



Delaware's Climate Change Impact Assessment



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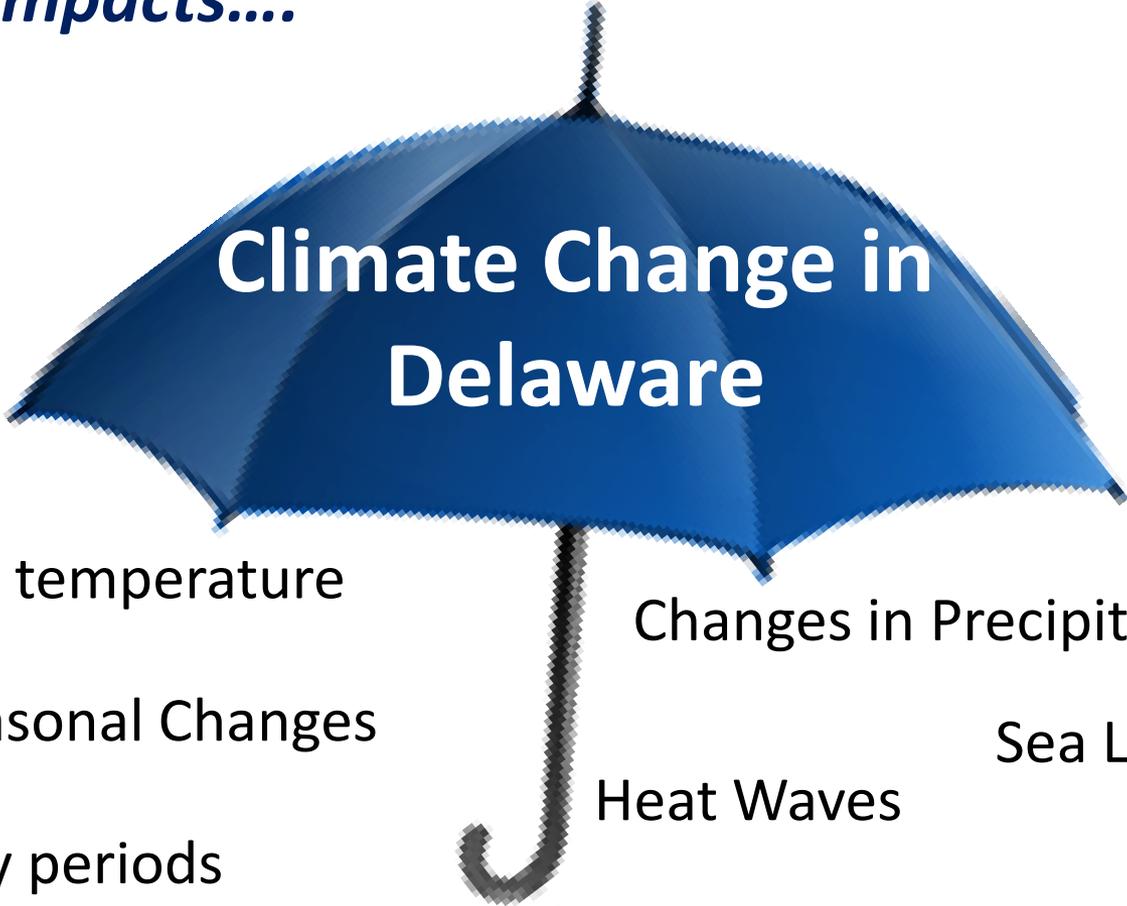
Center for Inland Bays – Citizens Advisory Committee
July 18, 2013

Why is the Assessment important for Delaware?



The goal of the Delaware Climate Change Impact Assessment is to understand and communicate the current and future impacts and risks from a changing climate.

The Assessment examines a wide range of climate impacts....



Climate Change in Delaware

Changes in temperature

Changes in Precipitation

Seasonal Changes

Sea Level Rise

Heat Waves

Extended dry periods

Heat Index

First and Last Frost

Extreme precipitation events

The Assessment is based on the best available climate science.....

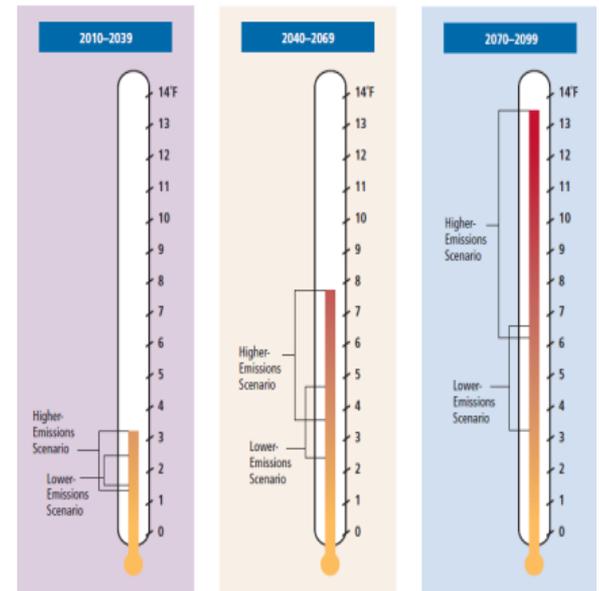


- Peer-reviewed studies
- Scientific assessments
- Steering Committee of scientists and practitioners
- Delaware historic climate trends analyzed by Dr. Dan Leathers, DE State Climatologist (UD)
- Delaware climate projections developed by Dr. Katharine Hayhoe (Texas Tech University)

Climate Trends and Projections:

- **Observational trends**
 - Historic data analysis of Delaware's climate over past 100 years
- **Climate projections**
 - High and low scenarios through 2100
 - Average annual and seasonal projections
 - Extremes of temperature and precipitation
- **Climate indicators**
 - Examples include:
 - Number of days above 90° F
 - Number of days of precipitation > 2"

FIGURE 1: Changes in Regional Average Summer Temperature

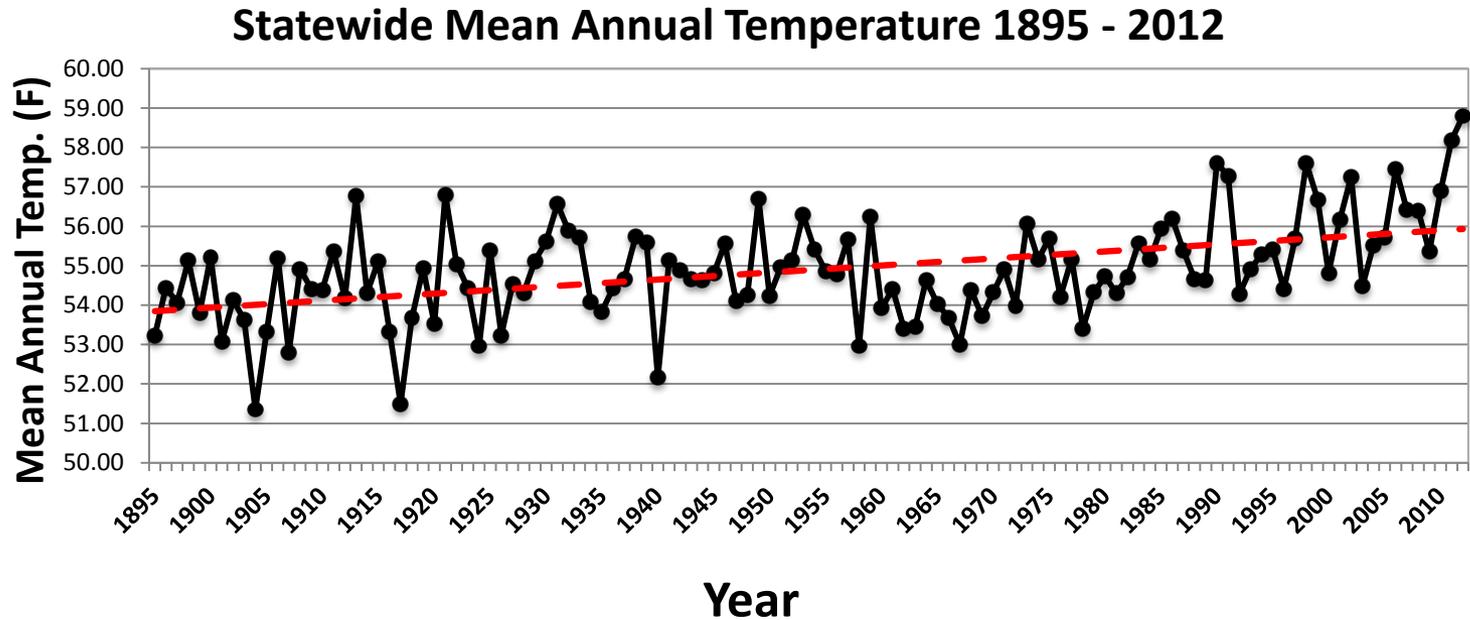


[sample graphic]

TEMPERATURE

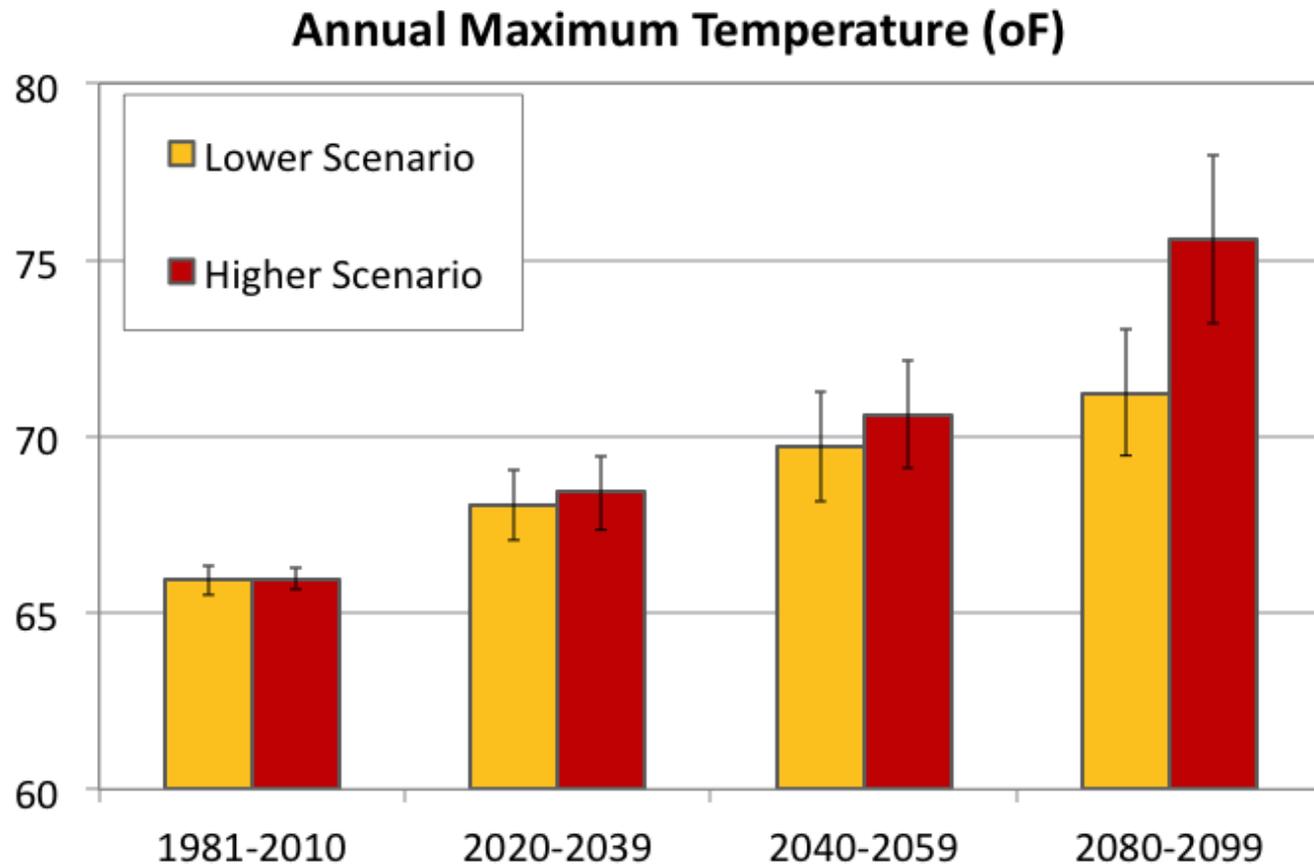
Historic observations:

An upward trend in mean ANNUAL TEMPERATURE since 1895 = $+0.2^{\circ}\text{F}$ / decade



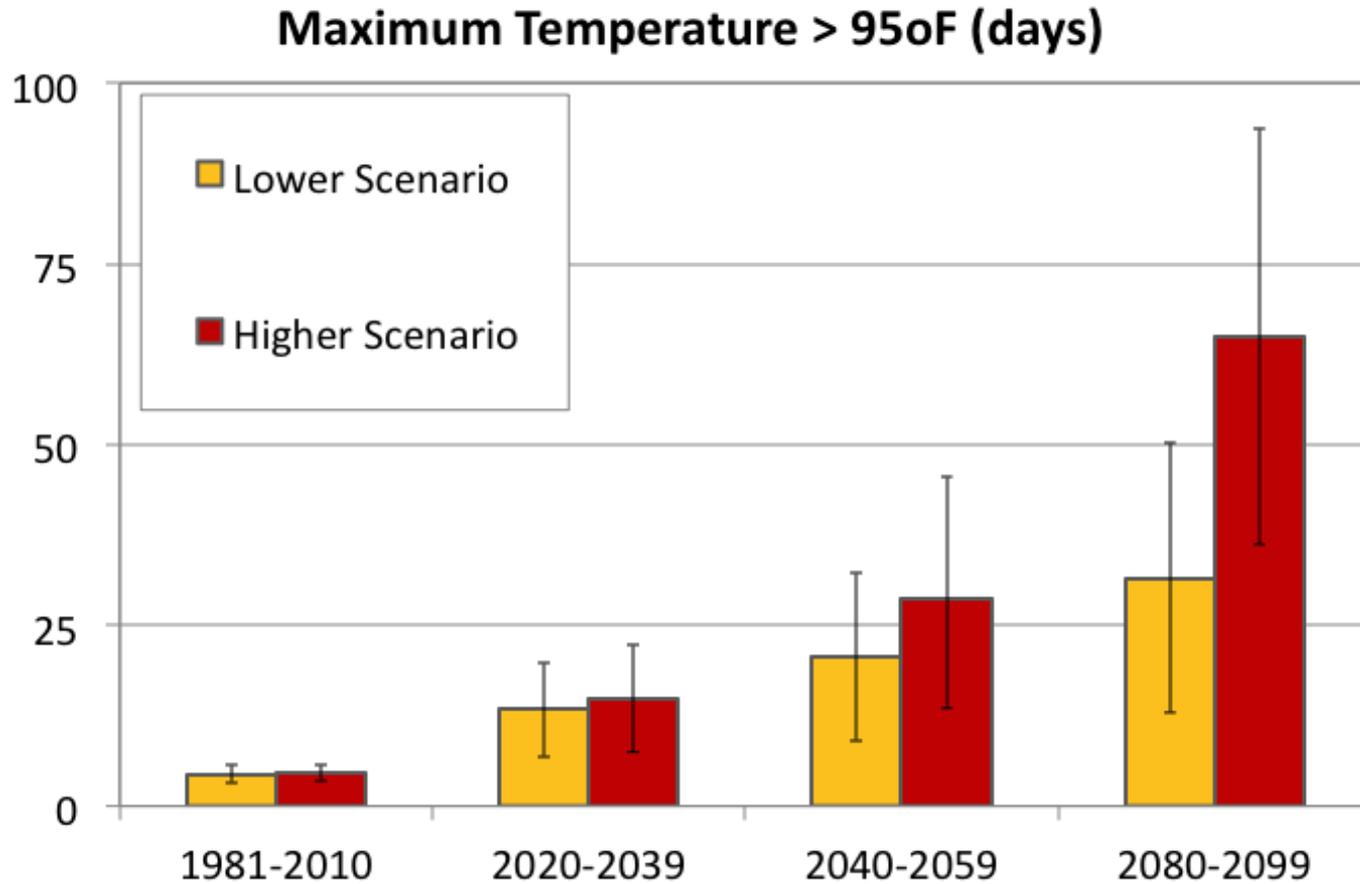
Source: Leathers 2013

In Delaware, mean annual maximum temperature is projected to continue to rise...



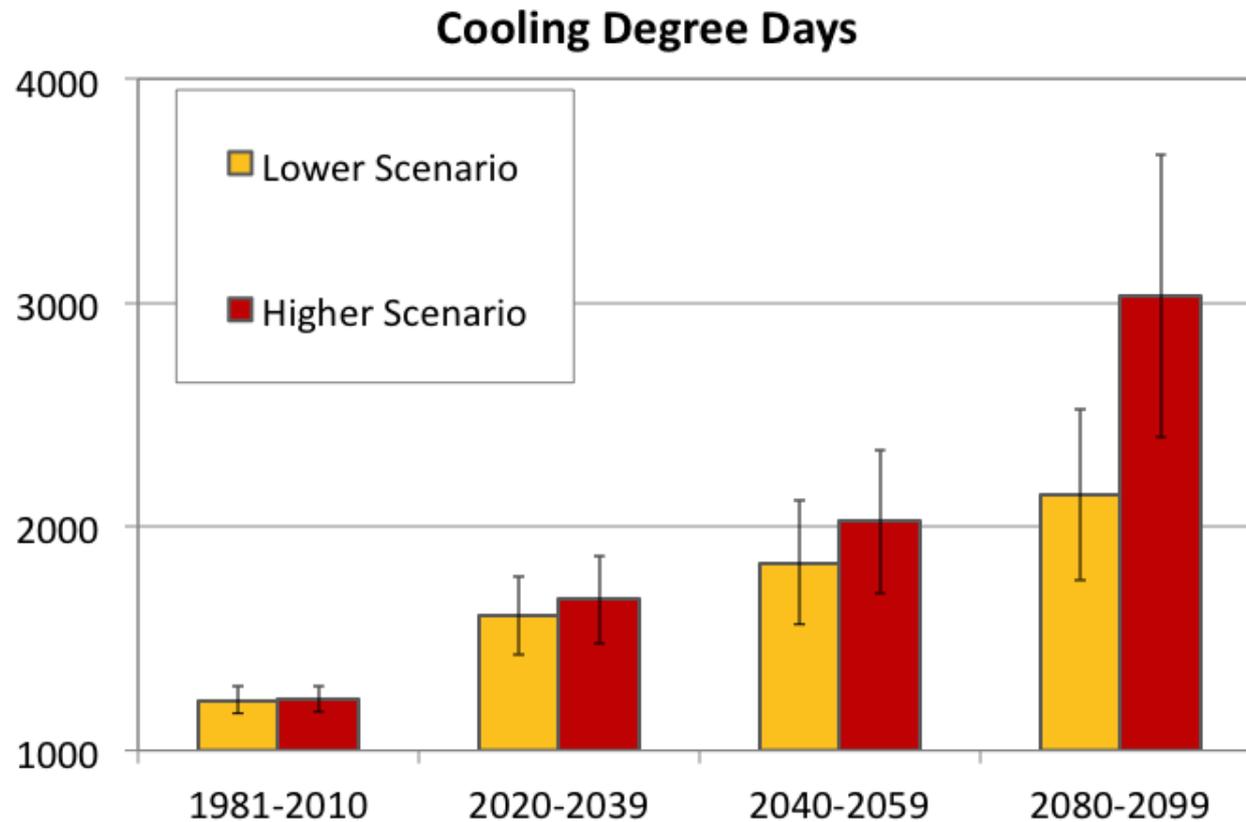
Source: Hayhoe, et al. 2013

More days above 95 degrees F...



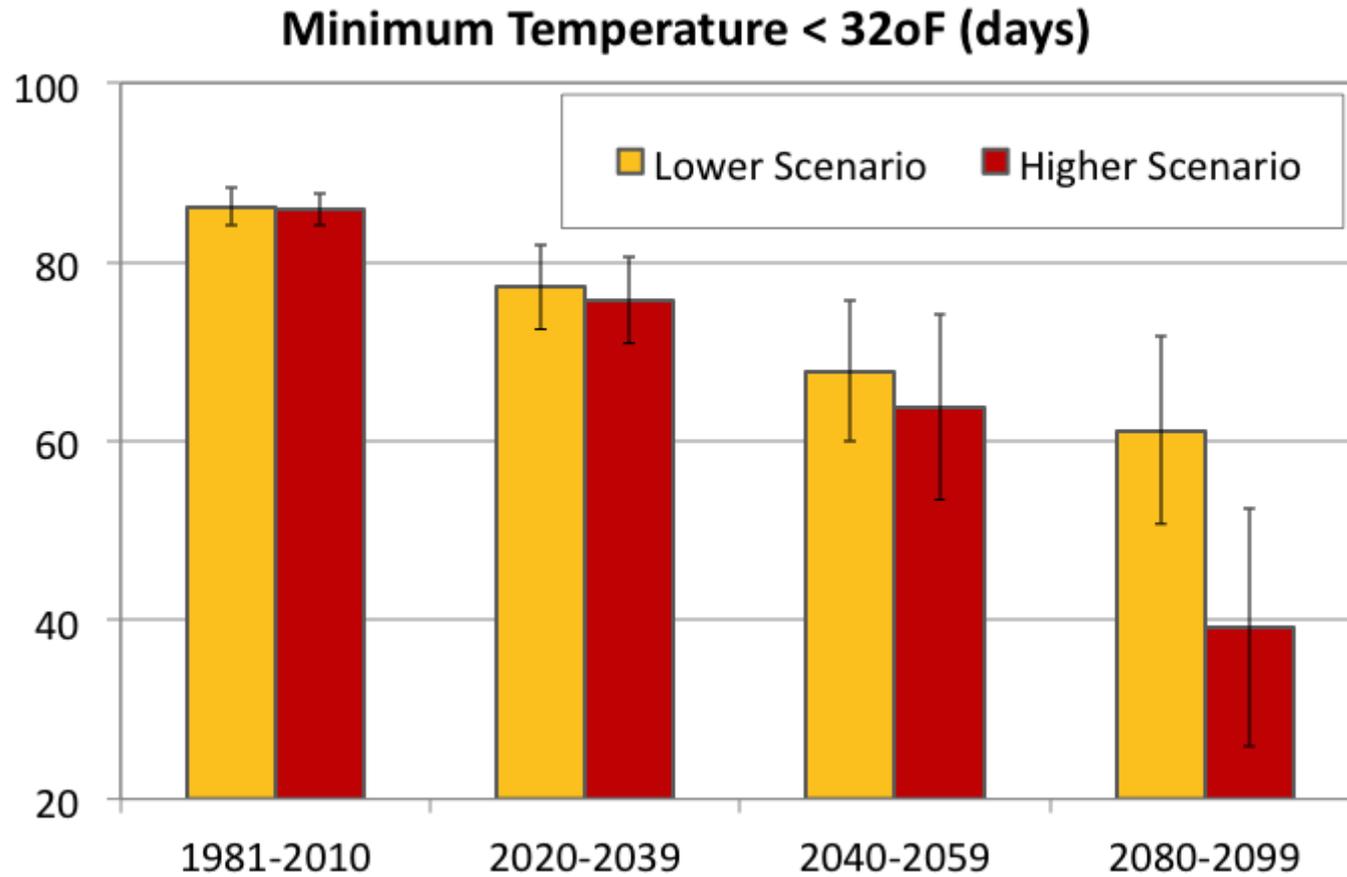
Source: Hayhoe, et al. 2013

.....leading to increased energy demands for cooling



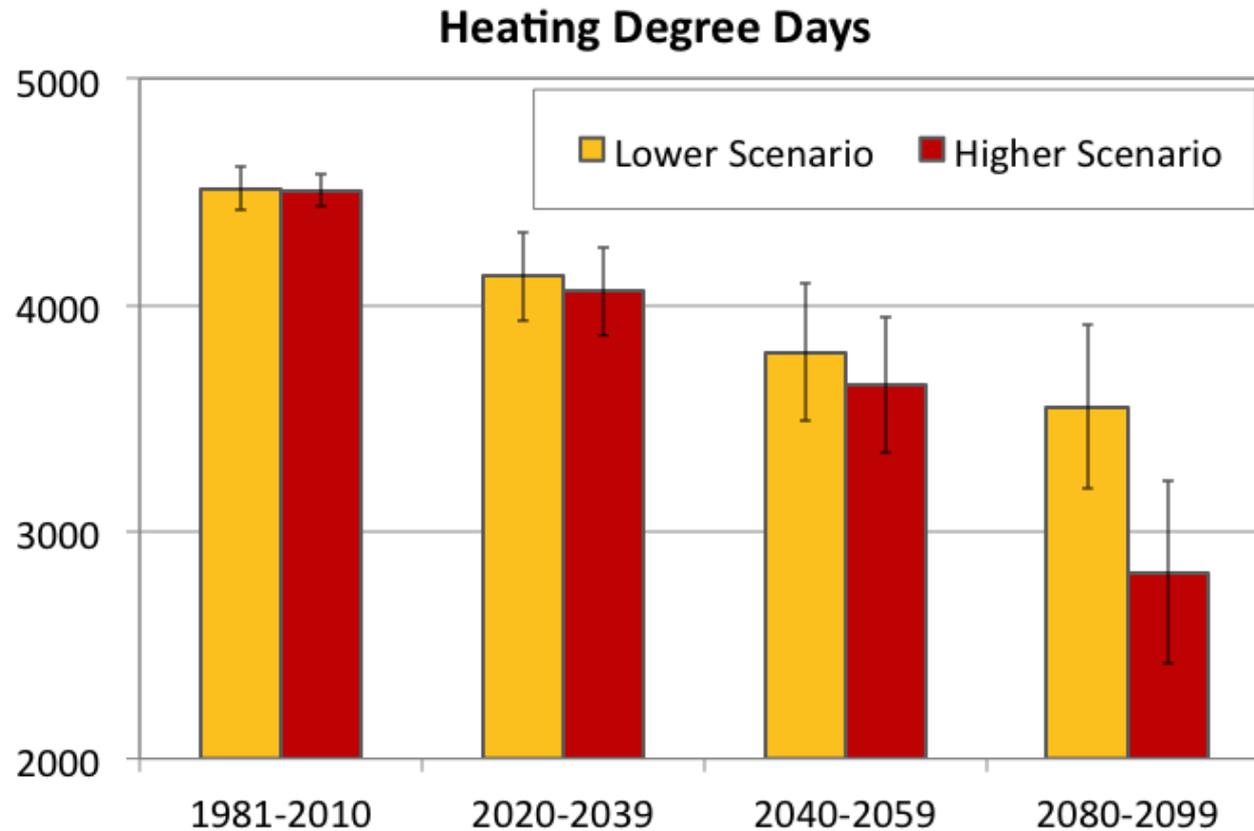
Source: Hayhoe, et al. 2013

Fewer days below freezing...



Source: Hayhoe, et al. 2013

... leading to decreases in heating demand



Source: Hayhoe, et al. 2013

Annual and seasonal temperatures are projected to increase, with slightly greater increases in summer as compared to winter.

Changes in agriculture

Shifts in energy demand

Extreme heat days and heat waves are becoming more frequent; extreme cold, less frequent.

Health risks

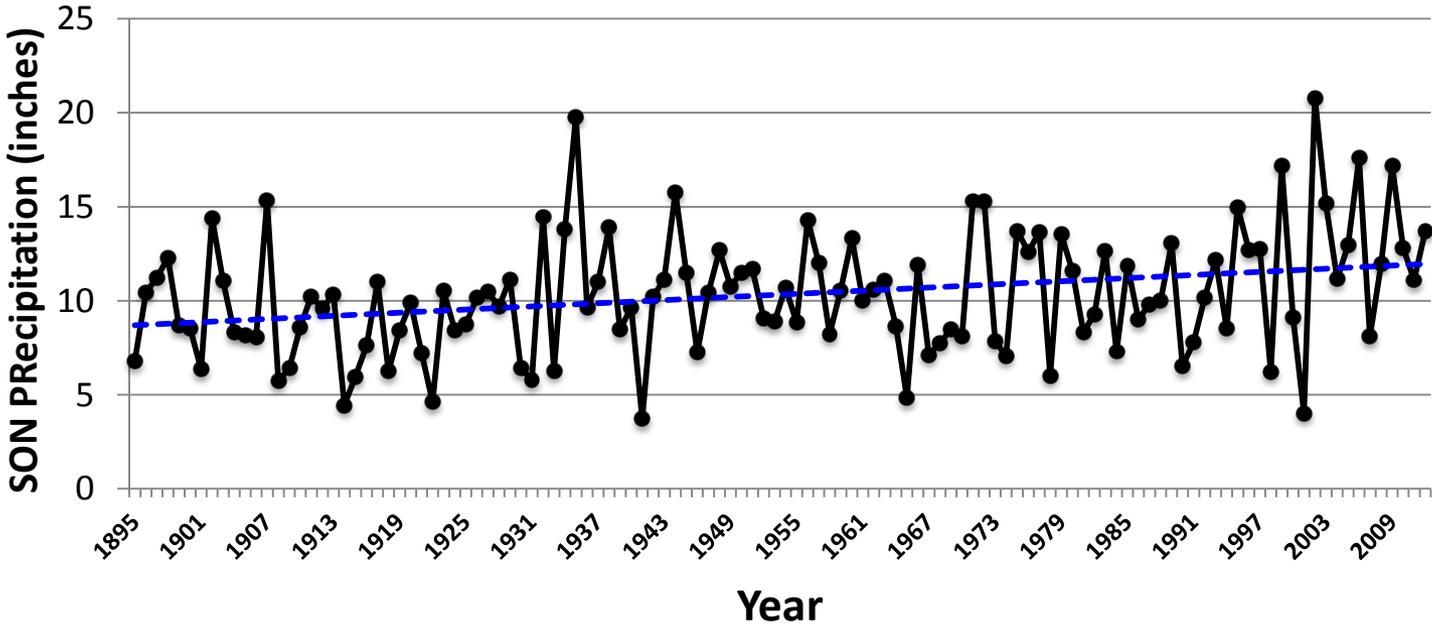
Impacts to tourism

PRECIPITATION

Historic Observations:

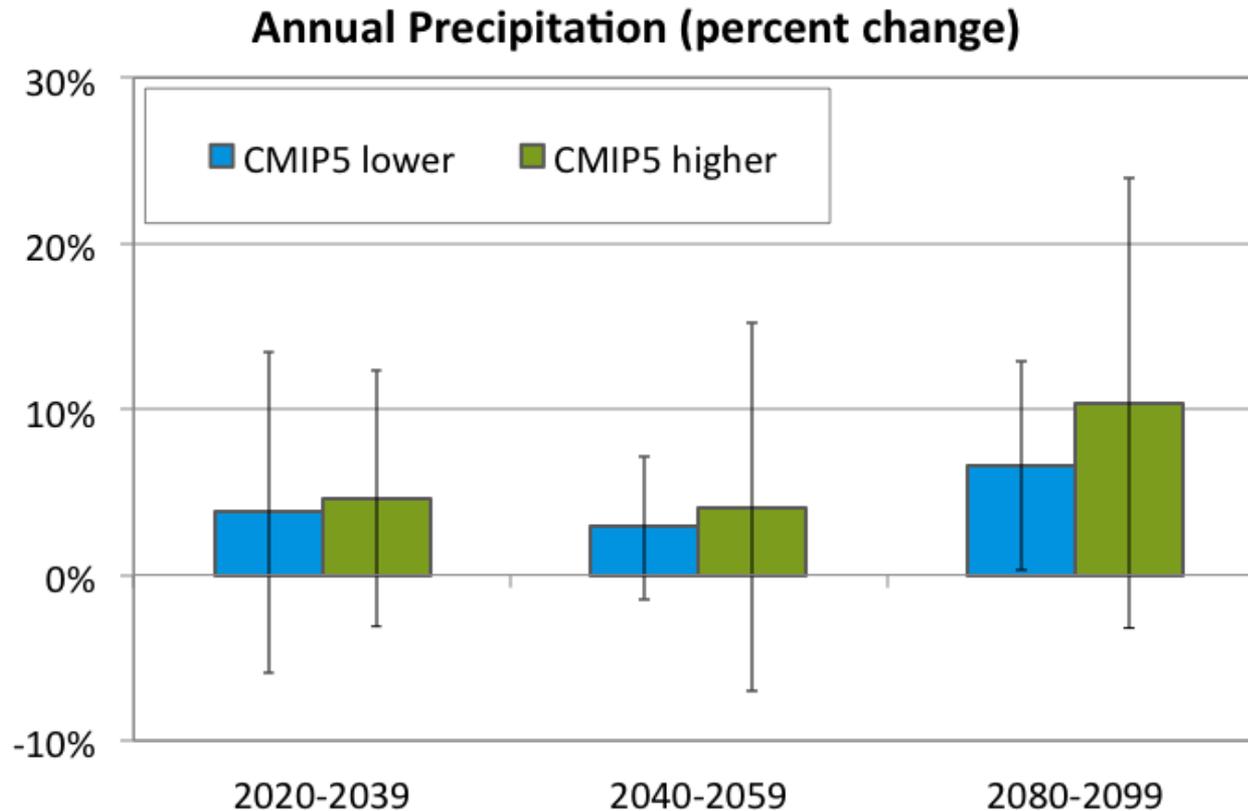
An upward trend in AUTUMN PRECIPITATION since 1895 = +0.27" / decade

Statewide Autumn (SON) Precipitation 1895 - 2012



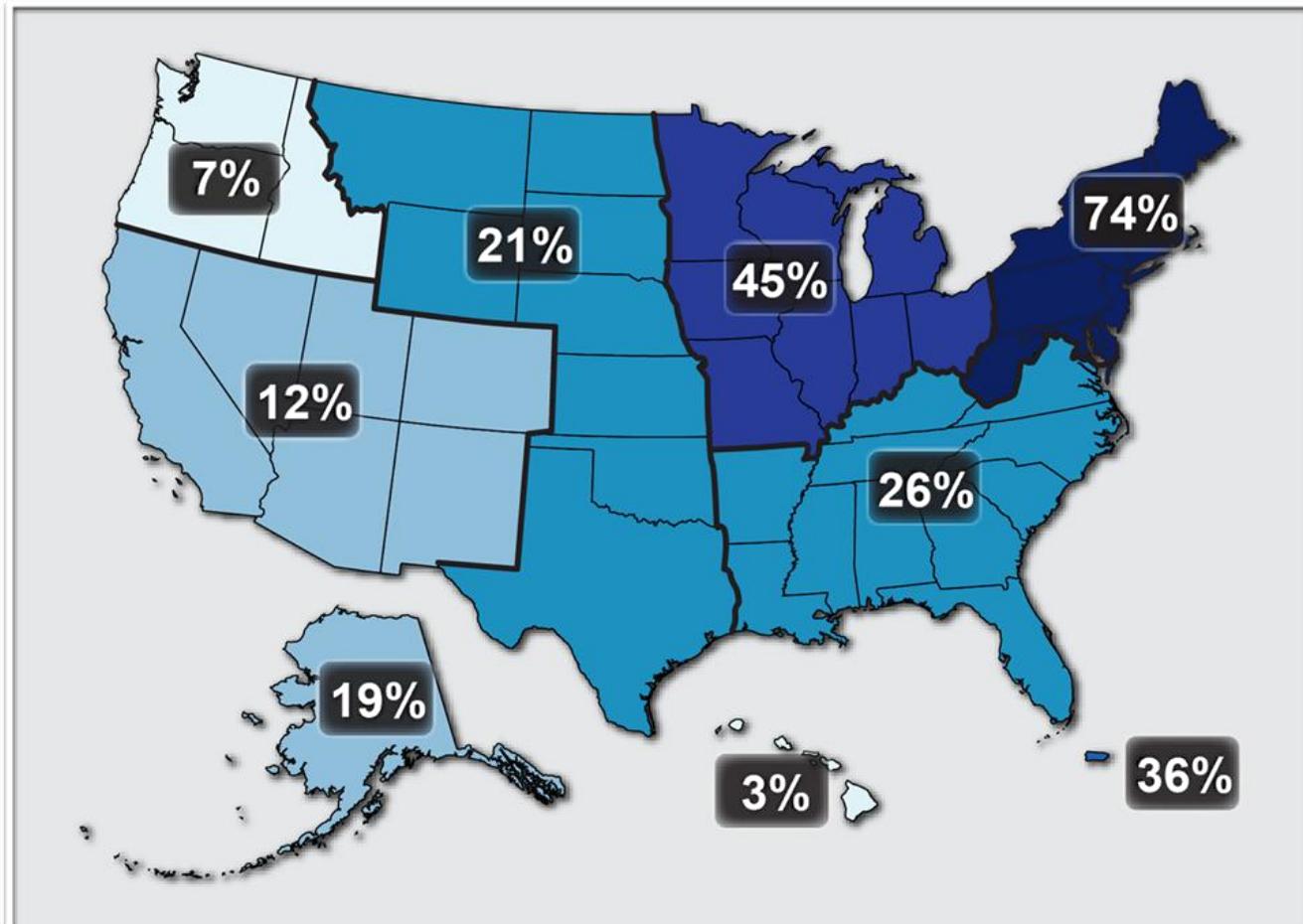
Source: Leathers 2013

***Annual precipitation is projected to increase....
primarily due to increases in winter and fall precipitation.***



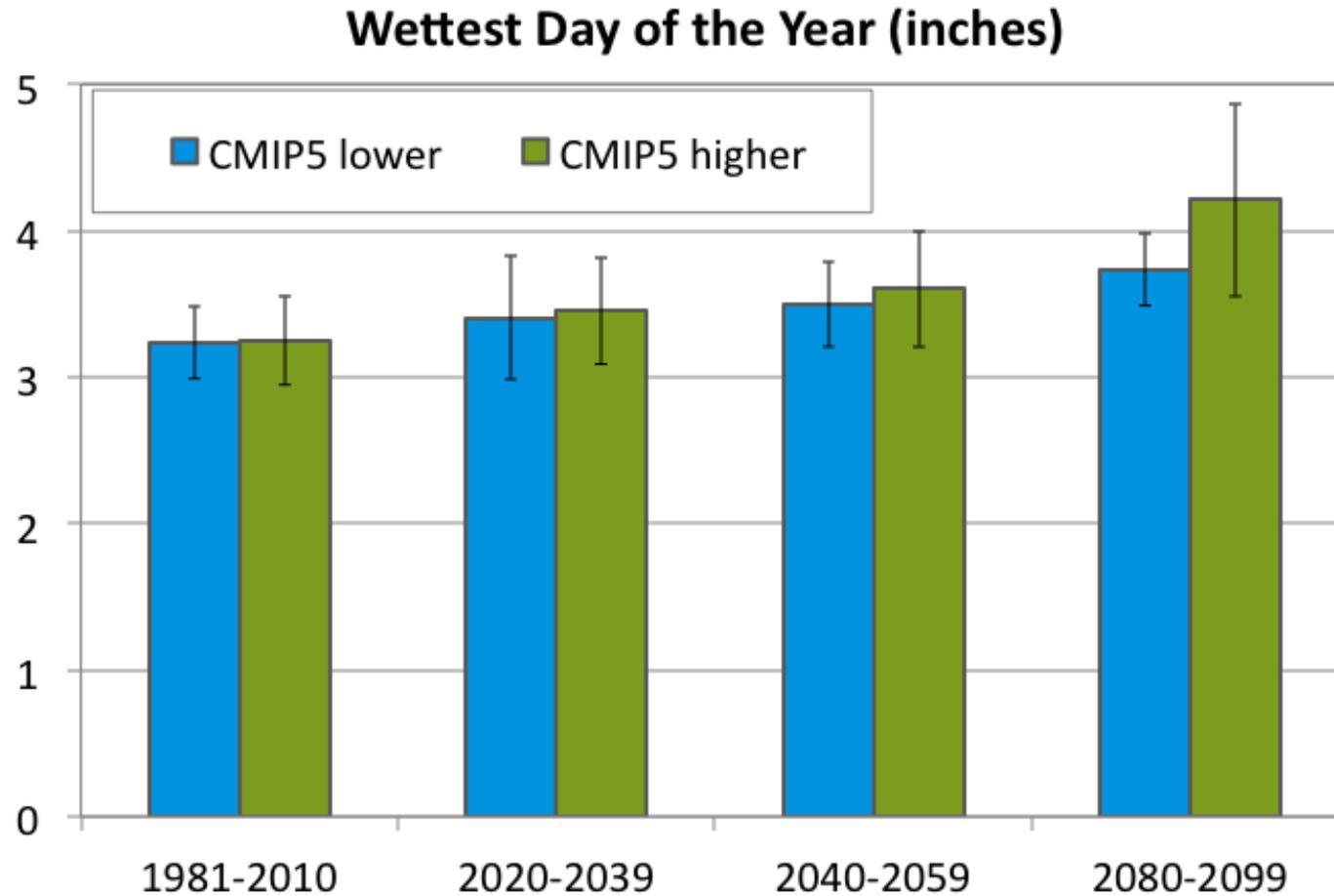
Source: Hayhoe, et al. 2013

Heavy precipitation is becoming more frequent...



Source: Third National Climate Assessment (draft, 2013)

This trend is projected to continue...



Source: Hayhoe, et al. 2013

Annual precipitation projected to increase, mostly due to changes in winter and fall.

Increased
flood risks

Heavy precipitation and dry days both expected to become more frequent as precipitation becomes more intense.

More dry
days
between rain
events

Infrastructure
failure during
peak rain
events

The Assessment evaluates potential impacts to key sectors in Delaware.....

Rural Impacts

- Agriculture
- Water Resources
- Ecosystems and wildlife

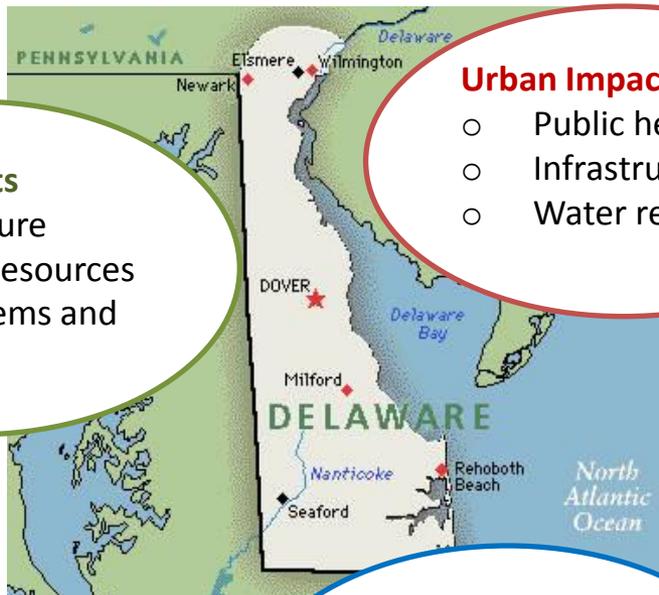
Urban Impacts

- Public health
- Infrastructure
- Water resources

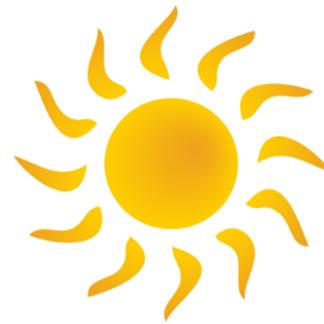
Coastal Impacts

- Ecosystems and wildlife
- Infrastructure
- Public health

- **Public Health**
- **Water resources**
- **Agriculture**
- **Ecosystems and Wildlife**
- **Infrastructure**



Increasing temperatures



Impacts to Agriculture



A longer growing season and warmer winter temperatures may benefit some crops, but may also result in increased competition from weed species and insect pests.

Impacts to Public Health



Extreme or prolonged periods of high heat will increase public health risks, especially in vulnerable populations. Increased temperatures may also exacerbate air quality problems, particularly ozone.



Impacts to Ecosystems

Freshwater habitats may be affected by higher water temperatures, resulting in algal blooms, decreased oxygen levels, and fish kills.

Increase in extreme rain events



Impacts to Infrastructure

Sewer and stormwater systems will be increasingly strained to manage peak flows that may exceed their design specifications.



Impacts to Agriculture

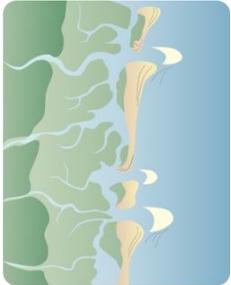
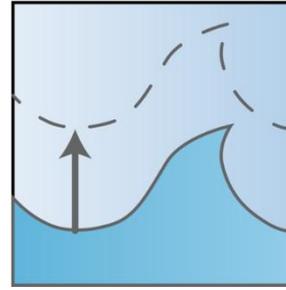
Rain events of increasing frequency and intensity will have significant impacts at critical periods in crop production, such as delayed planting or post-planting wash-outs and increases in disease pressure.



Impacts to Public Health

Flooding may stress the capacity of stormwater and wastewater outfalls, causing water to back up and transport polluted waters to upland areas.

Sea level rise



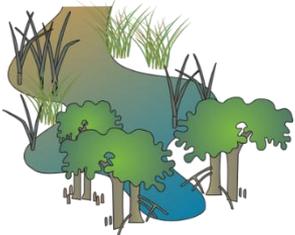
Impacts to Ecosystems

Beach and dune ecosystems are already vulnerable to coastal storms and the combined effects of sea level rise and severe storms may lead to increased erosion and loss of beach habitat.



Impacts to Infrastructure

Sea level rise is likely to impact transportation infrastructure – including roads, bridges, and evacuation routes. The Port of Wilmington is a major facility that could be significantly affected by sea level rise.



Impacts to Water Resources

Salinity in tidal reaches of rivers and streams may be affected by sea level rise and changes in precipitation patterns.

How will the Delaware Climate Change Impact Assessment be used?



- The Assessment is a scientific summary written for policy-makers, practitioners, and non-scientist readers.
- State agencies, local governments, business and community leaders will find the Assessment a resource for developing strategies to adapt to changing climate conditions.
- Educators can use the Assessment as a reference for climate science information that is relevant for Delaware.

Let us know how the Assessment can be useful to you – Thank you!