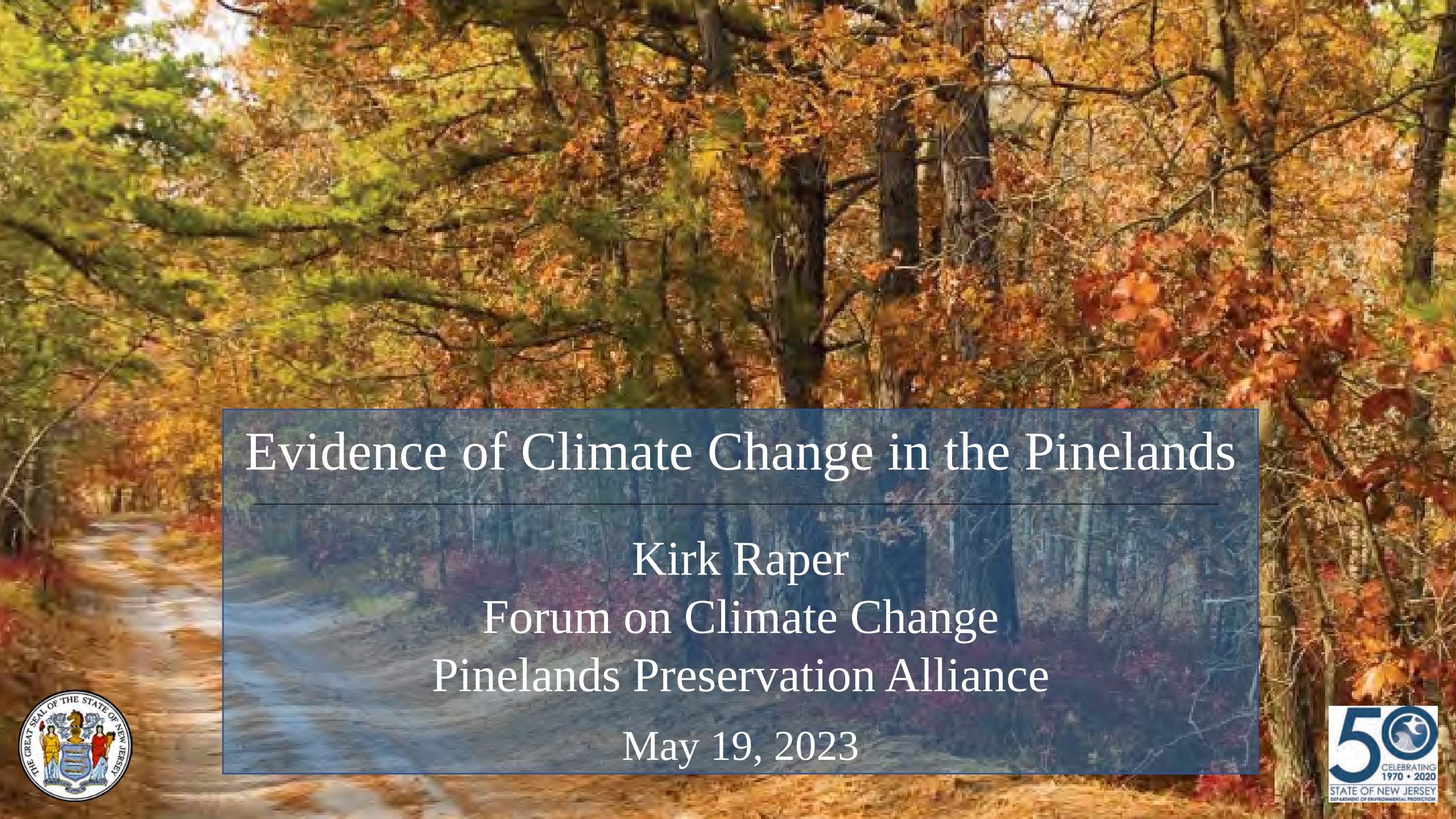


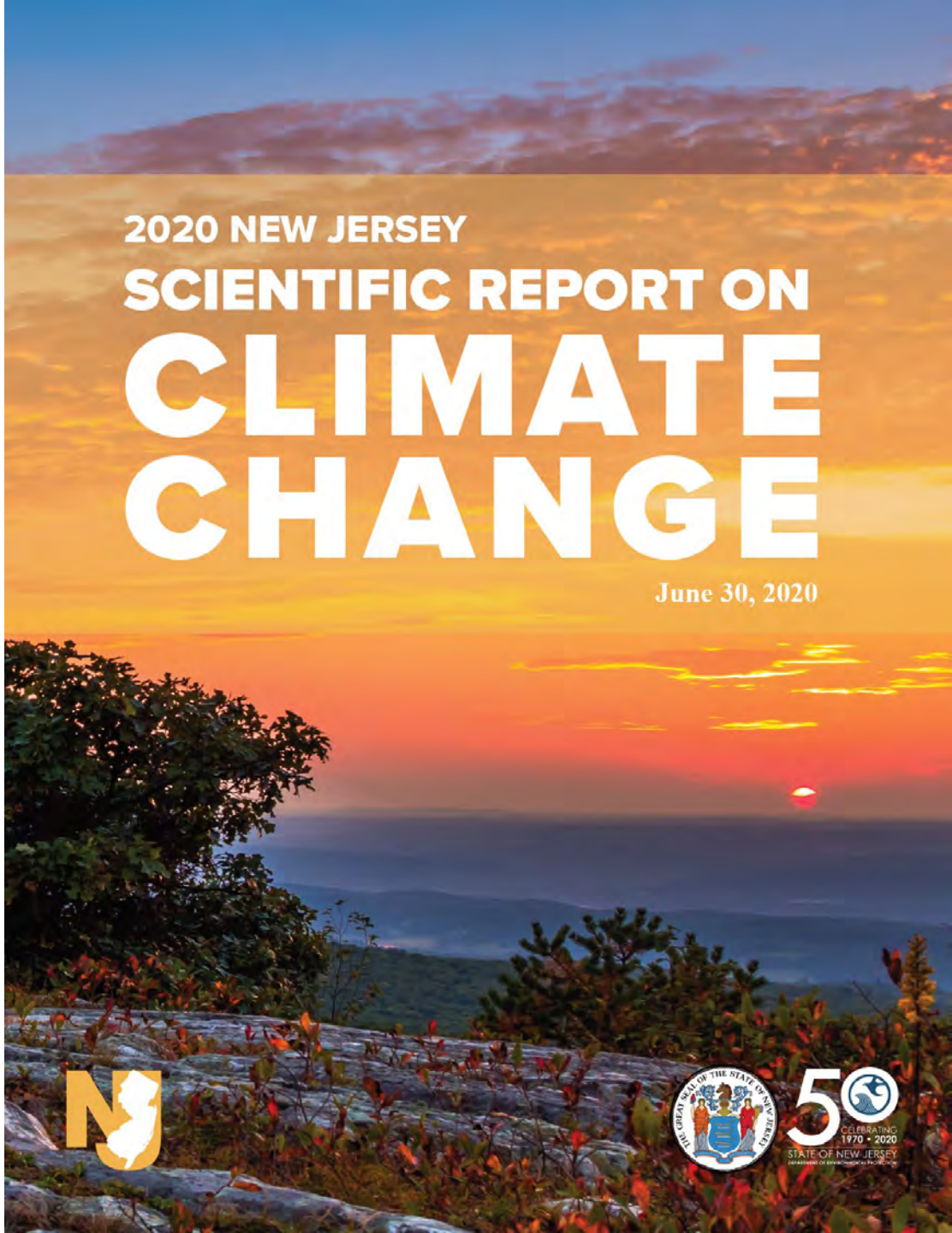
Evidence of Climate Change in the Pinelands

Kirk Raper
Forum on Climate Change
Pinelands Preservation Alliance

May 19, 2023

SCIENTIFIC REPORT ON CLIMATE CHANGE

- Greenhouse Gases and Climate Pollutants
- Temperature
- Precipitation
- Sea-Level Rise
- Ocean Acidification
- Resources and Ecosystem Impacts
- Research and Data Gaps



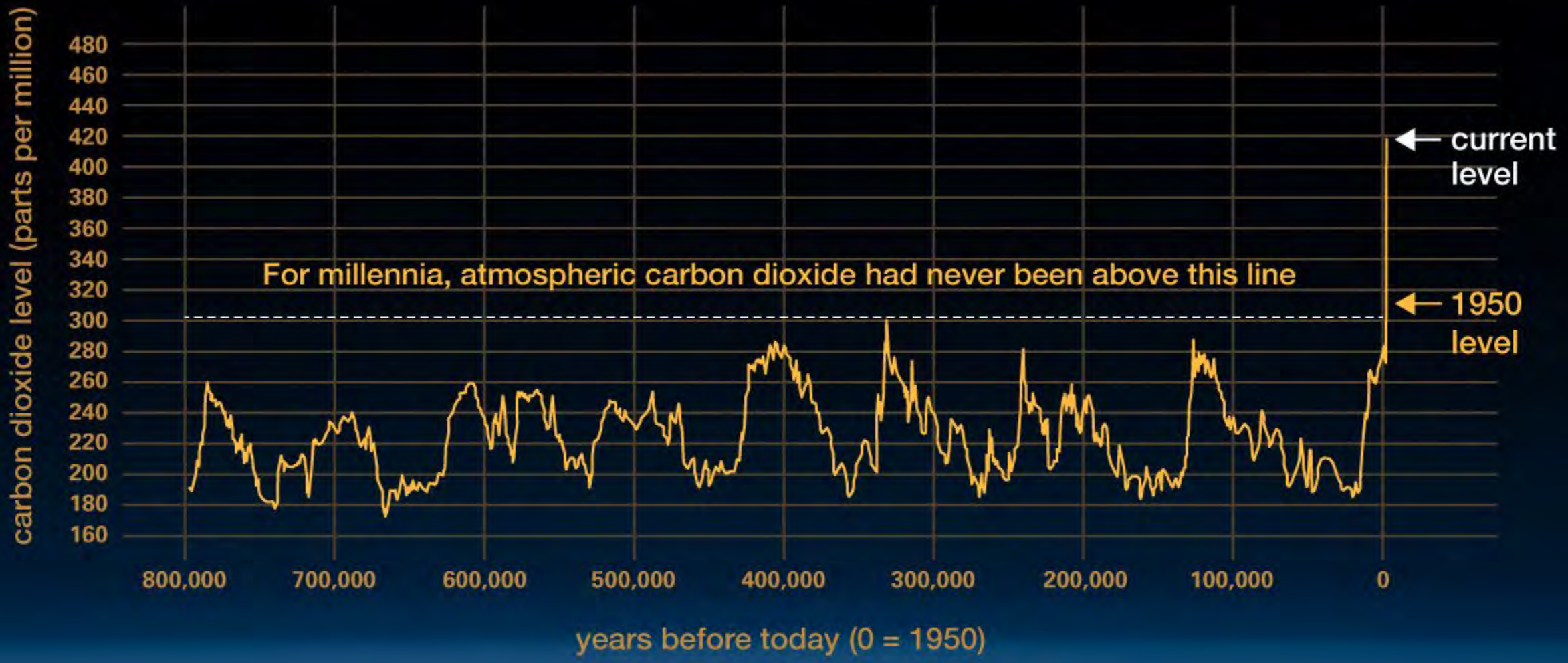
CLIMATE CHANGE IMPACTS ON HUMAN HEALTH AND COMMUNITIES

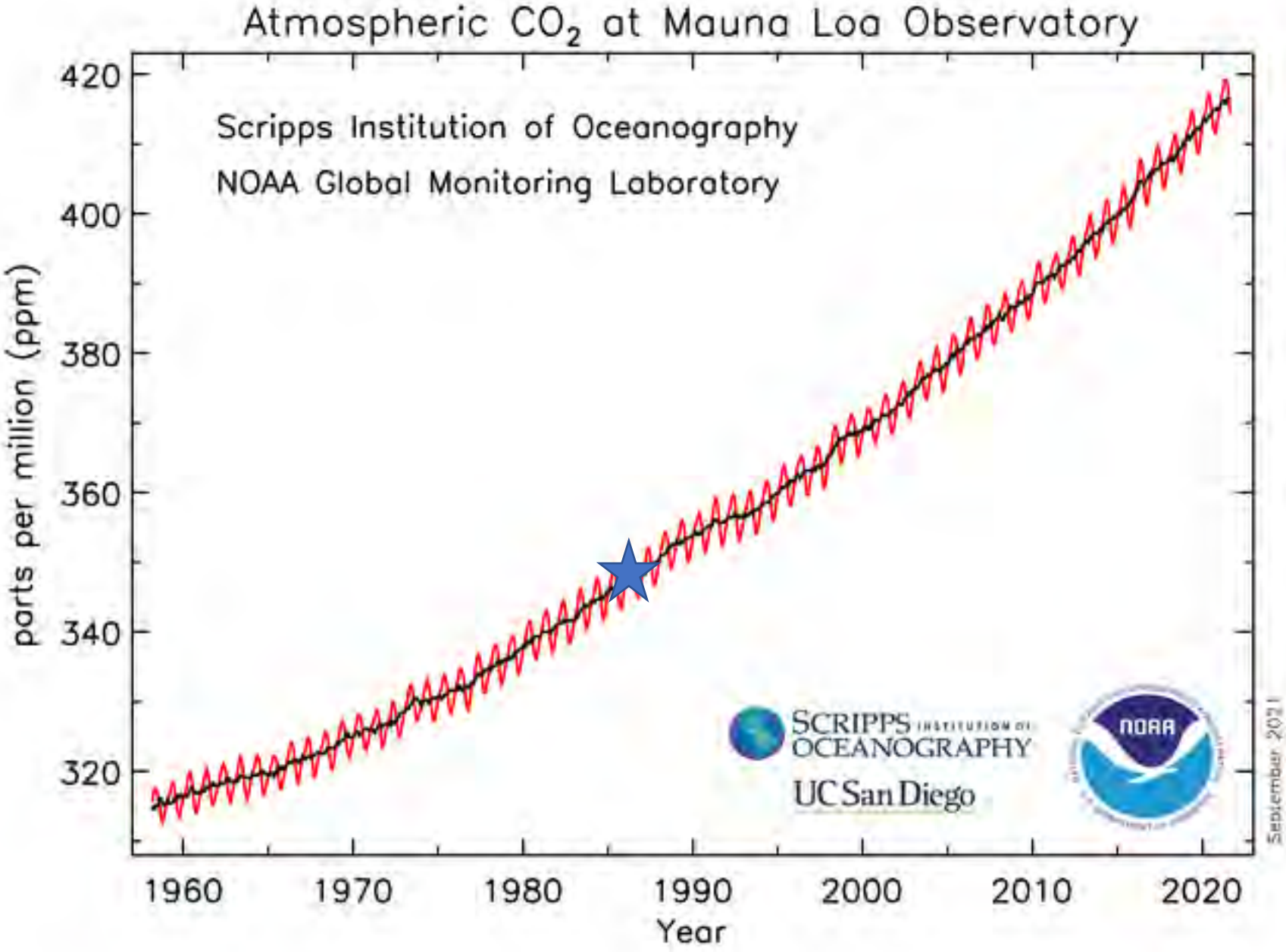
- Rising Temperatures
- Increasing Precipitation
- Sea-Level Rise
- Ocean Acidification
- Decreased Water Quality
- Extreme Weather
- Drought
- Decreased Air Quality

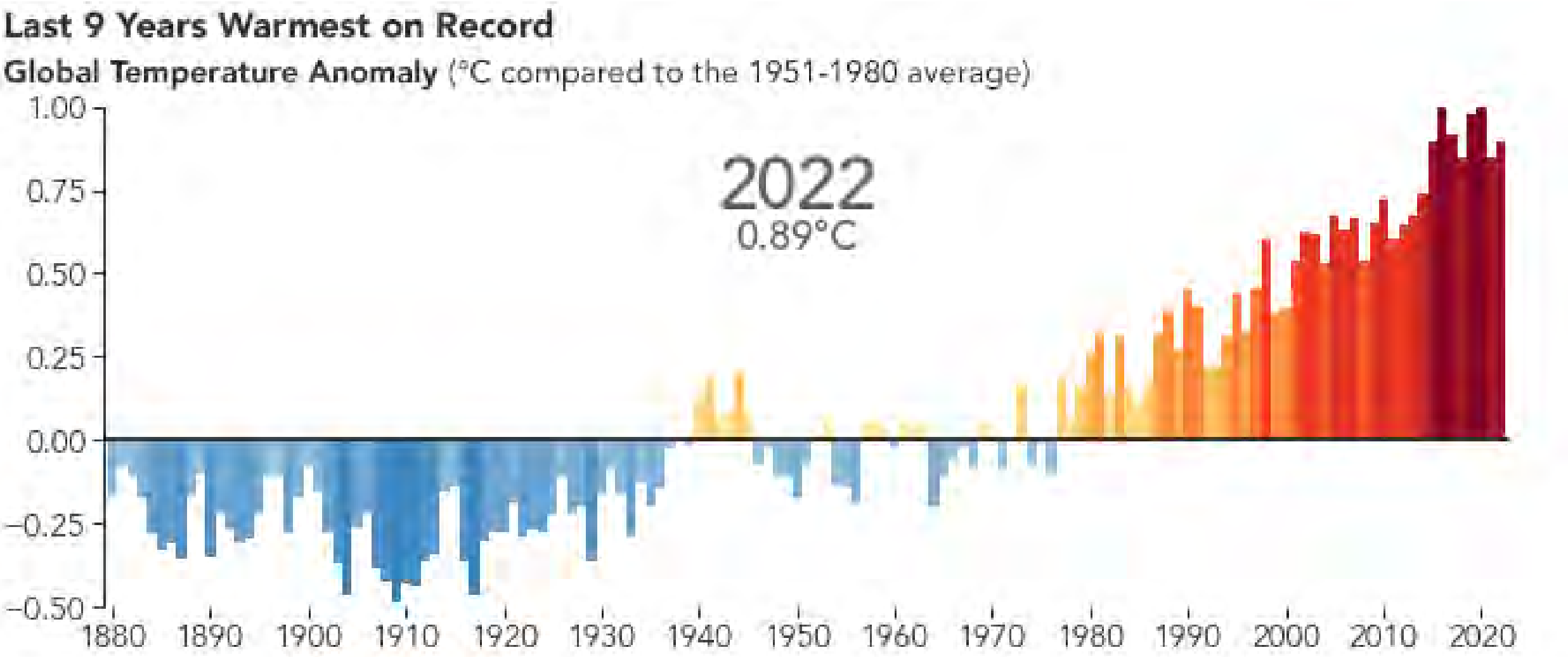
Presentation Overview

- Background
- Main effects (broad-scale)
- Impacts (fine-scale)

GLOBAL ATMOSPHERIC CO_2 RECORD



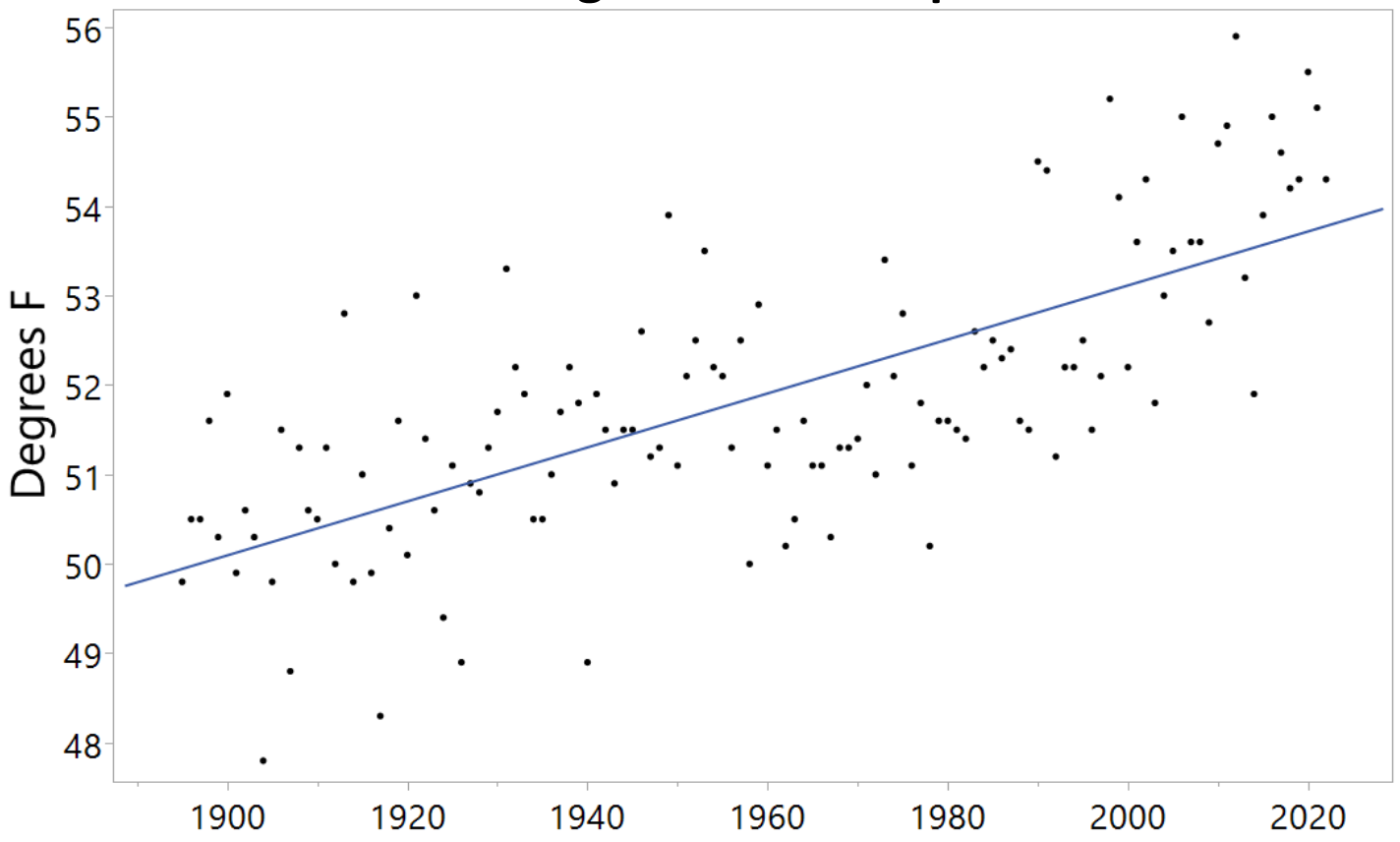

Atmospheric CO_2 at Mauna Loa Observatory
Scripps Institution of Oceanography
NOAA Global Monitoring Laboratory
parts per million (ppm)
420
400
380
360
340
320
1960
1970
1980
1990
2000
2010
2020
Year
SCRIPPS INSTITUTION OF OCEANOGRAPHY
UC San Diego
NOAA
September 2021

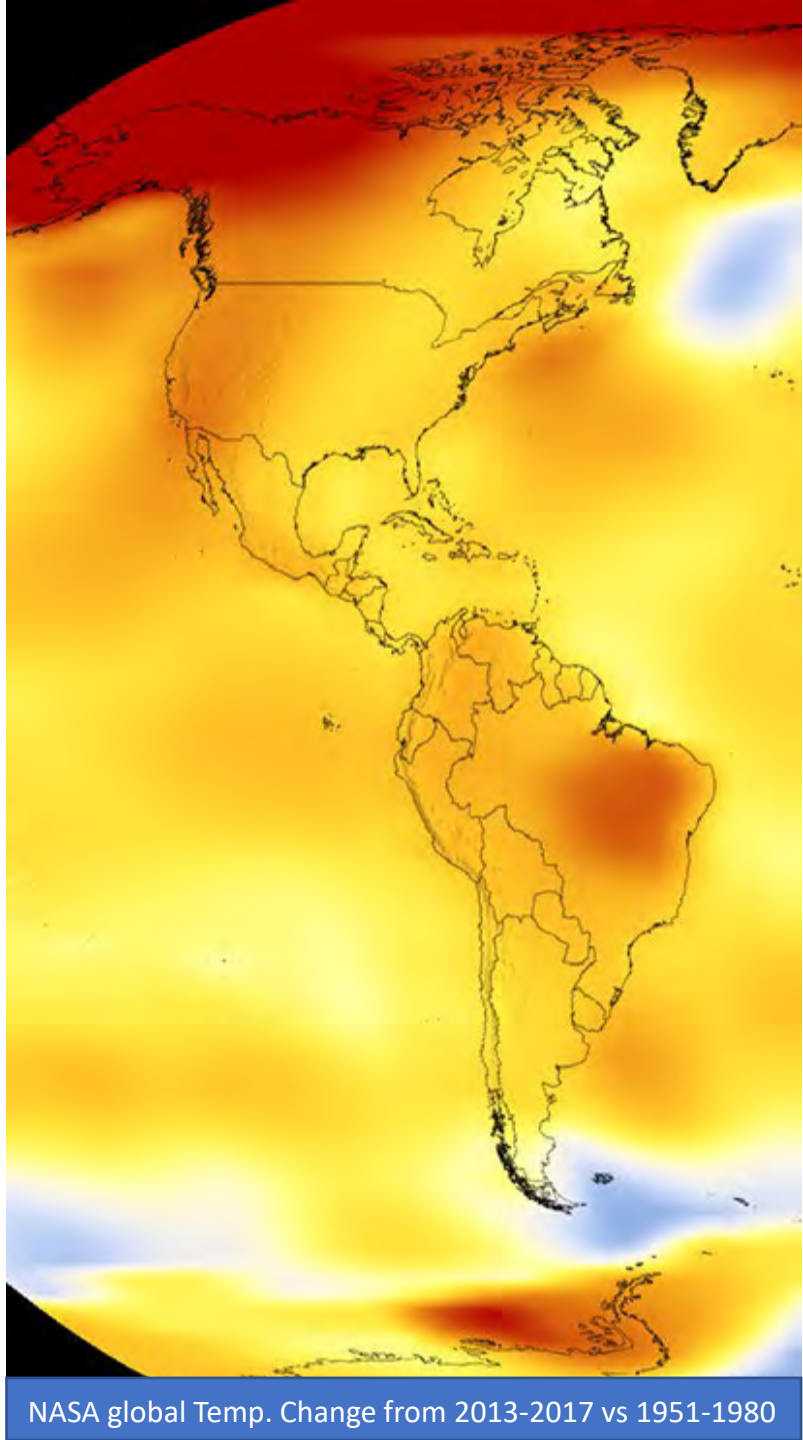


earthobservatory.nasa.gov

TEMPERATURE

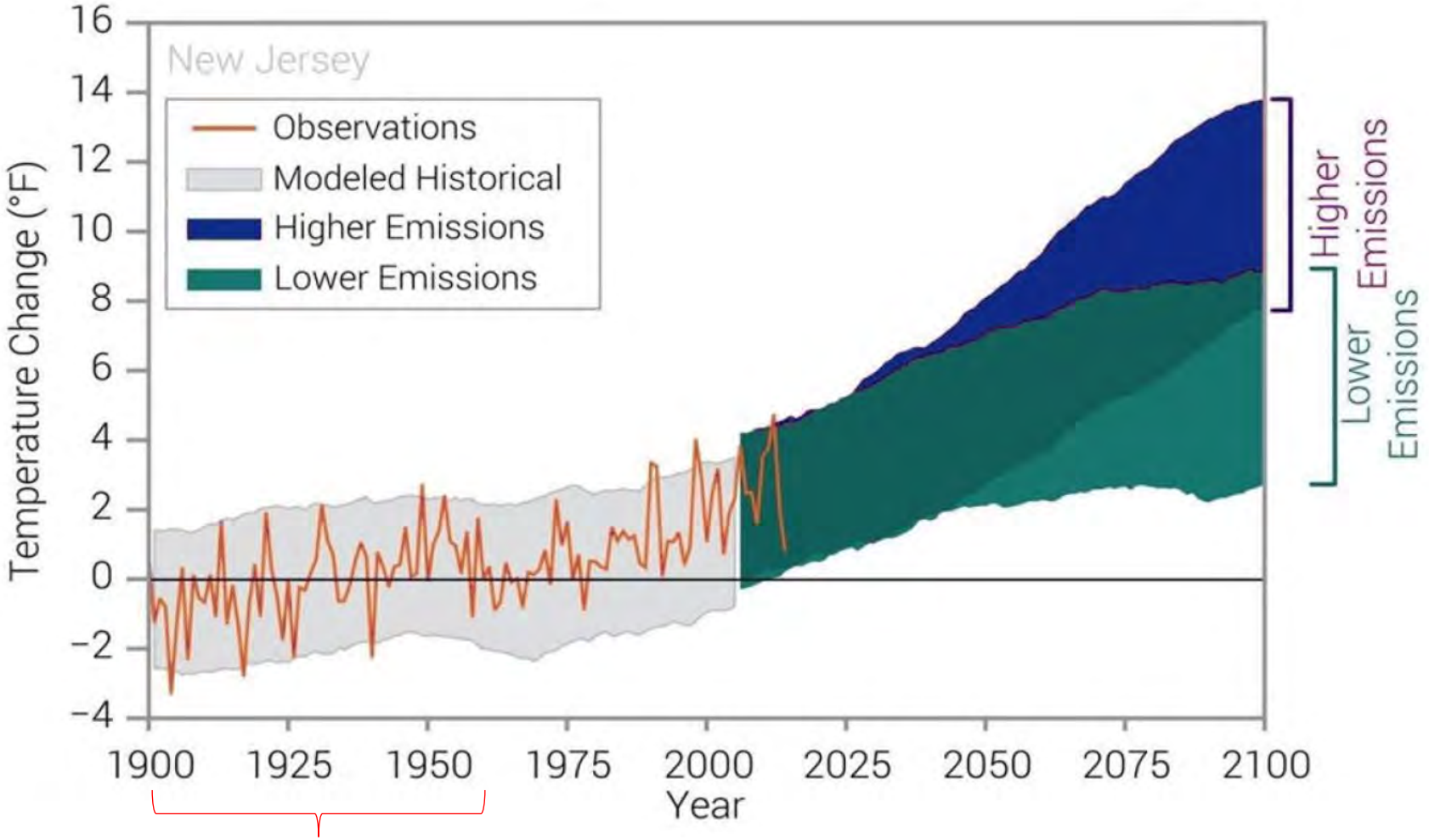
New Jersey's temperature since 1895 has increased by 3.86°F (2.15°C)





NASA global Temp. Change from 2013-2017 vs 1951-1980

NEW JERSEY TEMPERATURE

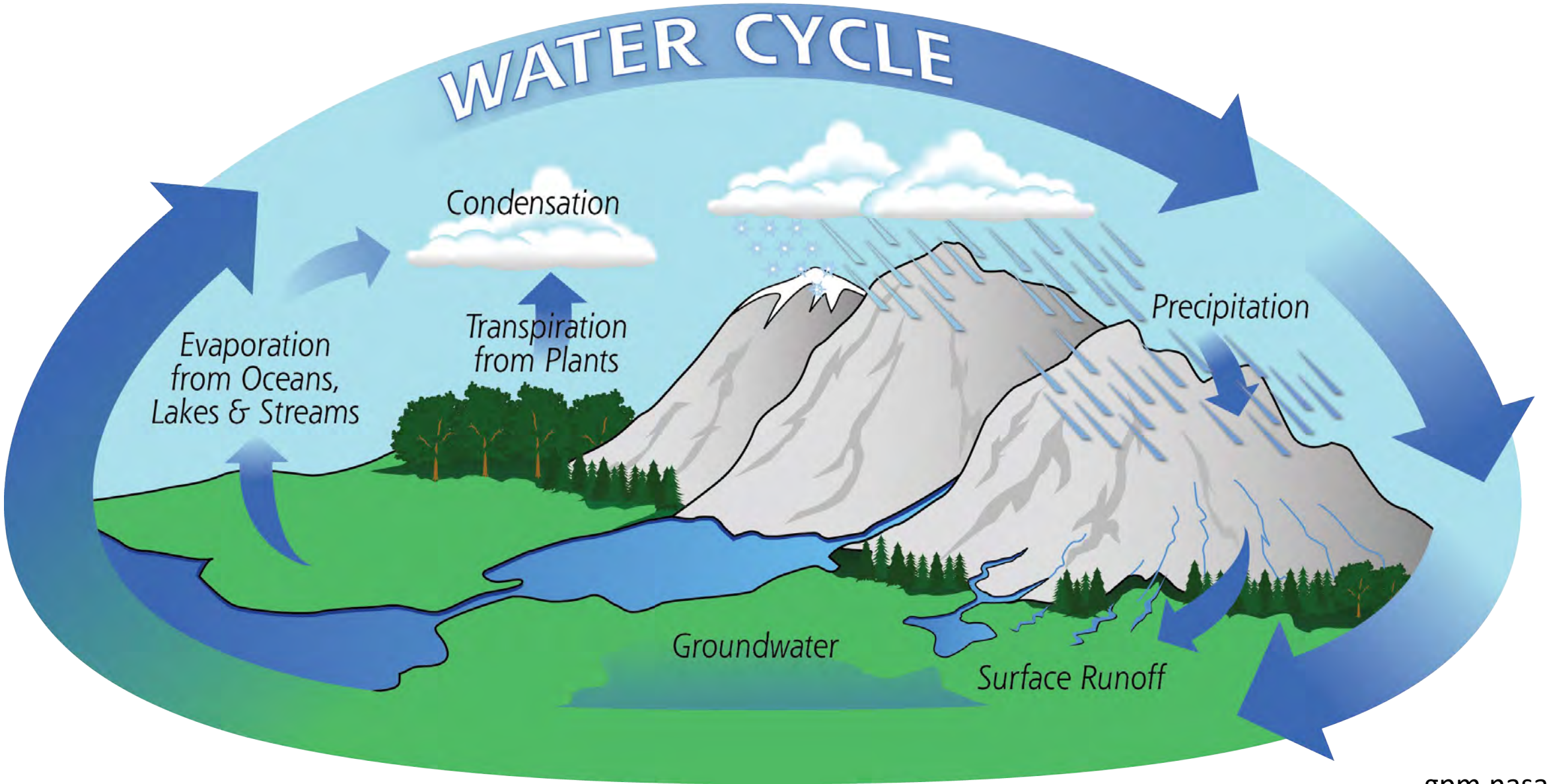


By 2050:
1°F to 6°F warmer by 2050

By 2100:
3°F to 9°F by 2100 (low)
6°F to 13°F by 2100 (high)

Runkle et al., 2022 New Jersey State Climate Summary. *NOAA Technical Report NESDIS 150-NJ*

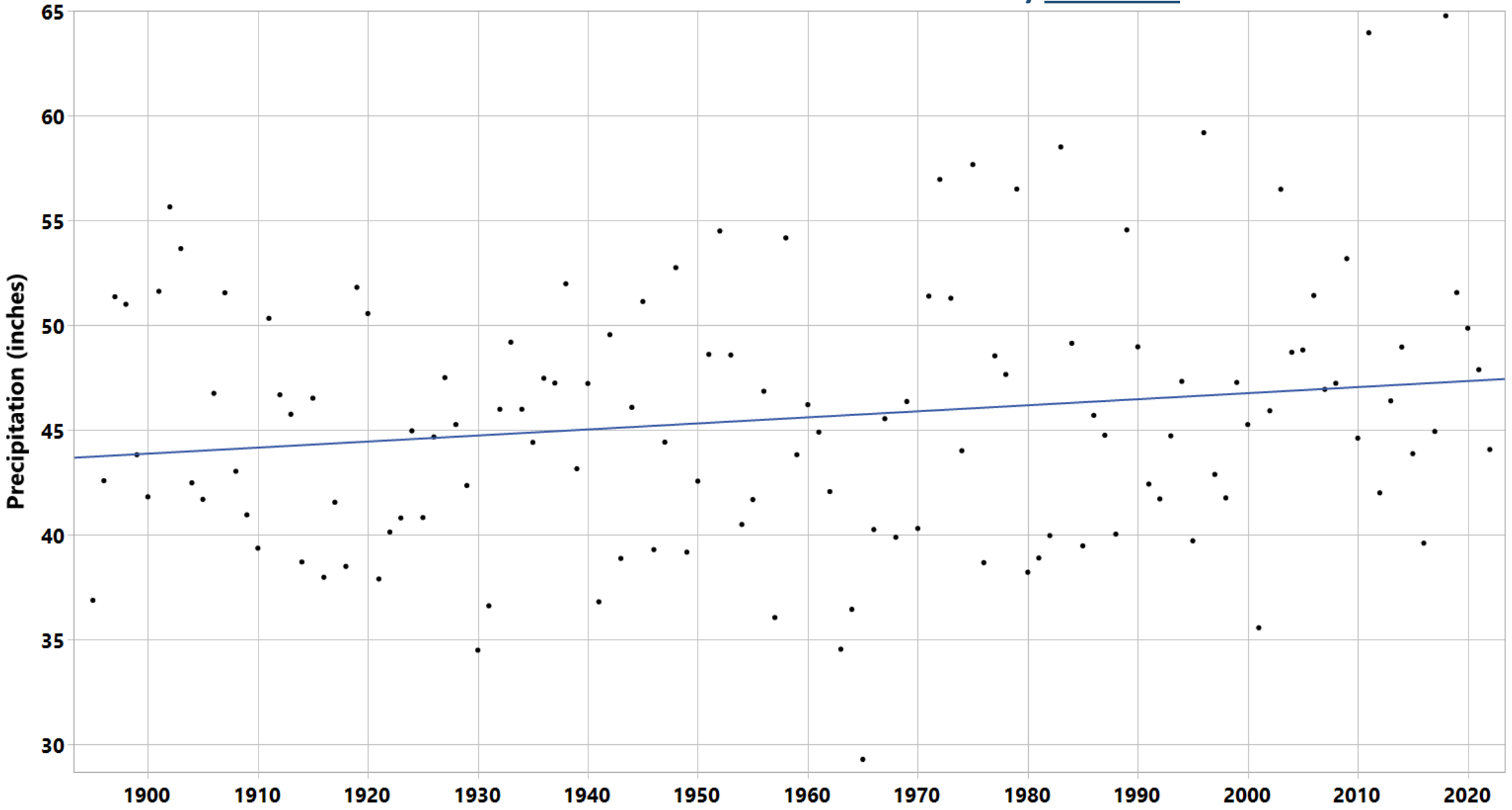
CHANGES IN THE WATER CYCLE



gpm.nasa.gov

PRECIPITATION CHANGES

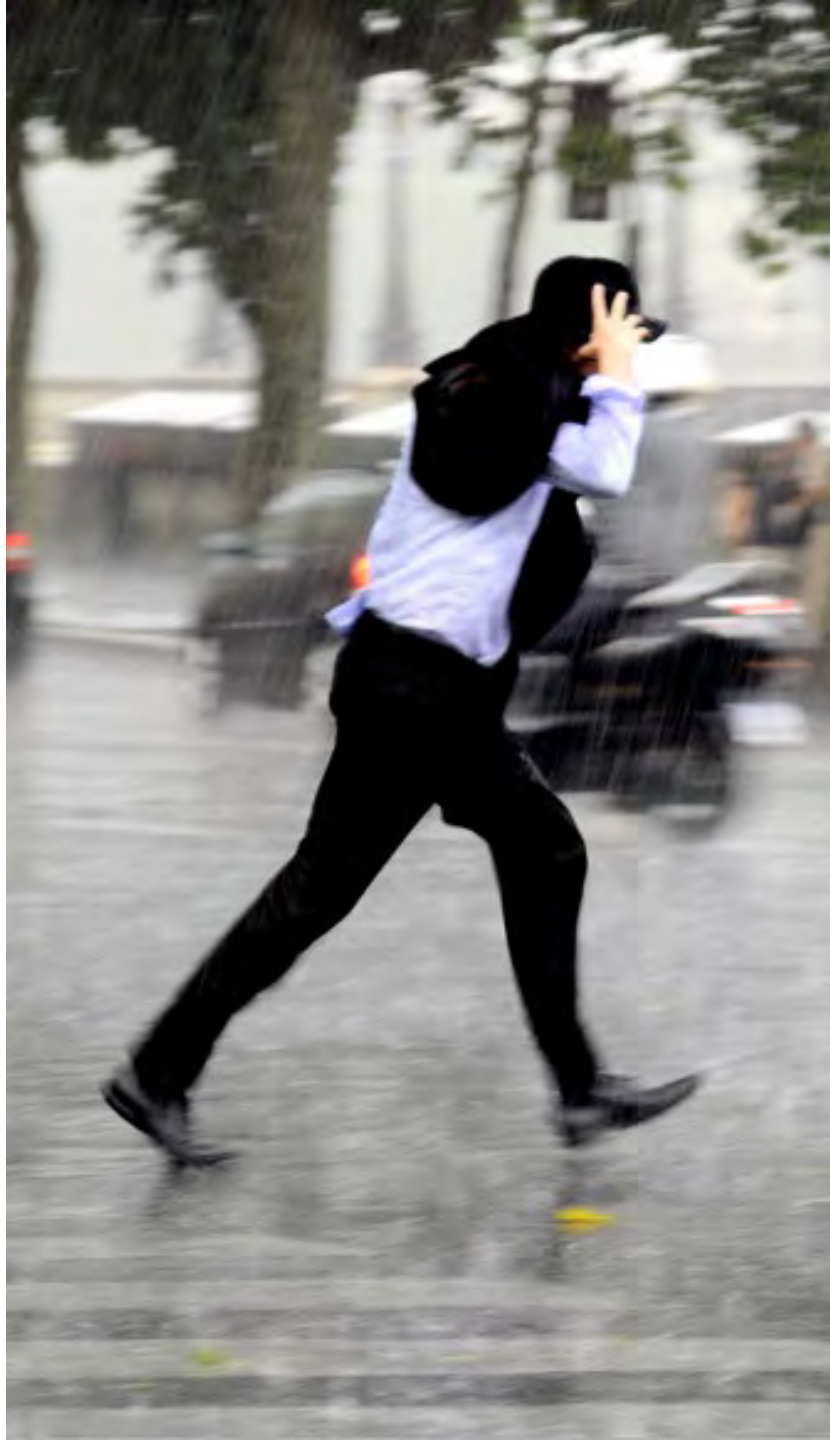
New Jersey's annual precipitation since 1895 has increased by 3.7 inches



PRECIPITATION CHANGES

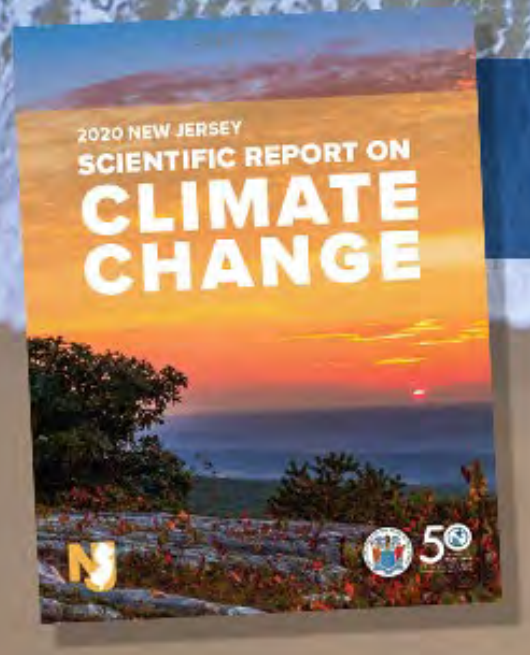
- By 2100, 6% to 9% increase in annual precipitation
- Increased frequency and intensity of heavy rains
- Longer and more persistent wet and dry periods throughout the Northeast

The intensity & frequency
of precipitation events is anticipated to
increase due to climate change.



CLIMATE SCIENCE FACT:

Sea-levels are rising at a greater rate in New Jersey than other parts of the world.



For more information, view New Jersey's **Scientific Report on Climate Change.**

THE GREAT SEAL OF THE STATE OF NEW JERSEY

50 CELEBRATING 1970 • 2020

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION

SEA-LEVEL RISE PROJECTIONS

New Jersey Sea-Level Rise above year 2000 baseline in feet.

Adapted from Rutgers 2019 STAP Report.

	Chance SLR Exceeds	2030	2050	2070 Emissions			2100 Emissions			2150 Emissions		
				Low	Mod.	High	Low	Mod.	High	Low	Mod.	High
Low End	*> 95% chance*	*0.3*	*0.7*	*0.9*	*1.0*	*1.1*	*1.0*	*1.3*	*1.5*	*1.3*	*2.1*	*2.9*
Likely Range	*> 83% chance*	*0.5*	*0.9*	*1.3*	*1.4*	*1.5*	*1.7*	*2.0*	*2.3*	*2.4*	*3.1*	*3.8*
	~ 50 % chance	*0.8*	*1.4*	*1.9*	*2.2*	*2.4*	*2.8*	*3.3*	*3.9*	*4.2*	*5.2*	*6.2*
	< 17% chance	*1.1*	*2.1*	*2.7*	*3.1*	*3.5*	*3.9*	*5.1*	*6.3*	*6.3*	*8.3*	*10.3*
High End	*< 5% chance*	*1.3*	*2.6*	*3.2*	*3.8*	*4.4*	*5.0*	*6.9*	*8.8*	*8.0*	*13.8*	*19.6*

*2010 (2001-2019 average) Observed = 0.2 ft

Table 4.3. Sea-level Rise Projections (ft. above year 2000 average sea level) for New Jersey from 2030 to 2150 Under Low, Moderate and High Emissions Scenarios

Impacts

- Changing growing conditions
- Warmer waters
- Expansion of invasive pests
- Birds are vulnerable to climate change, especially shorebirds

"Changes brought on by a warming climate, namely earlier springs, hotter summers, inconsistent precipitation, and rising CO_2 concentrations, will challenge the resilience of New Jersey's natural systems."

29%

of New Jersey's bird species are vulnerable to climate change.

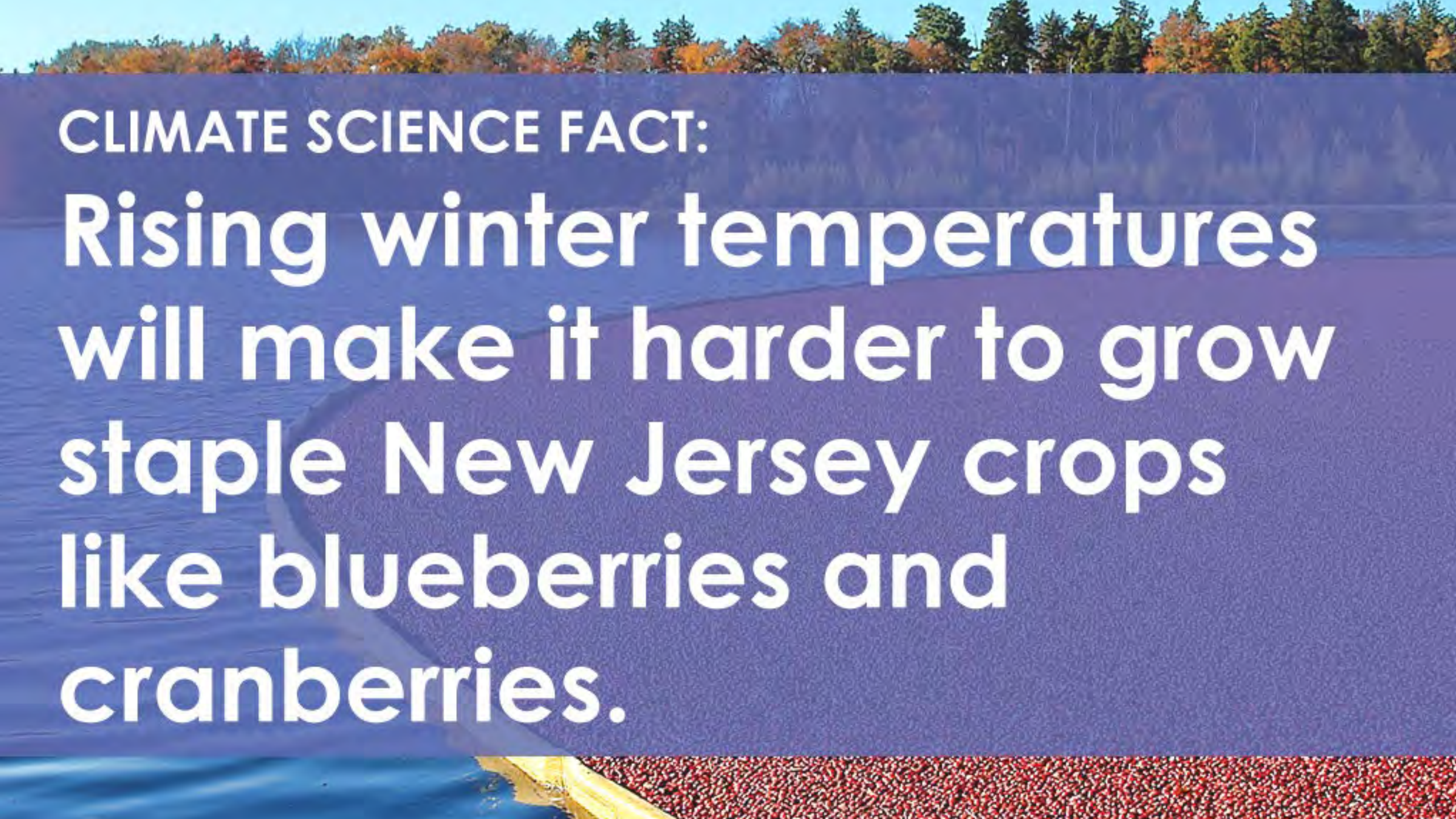
Impacts

- Average first flowering dates have advanced by 19 days since 1920

- Some species flowered even earlier
  - Highbush blueberry: 42 days earlier
  - Shadbush: 23 days earlier
  - Hepatica: 21 days earlier

- Average spring temperatures 10°F higher in 2012 than pre-1900 average

Round lobe hepatica



CLIMATE SCIENCE FACT:

Rising winter temperatures will make it harder to grow staple New Jersey crops like blueberries and cranberries.

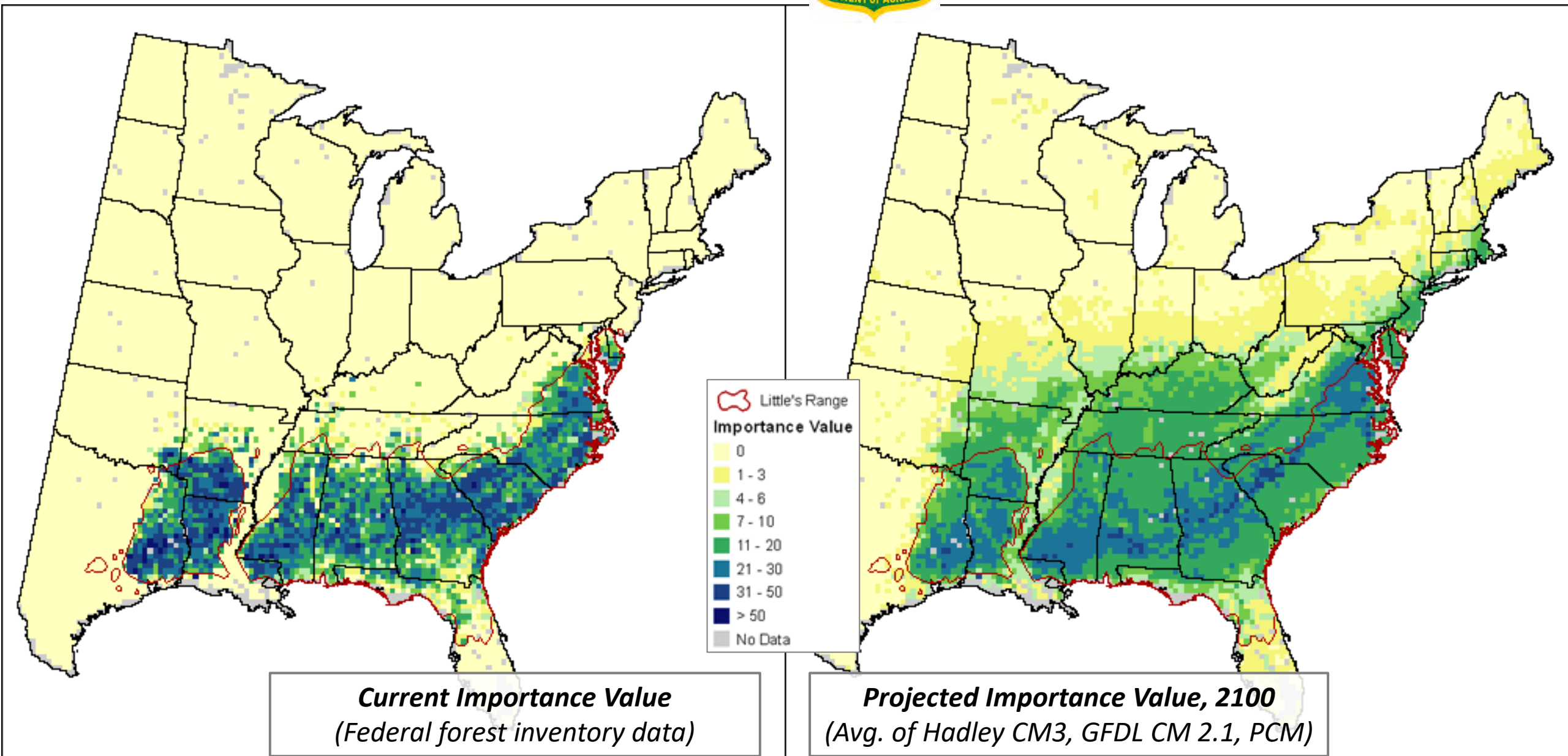
Impacts to Forests

- Range Shifts from Climate Change
- Changes to wildfire seasons
- Sea-level rise impact to coastal forests and carbon sequestration

SOUTHERN PINE BEETLE (*Dendroctonus frontalis*) ERUPTIVE OUTBREAK

LOBLOLLY PINE

USFS Climate Change Tree Atlas

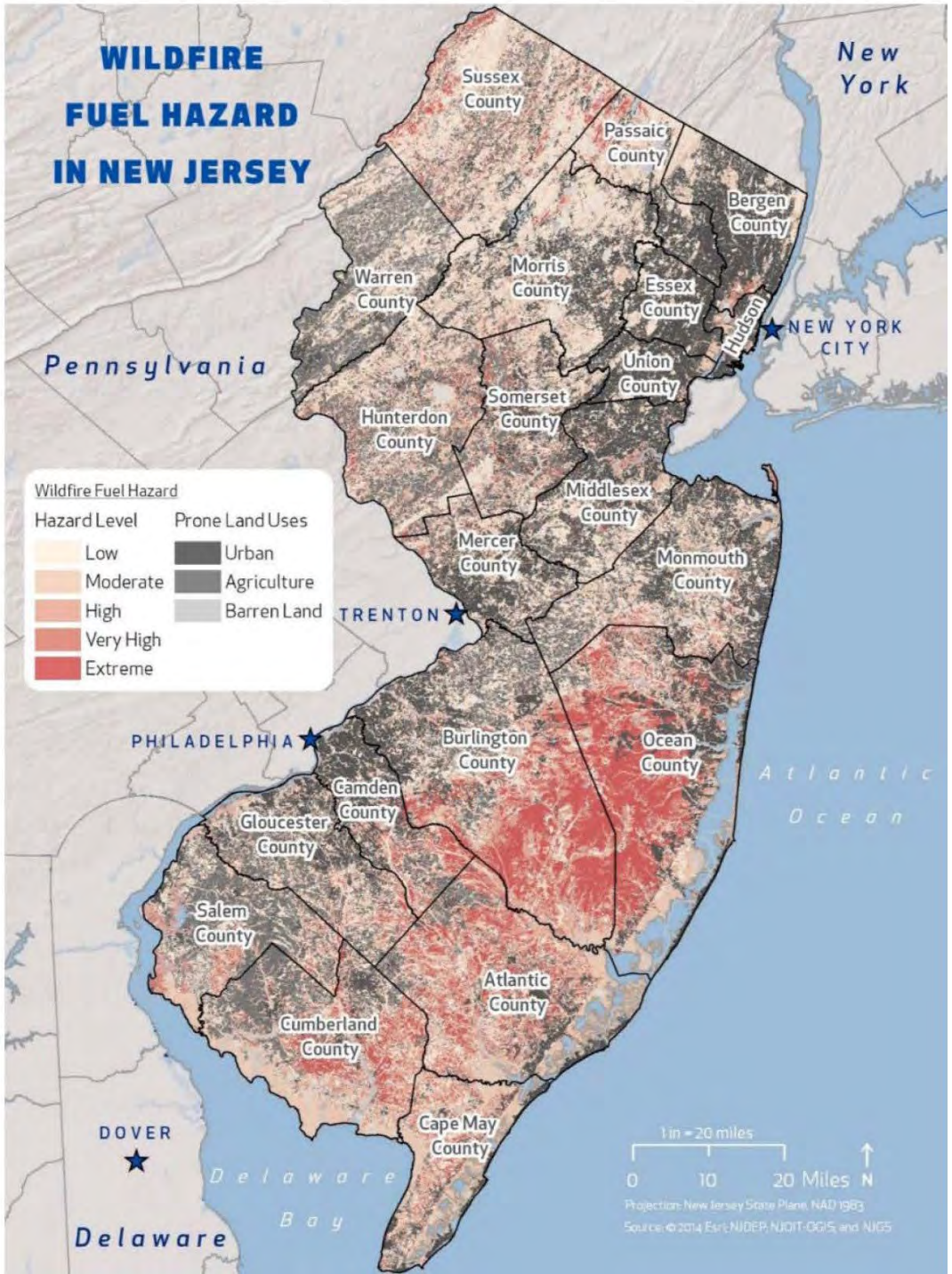


Current Importance Value
(Federal forest inventory data)

Projected Importance Value, 2100
(Avg. of Hadley CM3, GFDL CM 2.1, PCM)

FOREST FIRES

- Longer fire season
- Drier soils and vegetation increase severity and intensity
- Pineland are a high fuel hazard area



Vernal Pools


Tiger Sal
Jefferson Sal
Marbled Sal
Eastern Spadefoot
Wood Frog
Blue-spotted Sal
Pine Barrens treefrog
Spotted Sal

Air Quality

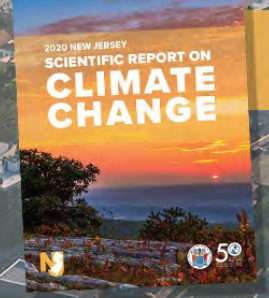
STORMWATER

INCREASED WATER DEMAND

HABS

CLIMATE SCIENCE FACT:

Summer heat waves may last longer and be more deadly due to increasing temperatures.



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DEPARTMENT OF ENVIRONMENTAL PROTECTION

WATER CHEMISTRY

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- Runkle, J., Kunkel, K. E., Champion, S. M., Frankson, R., Stewart, B. C., Sweet, W., & Spaccio, J. (2022). New Jersey State Climate Summary 2022. In *NOAA Technical Report NESDIS 150-NJ* (pp. 1–5).