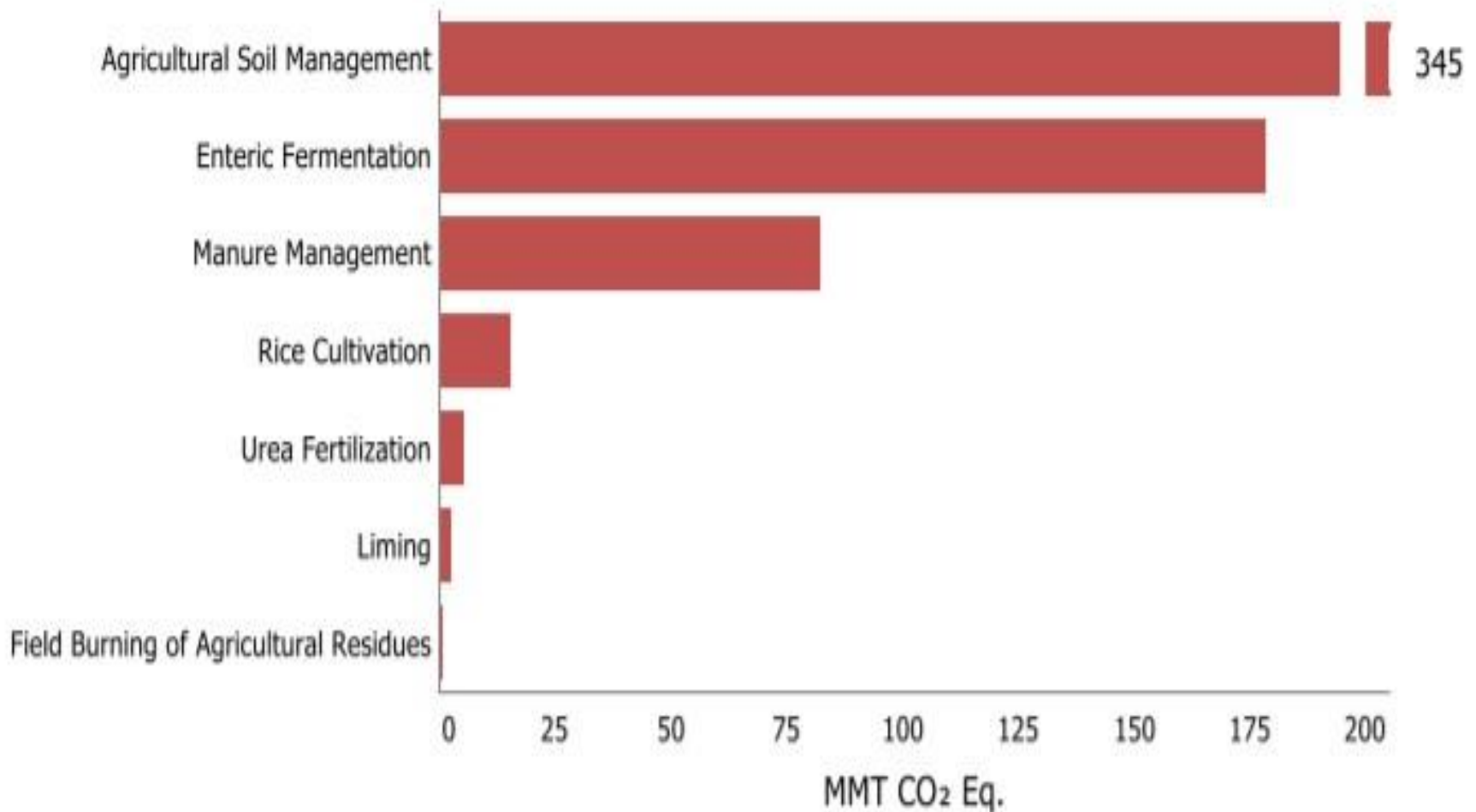
# What are the Greenhouse Gasses and Where are they Coming From in the US?

- Water vapor ( $H_2O$ )
- Carbon dioxide ( $CO_2$ )
- Methane ( $CH_4$ )
- Nitrous oxide ( $N_2O$ )
- Ozone ( $O_3$ )
- Chlorofluorocarbons  
and hydrofluorocarb  
(CFCs and HFCs)



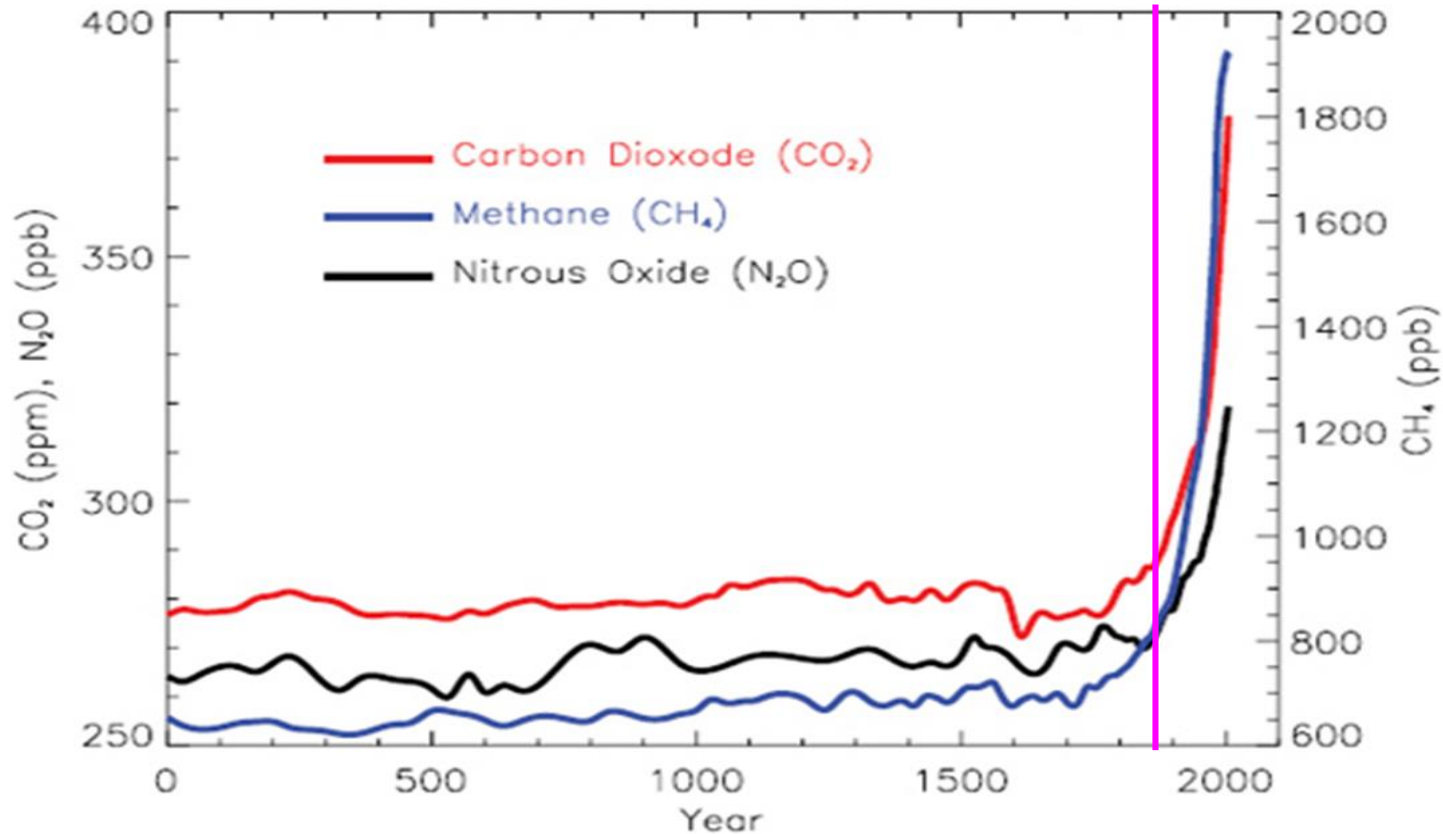


# Greenhouse Gas Emissions from Agriculture



Agricultural Soil Management: nitrous oxide emissions from fertilizer

# Concentrations of Greenhouse Gases From Years 0 - 2005



*End of 1800s: Beginning of 2<sup>nd</sup> industrial revolution, electric lights invented, and introduction of the automobile.*

# Half of human-related CO<sub>2</sub> emissions has occurred only in the last 40 years.



**Source:** Data: Luthi, D., et al.. 2008; Etheridge, D.M., et al. 2010; Vostok ice core data/J.R. Petit et al.; NOAA Mauna Loa CO<sub>2</sub> record.



***What was the carbon dioxide level in the atmosphere the year you were born? Click on link below:***

**<https://data.giss.nasa.gov/modelforce/ghgases/Fig1A.ext.txt>**

**(Current Level: 412 ppm December 2020)**





# *Reasons for Hope*



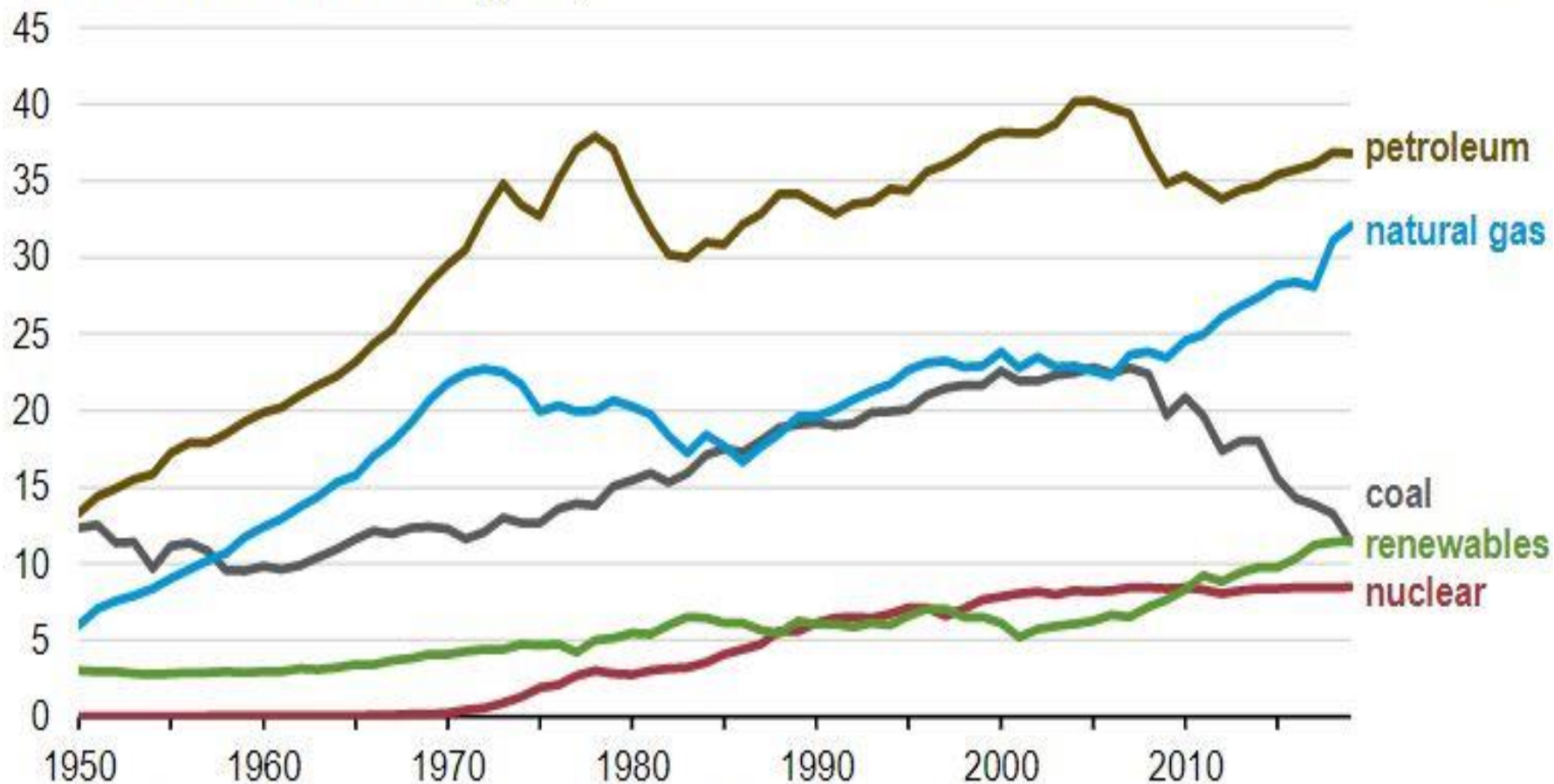
# US Hit Peak Greenhouse Gas Emissions in 2007



[Source: EPA](#)

### U.S. total energy consumption by source (1950-2019)

quadrillion British thermal units (quads)



Source: EIA



# USDA Resources

## COMET Farm/Planner



## Climate Hubs



## NRI/CEAP/ Soil Monitoring



## Snow Survey and Water Supply Forecasting



## SCAN/TSCAN



## USDA CarbonScapes



## Conservation Funding: EQIP, CIG, CRP, CSP



## Soil Health



## Environmental Markets





# Different Farming Practices Can Help Farms be Resilient to Weather Volatility

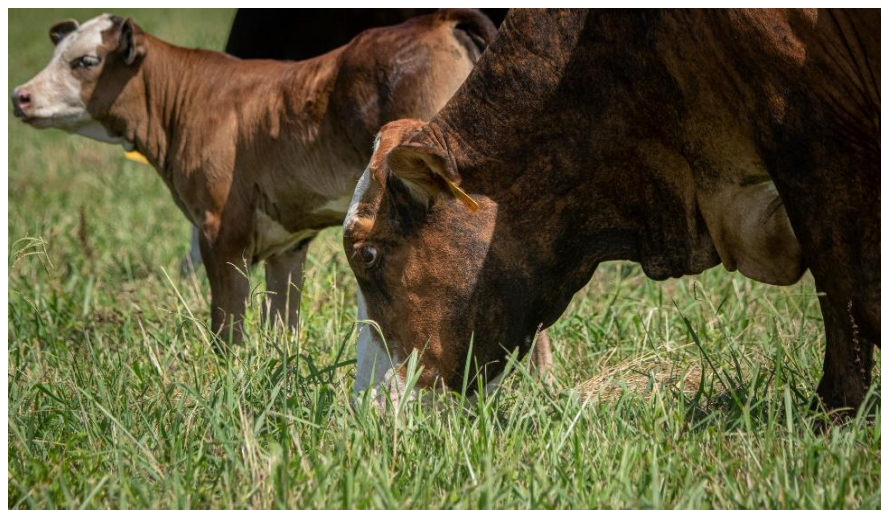
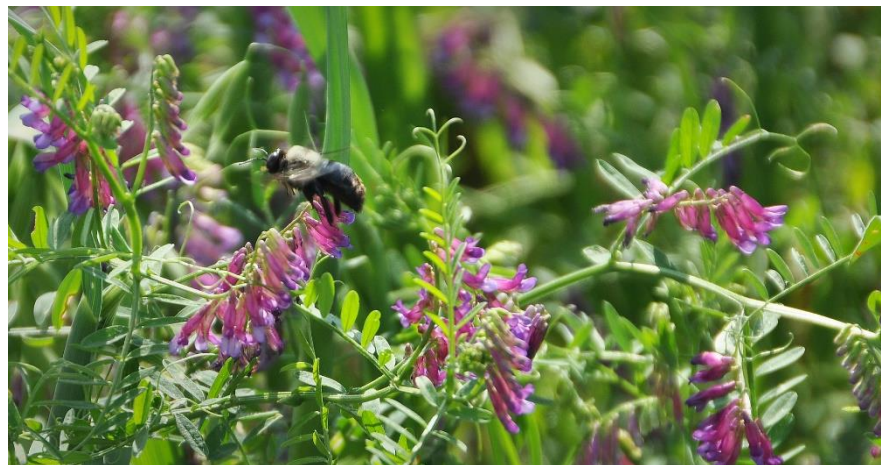
## Climate Smart Farming:

- Effective planning by identifying landscape vulnerability
- Improve Natural Resources (water/mineral, cycles, biological communities, and energy flow) on the farm
- Increase Infrastructure such as high tunnels, irrigation, drainage, etc. (can be expensive)





# *Climate Smart Farming*



Natural  
Resources  
Conservation  
Service

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

# Create Climate Smart Farms With Planning and Improving Natural Resources

- **Address Landscape Vulnerability**
  - Marginal land may only become more difficult to farm.
- **Improve Soil Health**
  - Improve Soil Structure (Disturb Less)
  - Increase Organic Matter
  - Keep Soils Covered
  - Keep Plants Growing Throughout the Year
- **Increase Health and Diversity of Biological Organisms (Above and Below Ground)**

# Practices That Are Going to Be Increasingly Problematic for Farmers

- **Leaving Soil Bare**
- **Moldboard Plowing**
- **Continuous Tilling**
- **Continuous Grazing**
- **Farming Slopes/Floodplains/Wetlands/  
Marginal Soils/Coastal Areas**
- **Climate Adaptations Involving Expensive  
Capital**





# *USDA Resources for Farmers and Forest Owners*



**The USDA Natural Resources Conservation Service can provide planning and financial assistance to help farmers adapt to climate change. Click here to find your local representative:**  
**<https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/contact/local/>**

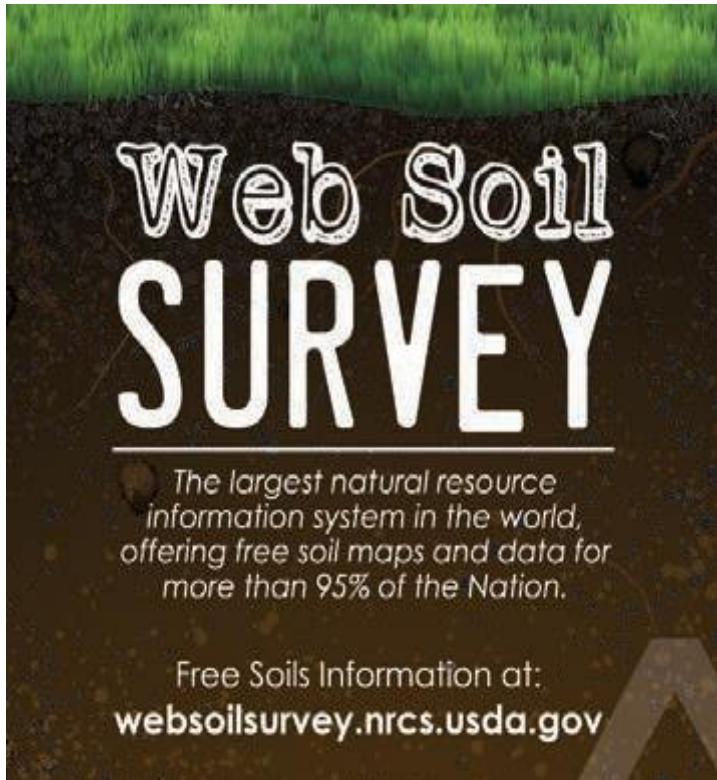




# Funding and Technical Assistance from the USDA NRCS

- **CTA – Conservation Technical Assistance**
- **EQIP – Environmental Quality Incentives Program**
- **CSP – Conservation Stewardship Program**
- **ACEP – Wetland Restoration**
- **CRP – Conservation Reserve Program (FSA)**
- **CIG – Conservation Innovation Grant**

# Planning and Technical Assistance





# EQIP and CSP







# Wetlands Reserve Program





# Conservation Reserve Program







# *In Conclusion*



Natural  
Resources  
Conservation  
Service

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



## **In Summary:**

- **The Northeast is experiencing increased temperatures (especially in winter), more extreme temperatures, increased rainfall (especially inland and in mountainous areas), and increased frequency of intense rainfall (over 2” in a 24 hour period). These trends are predicted to continue.**
  
- **Improving natural resources on the farm can significantly help farmers be resilient to these changes.**

## **In Summary, cont.:**

### **Climate Smart Farming includes:**

- **Addressing Landscape Vulnerability**
- **Improving Soil Health**
  - **Improve Soil Structure (Disturb Less)**
  - **Increase Organic Matter**
  - **Keep Soils Covered**
  - **Keep Plants Growing Throughout the Year**
- **Increasing Health and Diversity of Biological Organisms (Above and Below Ground)**



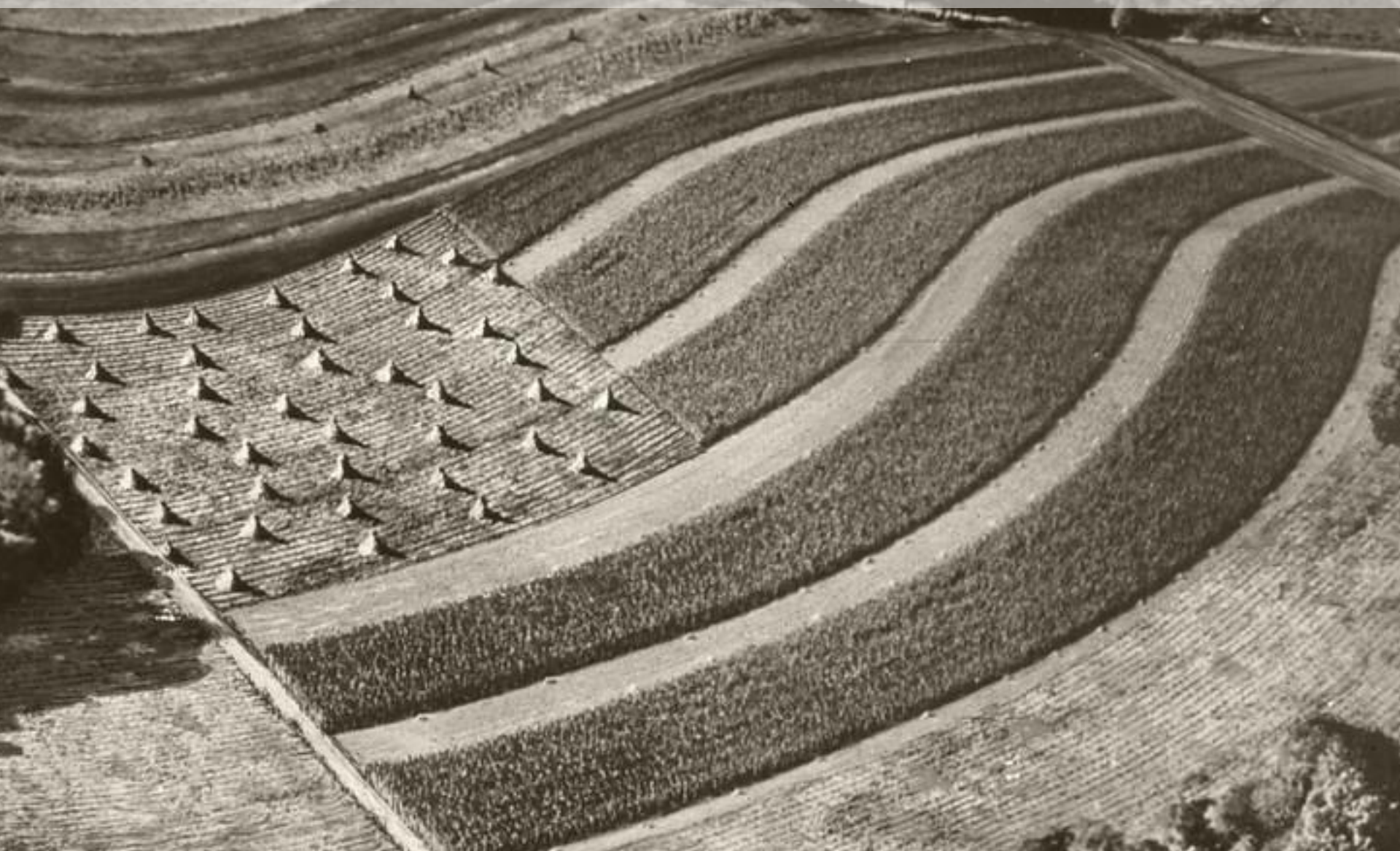
# The USDA Can Help

- **Information**
- **On Farm Technical Assistance and Planning**
- **Financial Assistance for Climate Smart Farming Practices**



Northeast Climate Hub  
U.S. DEPARTMENT OF AGRICULTURE

# Thank You for What You Do!





# Non-Discrimination Statement

In accordance with Federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, the USDA, its Agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, gender identity (including gender expression), sexual orientation, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs). Remedies and complaint filing deadlines vary by program or incident.

Persons with disabilities who require alternative means of communication for program information (e.g., Braille, large print, audiotope, American Sign Language, etc.) should contact the responsible Agency or USDA's TARGET Center at (202) 720-2600 (voice and TTY) or contact USDA through the Federal Relay Service at (800) 877-8339. Additionally, program information may be made available in languages other than English.

To file a program discrimination complaint, complete the USDA Program Discrimination Complaint Form, AD-3027, found online at [How to File a Program Discrimination Complaint](#) and at any USDA office or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by: (1) mail: U.S. Department of Agriculture, Office of the Assistant Secretary for Civil Rights, 1400 Independence Avenue, SW, Washington, D.C. 20250-9410; (2) fax: (202) 690-7442; or (3) email: [program.intake@usda.gov](mailto:program.intake@usda.gov).

**USDA is an equal opportunity provider, employer, and lender.**