

RUTGERS

THE STATE UNIVERSITY
OF NEW JERSEY

Climate Change Impacts on New Jersey's Waters

Northwest NJ Rivers Conference

Dr. David A. Robinson
Distinguished Professor,
Department of Geography
& New Jersey State Climatologist
Rutgers University



November 13, 2020

Overview

1. Greetings from the ONJSC
2. The global climate system
3. New Jersey's weather and climate
4. Climate change, past, present....future

Pequannock



Office of the NJ State Climatologist

Helping decision
makers

Locals trusting
locals

ONJSC

at Rutgers University

Office of the New Jersey State Climatologist · Rutgers University · 54 Joyce Kilmer Avenue · Lucy Stone Hall B224 · Piscataway, NJ 08854

Home

Quick Links

- NJWxNet
- New Jersey Forecast
- National Forecast
- NOAA Climate.gov

NJ

- Current Conditions
- Current Forecasts
- Climate Information

US

- Current Conditions
- Current Forecasts
- Climate Information

Other

- Coastal Observations
- El Niño/La Niña
- Hurricanes

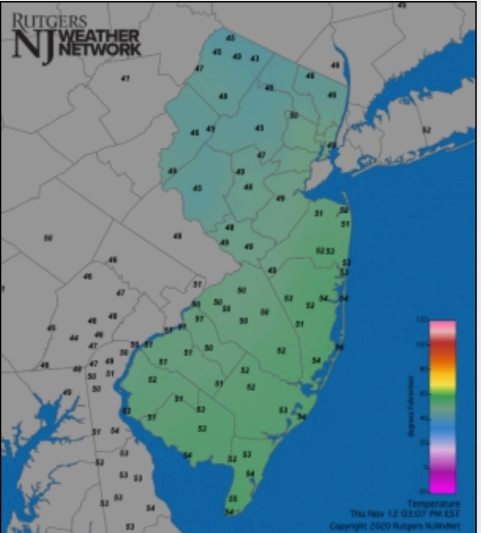
ONJSC

- Outreach
- About ONJSC
- Research
- Staff

Partners

Contact Us

Latest from the NJWxNet



Latest temperatures across NJ appear in the above map. Click on the map or here, the [Rutgers New Jersey Weather Network](#), for much more information.


Interested in becoming a volunteer weather observer?
[Click here](#) to learn more about the CoCoRaHS Network!

Frequently Updated Climate Data

- [Winter 2020–2021 Snow Event Totals](#)
- [Monthly Statewide/Divisional/County \(1895–Present\)](#)
- [Monthly Station](#)
- [Monthly Maps](#)

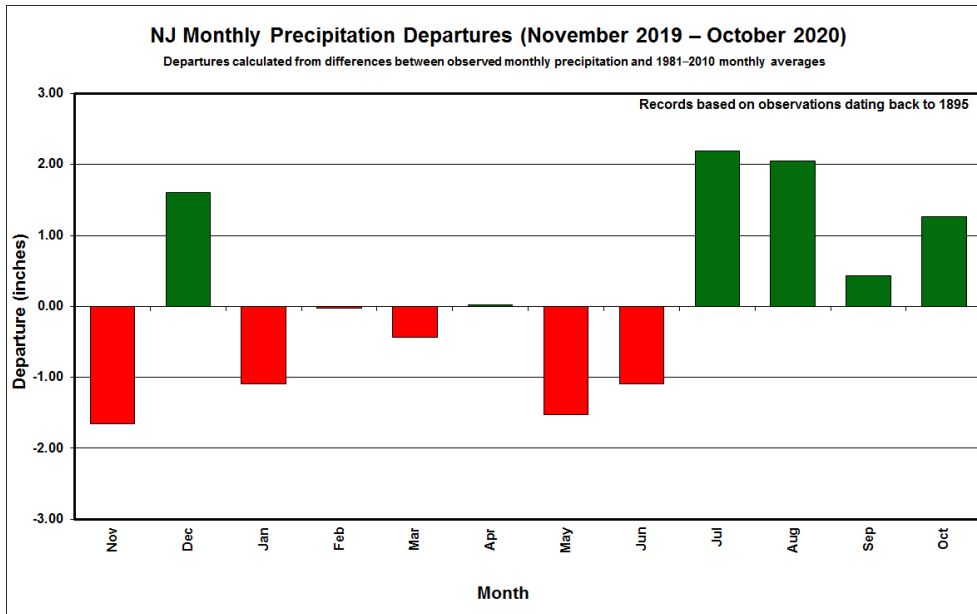
Latest News

- [New NOAA NJ Climate Change Report](#)

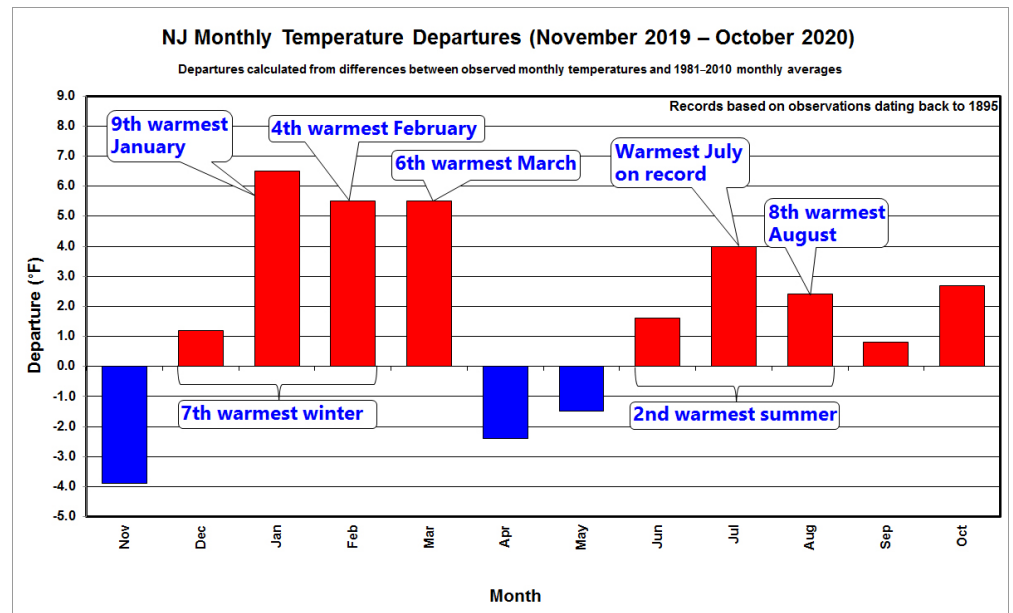


A dew-covered spider web from the morning of October 14th in Sparta (Sussex). Photo by N. Stefano.

A Transition Month for Sure: October 2020 Recap



NJ Monthly Precipitation & Temperature Departures: Nov 2019– Oct 2020



Rutgers New Jersey Weather Network

njweather.org

Brought to you by
ONJSC @ RUTGERS
 New Jersey Agricultural
 Experiment Station

[Home](#)
[News](#)
[Blog](#)
[myWxNet](#)
[Tabular Data](#)
[Maps](#)
[Charts](#)
[Contact Us](#)

Latest Temperatures

Current Radar

Latest Wind Speeds

Wind Gusts

Top Story

A Transition Month for Sure: October 2020 Recap

Thursday, November 5, 2020 - 1:52pm

Latest Extremes

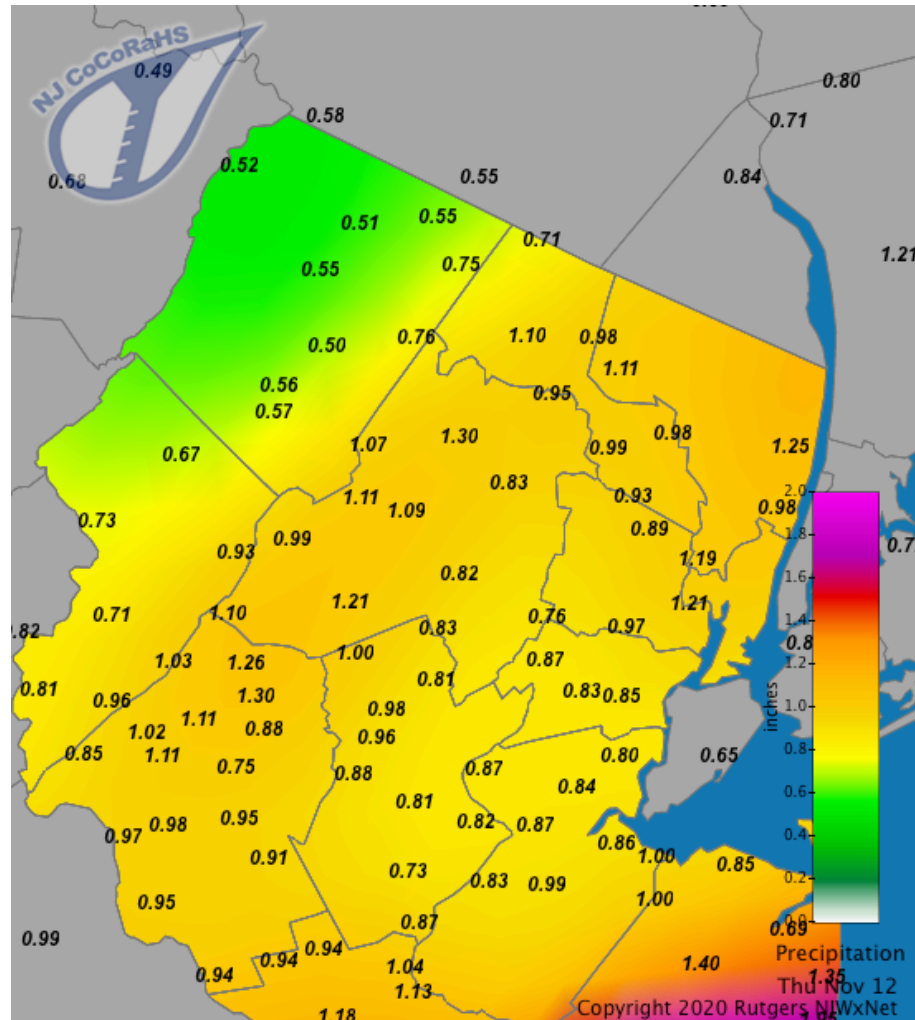
City, State	Temp	City, State	Temp
Harvey Cedars, NJ	55	High Point Monument, NJ	41
Atlantic City Marina, NJ	54	Vernon Twp., NJ	43
Toms River, NJ	54	Blue Mountain Lakes, NJ	43
Seaside Heights, NJ	54	High Point, NJ	43
Fortescue, NJ	54	Charlotteburg, NJ	45

most current information as of Nov 12 3:19 PM

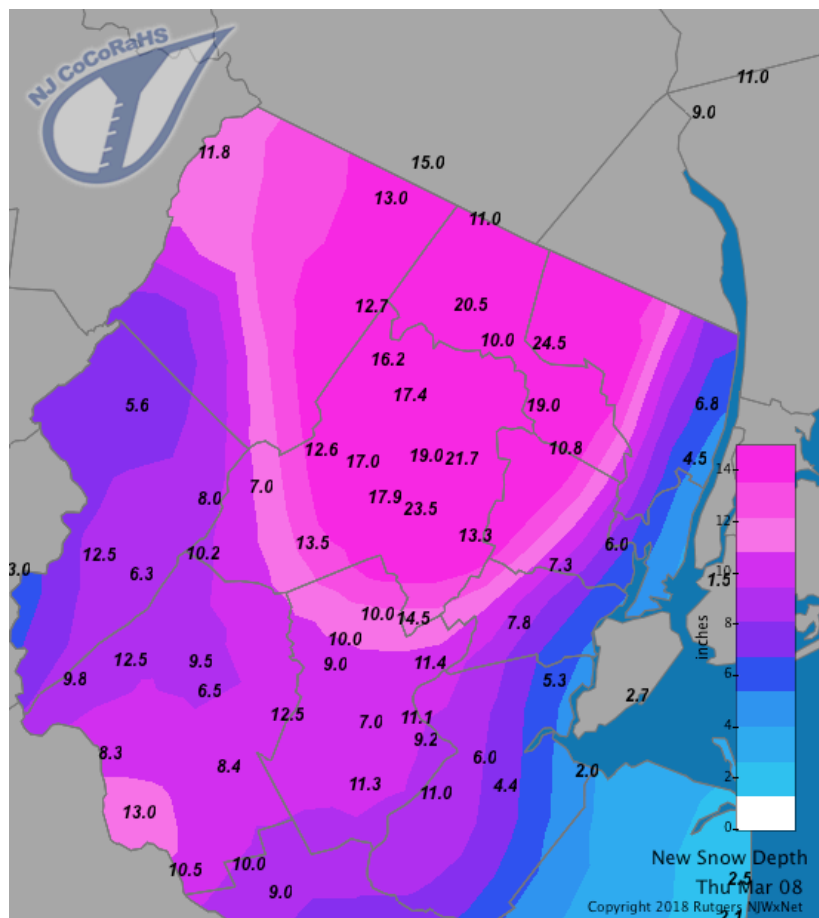
Community Collaborative Rain, Hail, and Snow Network

Precipitation:
7AM 11Nov. to
7AM 12 Nov. 2020

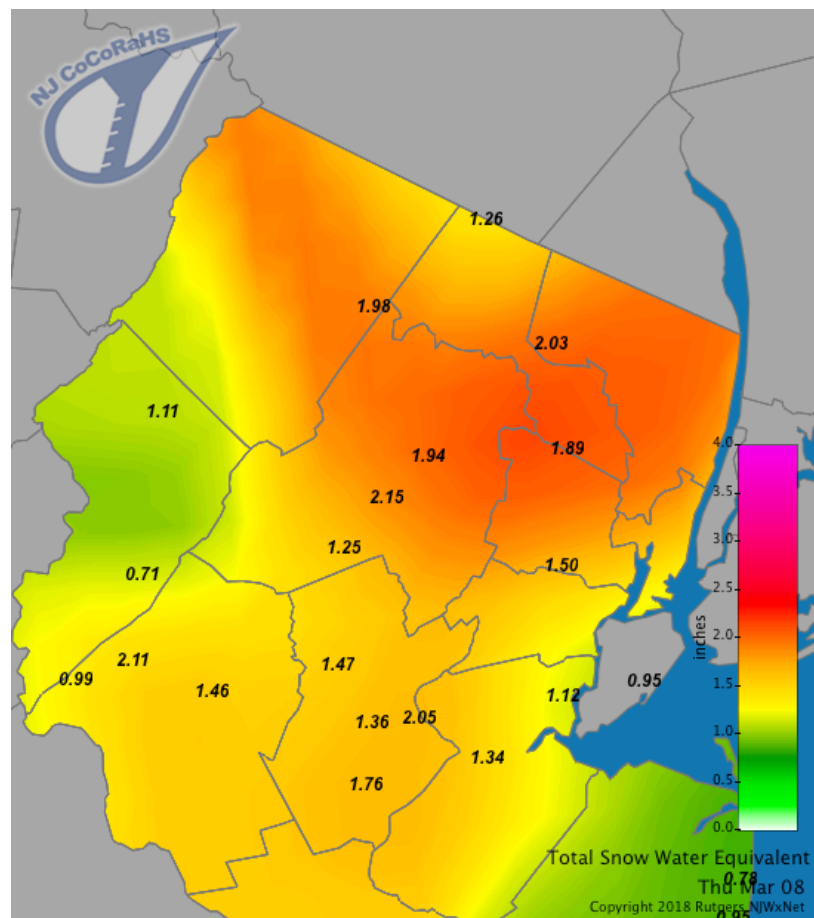
cocorahs.org



Snow depth



Snow Water Equivalent



March 8, 2018

Overview

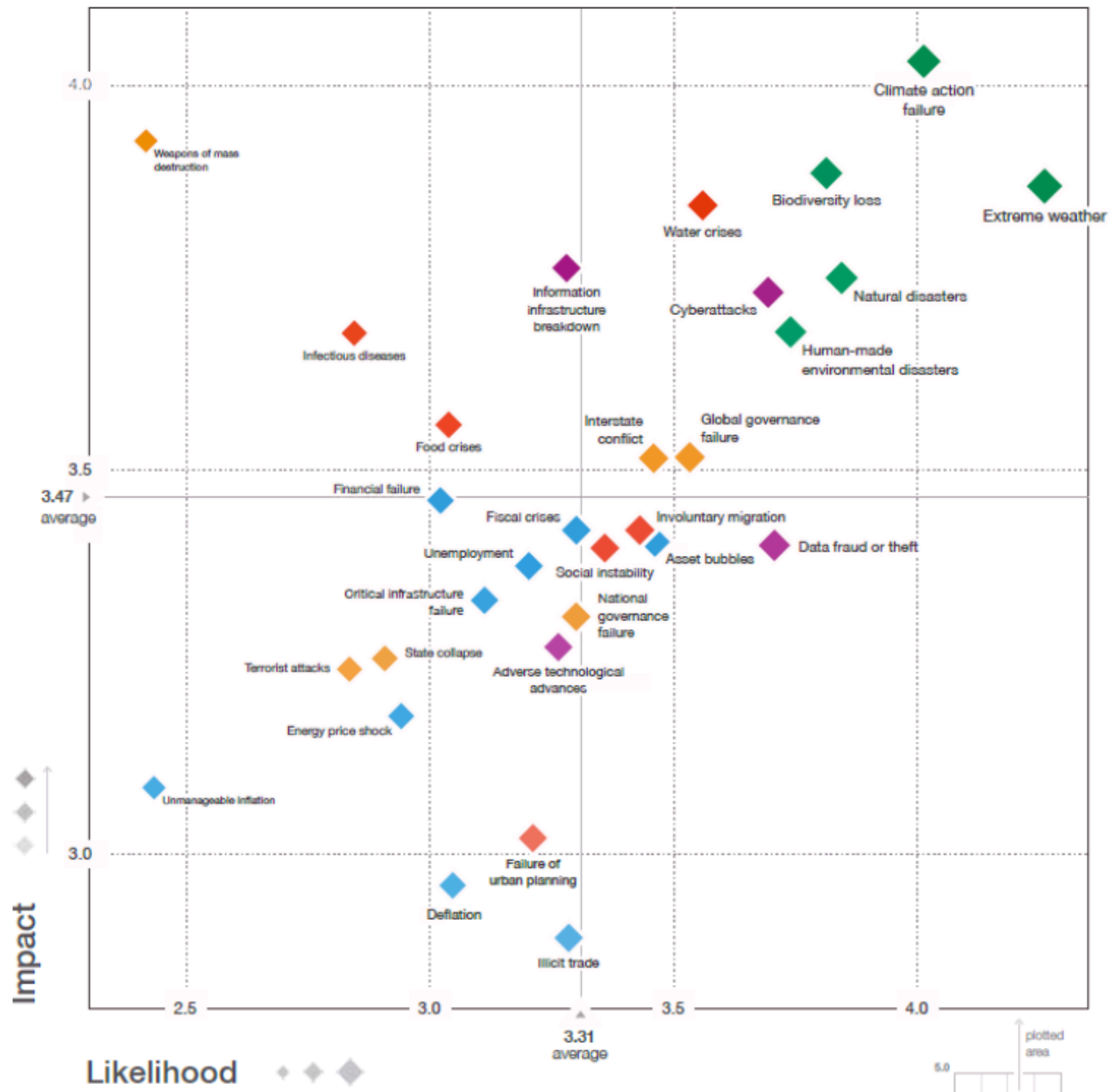
1. Greetings from the ONJSC
2. The global climate system
3. New Jersey's weather and climate
4. Climate change, past, present....future

Delaware

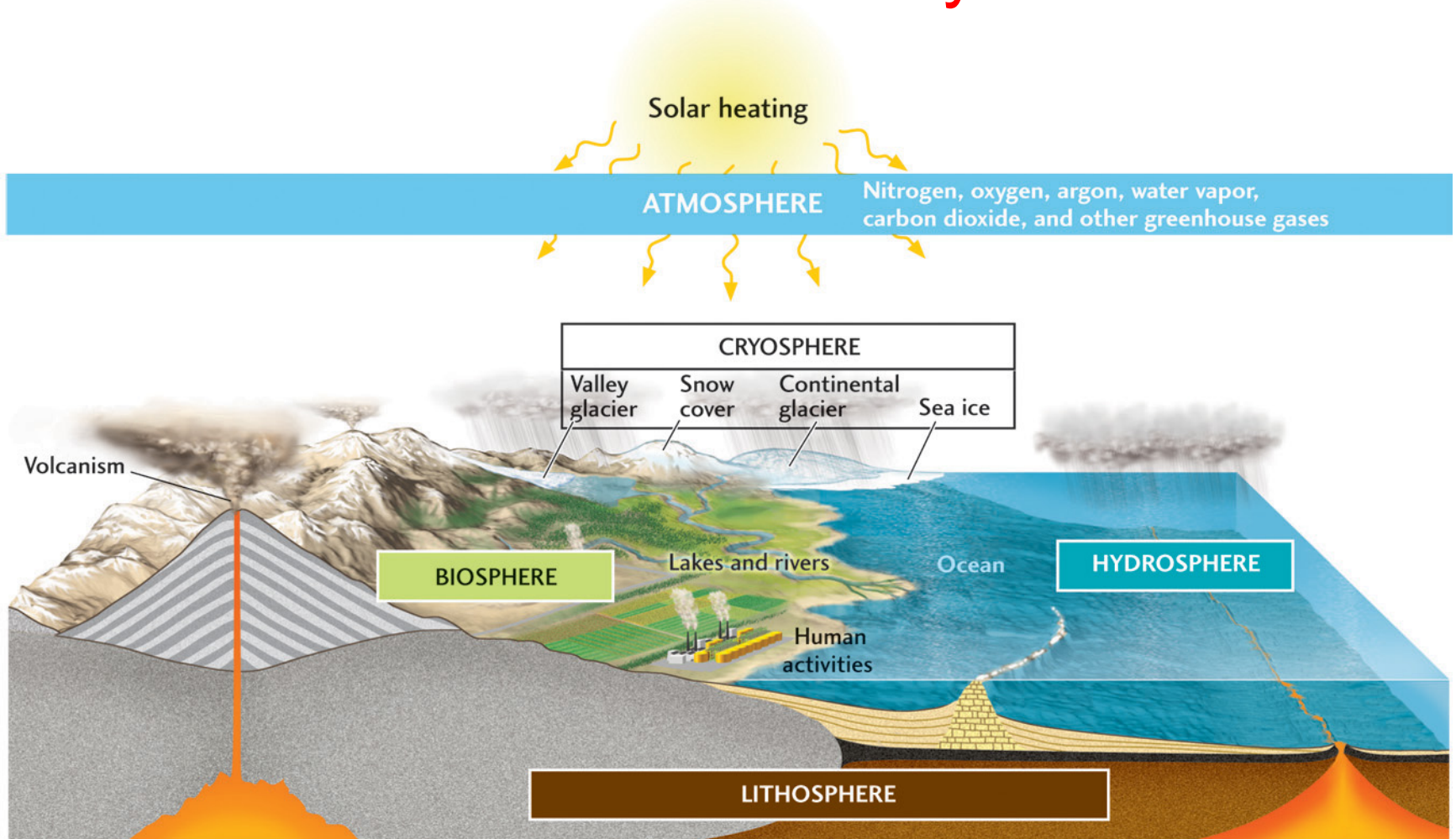


Global Risks Landscape 2020

World Economic Forum



The Earth's Climate System





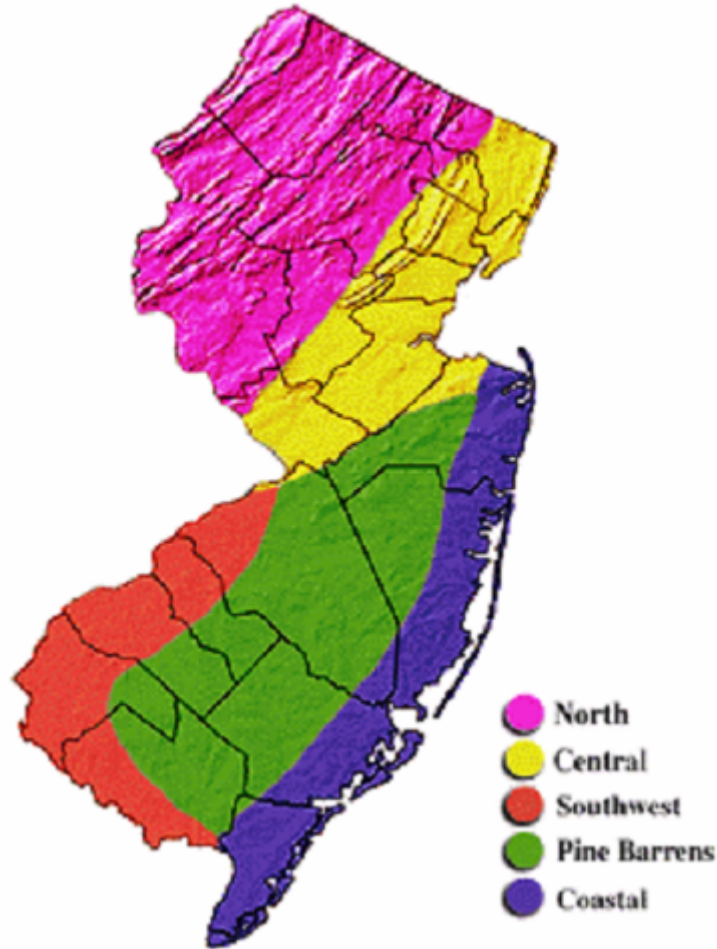
Wallkill

Overview

1. Greetings from the ONJSC
2. The global climate system
3. New Jersey's weather and climate
4. Climate change, past, present.....future

Diversity: local controls on NJ's weather and climate

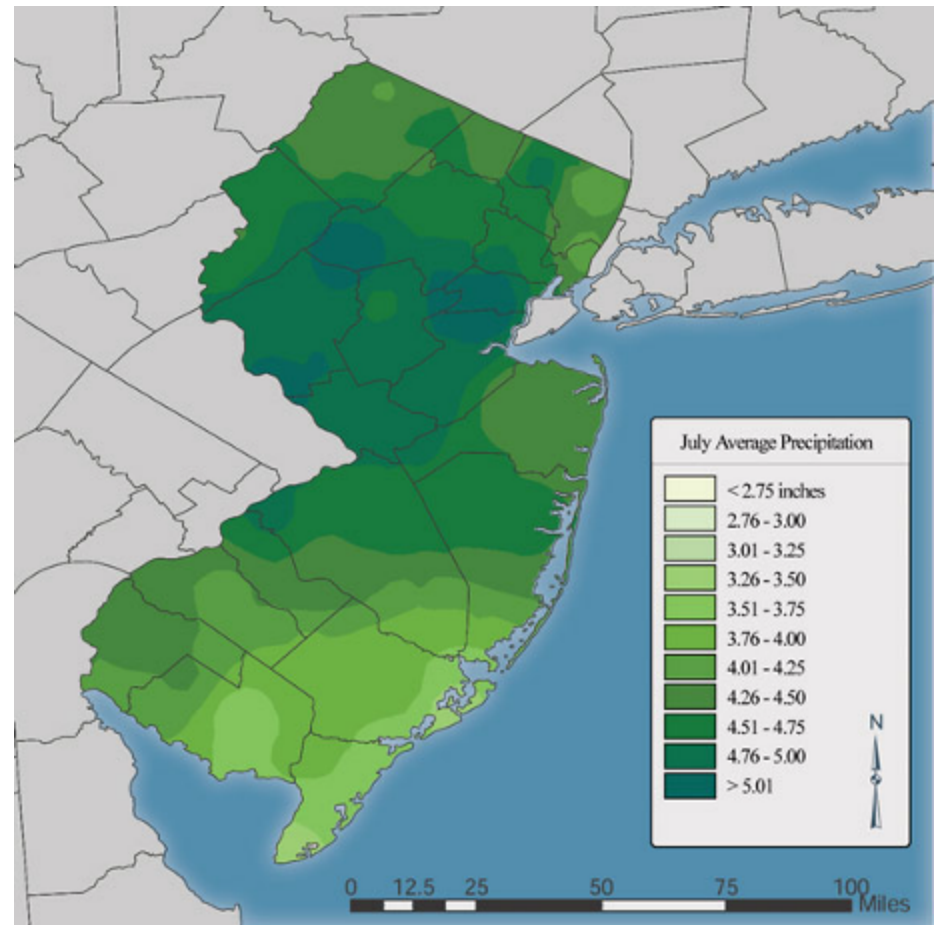
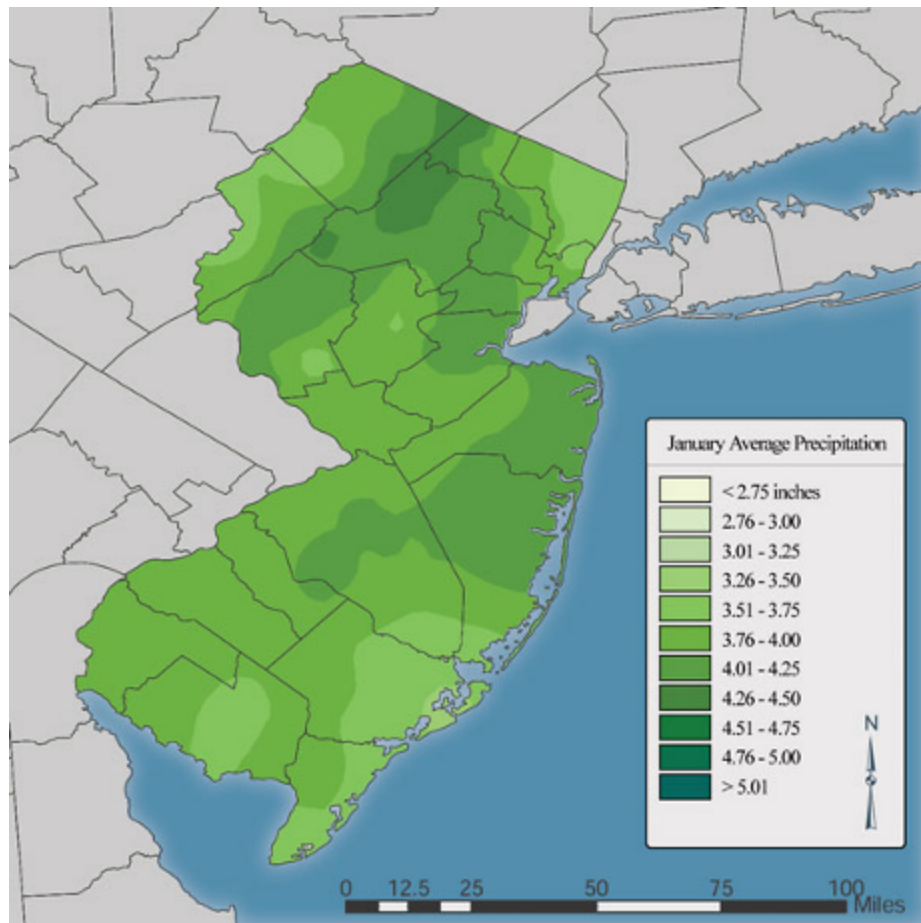
New Jersey Climate Zones



Altitude
Latitude
Surface Conditions
Land-Water Contrasts

Ludlum 1983

A precipitation
rich state.....



.....most often

But not always! 1960s Drought



Delaware River (bed) at Trenton



How do we get our precipitation?



1) Warm season local storms



Tomahawk Lake on
Lubbers Run
(Musconetcong headwaters)

USGS fact sheet 104-01, 2001



Figure 1. Total rainfall at 41 rain gages in northern New Jersey, August 11-14, 2000. (Data from Walter Nickelsburg, National Weather Service, written commun., 2000; Nicholas Stefano, Sussex County Weather Network, written commun., 2001; William Grinelli, Town of Newton, written commun., 2000; and unpublished data, U.S. Geological Survey, W. Trenton, N.J.)



Sparta

2) Tropical systems

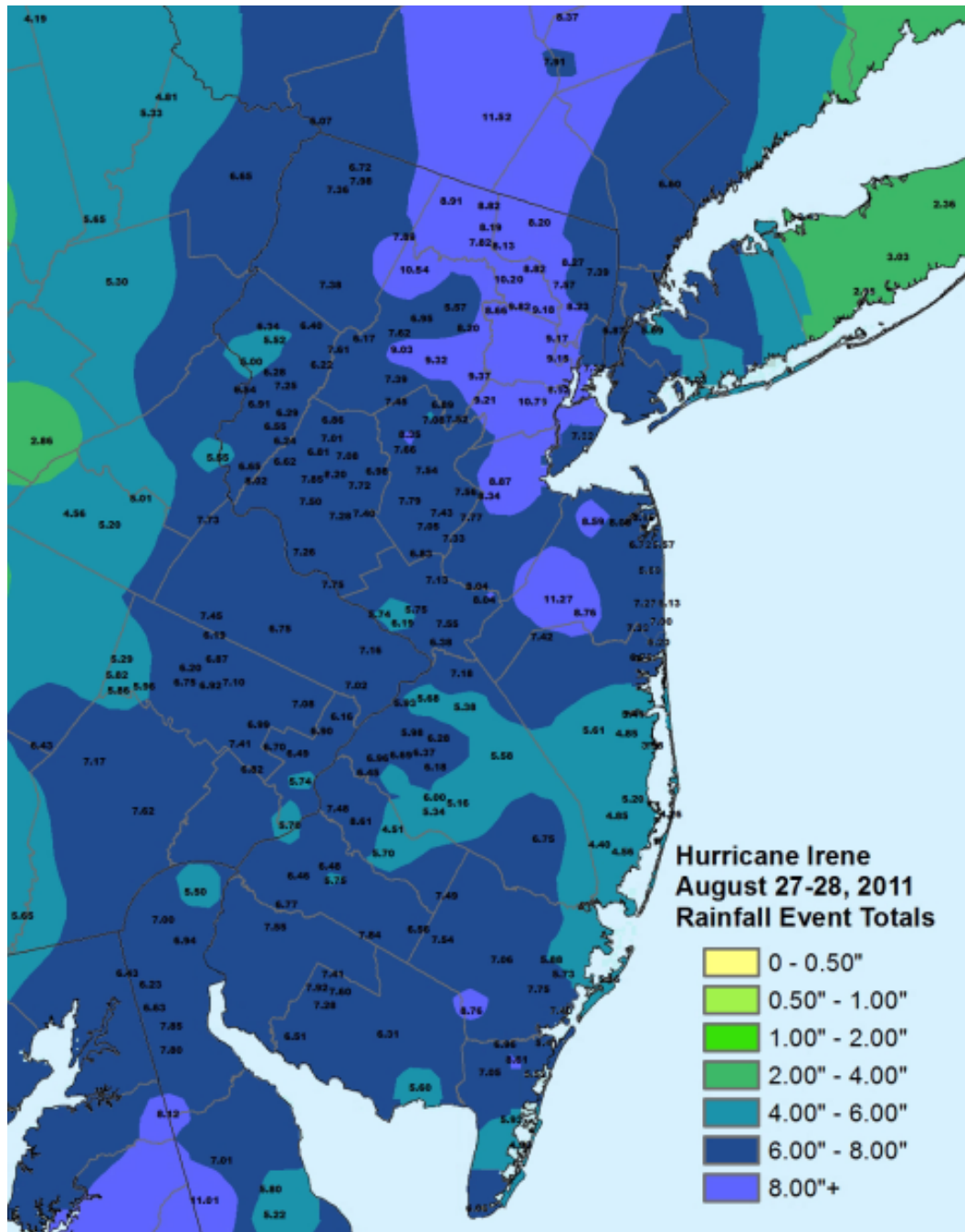
TS Irene
29 August 2011



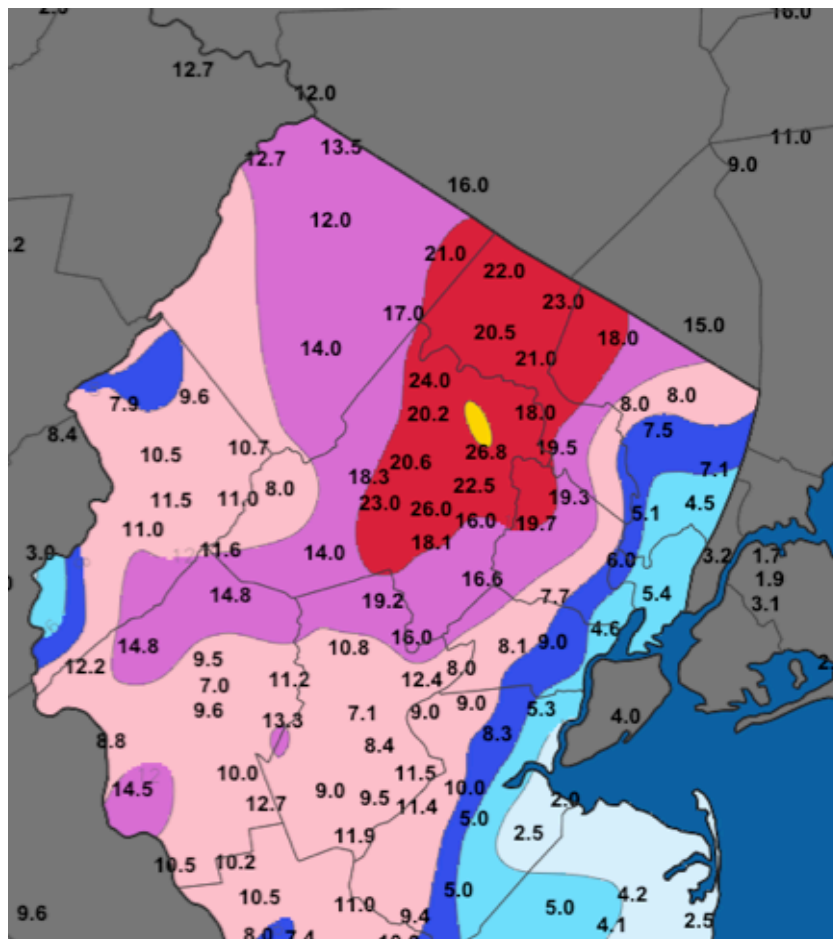
Manville

Irene rainfall

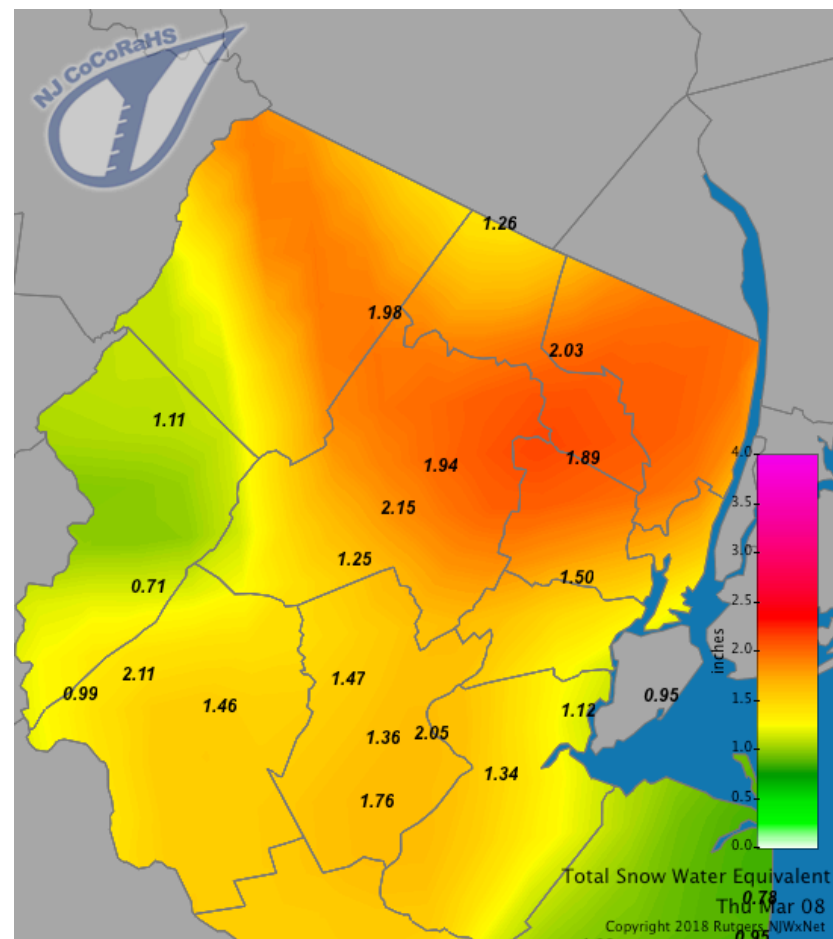
27-28 August 2011



3) Mid-latitude low pressure systems



Snowfall
6-7 March 2018



Snow Water Equivalent
8 March 2018

Overview

1. Greetings from the ONJSC
2. The global climate system
3. New Jersey's weather and climate
4. Climate change, past, present....future



Paulins Kill

Climate change...it's
real, it's happening
now, and it's affecting
New Jersey.



.....and humans are responsible for a significant portion of recent changes

1. Greenhouse theory
2. Observations
3. Models

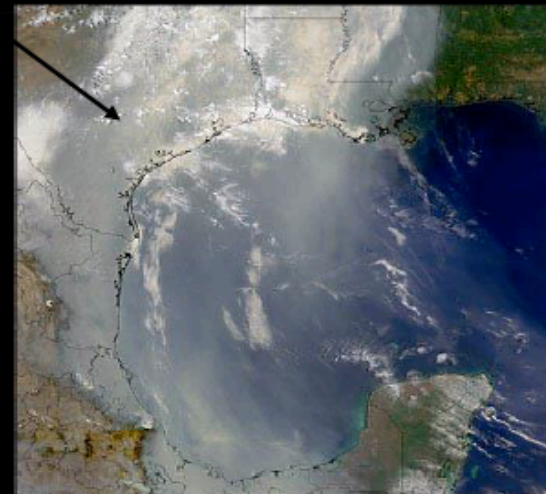
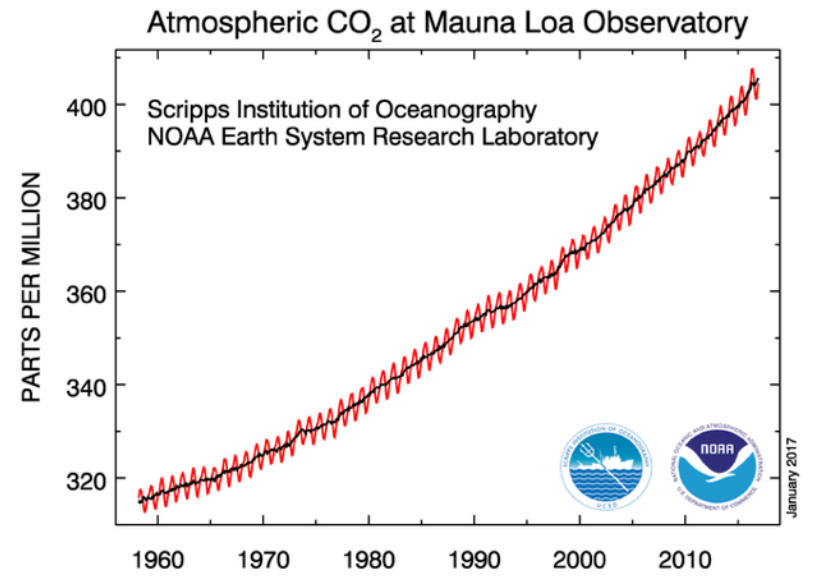
Human factors influencing climate

Non-natural mechanisms

Changes in the concentrations of atmospheric greenhouse gases →

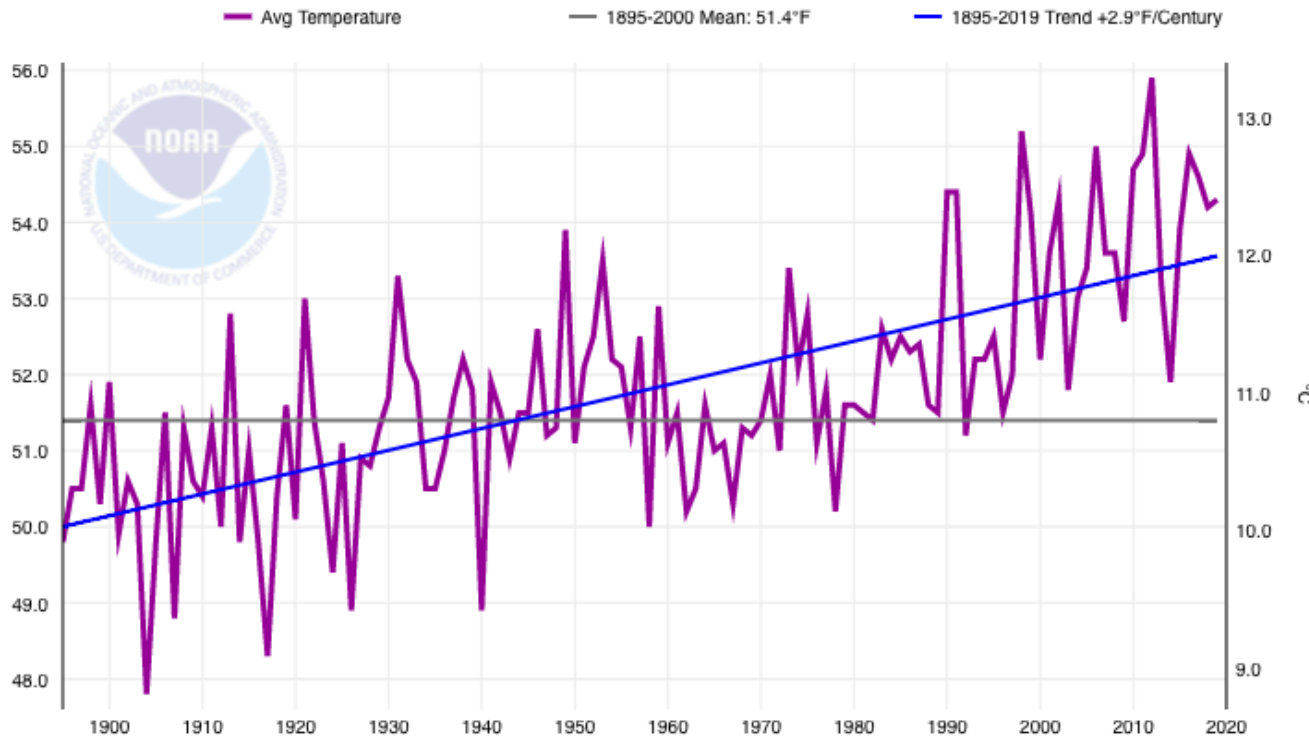
Changes in aerosols and particles from burning fossil fuels and biomass
coal (sulfate aerosols) – cooling
biomass (black carbon) – warming

Changes in the reflectivity (albedo) of Earth's surface and the hydrologic cycle



Smoke from fires in Guatemala and Mexico (May 14, 1998)

New Jersey annual temperature: 1895-2019



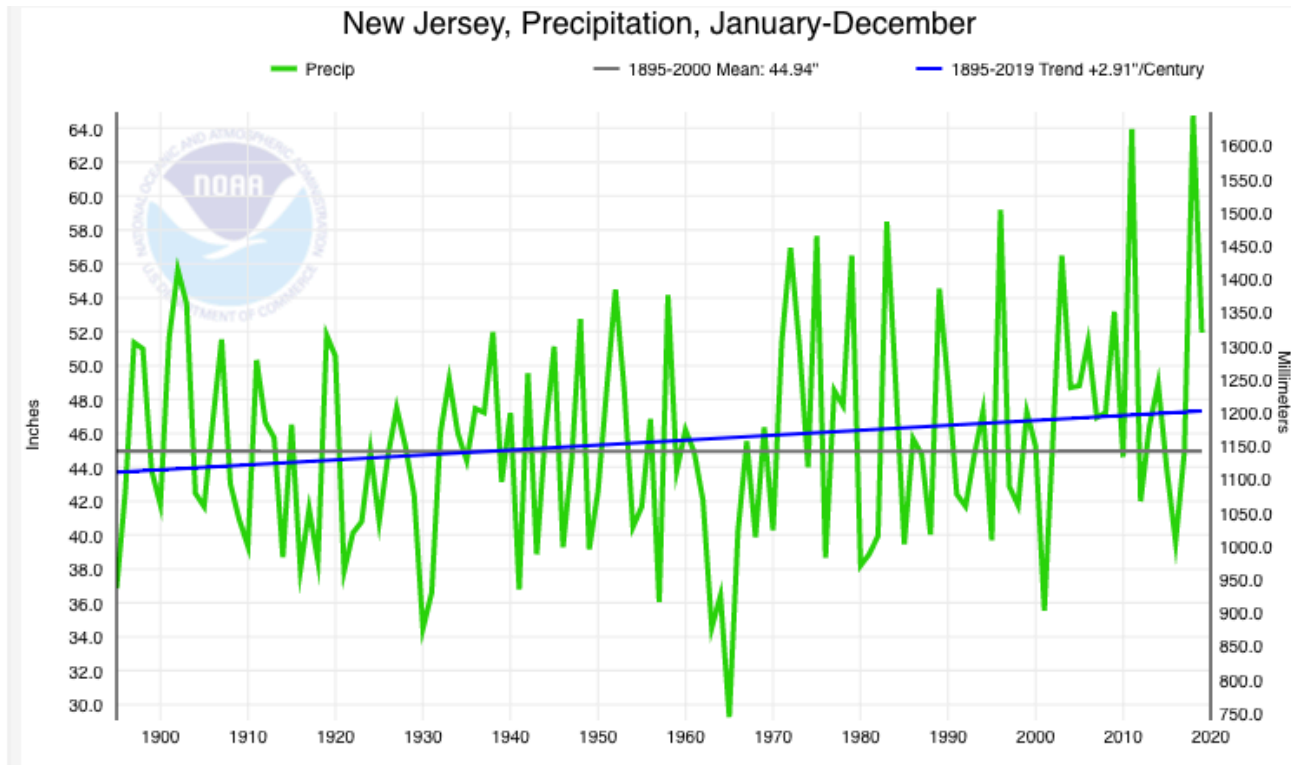
Long-term upward trend
of 2.9°F per 100 years

14 of the 20 warmest
years have occurred
since 2001; 19 of 20 since
1990

2012 was the warmest
year on record

data source: National Centers for Environmental Information

New Jersey annual precipitation: 1895-2019



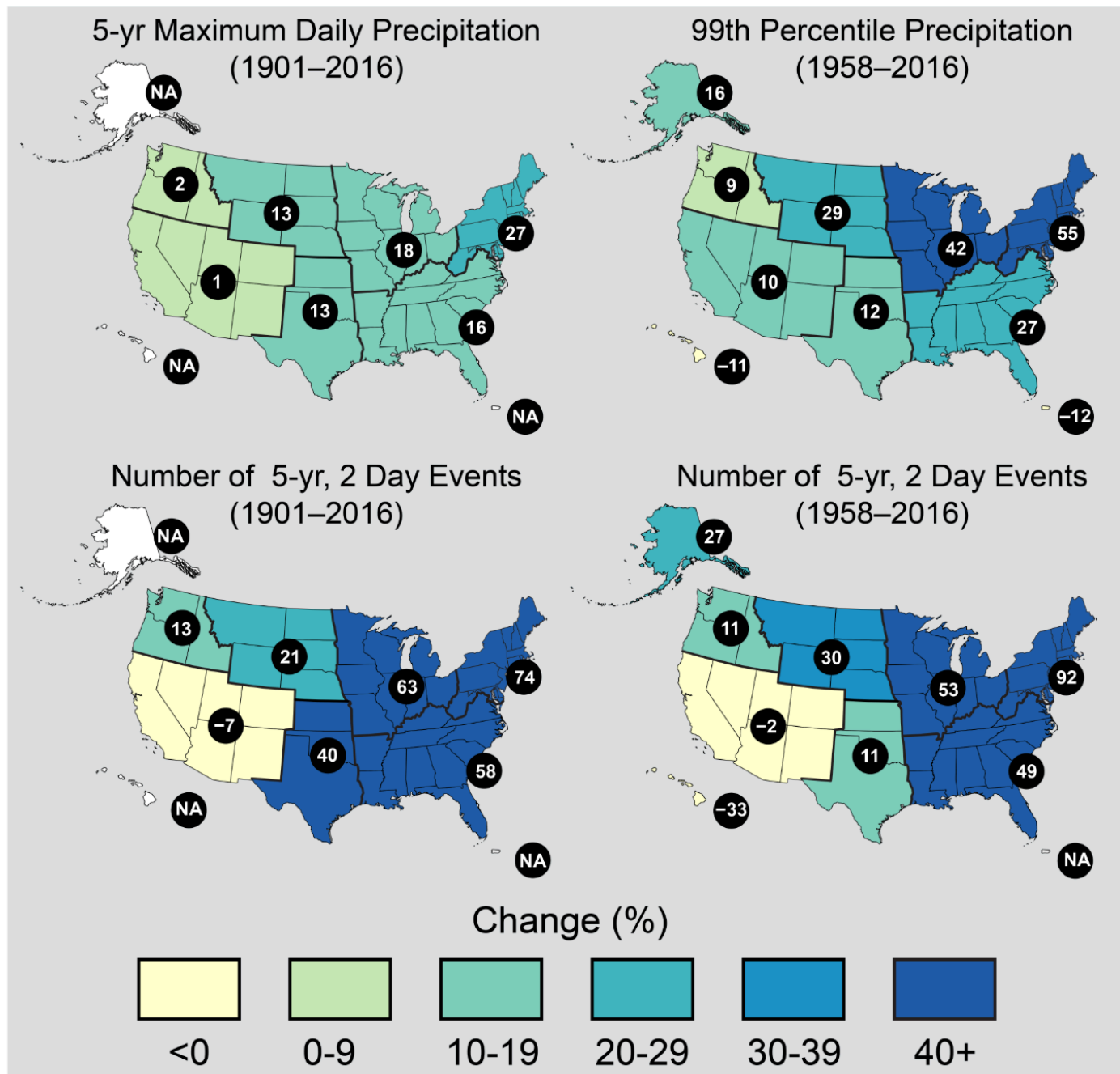
Long-term upward trend of 2.91" per 100 years

Large decadal variability
(early 1960s drought, wet 1970s, very wet in the past decade)

Most of the upward trend comes from changes in spring and fall

data source: National Centers for Environmental Information

Observed change in heavy precipitation



Combined top 10 events on the Passaic, Raritan and Delaware rivers 1950-2018

1950-59: 5

1960-69: 1

1970-79: 3

1980-89: 4

1990-99: 4

2000-09: 7

2010-18: 6

New Jersey's future climate

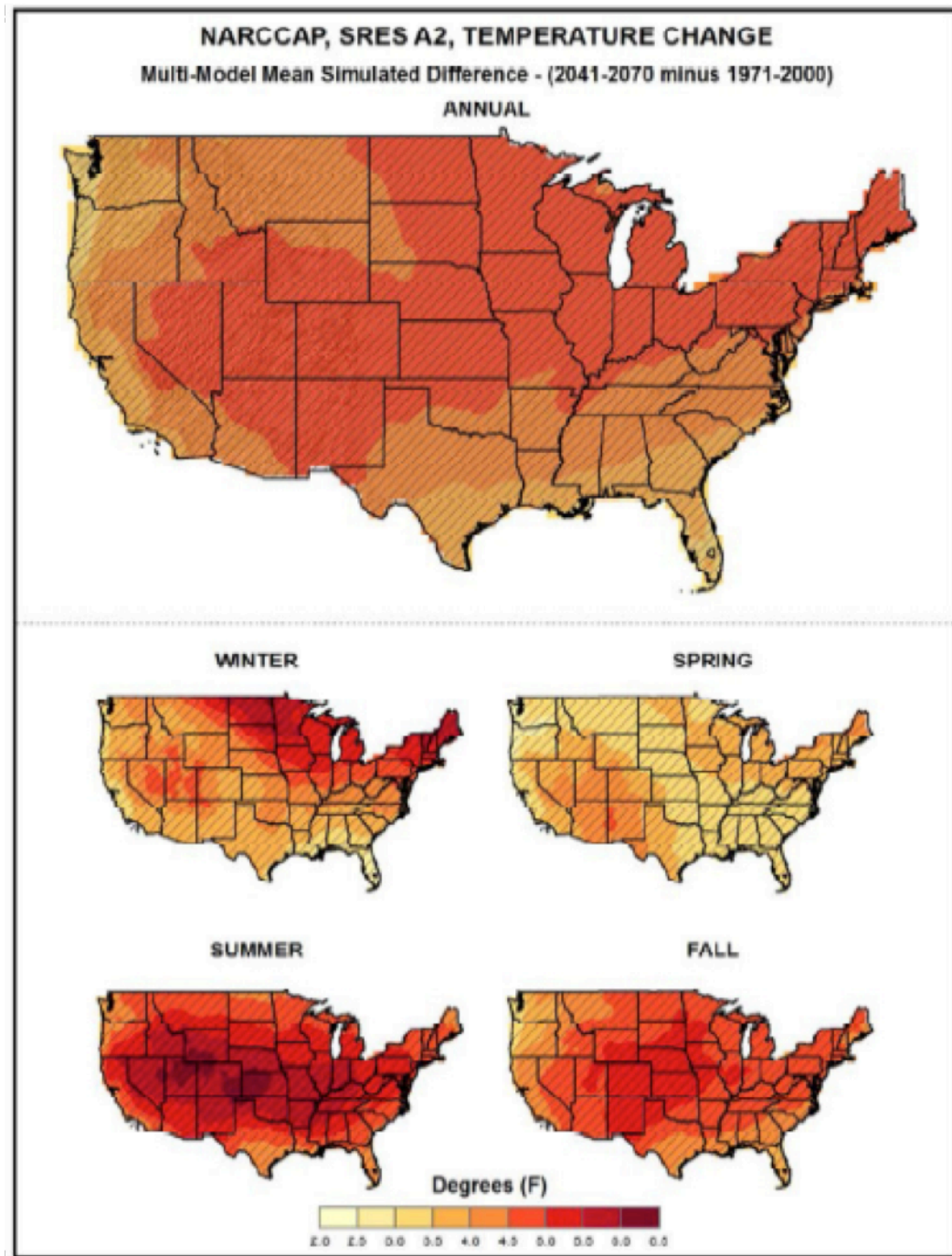
- Rising temperatures
- Steady or increasing precipitation
- Increasing variability and extremes
 - storms, flood, drought, heat.....
- Rising sea level

Changing Annual and Seasonal Temperatures

2041-2070
minus
1971-2000

North American Regional
Climate Change Assessment
Program

Kunkel et al. NOAA Tech.
Report NESDIS 142-9, 2013

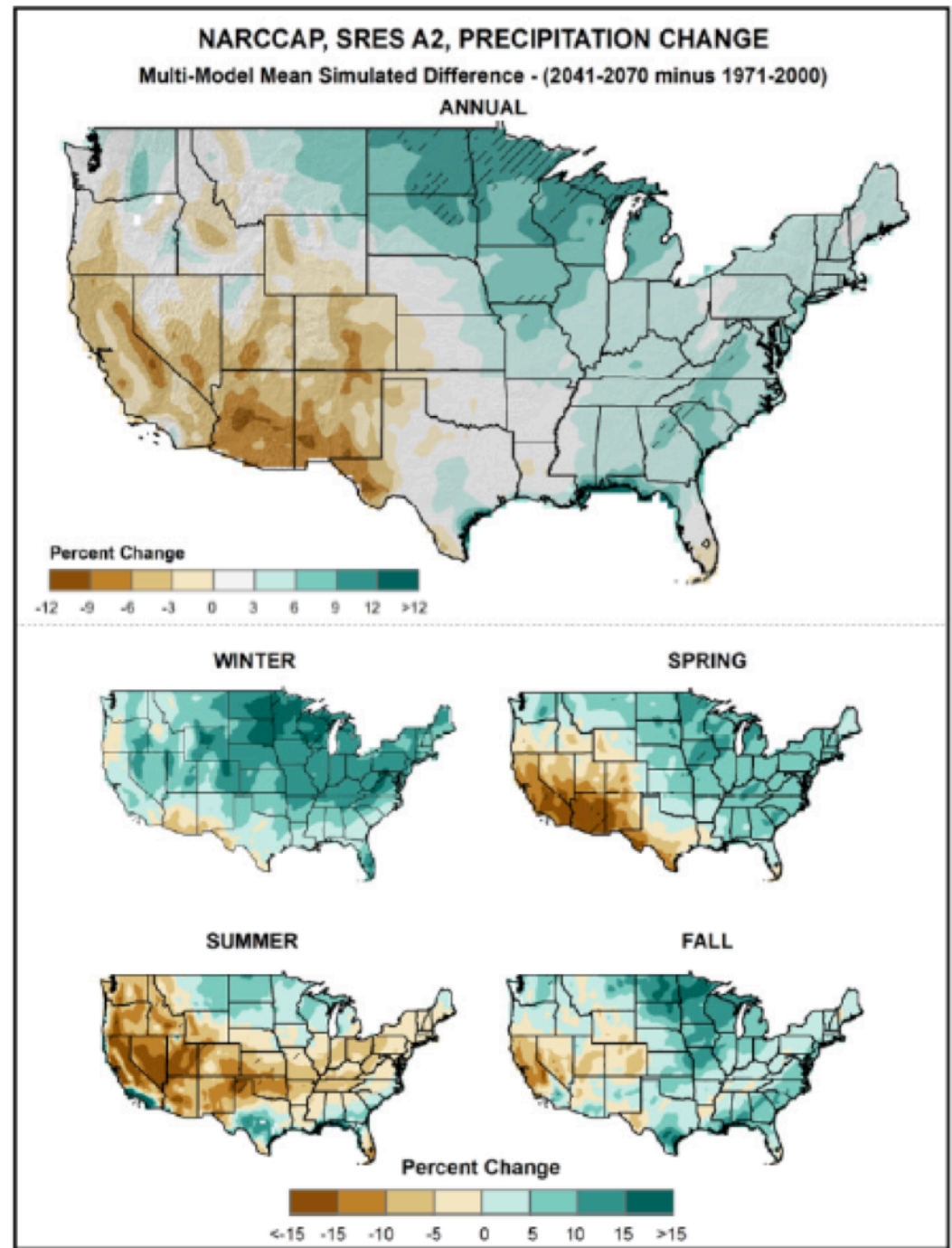


Changing Annual and Seasonal Precipitation

2041-2070
minus
1971-2000

North American Regional
Climate Change Assessment
Program

Kunkel et al. NOAA Tech.
Report NESDIS 142-9, 2013



Seeking further understanding

1. Magnitude of baseline change
2. Seasonality of change
3. Nature and magnitudes of extremes
4. Speed and magnitude of sea level rise

Summing up:

New Jersey has a wide (sometimes wild) variety of weather and climate conditions.

Climate continues changing in NJ, much like elsewhere. This includes changes in extremes.

Change will continue and likely accelerate in the foreseeable future. Expect more extremes.

Impacts on the state's hydrological system will expand.

While ongoing change is certain, time remains for mitigative and adaptive actions to address and attenuate conditions.

If behooves us to keep a keen eye of NJ's weather and climate



Thank you

david.robinson@rutgers.edu

Ken Lockwood Gorge, Raritan River