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THE STATE UNIVERSITY OF NEW JERSEY

Delaware Basin Flooding
Past. Present. Future?

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Rutgers University

Delaware River Basin
Flood Warning User Forum

Easton, PA
September 21, 2010

Outline

1. The ONJSC
2. Past Delaware flooding
3. Liquid extremes
4. What the future holds
5. A watchful eye

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Office of the NJ State Climatologist

Our mission: Monitor Understand Inform

http://climate.rutgers.edu/stateclim

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Delaware Basin 1653-1655

Pier Lindestrom, Map of New Sweden, 1653–1655.

This early map of New Sweden reverses our expectations by placing Delaware Bay, which is south, at the top. It was drawn by Pier Lindestrom (1632–1691), a Swedish military engineer and clerk for the colony in 1653–1655. He explored the "south river" and recorded as best he could the creeks emptying into it, the depth of the water, and the channels in the bay, noting that the river was navigable up to the "Falls Asinpinck," today's Trenton. He left a manuscript account of his travels in the area, *Geographia Americae*, which was translated into English and printed in 1925.

SOURCE: National Archives of Sweden; photographed by Kurt Eriksson.

Mapping NJ 2009 Rutgers U. Press

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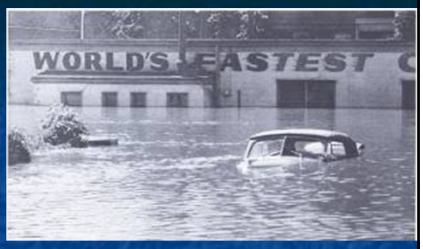
Delaware River

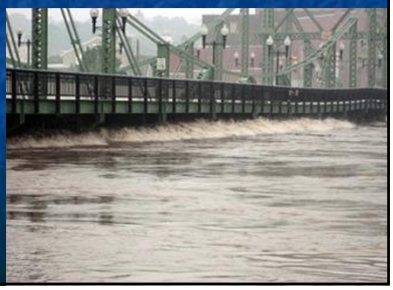
Trenton train station, September 23, 1882

September 2004

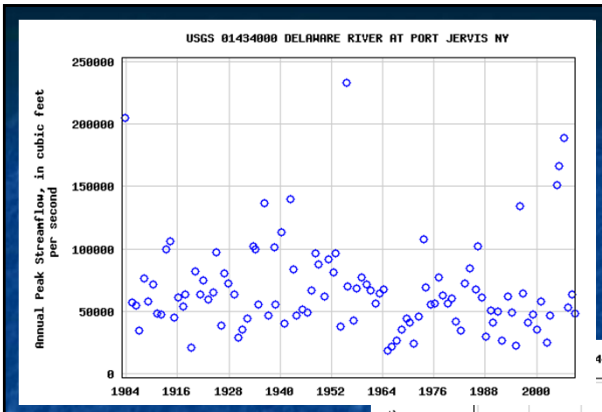


Easton, PA, August 1955

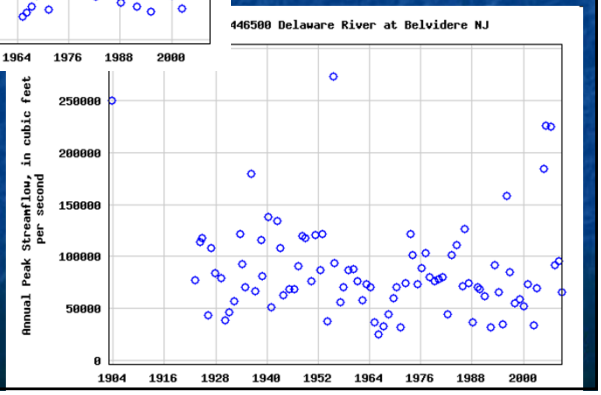
Easton-Phillipsburg Bridge: June 2006



Peak Annual Flow

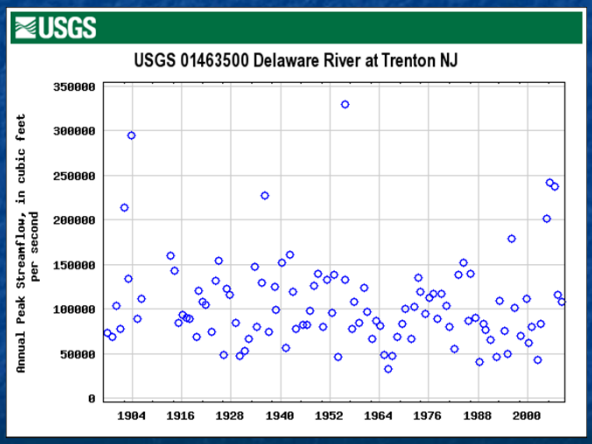


Port Jervis, NY



Belvidere, NJ

Peak Annual Flow



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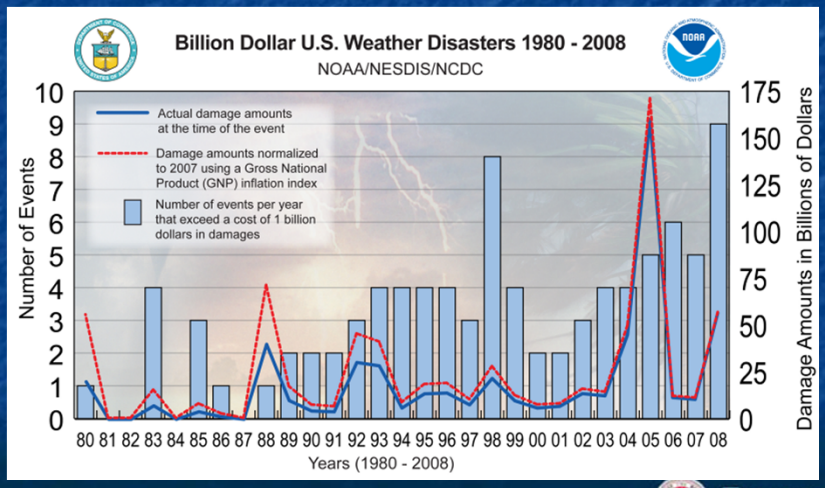
Weather and climate extremes are among the most serious challenges to society in coping with global climate change



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How do we define extremes?

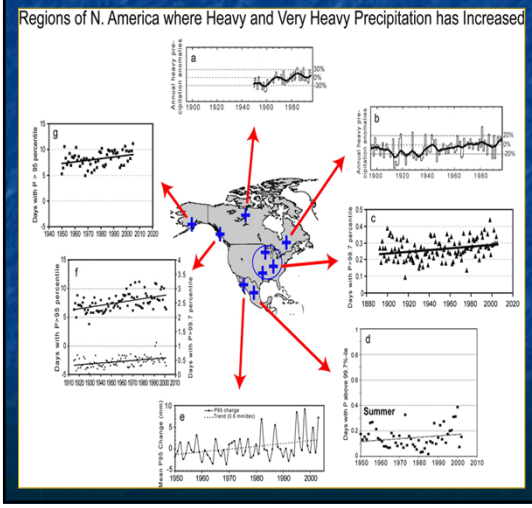
- Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report Glossary:

"an extreme weather event is an event that is ***rare*** at a particular place and time of year"

- "***rare***" is defined as the highest or lowest 10%

Precipitation Extremes

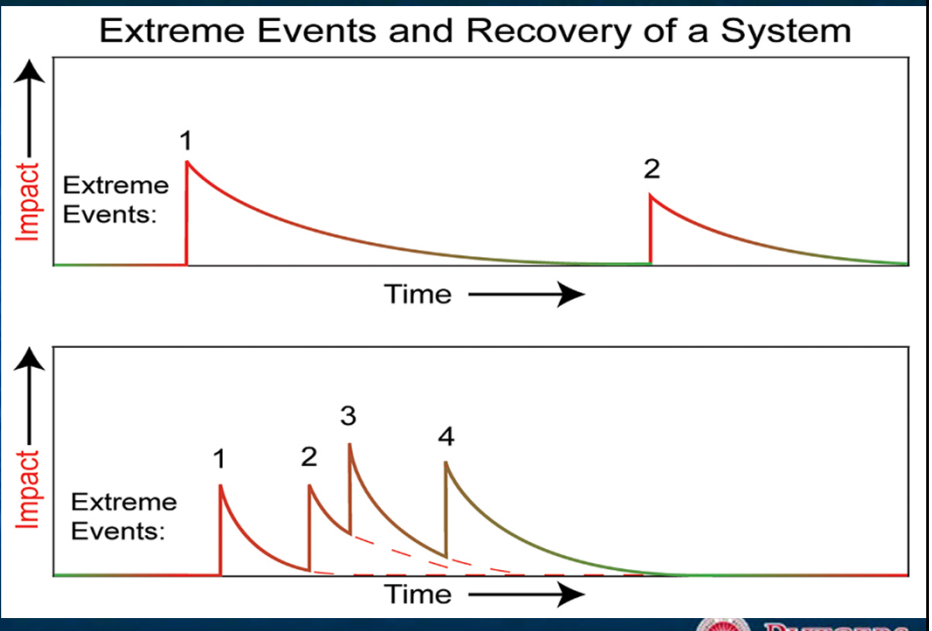
Extreme precipitation episodes (heavy downpours) have become more frequent and intense in recent decades over most of North America



- Intense precipitation (heaviest 1%) increased 20% over the past century - total precipitation increased by 7%

Multiple and Compound Extreme Events

- Multiple events: when additional events occur before a system has fully recovered.
- Compound events: when two or more events occur simultaneously in the same location.



Tropical Storm Tracks Associated with Delaware Flooding 1933-2004

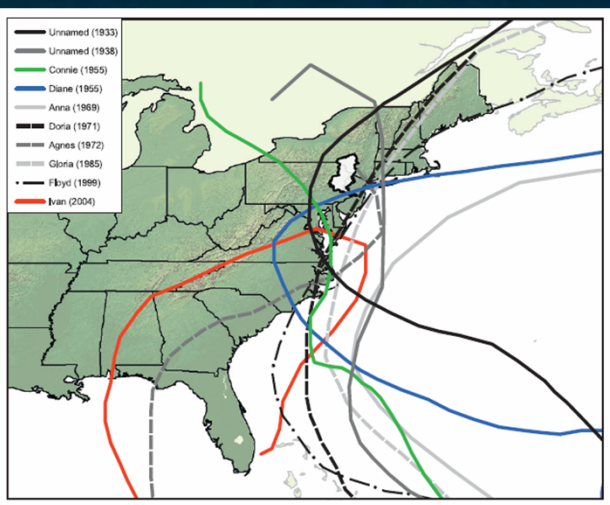


FIG. 4. Storm tracks for tropical cyclones producing annual flood peaks in the Delaware River at Trenton (see Fig. 3). The solid red line shows the track for Ivan, which makes first landfall on the Gulf Coast. The green and blue lines show the tracks of Connie and Diane, respectively, which produced extreme rainfall in the Delaware River basin during August of 1955.

Smith et al. 2010, J. Hydromet.

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September 2004

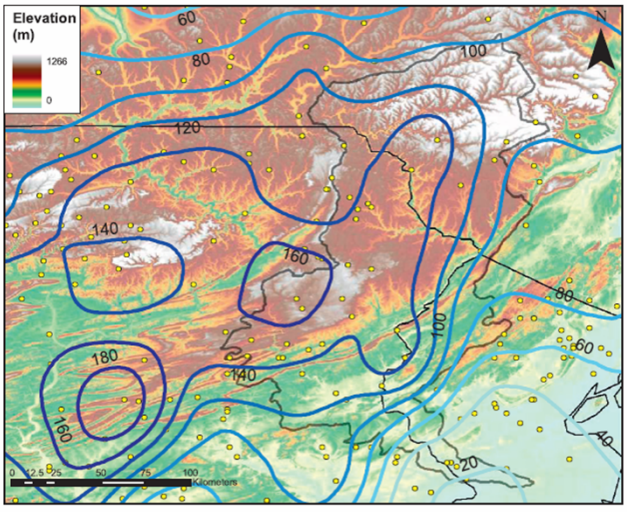

FIG. 5. Storm total accumulation field (mm) derived from the operational rain gauge network for the September 2004 storm. Yellow circles denote the locations of gauges.

Smith et al. 2010, J. Hydromet.

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April 2005

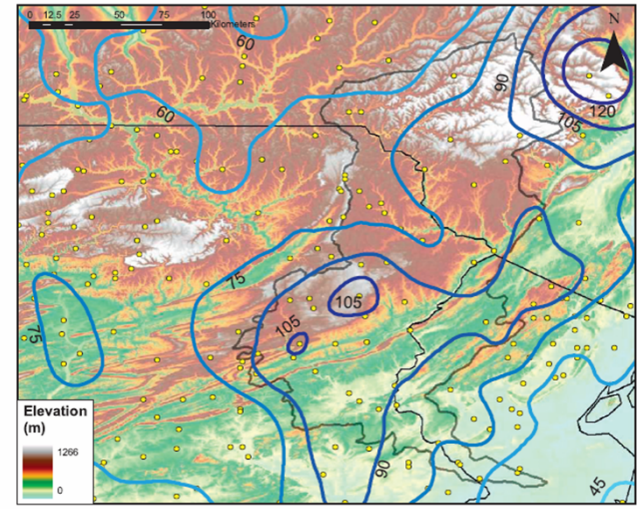

FIG. 6. As in Fig. 5, but for the 2–3 Apr 2005 storm.

Smith et al. 2010, J. Hydromet.

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February 12, 2010 MODIS image

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June 2006

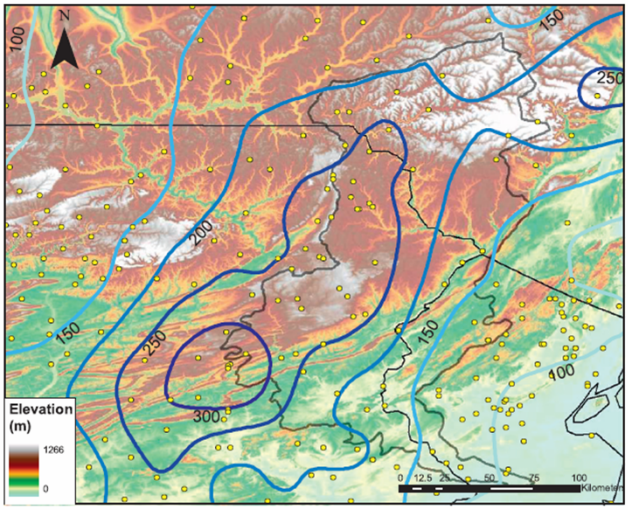

FIG. 8. As in Fig. 5, but for the 25–28 Jun 2006 storm.

Smith et al. 2010, J. Hydromet.

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Sometimes too little……

Delaware River: November 1963

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New Jersey's future climate

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

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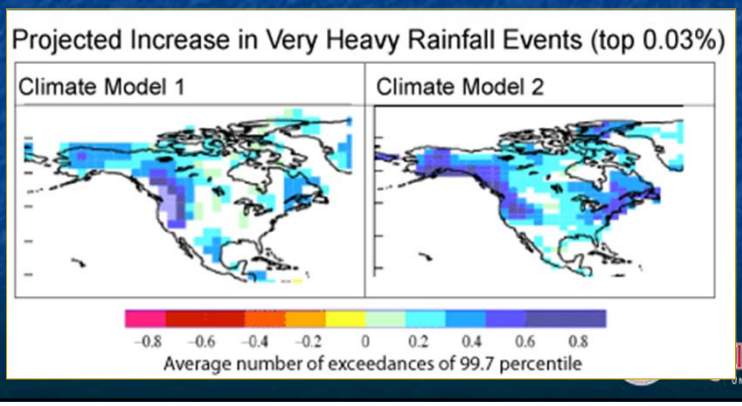
Precipitation Extremes

- Overall, precipitation will likely be less frequent but more intense
- 1-in-20 yr precipitation - projected to occur 1-in-8 years by 2100 over much of eastern N. America (mid-range emission scenario)



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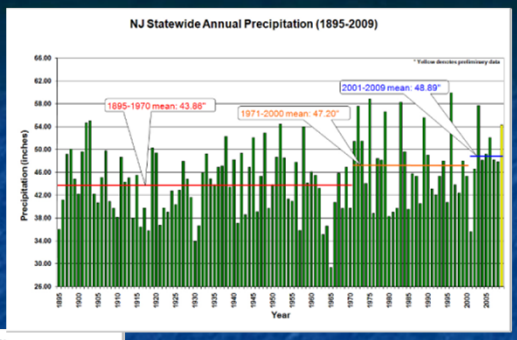
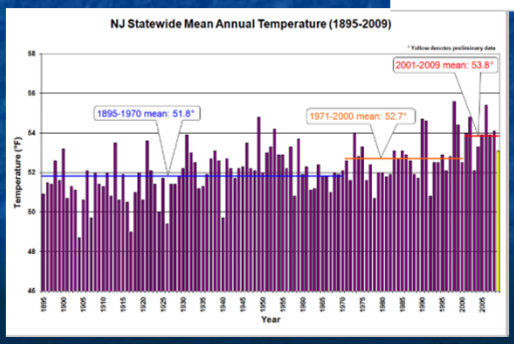
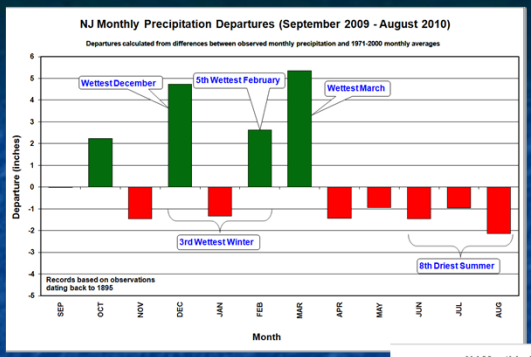
Past century of NJ climate variability

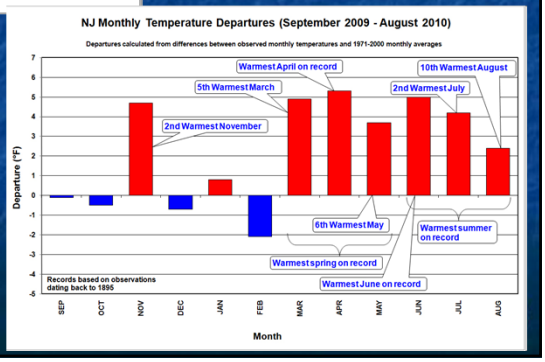




Climate Observations

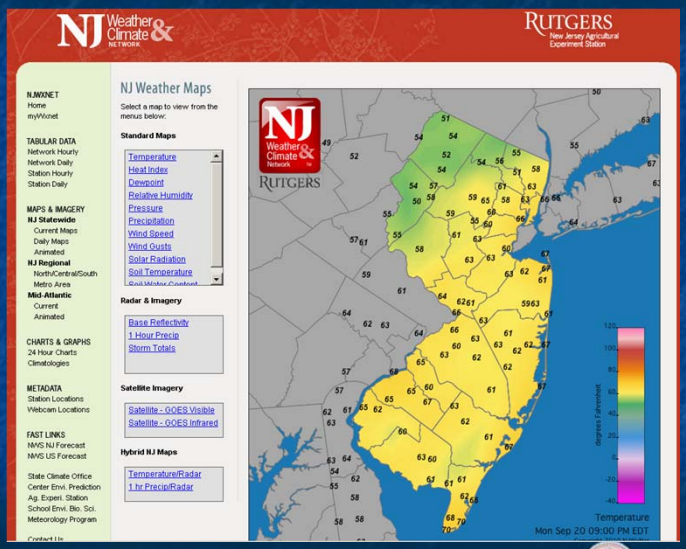


Past 12 months of NJ's climate



NJ Weather & Climate Network

http://climate.rutgers.edu/njwxnet



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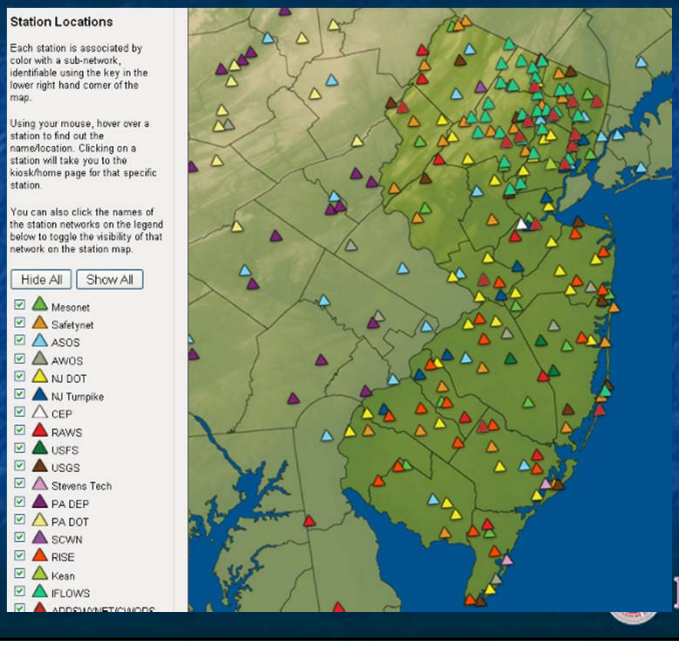
NJ Weather and Climate Network stations



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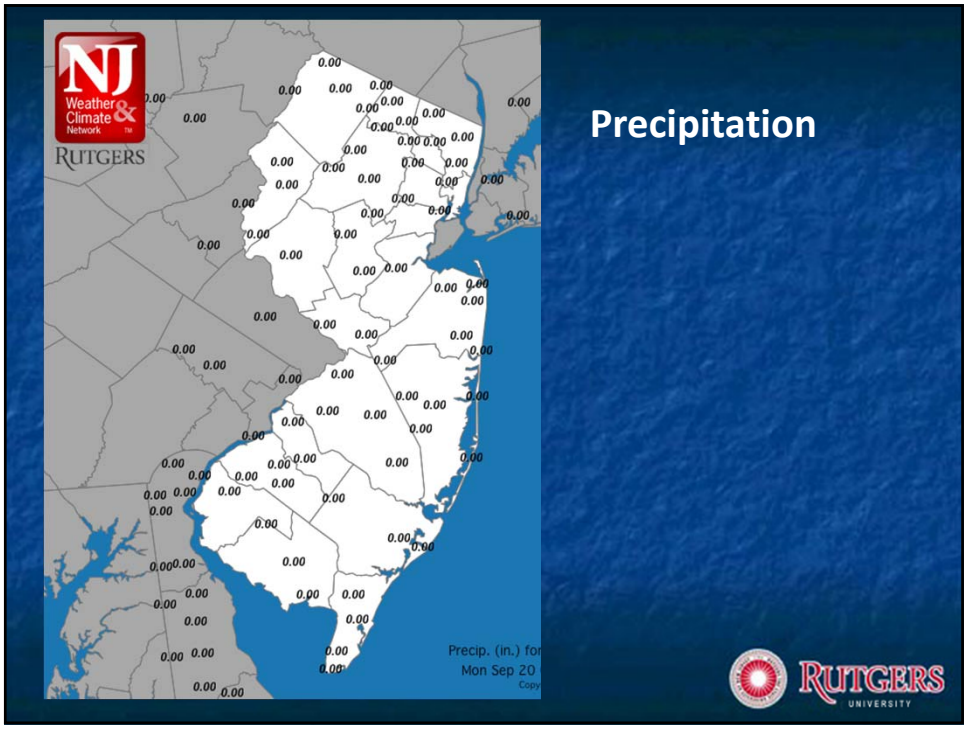

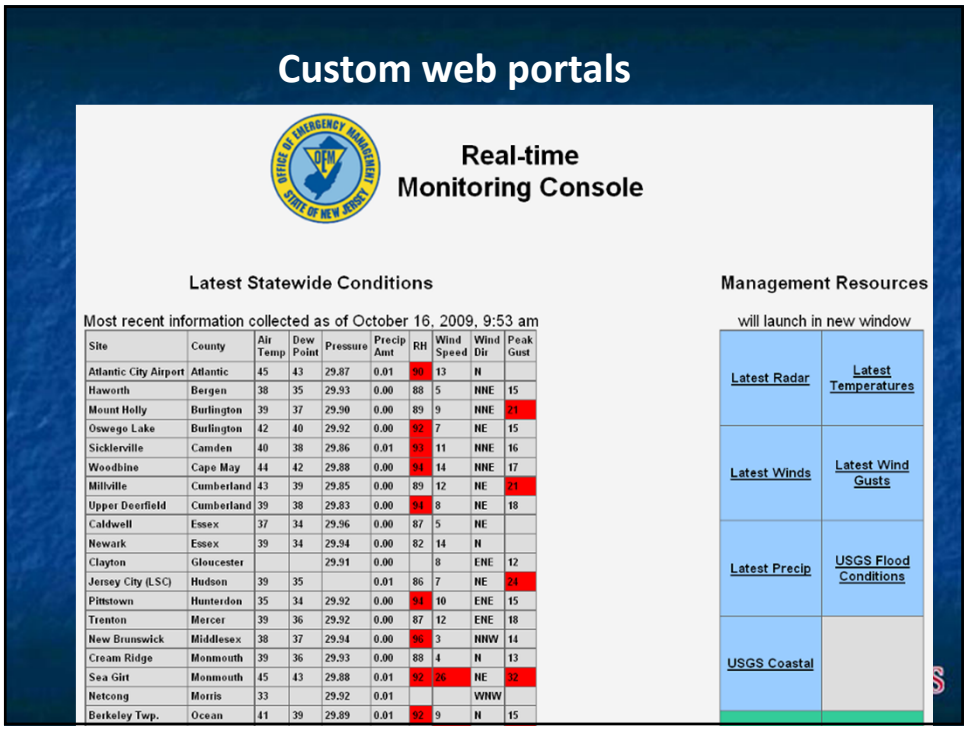

Site	County	Air Temp	Dew Point	Pressure	Precip Amt	RH	Wind Speed	Wind Dir	Peak Gust
Atlantic City Airport	Atlantic	45	43	29.87	0.01	90	13	N	
Haworth	Bergen	38	35	29.93	0.00	88	5	NNE	15
Mount Holly	Burlington	39	37	29.90	0.00	89	9	NNE	21
Oswego Lake	Burlington	42	40	29.92	0.00	92	7	NE	15
Sicklerville	Camden	40	38	29.86	0.01	93	11	NNE	16
Woodbine	Cape May	44	42	29.88	0.00	94	14	NNE	17
Millville	Cumberland	43	39	29.85	0.00	89	12	NE	21
Upper Deerfield	Cumberland	39	38	29.83	0.00	94	8	NE	18
Caldwell	Essex	37	34	29.96	0.00	87	5	NE	
Newark	Essex	39	34	29.94	0.00	82	14	N	
Clayton	Gloucester			29.91	0.00		8	ENE	12
Jersey City (LSC)	Hudson	39	35		0.01	86	7	NE	24
Pittstown	Hunterdon	35	34	29.92	0.00	94	10	ENE	15
Trenton	Mercer	39	36	29.92	0.00	87	12	ENE	18
New Brunswick	Middlesex	38	37	29.94	0.00	96	3	NNW	14
Cream Ridge	Monmouth	39	36	29.93	0.00	88	4	N	13
Sea Girt	Monmouth	45	43	29.88	0.01	92	26	NE	32
Netcong	Morris	33		29.92	0.01			WNW	
Berkeley Twp.	Ocean	41	39	29.89	0.01	92	9	N	15

NJ Community Collaborative Rain, Hail and Snow Network

Daily observations by trained volunteers of all ages

Augmenting automated precipitation observations

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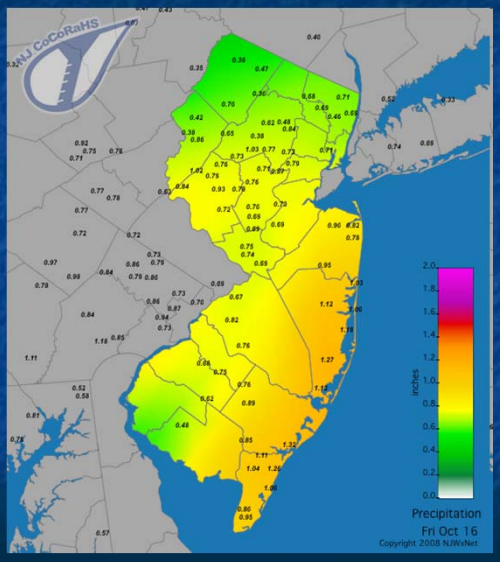
http://cocorahs.org



October 16, 2009

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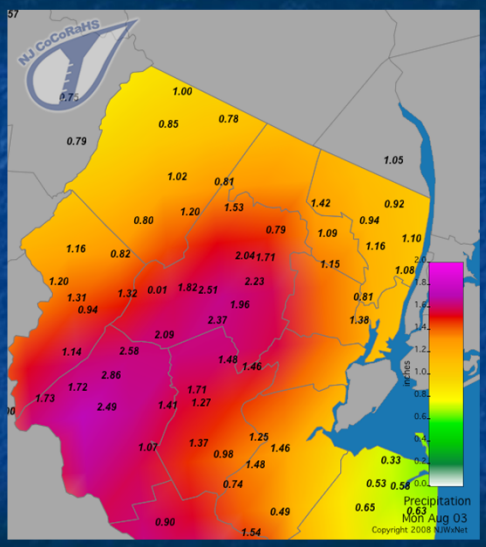

7AM August 2
to 7AM August 3, 2009

High Bridge: 3.51
Califon: 3.10
Bethlehem Twp: 2.51
Franklin Twp 1: 3.00
Franklin Twp 2: 2.92
Kingwood: 3.41
Stockton: 2.72
Pittstown: 3.08
Stewartsville: 2.59
Readington: 1.56
Flemington: 1.54

Thanks

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