

RUTGERS

THE STATE UNIVERSITY
OF NEW JERSEY

Exploring NJ Climate Variability and Change



Presentation to the Pinelands Commission

Dr. David A. Robinson

Professor, Department of Geography & New Jersey State Climatologist
Rutgers University

November 18, 2015

Office of the NJ State Climatologist

Data



Information



Knowledge



Decision

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

RUTGERS
New Jersey Agricultural Experiment Station

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New Jersey
Agricultural
Experiment Station

Latest from the NJWxNet

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

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

New Jersey CoCoRaHS

NJ Water Watch 2015

Frequently Updated Climate Data

[Monthly and Annual Statewide \(1895-Present\)](#)

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[Winter 2014-2015 Snow Event Totals](#)

Latest News

Waves crash into a sheet pile wall in Brick (Ocean County) on October 5. (Photo by [Sharkey-images](#)).

On Average, Rather Average, Bookended by Stormy Conditions October 2015 Recap

Dr. David A. Robinson
New Jersey State Climatologist
November 6, 2015

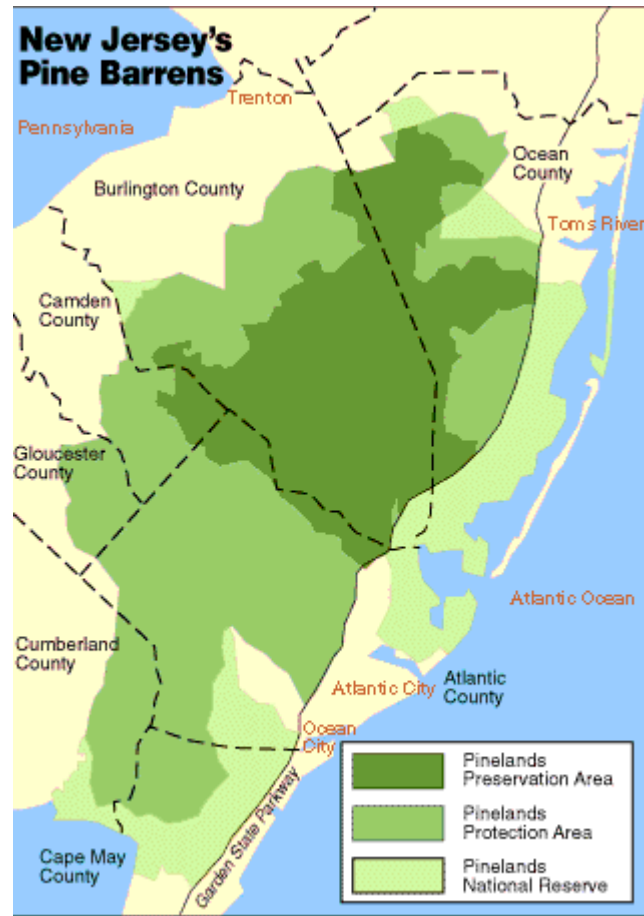
There were many sides to New Jersey's October 2015 weather, however, when temperature and rainfall observations were averaged, conditions were quite close to long-term (1981–2010) means. The statewide average temperature of 54.4° was 0.4° below normal. This ranked as the 53rd coolest since 1895 (121 years). Precipitation averaged 4.17", which is 0.24" above normal and ranks as 44th wettest. October was bookended by events that dumped the vast

Overview

1. Pinelands weather and climate
2. Climate change, past, present.....future?
3. Impacts and potential actions



Copyright 2005 - geology.com



Press graphic

Climate or Weather???

Weather refers to the short-term phenomena

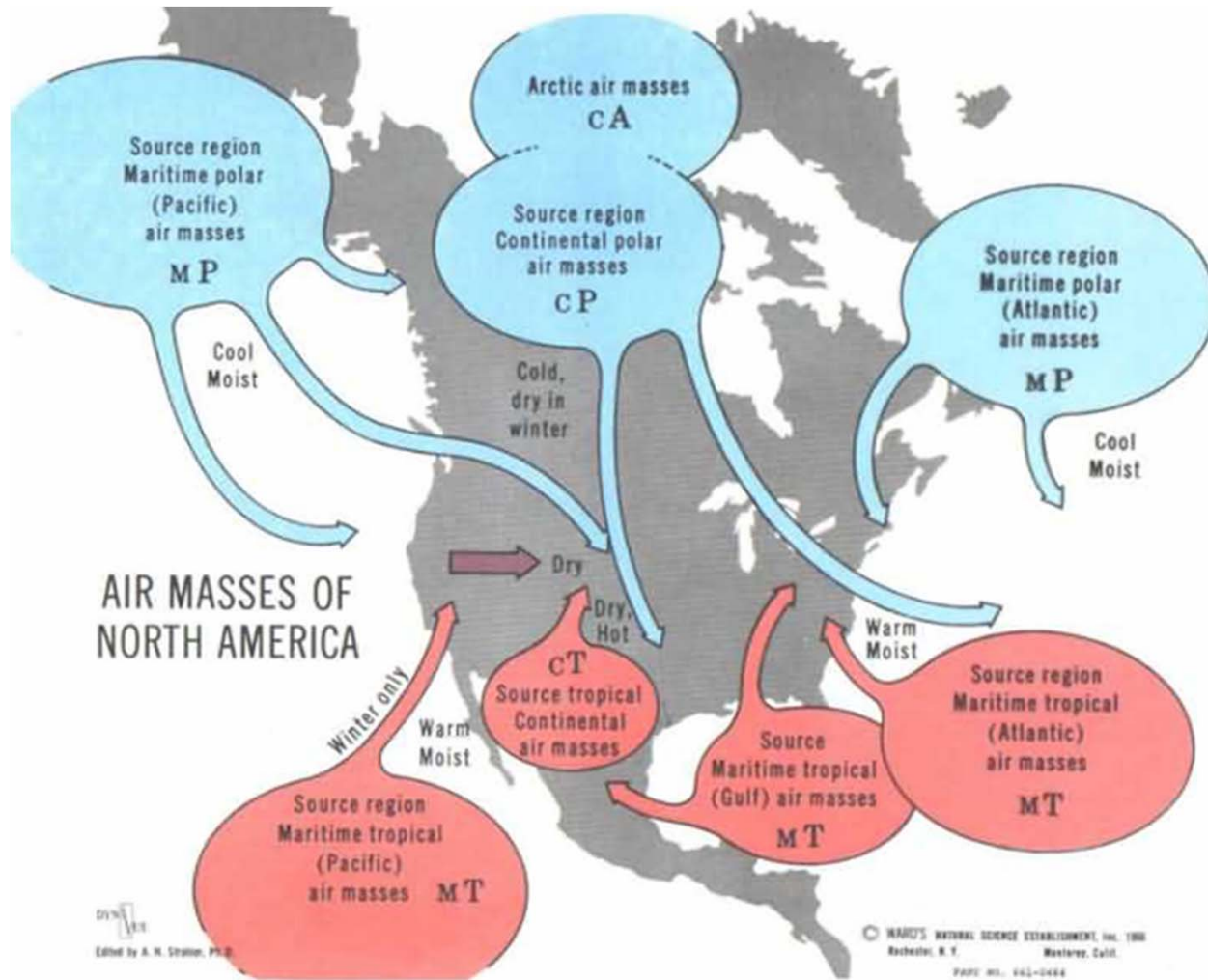
Climate refers to the long-term patterns

Better yet!

Climate is your personality.....

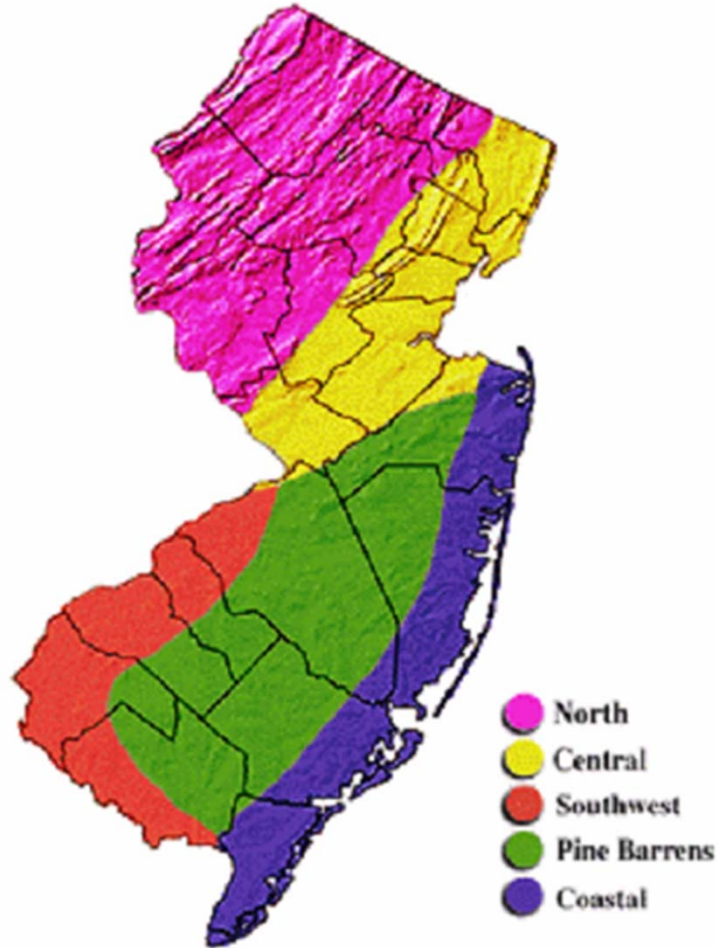
Weather is your mood.....

The big picture: a NJ squeeze play



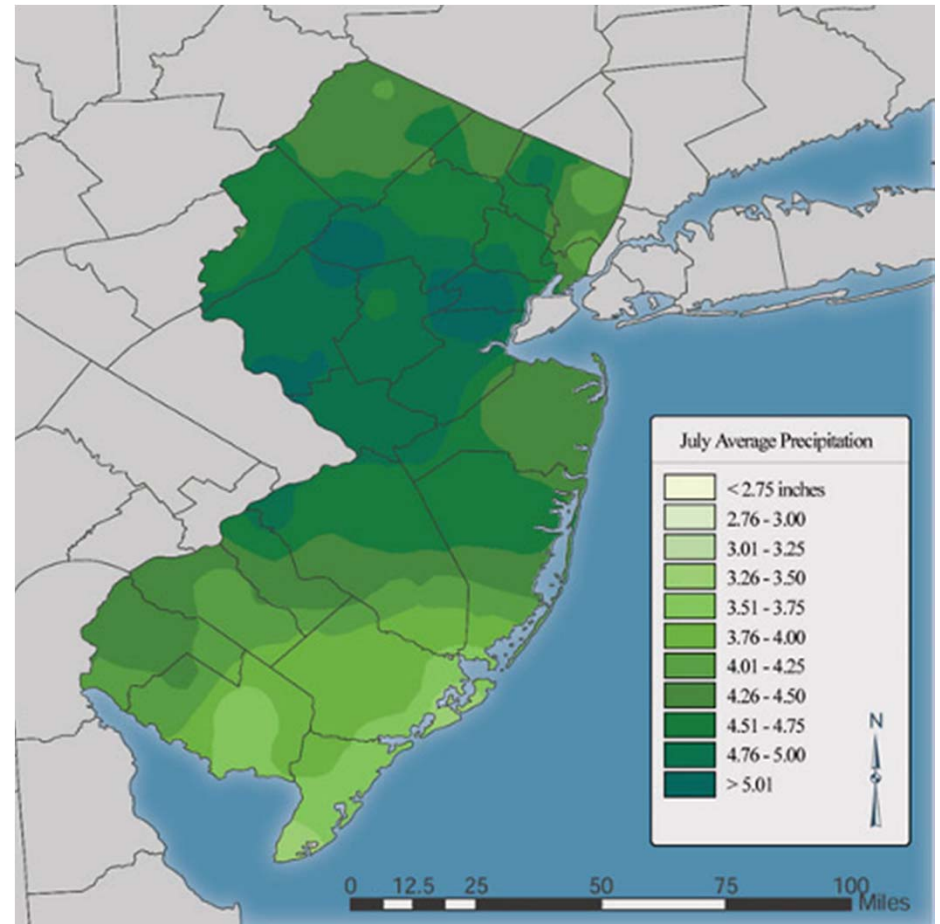
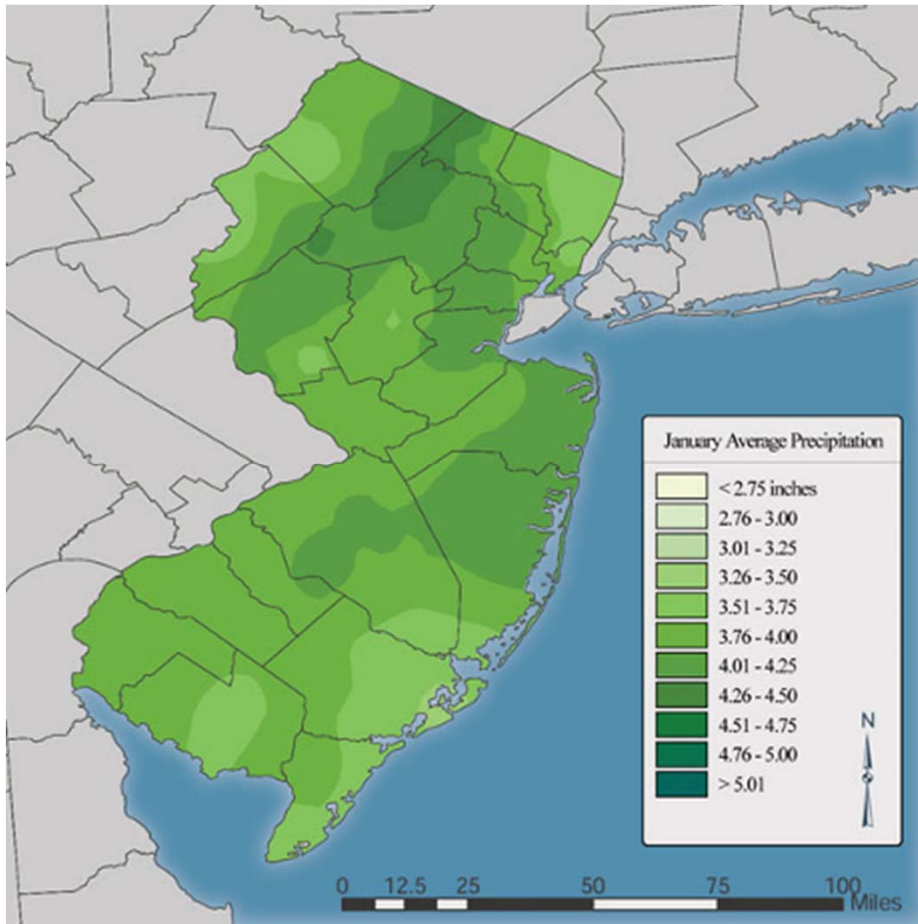
Diversity: Local Controls

New Jersey Climate Zones



Altitude
Latitude
Surface Conditions
Land-Water Contrasts

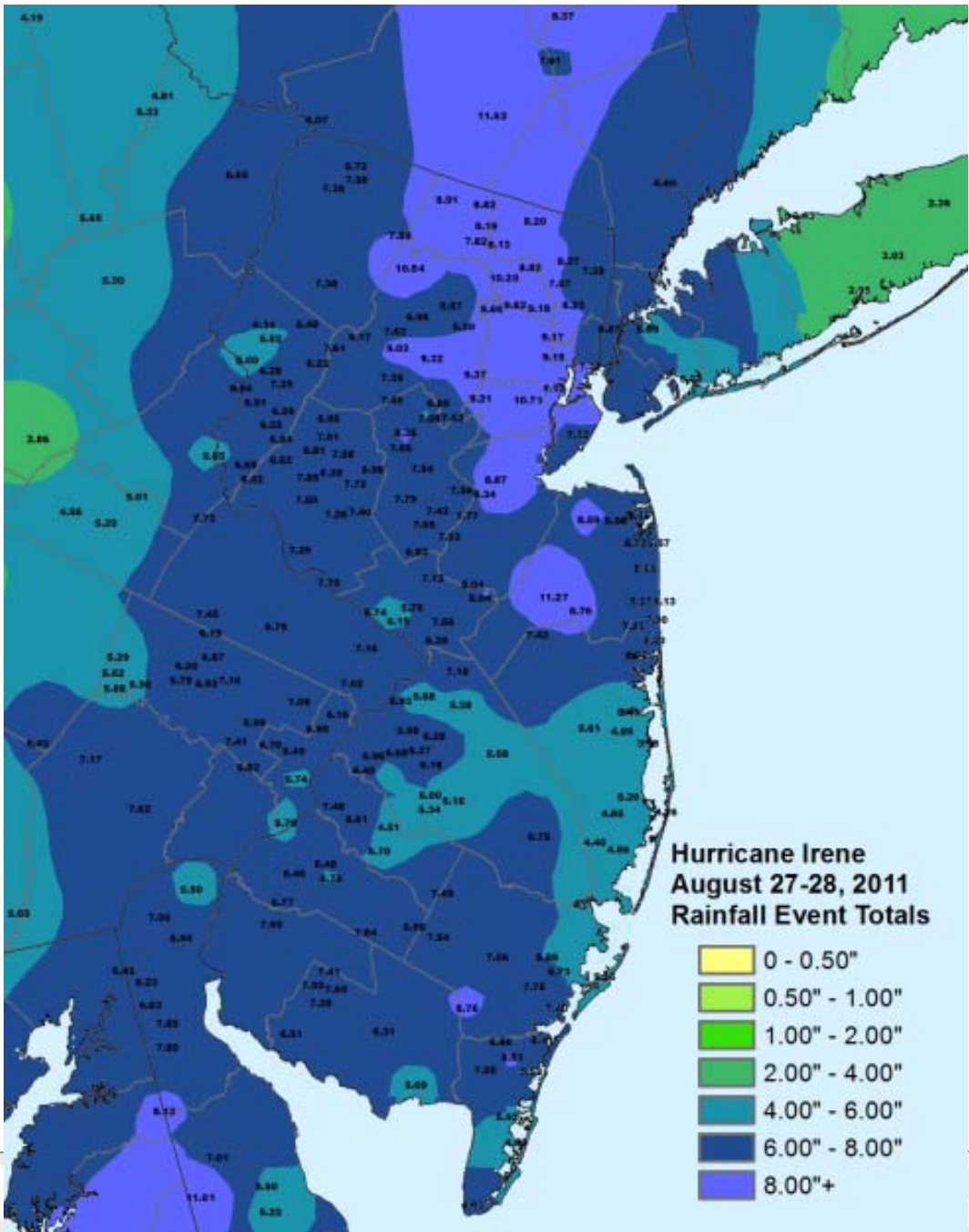
A precipitation rich state.....



.....most often

Sometimes
too much.....

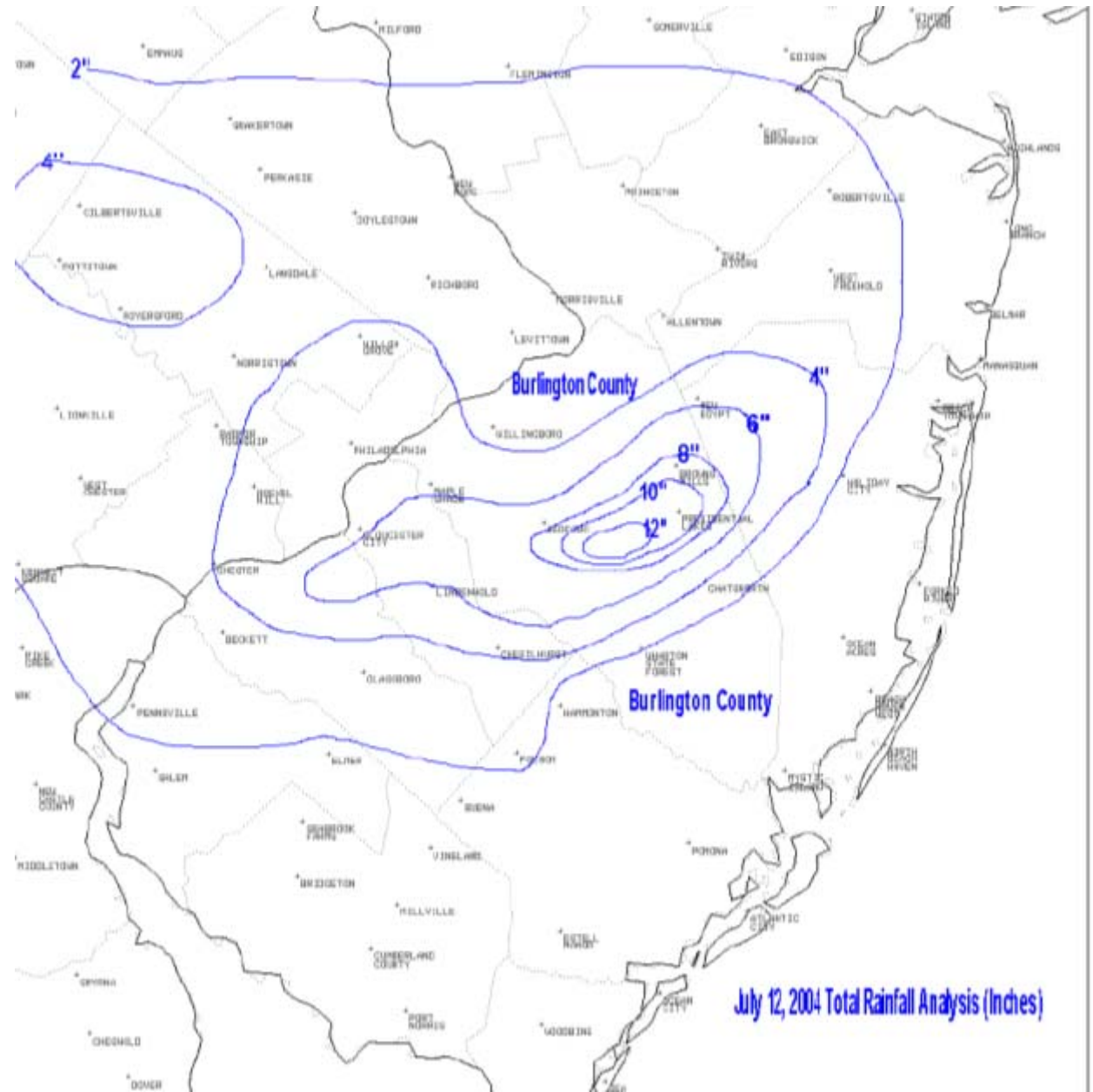




And
sometimes
far too much

Irene rainfall

Burlington County
deluge
12 July 2004



Sometimes too little....



A season for everyone

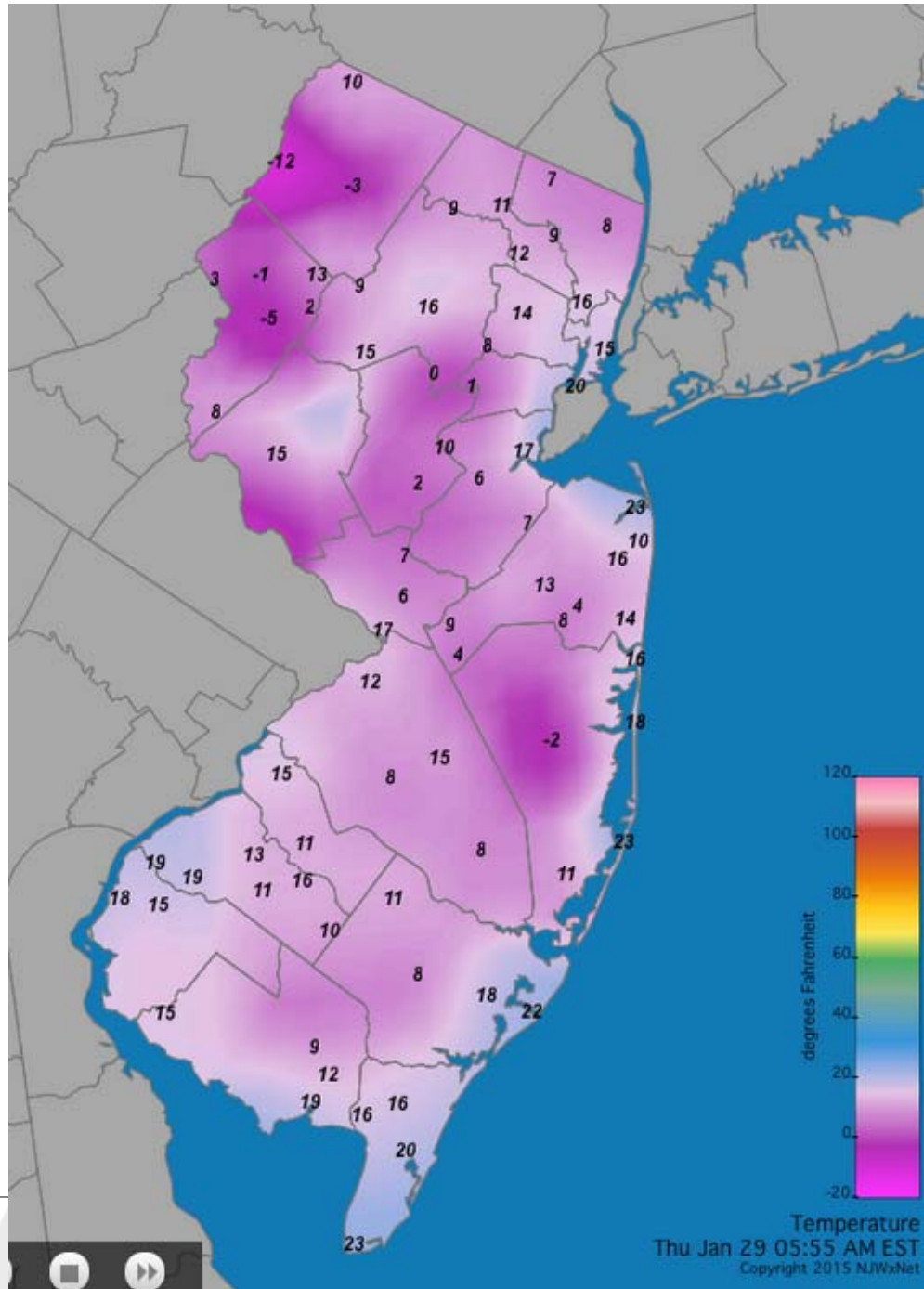


Photo by John Bunnell

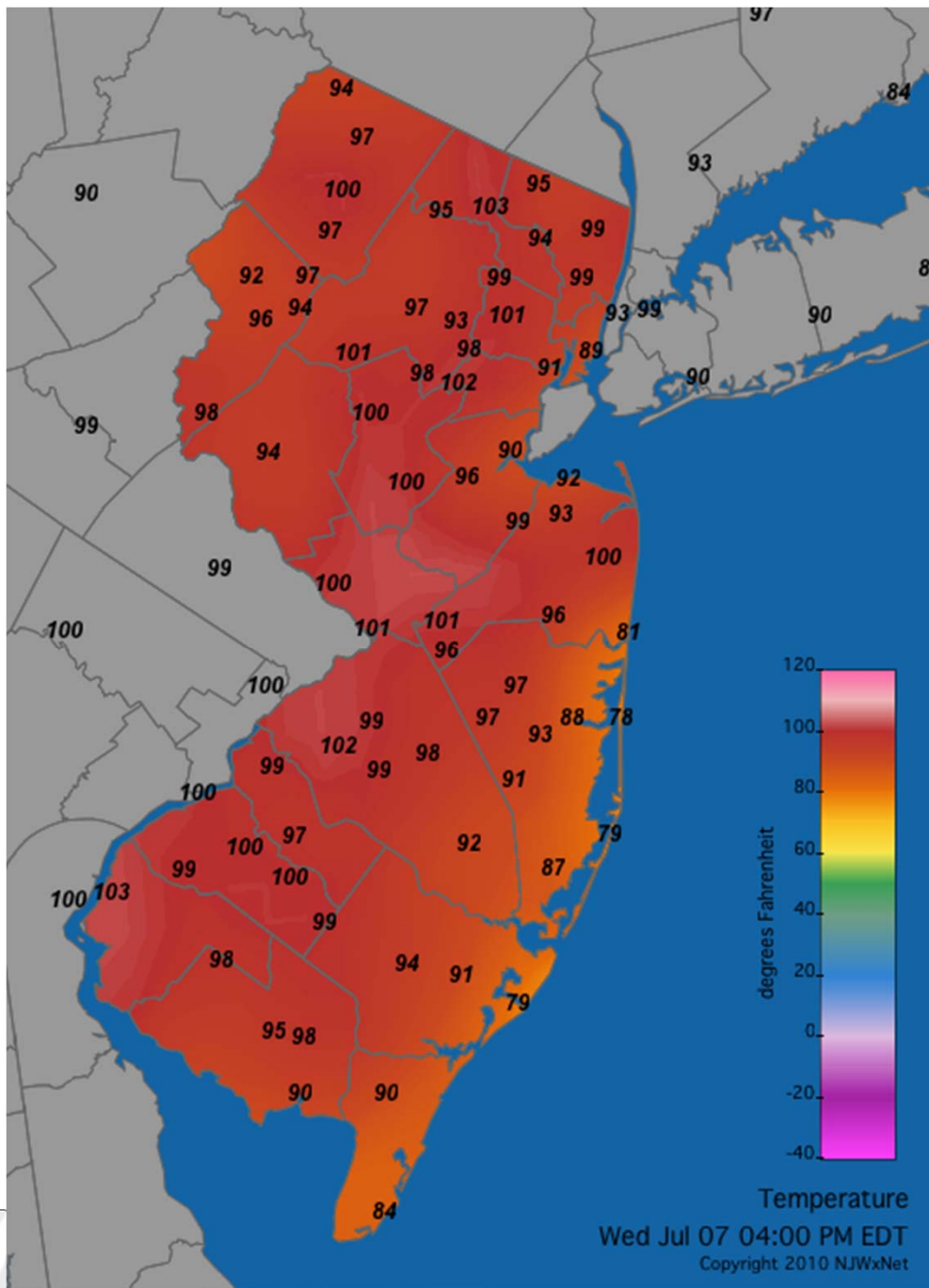
RUTGERS



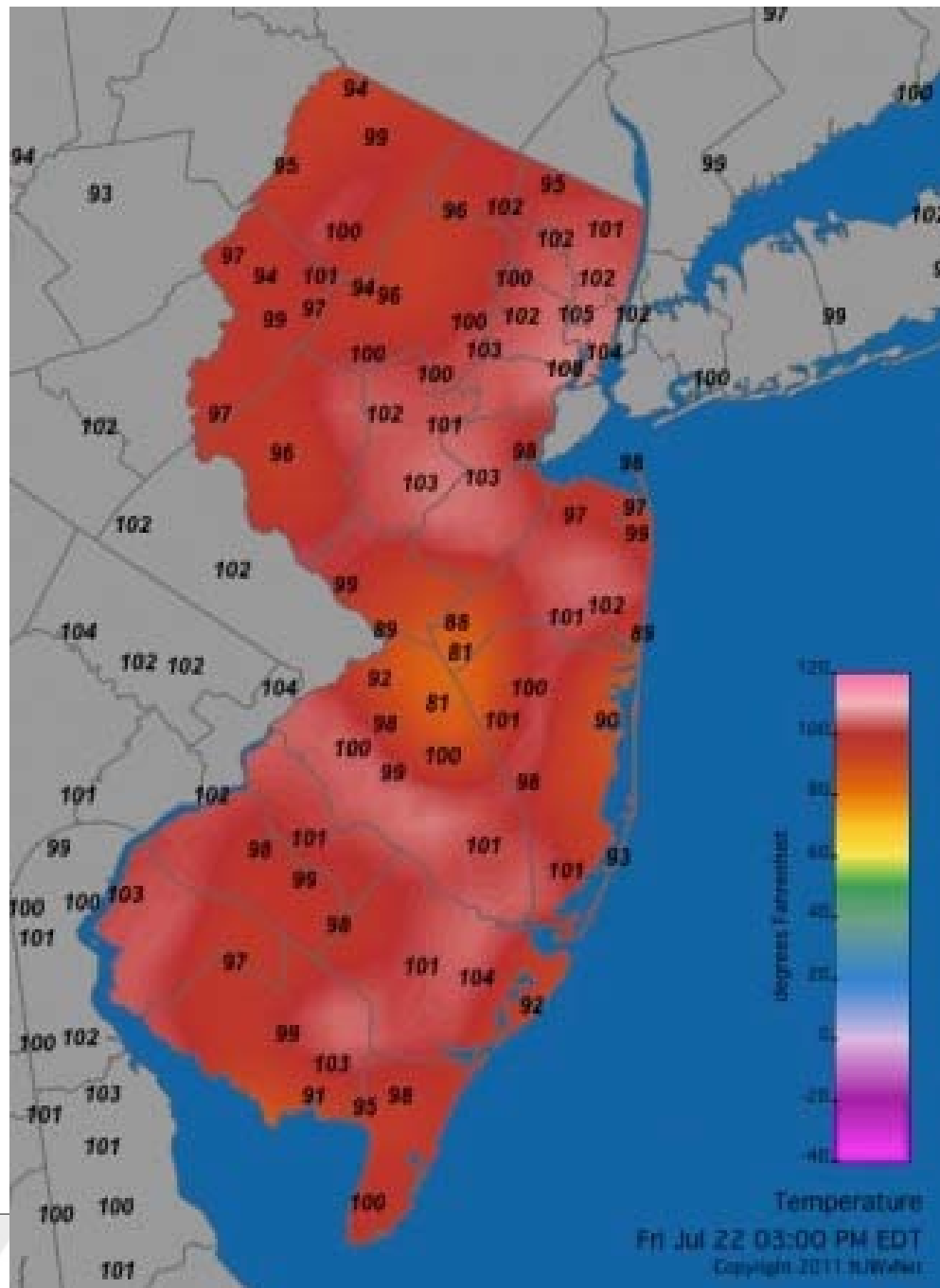
29 January 2015
5:55 AM



7 July 2010
4:00 PM



22 July 2011
3:00 PM



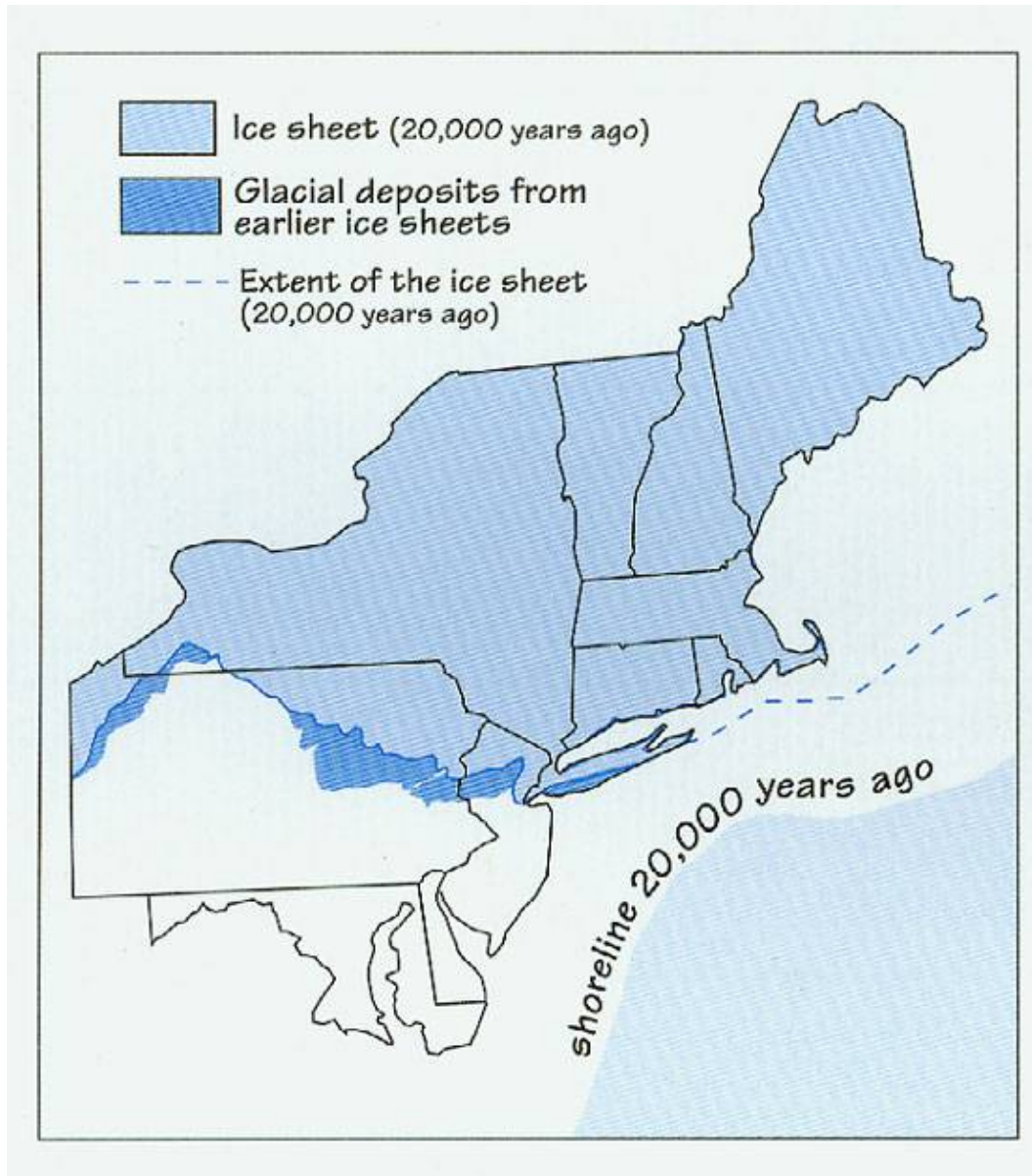
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Is climate presently changing in NJ & elsewhere?

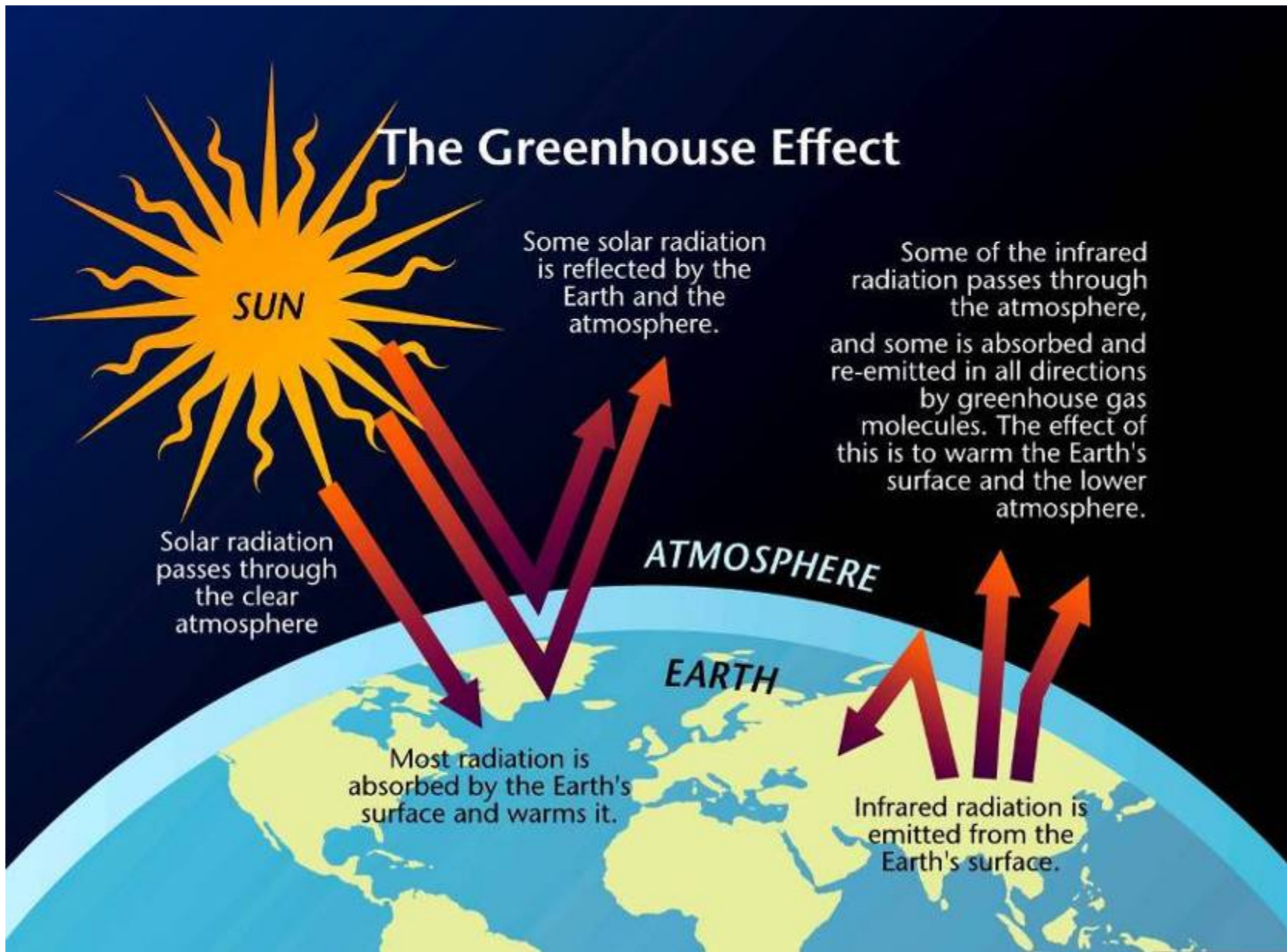
Preponderance of evidence suggests climate change is occurring and humans are responsible for a significant portion of recent changes

1. Theory
2. Observations
3. Models

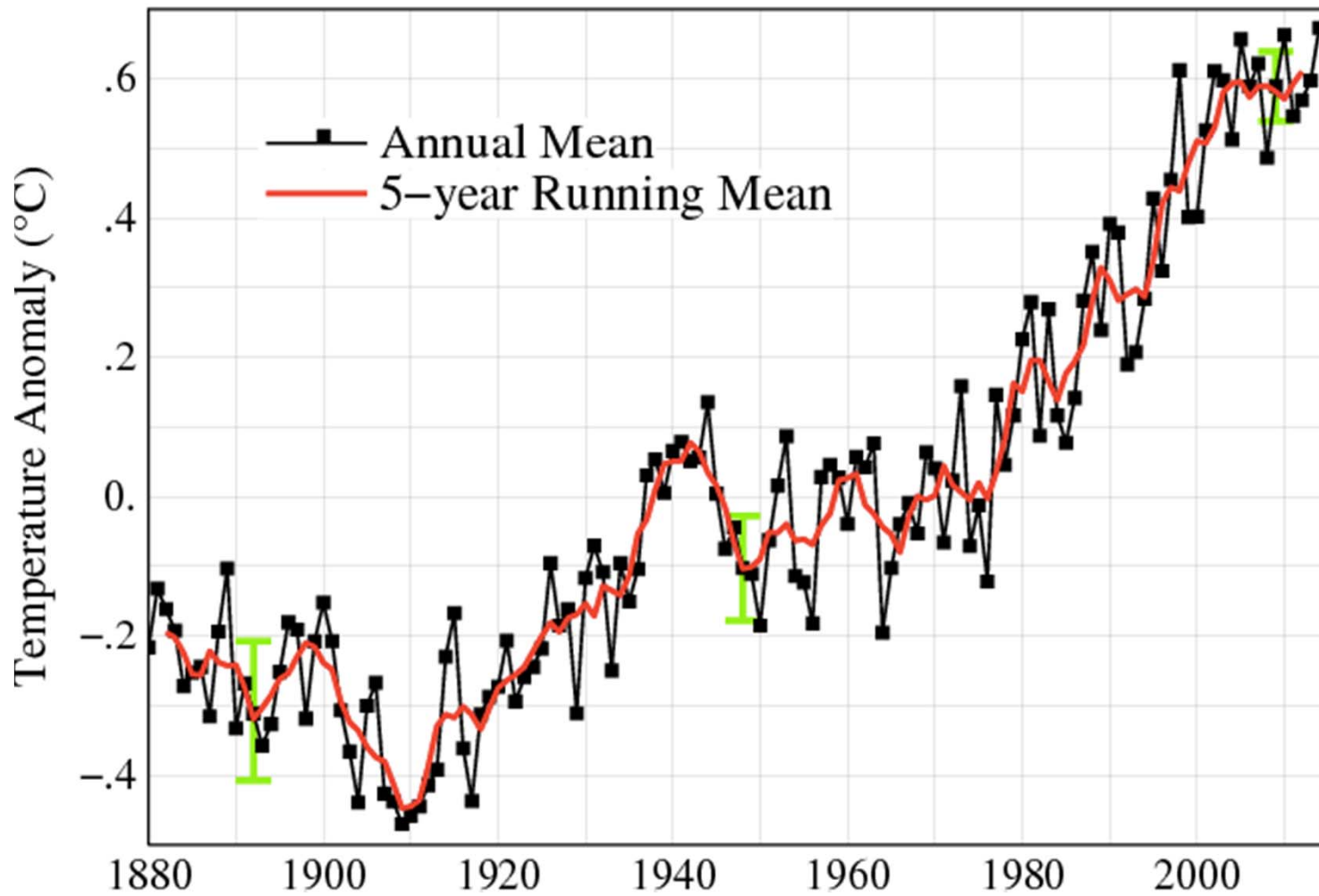


Climate regimes have changed dramatically on many time scales in the past

The Greenhouse Effect

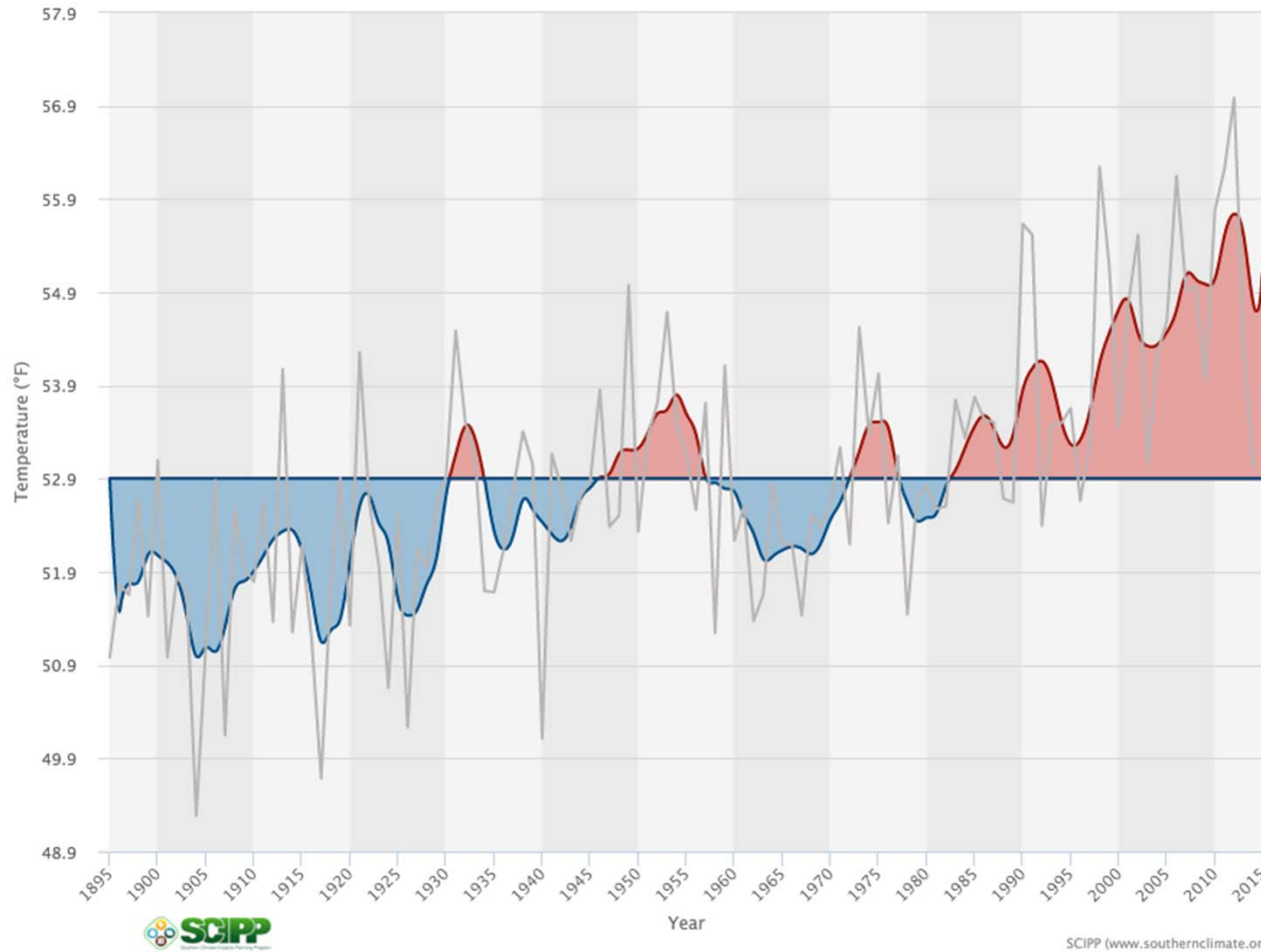


Global land-ocean temperatures: 1880-2014



NASA GISS

Trends in annual mean south Jersey temperature: 1895-2014



Long-term upward trend of approx. 3°F per 100 years

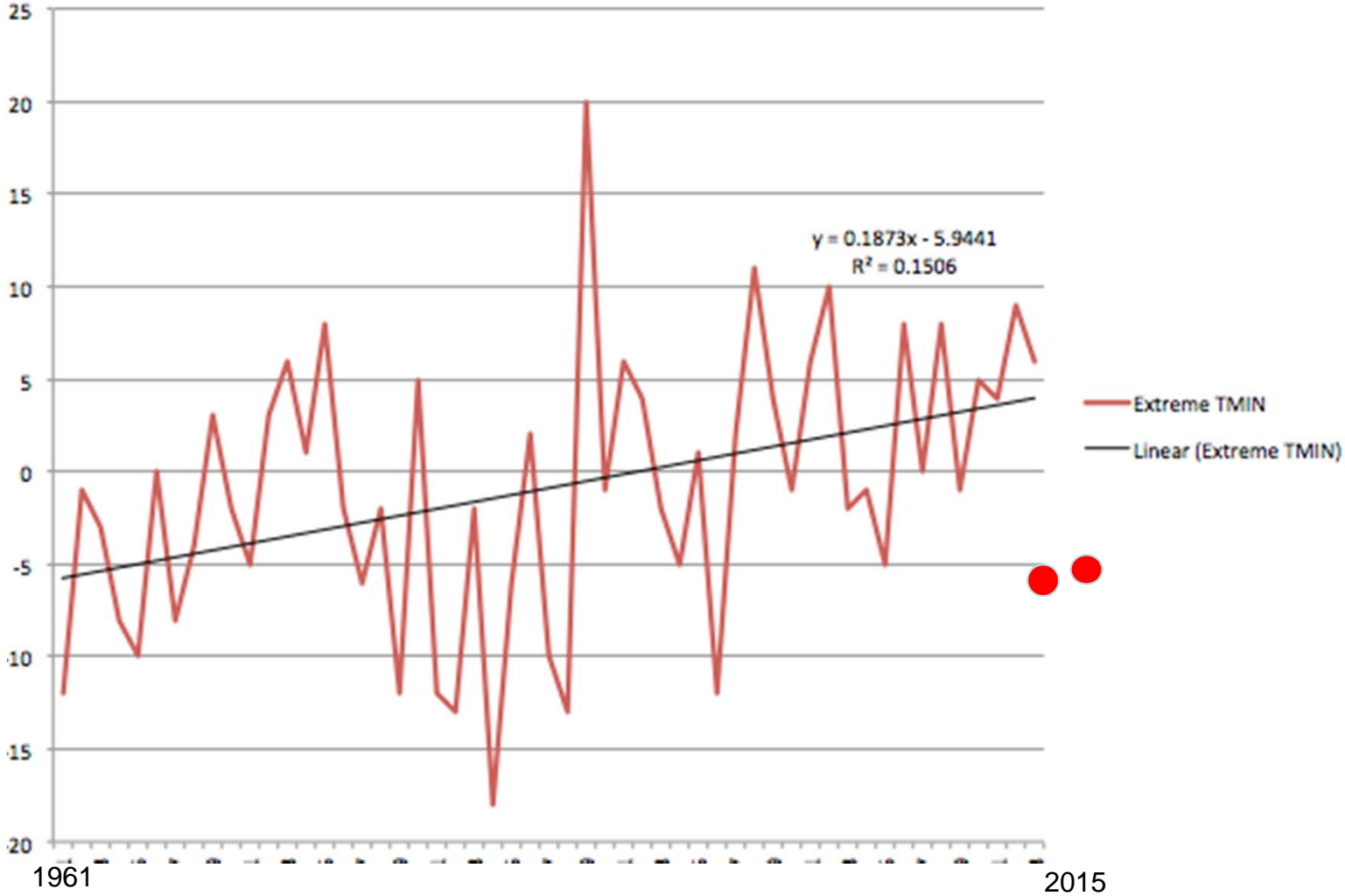
More rapid warming since 1980

The three warmest years have occurred since 1998

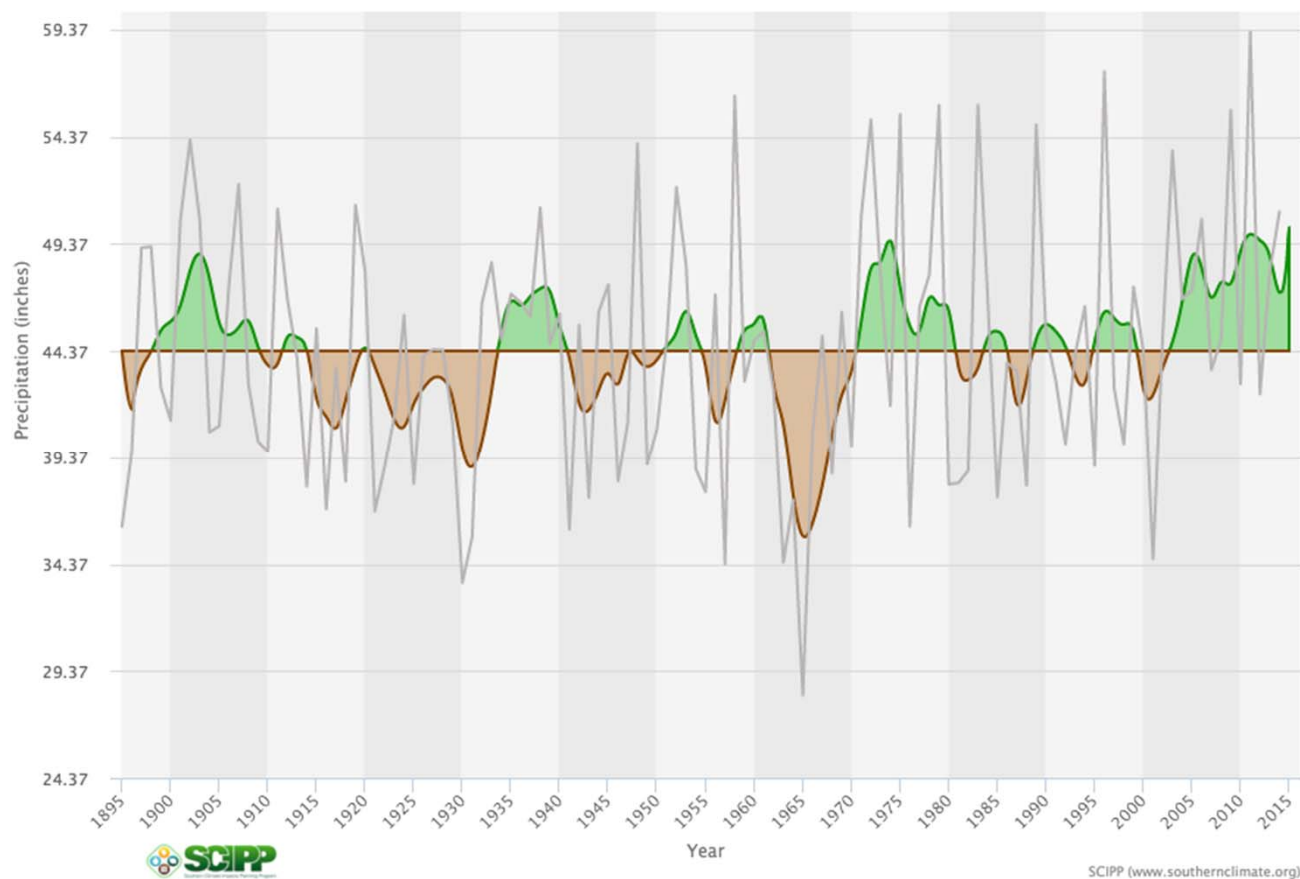
2012 was the warmest year on record

data source: National Climatic Data Center

Indian Mills: Winter Extreme Minimum Temperature: 1961-2015



Trends in annual mean south Jersey precipitation: 1895-2014



Long-term upward trend
of 4.1" per 100 years

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

data source: National Centers for Environmental Information

Bound Brook



September 17, 1999

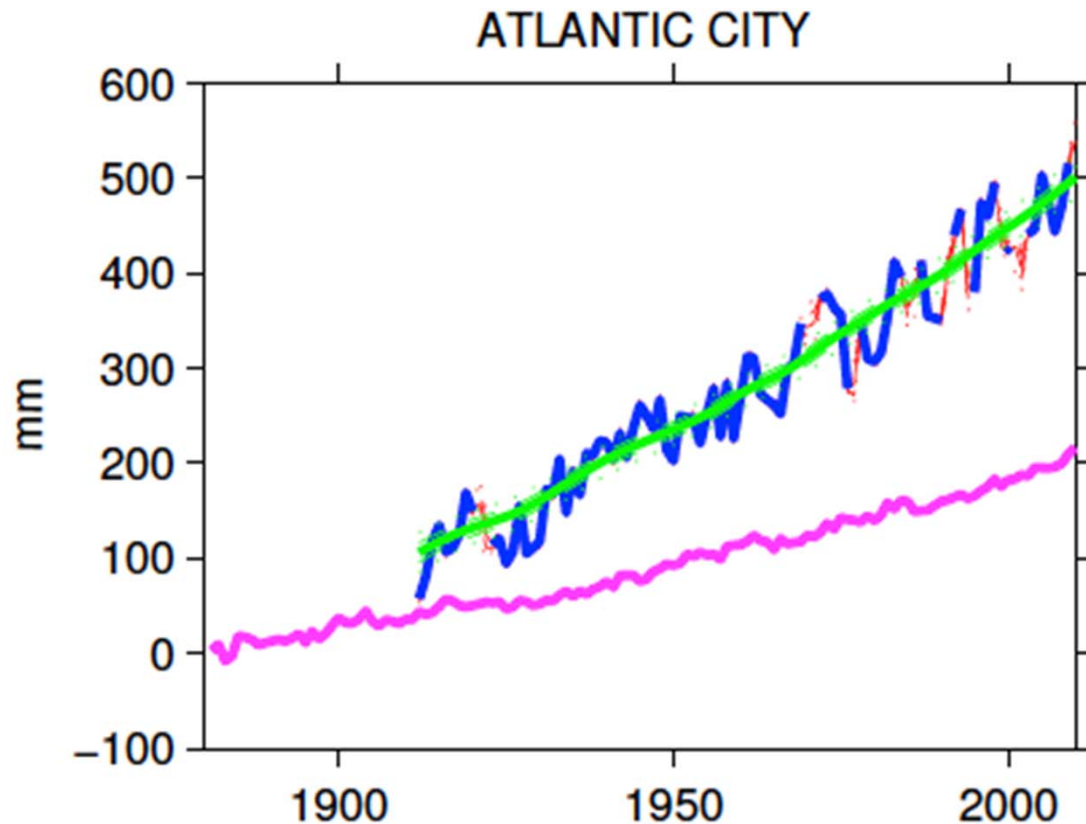
April 16, 2007



Hopewell, Mercer County August 20, 2010



Sea level rise: global and regional: 1880-present

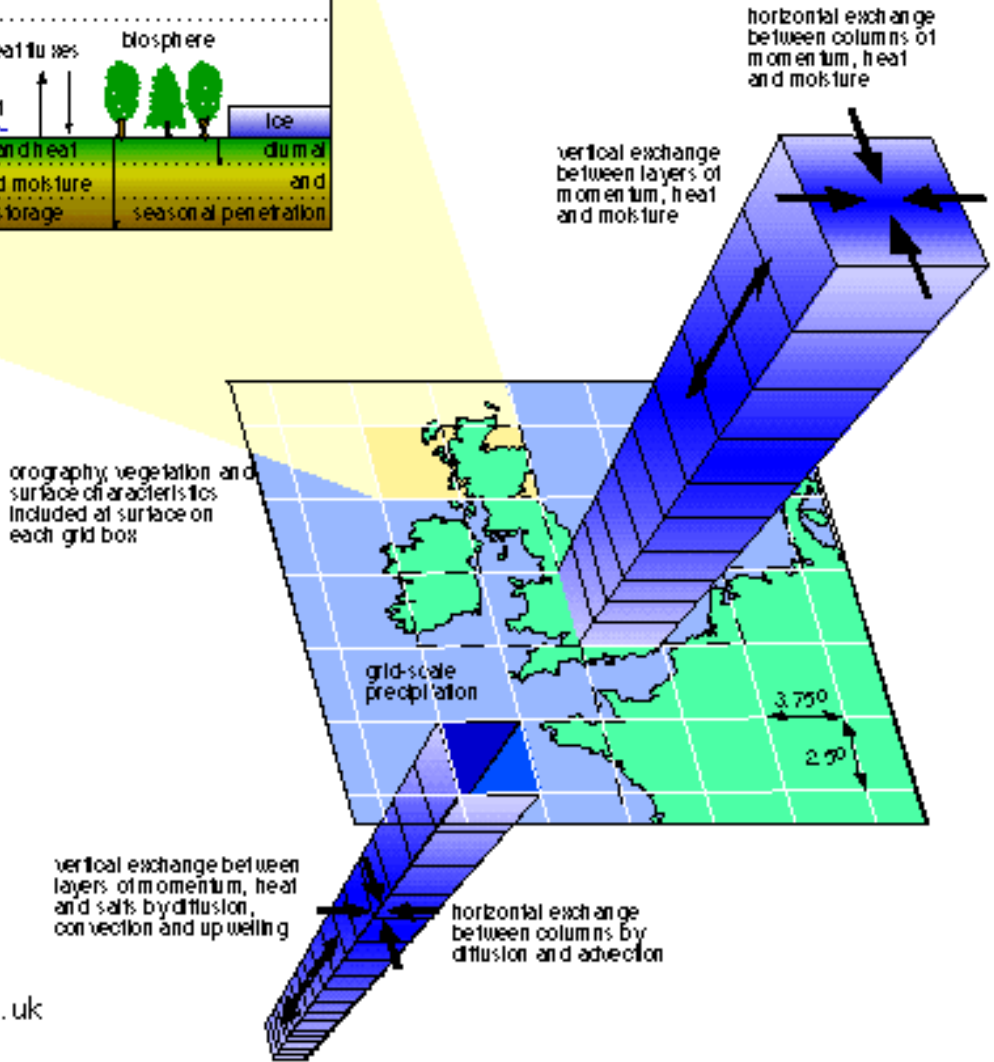
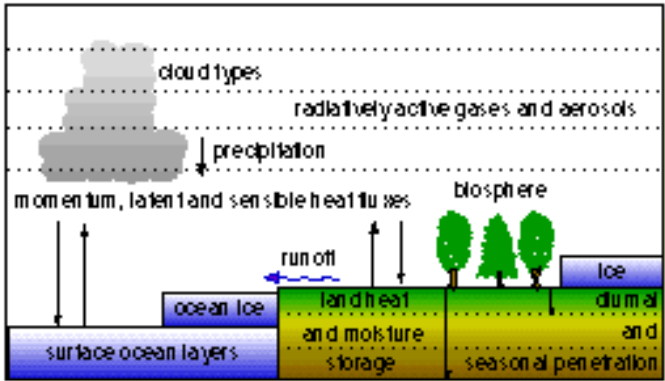


- Local sea level rise along the NJ coast has been more rapid than the global rise due to land subsidence (combination of post-glacial movement of earth's crust and compaction of coastal plain sediments)

Purple: Church & White (2011) GSL
Blue: Tide gauge data
Green: Long-term sea-level signal

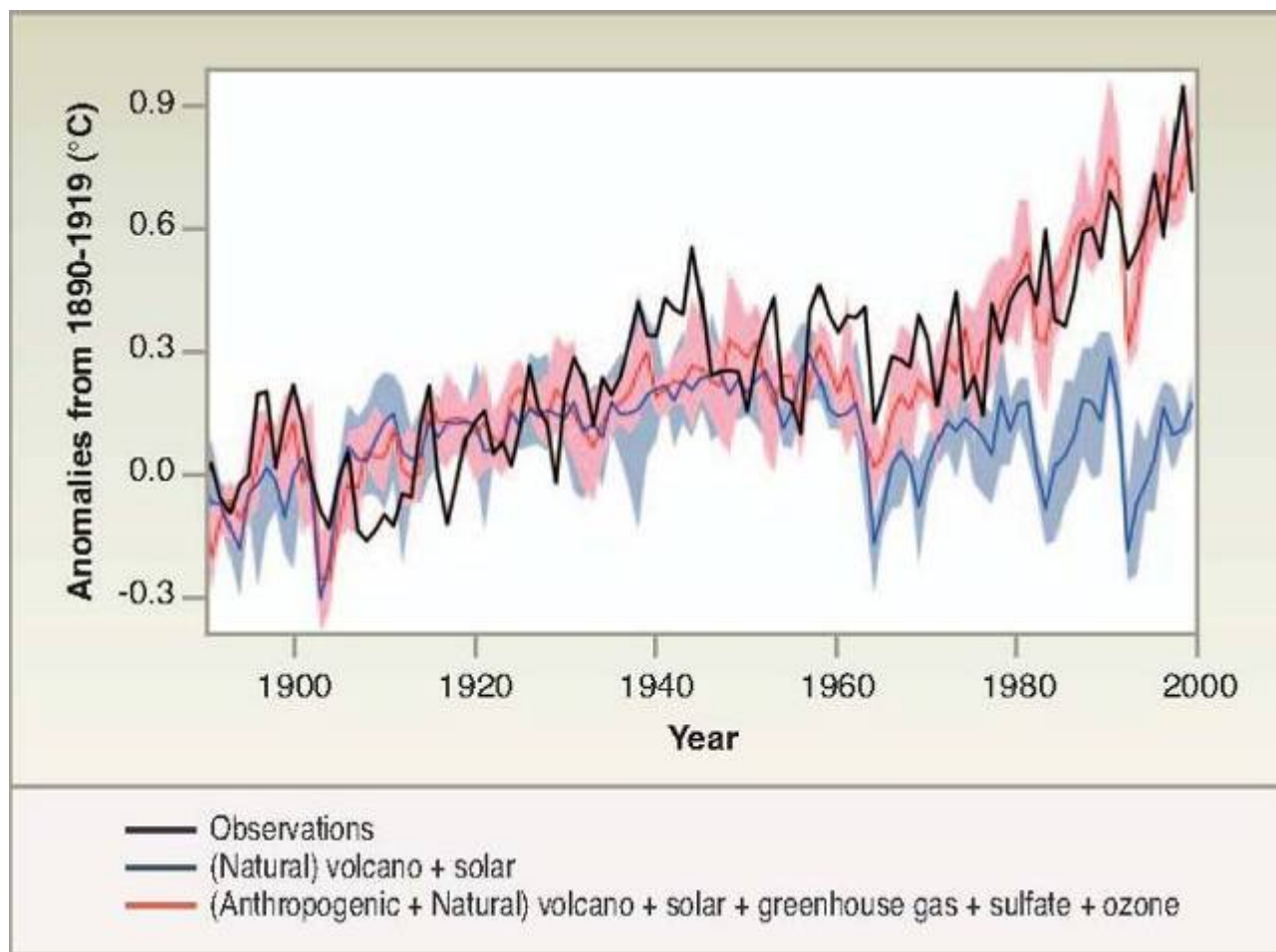
~1.3 mm/y GIA 1.7 mm/y NJ
An additional ~1 mm/y on the shore

Coupled Climate Model Schematic



d.viner@uea.ac.uk

Natural and anthropogenic forcings and 20th century temperatures



Meehl, G.A., et al., 2004

Pineland's future climate

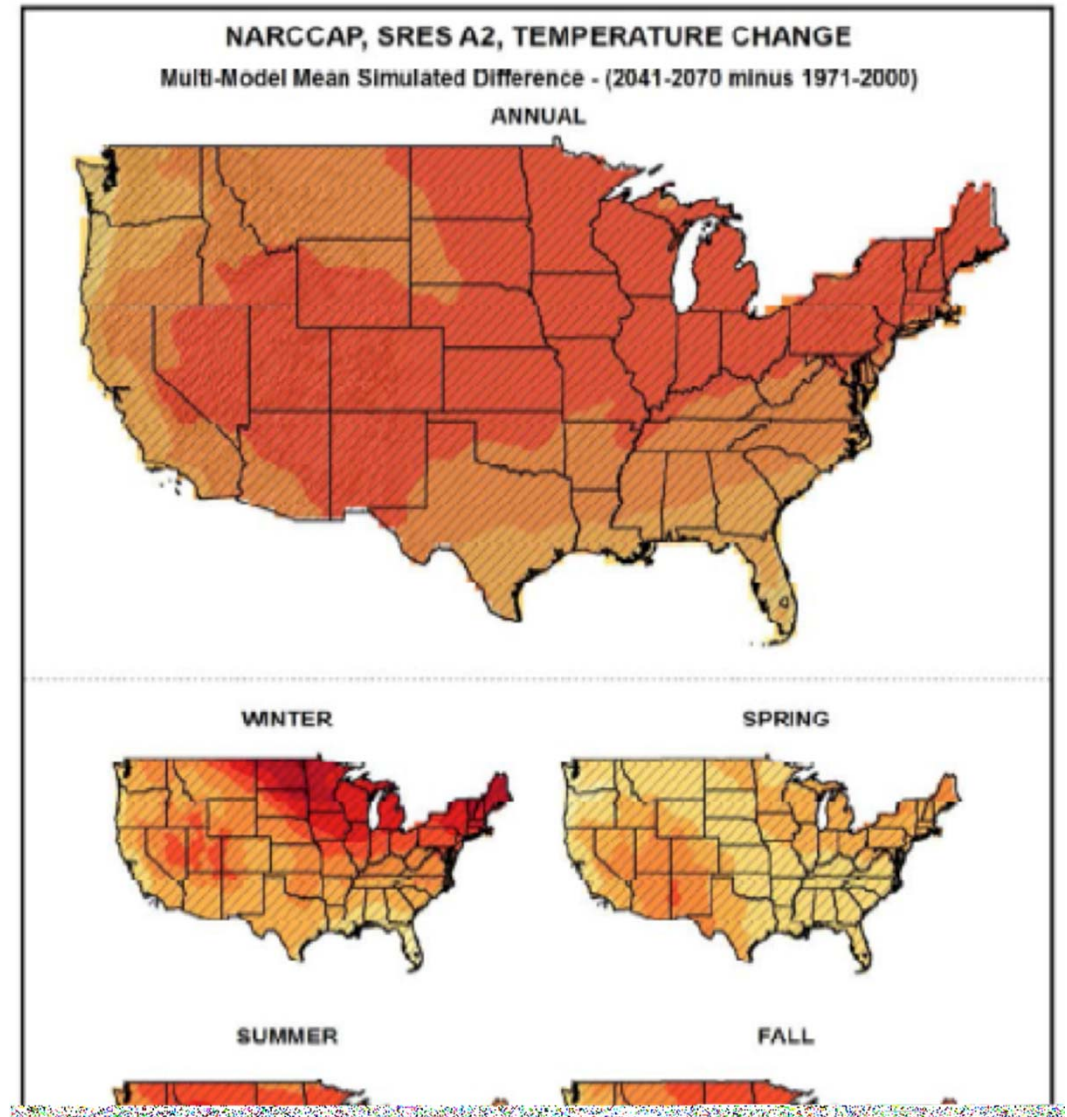
- Rising temperatures
- Steady or increasing precipitation
- Increasing variability and extremes
 - storms, flood, drought, heat.....
- Rising sea level

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

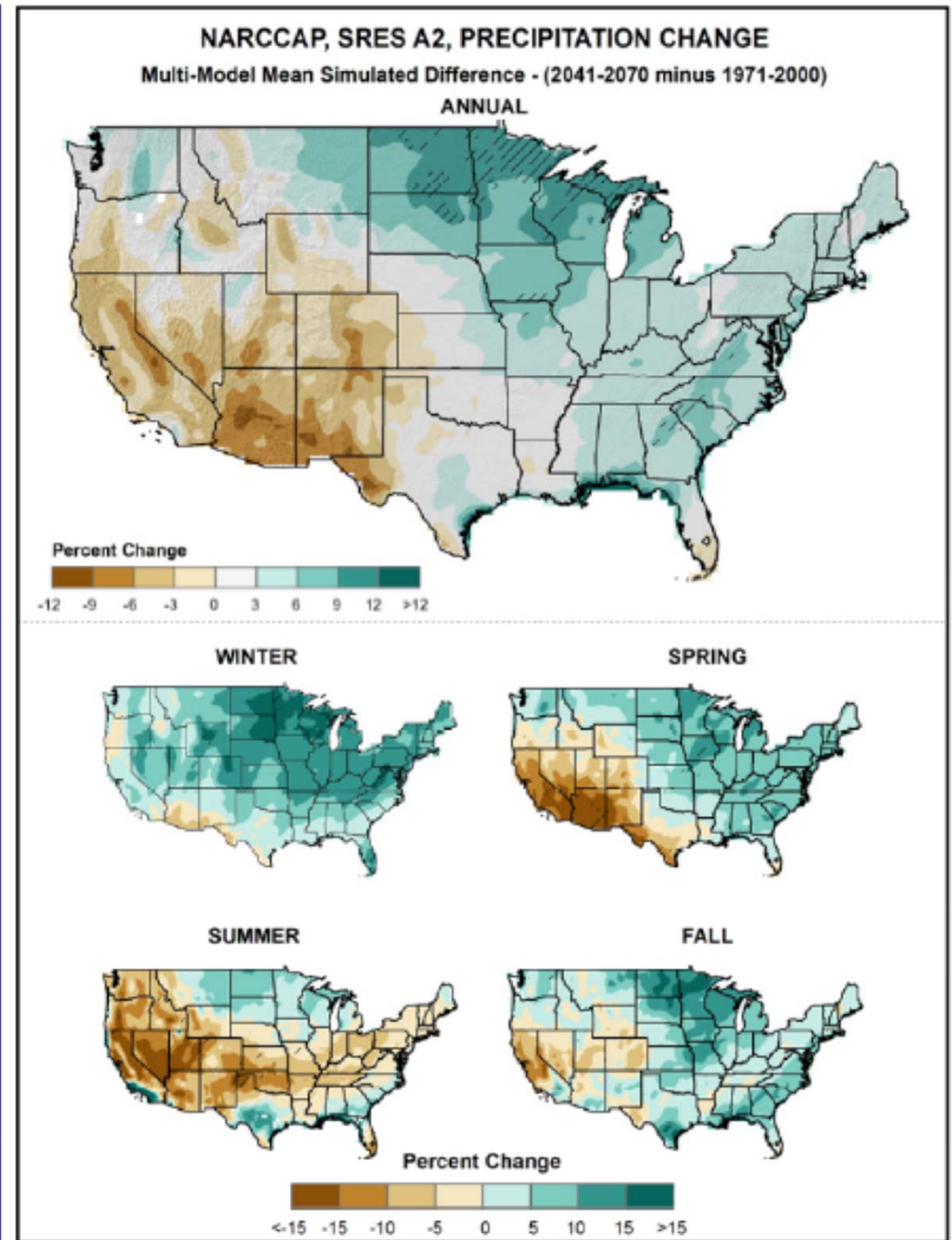


Changing Annual and Seasonal Precipitation

2041-2070
minus
1971-2000

North American Regional
Climate Change Assessment
Program

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



A change in extremes?



2 crest 21.0' (nearby Blackwells Mills: 1921-present)

Manville



6 crest 16.2' (1 May 2014 #7 crest 15.9')



3 crest 19.2'



1 crest 21.2'

Future sea level in NJ: Miller & Kopp

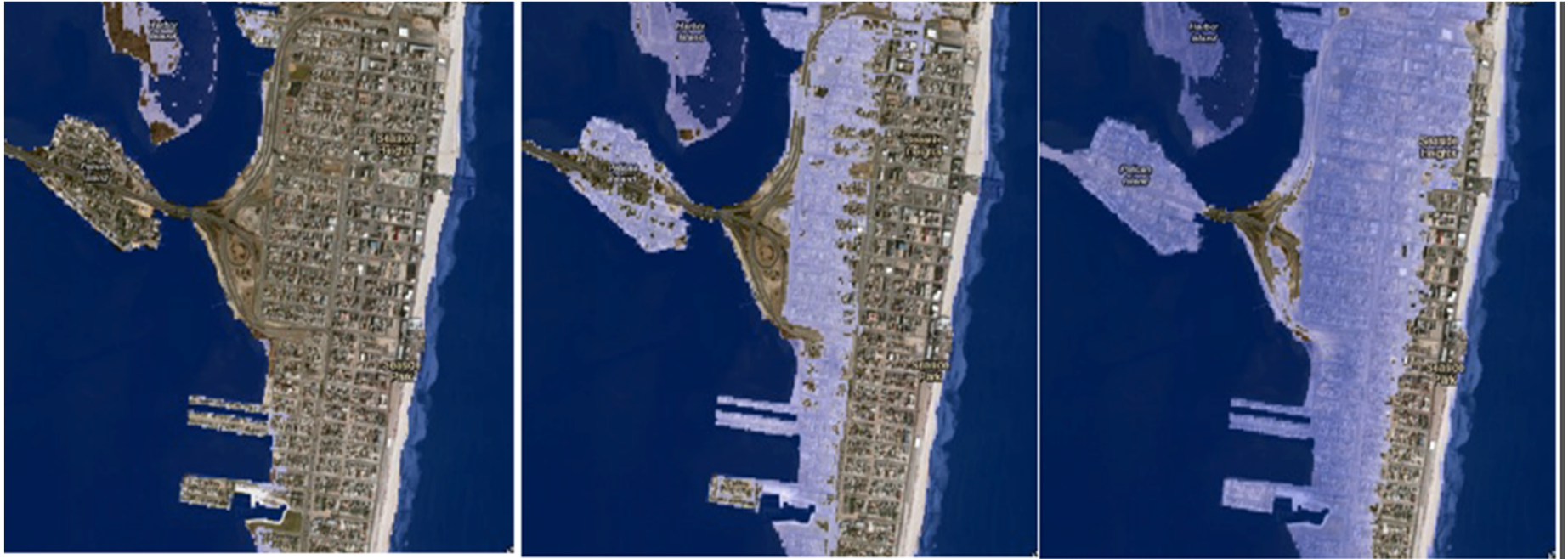
Total sea level rise projections for New Jersey.

	Total cm	Total inches	Total feet
2050 best	40	16	1.3
2050 low	23	9	0.7
2050 high	60	24	2.0
2100 best	96	38	3.1
2100 low	50	20	1.6
2100 high	147	58	4.8

All values with respect to a year 2000 baseline.

Based in the slightly lower melting figures of Shepherd et al. (2012), subsidence rates of 1-2 mm/yr in excess of global, and dynamic oceanographic effects

Seaside Heights



1 foot
(likely by ~2040)

3 feet
(likely by 2090s)

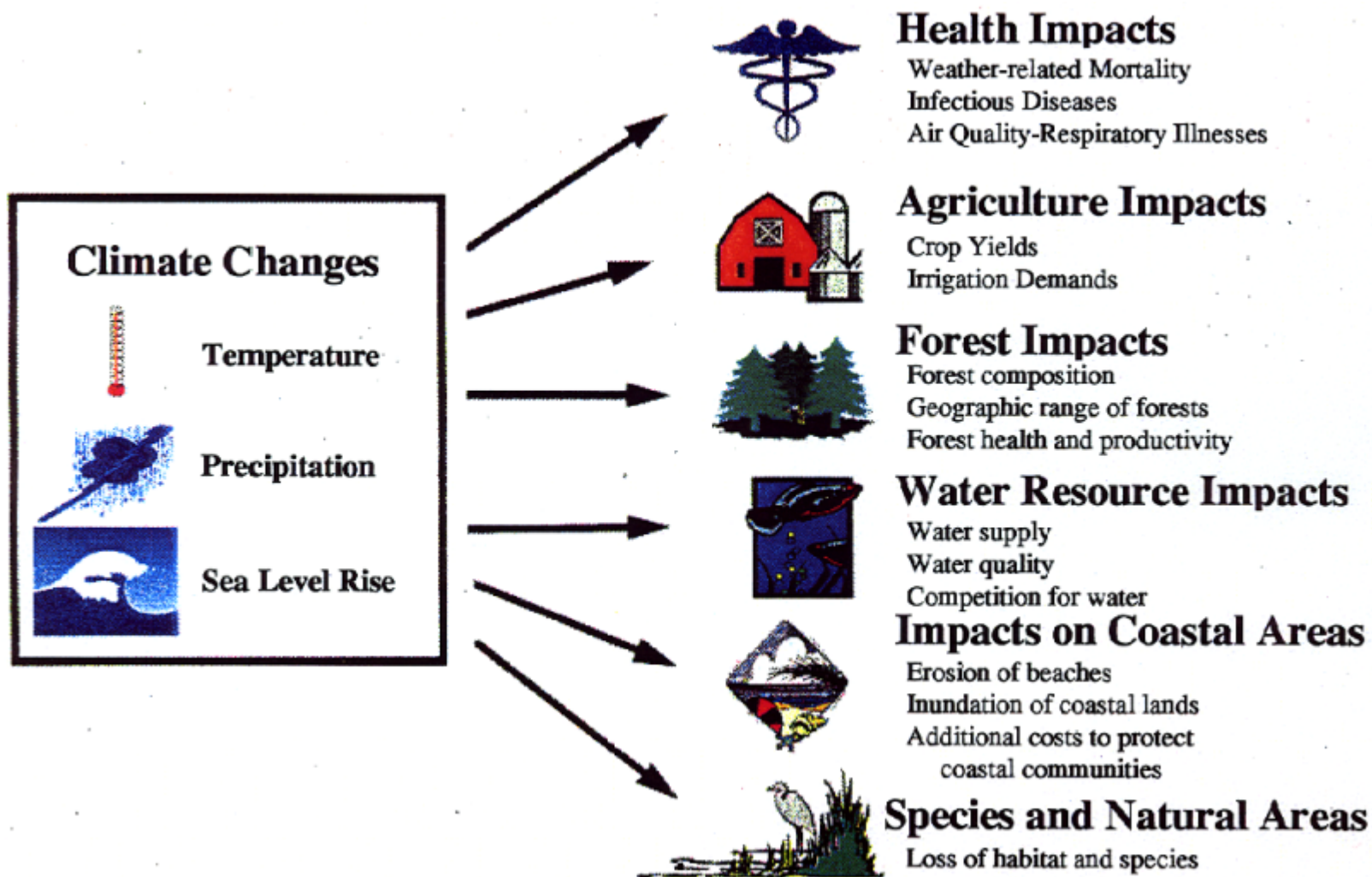
6 feet
(~5% chance by
2100)

Maps available from <http://slrviewer.rutgers.edu/> and <http://sealevel.climatecentral.org/>

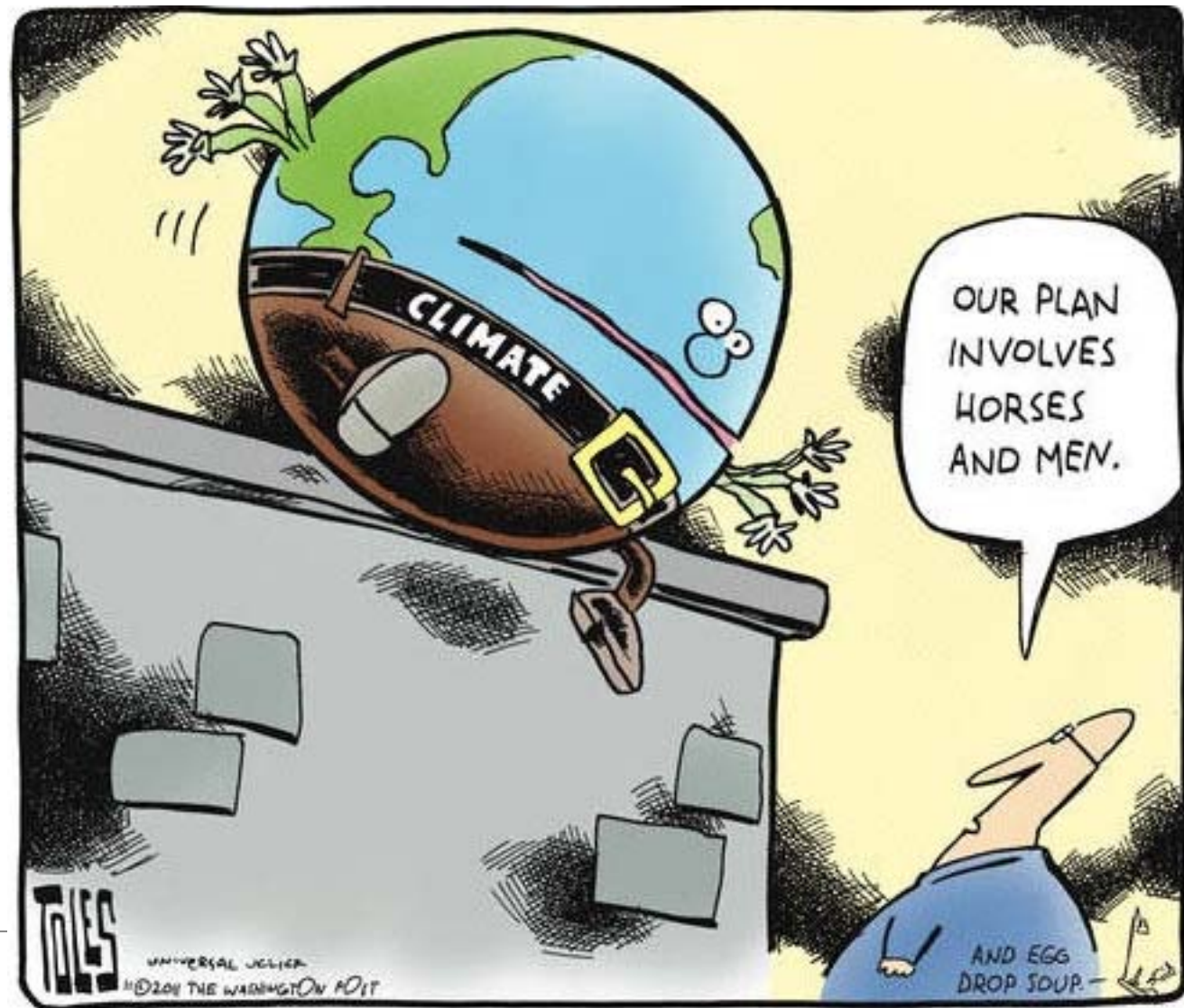
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Potential climate change impacts

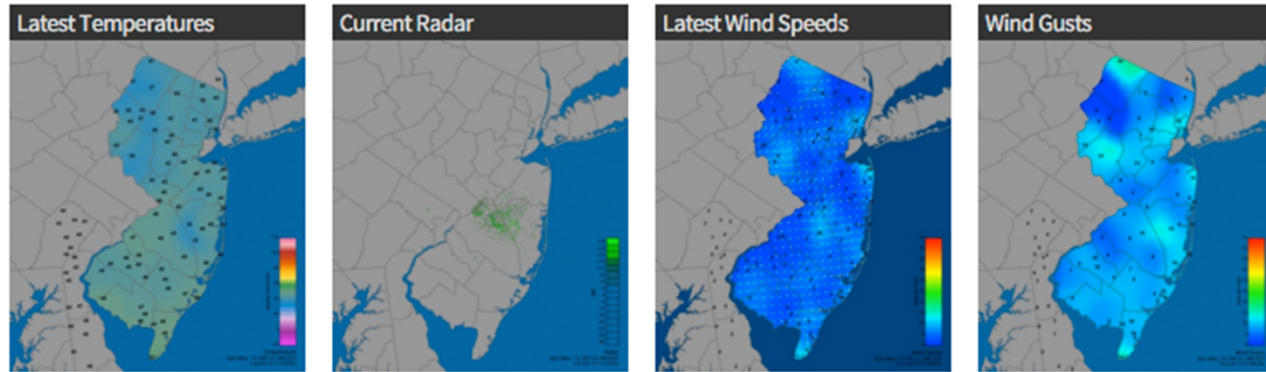


Is there something we should be doing about this climate dilemma?



- **Knowledge:** Develop a better understanding of the details of future climate change.
- **Mitigation:** Reduce emissions of carbon dioxide and other greenhouse gases.
- **Adaptation:** Increase the resilience of society to climate change.
- **Leadership:** Raise public awareness of the challenges posed by climate change and the need to mitigate and adapt.

New Jersey Weather & Climate Network



Top Story

On Average, Rather Average, Bookended by Stormy Conditions: October 2015 Recap

Friday, November 6, 2015 - 4:58pm



Waves crash into a sheet pile wall in Brick (Ocean County) on October 5. (Photo by Sharkey-Images).

Latest Extremes

City, State	Temp	City, State	Temp
Atlantic City (NJDOT), NJ	54	Mount Olive Township, NJ	38
West Cape May, NJ	52	High Point Monument, NJ	38
Cape May Court House, NJ	51	Kingwood, NJ	39
Woodbine, NJ	50	Hackettstown, NJ	39
Dennis Twp., NJ	50	Lafayette, NJ	39

most current information as of Nov 15 9:22 AM

Latest Conditions & Forecast

New Brunswick, NJ

Rutgers University Meteorology Program

44 °F

Wind
8 mph from the WSW

Wind Gust
12 mph from the WSW

<http://njweather.org>

NJWxNet stations measure:

Air temperature

Wind speed and direction

Dew point/Relative Humidity

Precipitation

Barometric pressure

Solar radiation

Soil temperature

Soil water content

Solar power

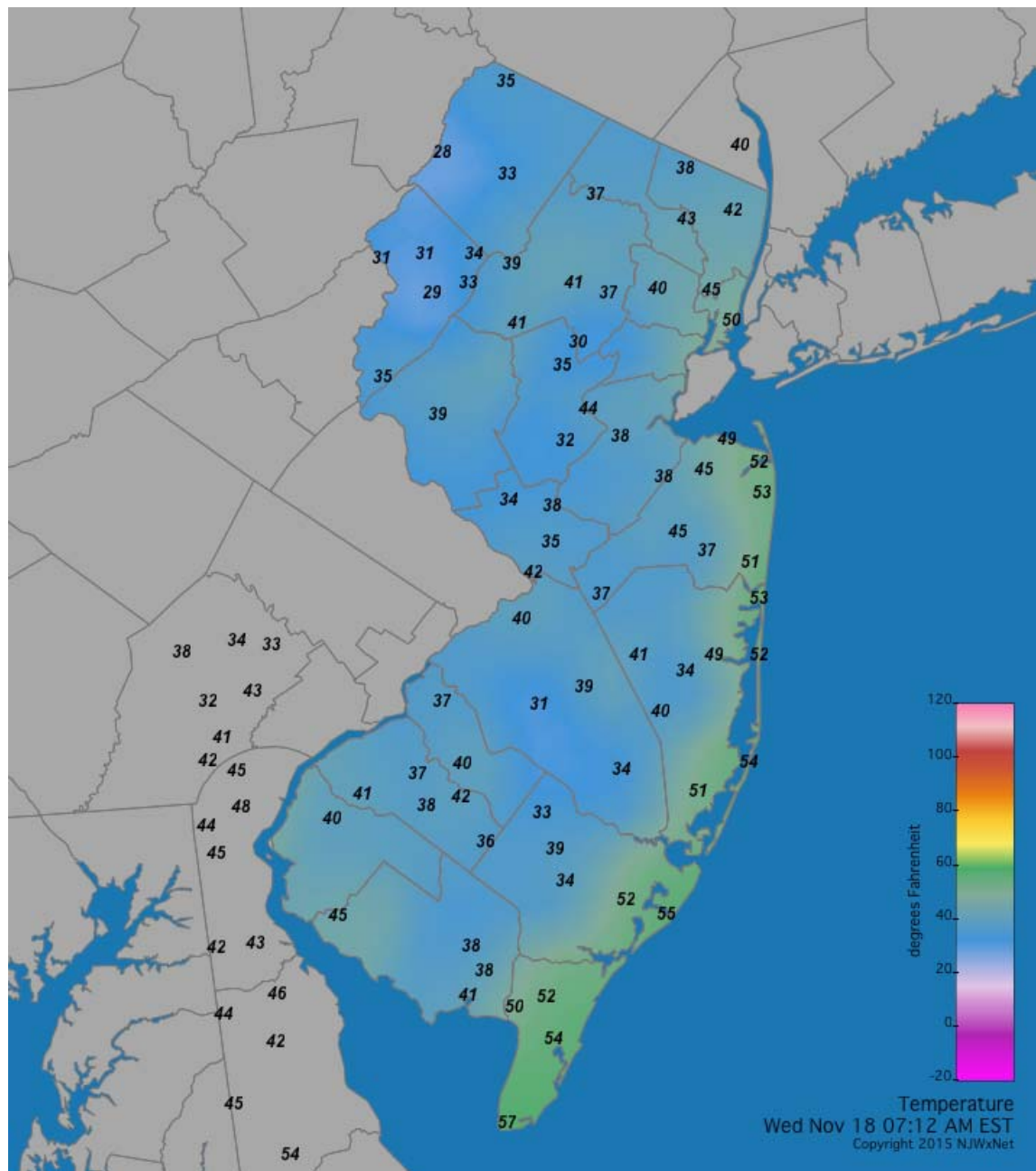
Cellular communications

Ability for expansion built
into station design



Oswego Lake: Rutgers Marucci Blueberry and Cranberry Research and Extension Center

18 November 2015
7:12 AM



Berkeley Twp., NJ
RJ Miller Air Park

SET AS FAVORITE

search by zipcode or city/state **GO**

Latest NWS Forecast



Sunny

58 °F

Today

Sunny, with a high near 58. West wind 7 to 15 mph.



Clear

38 °F

Tonight

Clear, with a low around 38. West wind around 8 mph.



Sunny

64 °F

Monday

Sunny, with a high near 64. West wind 7 to 9 mph.



Mostly Clear

42 °F

Monday Night

Mostly clear, with a low around 42. North wind 5 to 11 mph becoming northeast after midnight.



Tuesday

Mostly sunny, with a high near 52. East wind 10 to

Latest Conditions

46 °F



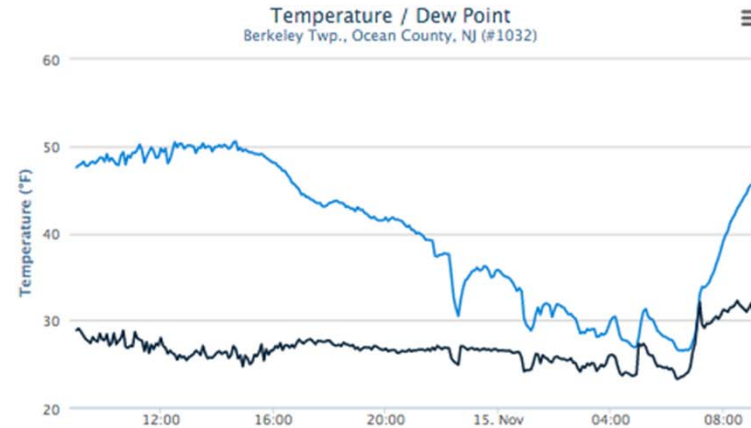
Wind
7 mph from the W
Wind Gust
12 mph from the W

	Now	This Hour		Last 6 hr		Today		Last 24 hr	
Temperature	46	45	46	26	47	26	46	26	51
HeatIndex	--	--	--	--	--	--	--	--	--
Dewpoint	31	30	33	23	33	23	33	23	33
Wind Speed/Gust	7	--	15	--	15	--	15	--	34
Precip	--	0.00		0.00		0.00		0.00	

Values in blue are minimums, values in red are maximums. Data as of Nov 15 09:15 AM.

View expanded tabular data for this station: [5 Minute](#) / [Hourly](#) / [Daily](#)

Trends and Climatologies



Custom
tabular
data for
decision
makers

USFS

NJ Fire Danger Monitoring Console

Most recent information collected as of November 18, 2015, 7:53 am

Site	Air Temp	RH	Wind Sp	Peak Gust	Wind Dir	10hr Fuel Moisture	10hr Fuel Temp	24hr Precip
Ancora Hospital	35	99	0	3		19	34	
Berkeley Twp.	43	95	3	4	NE	17	49	0.00
Cedar Bridge	42	90	3	5	ESE	16	33	0.00
Coyle Field	43	92	4	6	ENE	24	40	
Cream Ridge	42	88	3	6	E	19	48	0.00
Forsythe	52	84	6	10	E			
Fort Dix I	42	90	3	6	NE	22		0.00
Hammonton	37	98	0	0	S			0.00
Howell	42	96	0	0	NE			0.00
Jackson	33	97	0	0	NNW	25	31	
Lakehurst		92	3		ENE			
Oswego Lake	38		1	3	NE	26	38	0.00
Piney Hollow	38	99	1	2	NNW			0.00
Silas Little	40	91	4	6	ENE	20	32	0.00
Upper Deerfield	42	91	7	10	E			0.00
Woodbine	56	71	9	16	ESE			0.00

Legend:

Relative Humidity	< 40%	< 30%	< 20%
Wind Speed/Gust	> 15	> 20	> 25
Fuel Moisture	< 20	< 15	< 10

This page will automatically reload every 60 seconds.

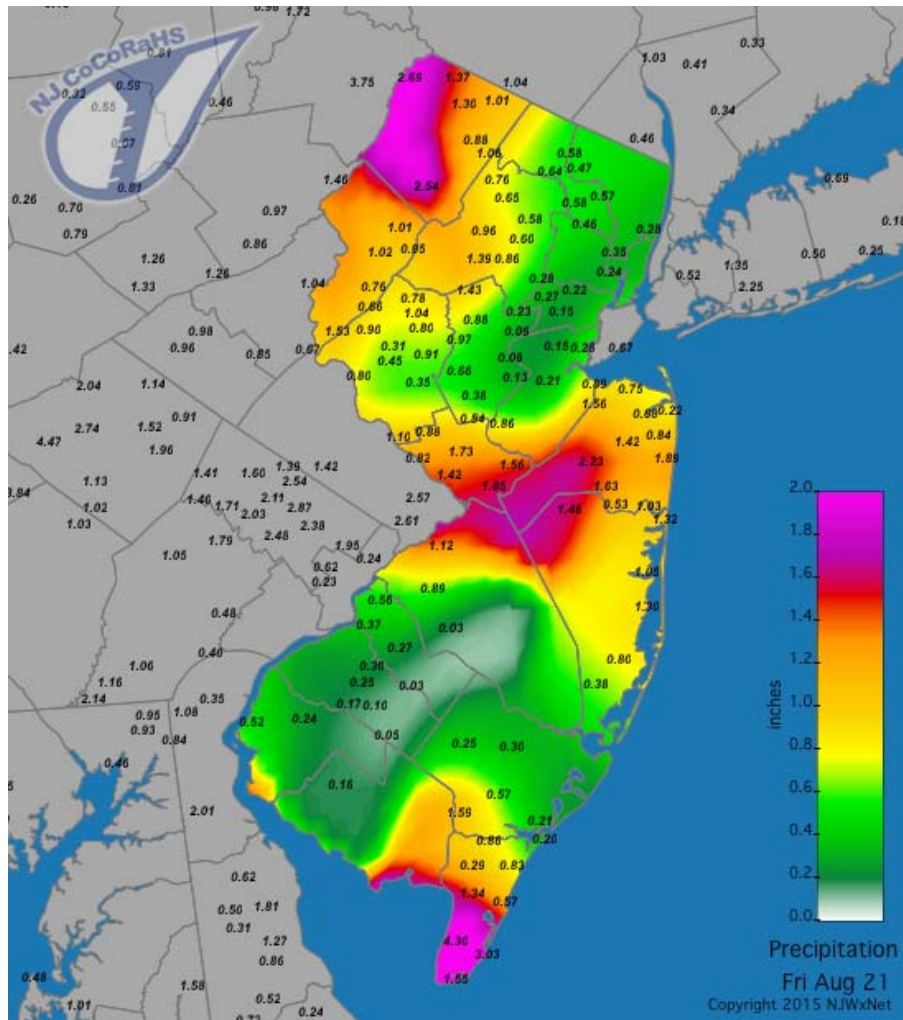
Augmenting automated weather observations



Daily observations by trained volunteers of all ages



Community Collaborative Rain, Hail and Snow Network:



7AM 20 Aug – 7AM 21 Aug 2015

www.cocorahs.org

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NJclimate.org

Summing up:

Be it weather moodiness or long-term climate personality changes, a dull moment is rare to find in the Pinelands, throughout southern NJ and beyond.

There is abundant evidence that the atmosphere, oceans and continents are primed to produce even more action, more variability, and more change in the decades ahead on local to global scales.

Continued vigilance is required to monitor, understand and predict the future behavior of the climate system.



Thanks

david.robinson@rutgers.edu

<http://njclimate.org>