Introduction

Susie Arnold, Co-Chair STS
Island Institute

Ivan J. Fernandez, Co-Chair STS
School of Forest Resources, Climate Change Institute
University of Maine

Stephen M. Dickson, Co-Chair STS
Maine Geological Survey

Climate & Human Dimensions | **May 16, 2024**

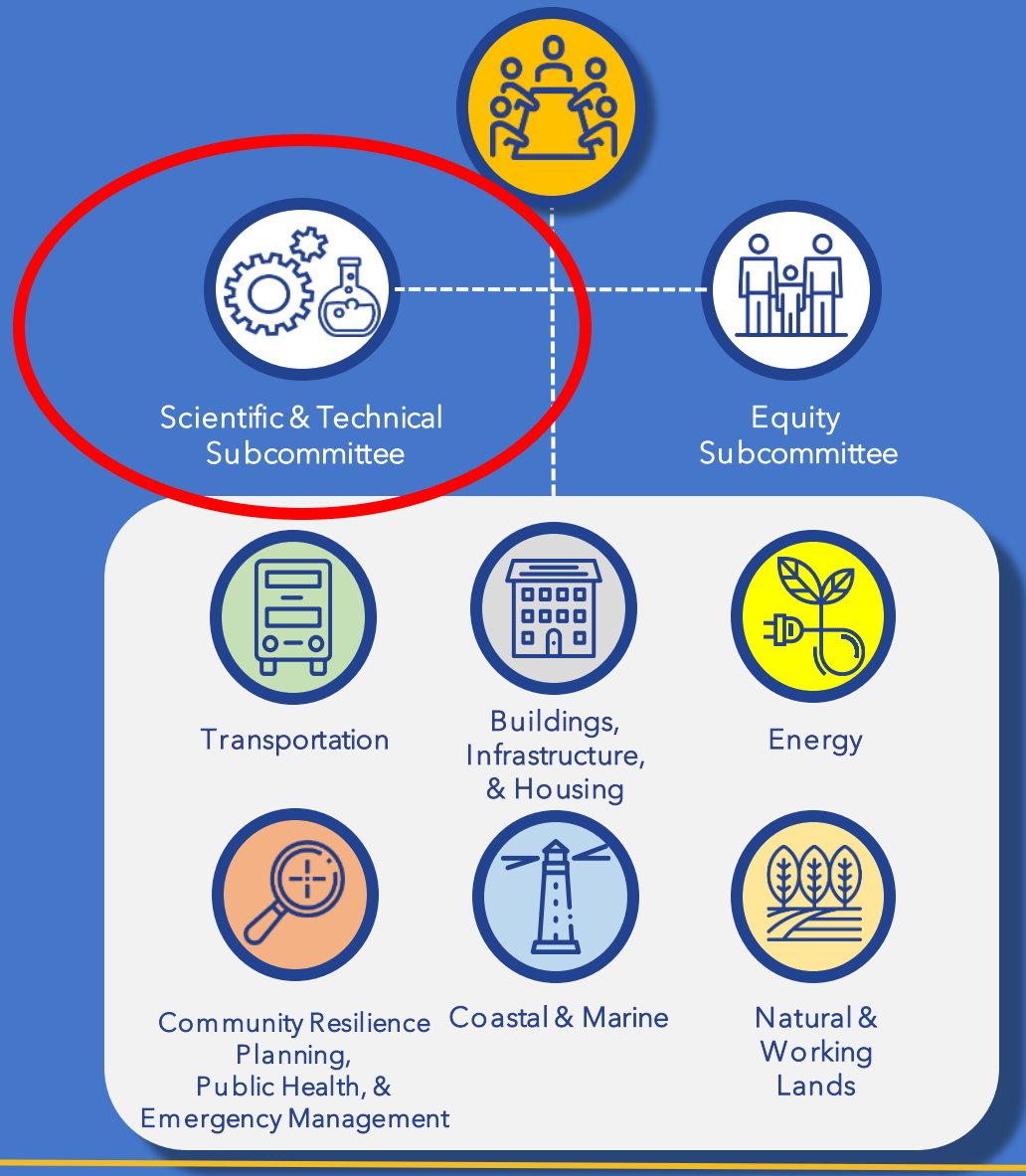
Maine Climate Council

The **39-member Maine Climate Council**, an assembly of scientists, industry leaders, bipartisan local and state officials, is responsible for **developing a Climate Action Plan** for Maine.

An expert **Scientific and Technical Subcommittee** is responsible for identifying the impacts of climate change in Maine.

An **Equity Subcommittee** will support planning and implementation of climate strategies to ensure benefits across diverse populations of Maine people.

Six working groups comprised of 230+ volunteer members recommend strategies to the Council for achieving Maine's climate goals.

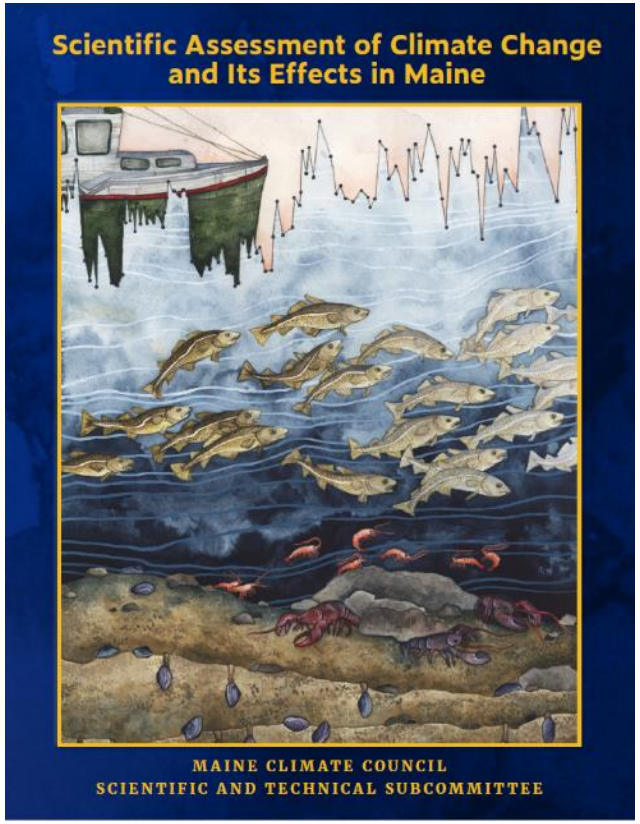


The Maine Climate Council Scientific and Technical Subcommittee

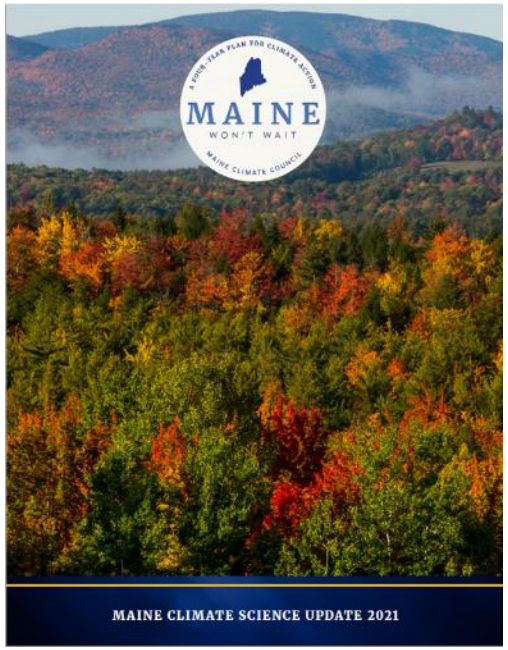
What do we do?

In 2019, Public Law Chapter 476 established the Maine Climate Council and the Scientific and Technical Subcommittee (STS) within the Council **"to identify, monitor, study and report out to the council and to the working groups…findings and recommendations related to climate change in the State and its effects on the State's climate, species, marine and coastal environments and natural landscape and on the oceans and other bodies of water."**

Maine Climate Science Assessment



2020



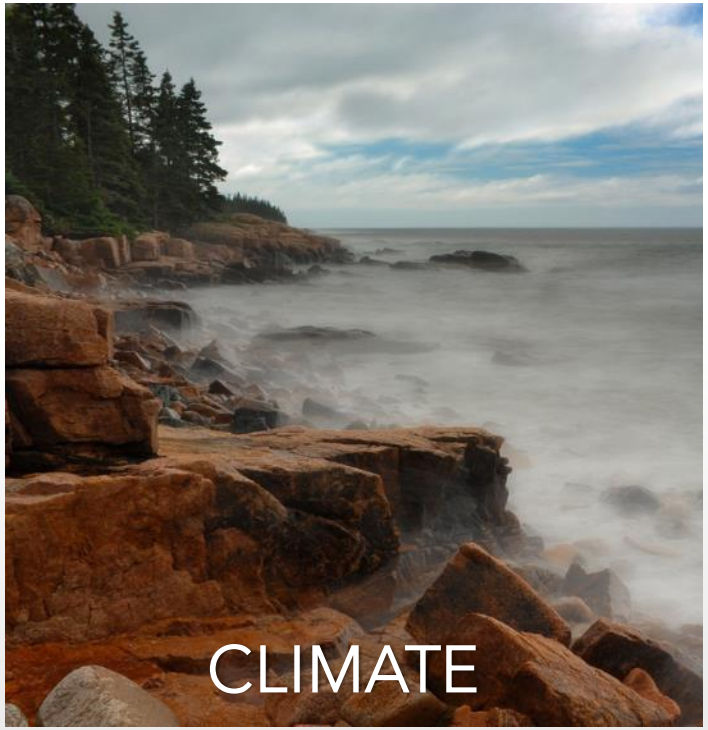
2021

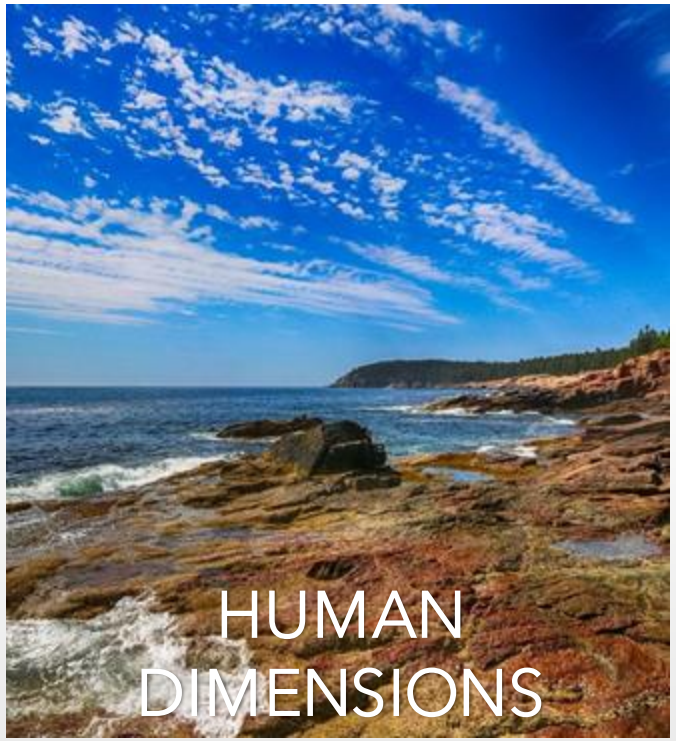
Scientific Assessment of Climate Change and Its Effects in Maine

2024

www.maine.gov/future/climate/council/sts

climatechange.umaine.edu/climate-matters/maines-climate-future/


CLIMATE


HUMAN
DIMENSIONS


HUMAN HEALTH

Climate

Sean Birkel
Assistant Professor & Maine State Climatologist
Climate Change Institute
Cooperative Extension
University of Maine

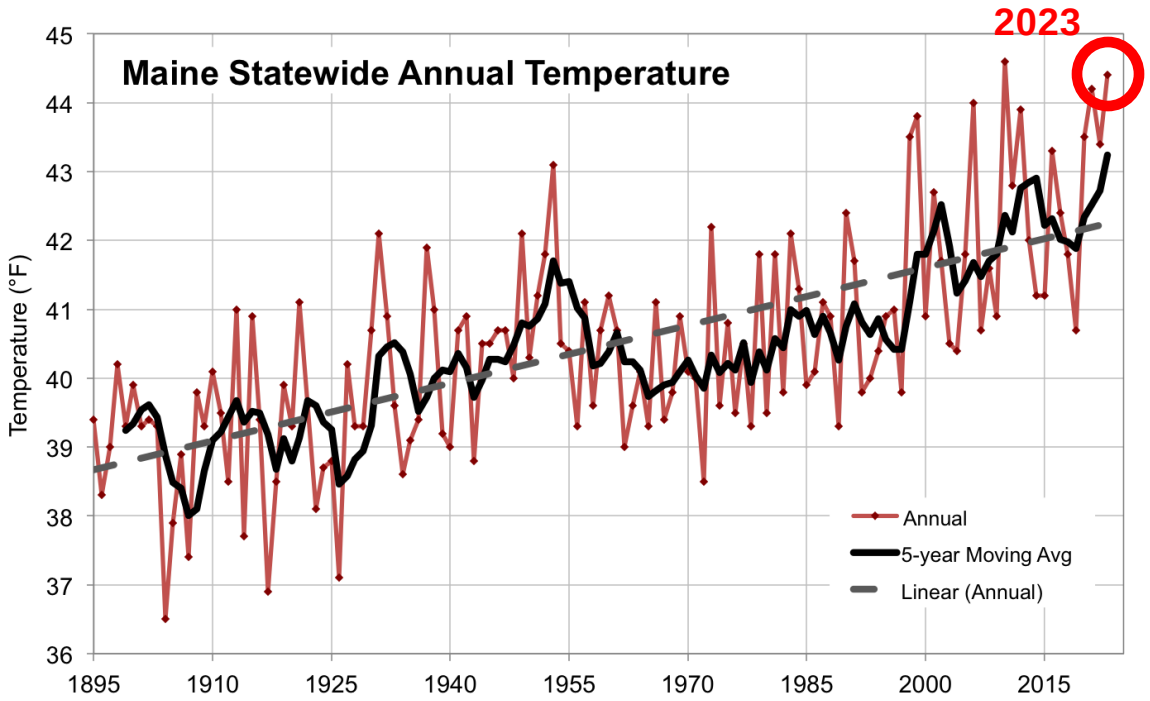
Maine's climate continues to get warmer and wetter with more extremes

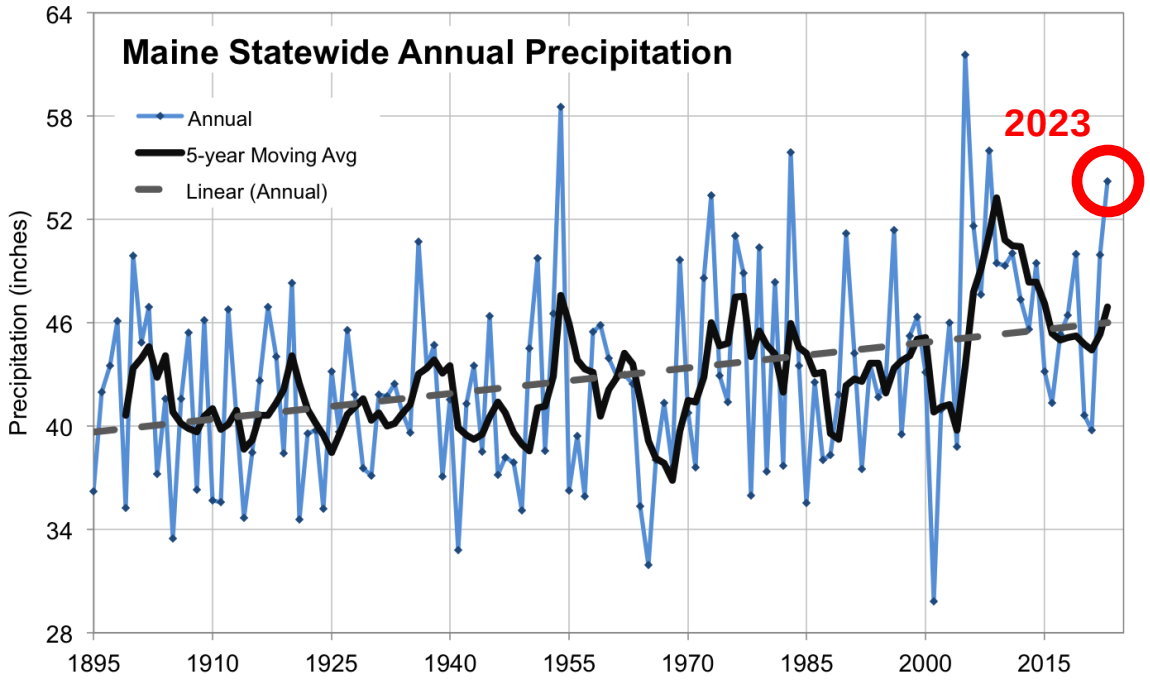
Temperature

- Annual increase of about 3.5 °F since 1895
- The 10 warmest years have occurred years since 1998
- Projected 2–10 °F warming by 2100 depending on emissions scenario

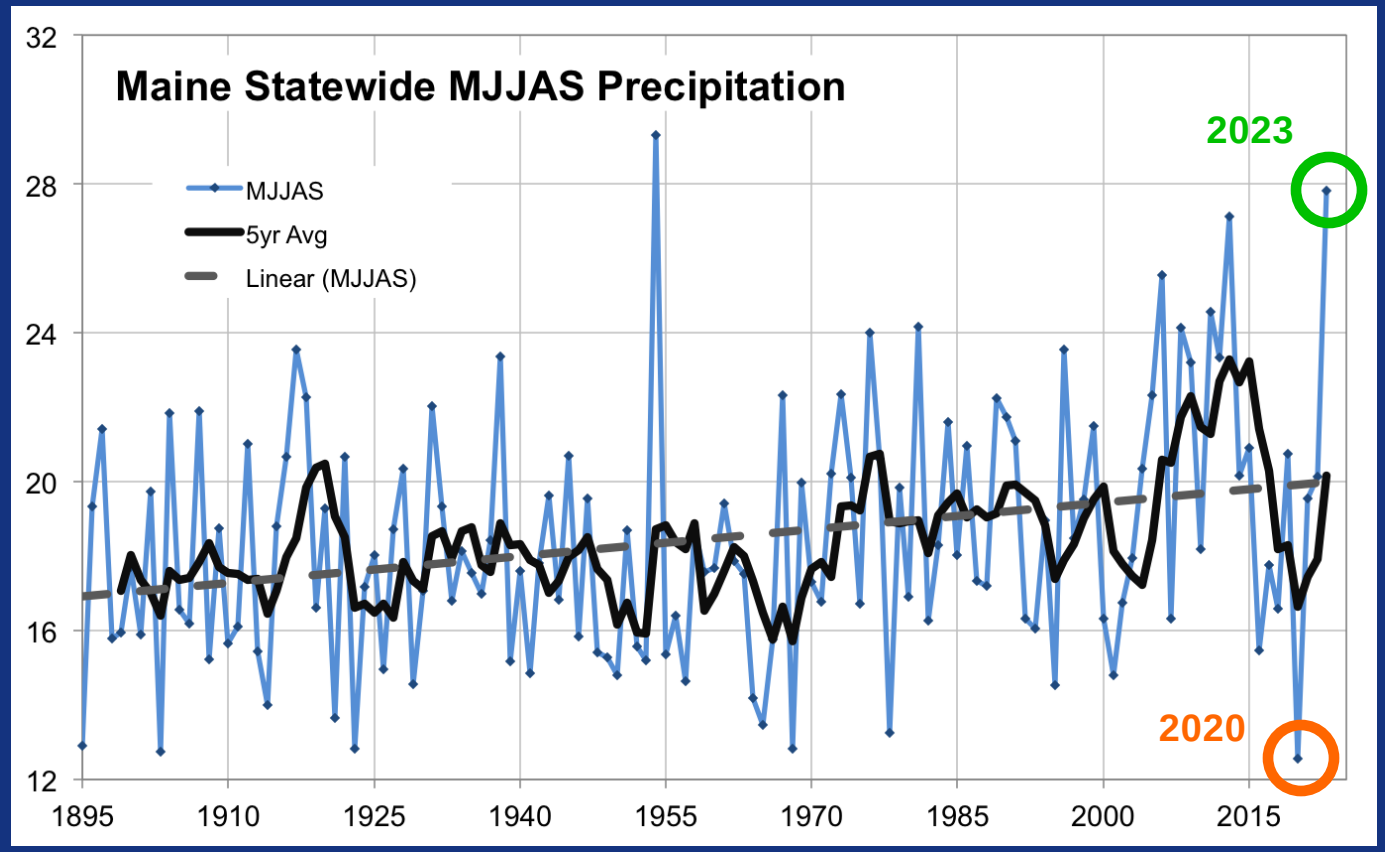
Precipitation

- Annual increase of about 6" since 1895
- Heavy precipitation > 2" per day becoming more common
- Projected 5-14% annual rainfall increase by 2100 and more frequent extremes





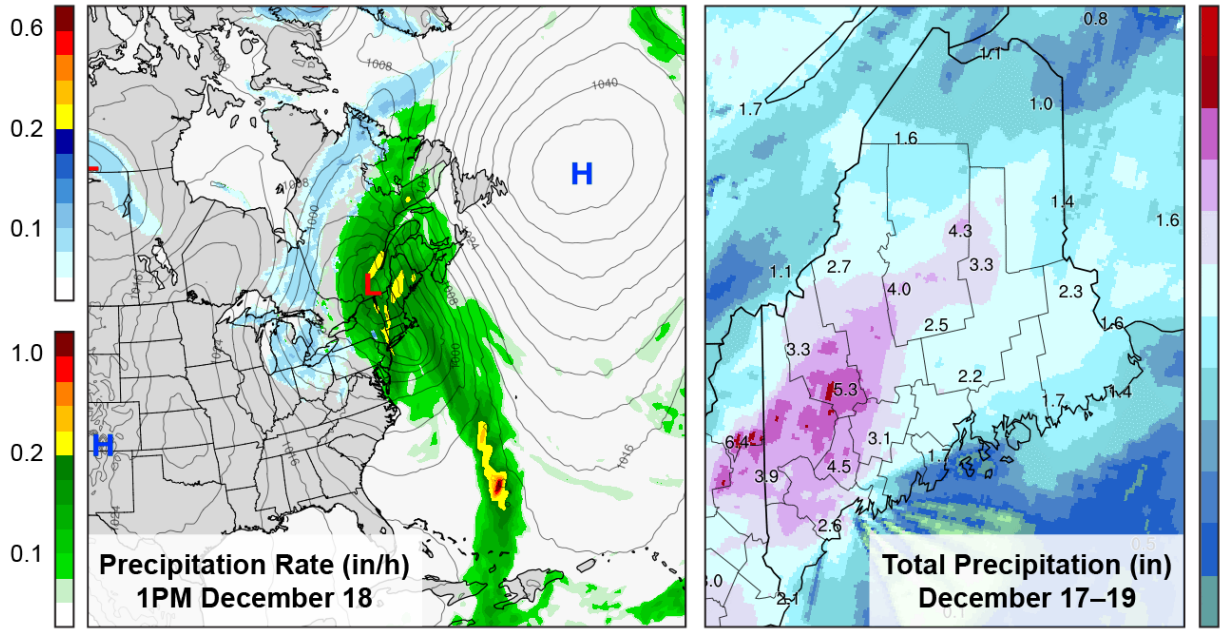
Season Extremes, May–Sep 2020 (driest), 2023 (2nd wettest)



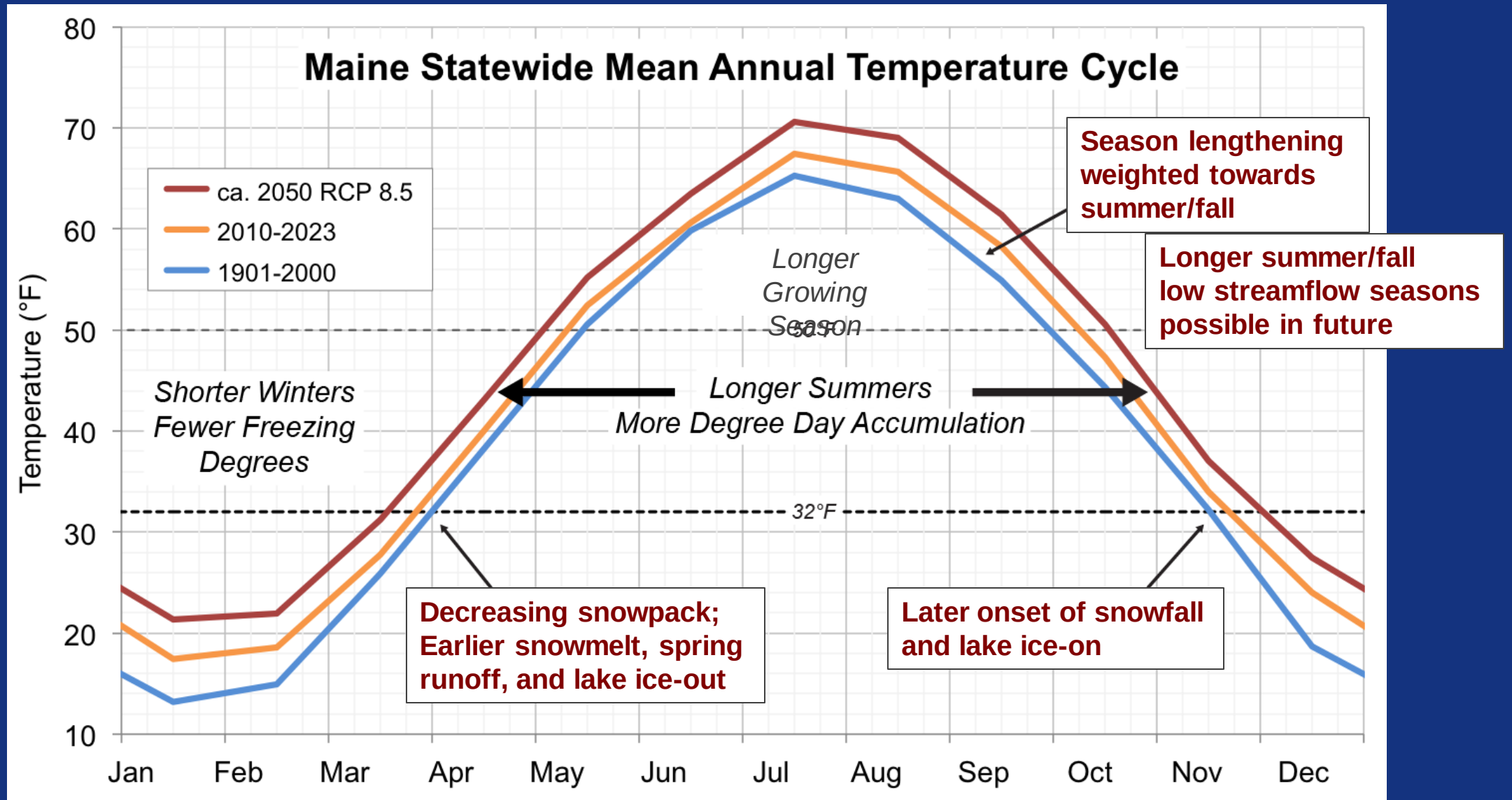
- Recent studies find an intensified hydrologic cycle could produce “drier dry” periods, and “wetter wet” periods. Must manage both.
- Maine variously impacted by drought 2016–2022. The 2020 drought, May–Sep, culminated in drought disaster declaration before wet weather returned in October.
- In 2023, frequent rain led to flooding, erosion, difficult field access, and in some cases decreased yield or crop losses.

Warming is projected to increase storm intensities, but changes in frequency are uncertain

- Storms enhanced by warming-driven intensification of the hydrologic cycle. Also associated with weaker circulation and blocking patterns.
- Strong mid-autumn storms 1979–2019 found to have trend toward more accompanying precipitation; no trend in frequency or wind intensity.
- Most climate models project an overall decrease in extratropical cyclones along the U.S. East Coast, but with increasing intensity.
- More research is needed to understand both



As temperature rises, the warm season lengthens and the winter snow and ice season shortens



Human Dimensions

Cindy Isenhour
Professor of Anthropology and Climate Change
University of Maine

Scientific &
Technical Subcommittee Highlights

May 16, 2024

Jonathan Rubin – University of Maine, Professor of Economics, Director of the MCS Policy Center. Expertise: environmental economics, transportation, energy, climate policy.

Rebecca Lincoln – Maine Center for Disease Control and Prevention. Expertise: Environmental epidemiology, exposure assessment, heat and health.

Darren Ranco– University of Maine, Professor of Anthropology, Chair Native Programs. Expertise: indigenous communities, climate adaptation.

Cindy Isenhour – University of Maine, Anthropology and Climate Change. Expertise: mitigation/adaptation potential of circular economy policy. Climate justice.

Susan Elias - Staff Scientist Maine Medical Center Research Institute. Expertise: vector-borne disease, one health, modeling disease risk.

Allison Gardner– University of Maine, School of Biology and Ecology. Expertise: vector-born disease, epidemiology.

Eileen Sylvan Johnson – Bowdoin, Environmental Studies. Expertise: community resilience, collaborative resource management, decision support tools.

Gail Carson – Colby College, Environmental Studies, Director of the Buck Lab for Climate & Environment.Expertise: environmental health, food security, safer chemicals

HUMAN DIMENSIONS WORKING GROUP

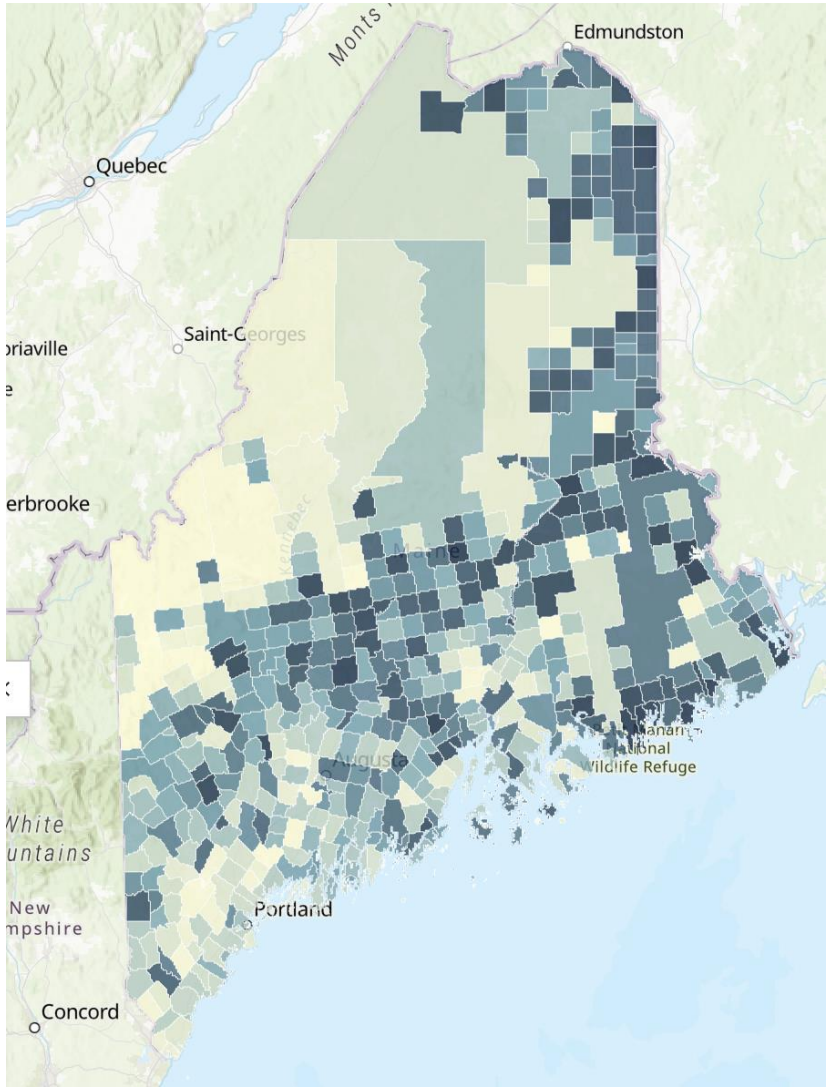
Social & Economic impacts

Climate change is **already** affecting Maine's social and economic systems.

- Home insurance rates
- Growing $ costs of CO2 pollution
- More than monetary

Projections are uncertain.

- Projected increase in demand for services
- Market responses: some hopeful, others not (solar, insurance, winter tourist markets)
  - e.g. Housing: market response to migration, impacts of storm events, insurance, heating/cooling efficiency

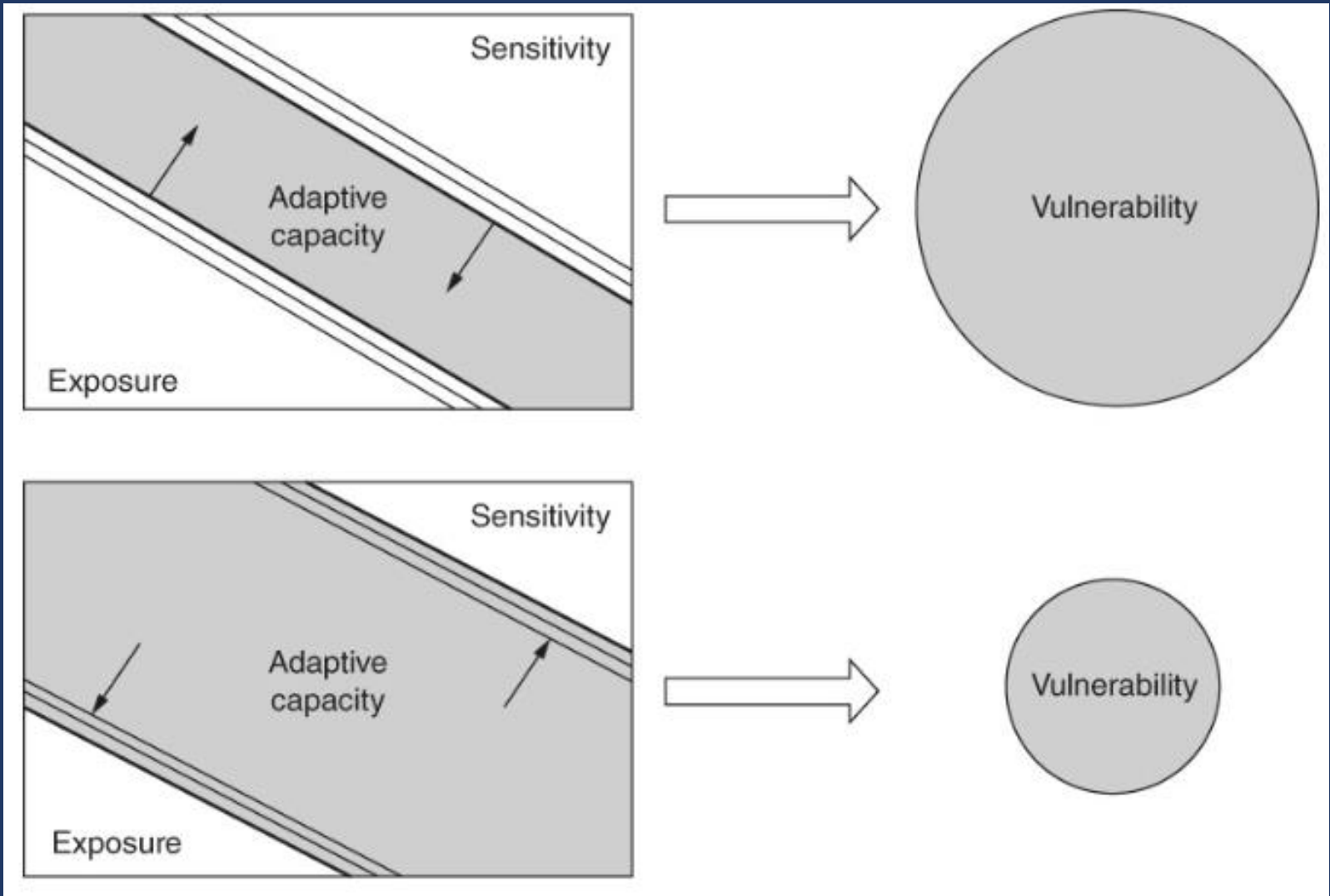


Maine SVI: The Maine Climate Impact Dashboard

Vulnerability

Mainers experience differential levels of vulnerability:

- Physical risk/exposure: coastal, inland, drought, heat, flooding
- Social vulnerability: high rates of poverty, disability, elderly populations
- Adaptive capacity: social networks, collective action, governance structure, information



Thomas et al. 2019

Vulnerability Matters

- can be **exacerbated** by policy that represents the views/interests of some
- can be **reduced** through inclusive and participatory designs (empowerment and sovereignty)
- reduced vulnerability can result in **co-benefits** and lead to more effective climate action

Photo: Deer Isle Causeway (Island Institute)

Adaptation and Resilience

Resilience is linked to **strong social infrastructures and institutions**:

- importance of social capital
- collaboration and capacity building
- care across scale
- infrastructure for participatory governance

Key **enablers** of adaptation success:

- good information about impacts and solutions
- political commitments
- institutionalization of planning frameworks
- policies with clear goals
- adequate financial resources
- **inclusive governance**

Human Health

Rebecca Lincoln
Environmental Epidemiologist
Maine Center for Disease Control

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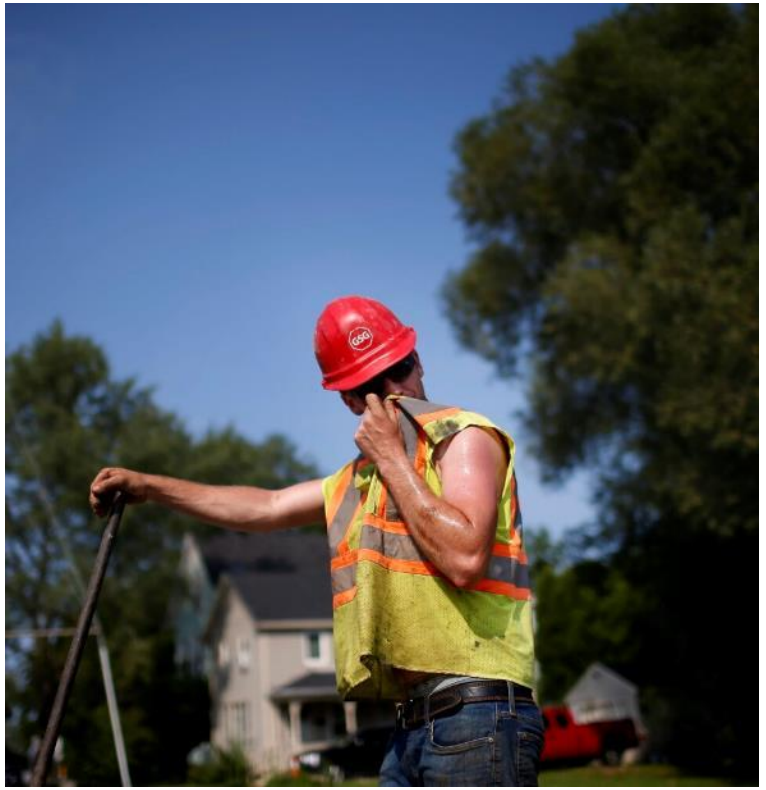
Takeaway #1: Extreme Weather & Health

- Maine is projected to experience more periods of **extreme heat**
  - **Men, middle-aged adults,** and those who **work outdoors/in a hot environment** are disproportionately affected
- Recent severe **heat waves** in **temperate areas** of the U.S. have caused significant morbidity and mortality and **illustrate the need for adaptation**
- Evidence for **health impacts of heat exposure** continues to expand
- **Other types of extreme weather** events can also have significant health impacts
  - The December 18, 2023, storm caused at least **4 confirmed deaths** and **dozens** of **Emergency Department visits**



Takeaway #2: Mental Health

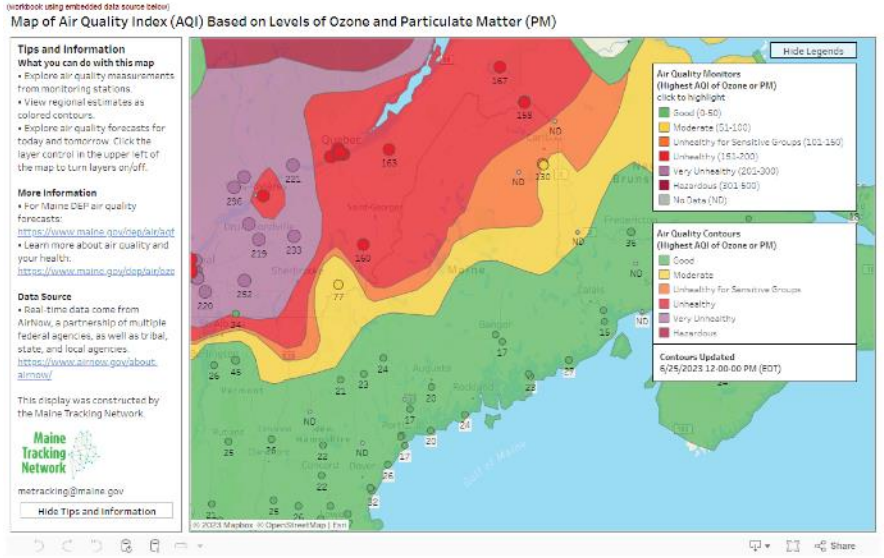
- There is **increasing evidence** for adverse **mental health** impacts of climate change
  - Direct **exposure** to **climate hazards** can **exacerbate existing conditions** or **cause new onset of symptoms**
  - Concern for current and future **threats posed by climate change** can produce **'climate anxiety'**
- Rates of **mental health disorders** remain **high in Maine**, and there are persistent **gaps between existing need** and **available services**
- Efforts to **expand and improve mental health services** should account for **climate-related impacts** and **climate anxiety**
- Efforts to **improve preparedness for climate hazards** should account for the likely **need for mental health services**

Takeaway #3: Vector-borne Diseases

- A **warmer, wetter Maine climate** is likely to support **increasing** populations of **ticks and mosquitoes**
- **Blacklegged (deer) ticks** are established in southern Maine and **increasing in northern Maine**
  - Carriers of Lyme disease, anaplasmosis, babesiosis, Powassan encephalitis, relapsing fever
  - **Lyme disease cases** in Maine continue to **increase**
- **Lone star ticks** are **appearing more frequently** in Maine
  - Carriers of ehrlichiosis, tularemia, alpha-gal syndrome (red meat allergy)
- **2023** was an **unusually active** year for **mosquito-borne diseases**
  - **Veterinary outbreak** of **Eastern Equine Encephalitis Virus (EEEV)**
  - **Mosquitoes** carrying **EEEV**, **West Nile Virus**, and **Jamestown Canyon Virus**

Takeaway #4: Air Quality

- In **2023**, the Eastern U.S. experienced periods of **poor air quality** due to wildfires in Canada and the Western U.S.
- **Most of the future health burden** from Western states' wildfire smoke is likely to be **on the East Coast** due to **higher population density**
- Other climate-related air quality issues of importance include increasing levels of **pollen/aeroallergens**
- **Maine Center for Disease Control (CDC)** is working with the Department of Environmental Protection (**DEP**) to develop tools for tracking **climate-related air quality** issues:
  - Developing a **wildfire** and **air quality data dashboard**
  - Implementing a statewide **pollen monitoring network**



Takeaway #5: Food & Water

- **Heat, storms, and drought** can damage crops, increase food prices, and lead to **food insecurity** in Maine and globally
- **Water quality** is vulnerable to climate change, especially from **flooding and drought**
  - Extreme **precipitation** and **flooding** can cause outbreaks of **gastrointestinal disease**
  - **Warmer** conditions contribute to the formation of **harmful algal blooms** in lakes and oceans
  - **Drought** can impact **well water availability and quality** through **depletion**, mobilization of **arsenic** and other contaminants, and **saltwater intrusion** in coastal areas
- **Warming ocean waters** can allow for the spread of **harmful pathogens** such as ***Vibrio* bacteria** through **shellfish contamination** or **infection of wounds** in bathers

Maine Climate Council – Climate Science Webinars

Climate & Human Dimensions

Thursday, May 16, 12-1PM

Registration link: https://mainestate.zoom.us/webinar/register/WN_7f8ZI003Qlm837-gQdvyrA#/registration

Forests, Biodiversity & Agriculture

Wednesday, May 29, 12-1PM

Registration link: https://mainestate.zoom.us/webinar/register/WN_Wb_wvsIeTVWK11TsfeZCFw#/registration

Sea Level Rise & Marine Systems

Wednesday, June 5, 12-1PM

Registration link: https://mainestate.zoom.us/webinar/register/WN_96fV4Zj6RLuEmgJfLLU52w#/registration