

RUTGERS

THE STATE UNIVERSITY
OF NEW JERSEY



Jerry McCrea, The Star-Ledger

Climate Change in New Jersey

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

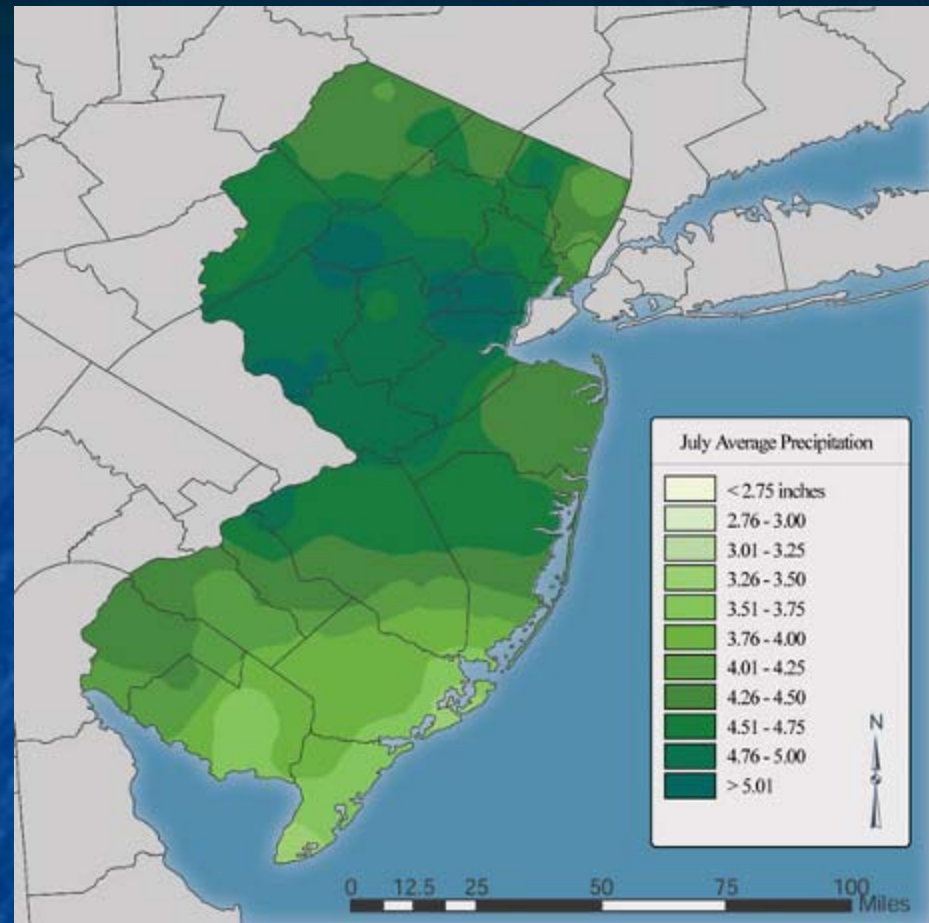
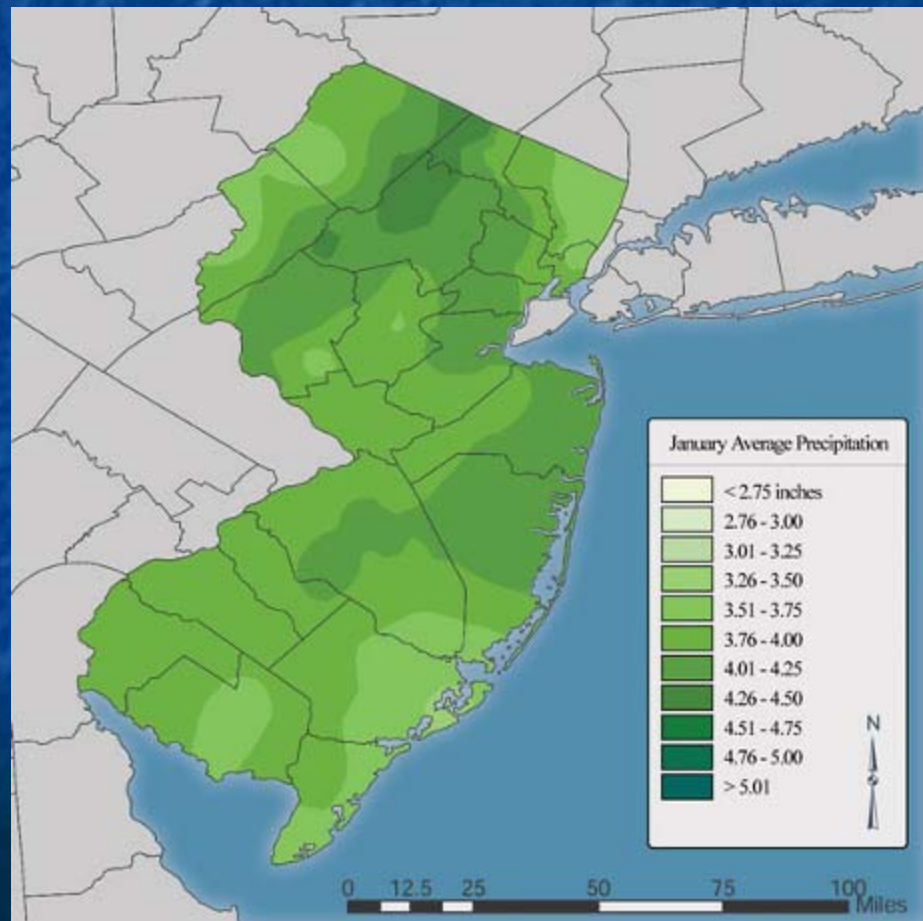
New Jersey Clean Water Council
Public Hearing
December 7, 2009



Outline

1. NJ's precipitation regime
2. NJ climate: past and present
3. NJ climate: what lies ahead
4. Impacts of a changing climate
on NJ water quality
5. Keeping a watchful climate eye

A precipitation rich state.....



.....most often

**Sometimes
too much.....**



Manville

**Nor'easter
April 15-16, 2007**



Bound Brook



River Vale

**Sometimes
too little.....**



Jerry McCrea, The Star-Ledger

Spruce Run Reservoir: March 2002



Photo by Scott Stetzer

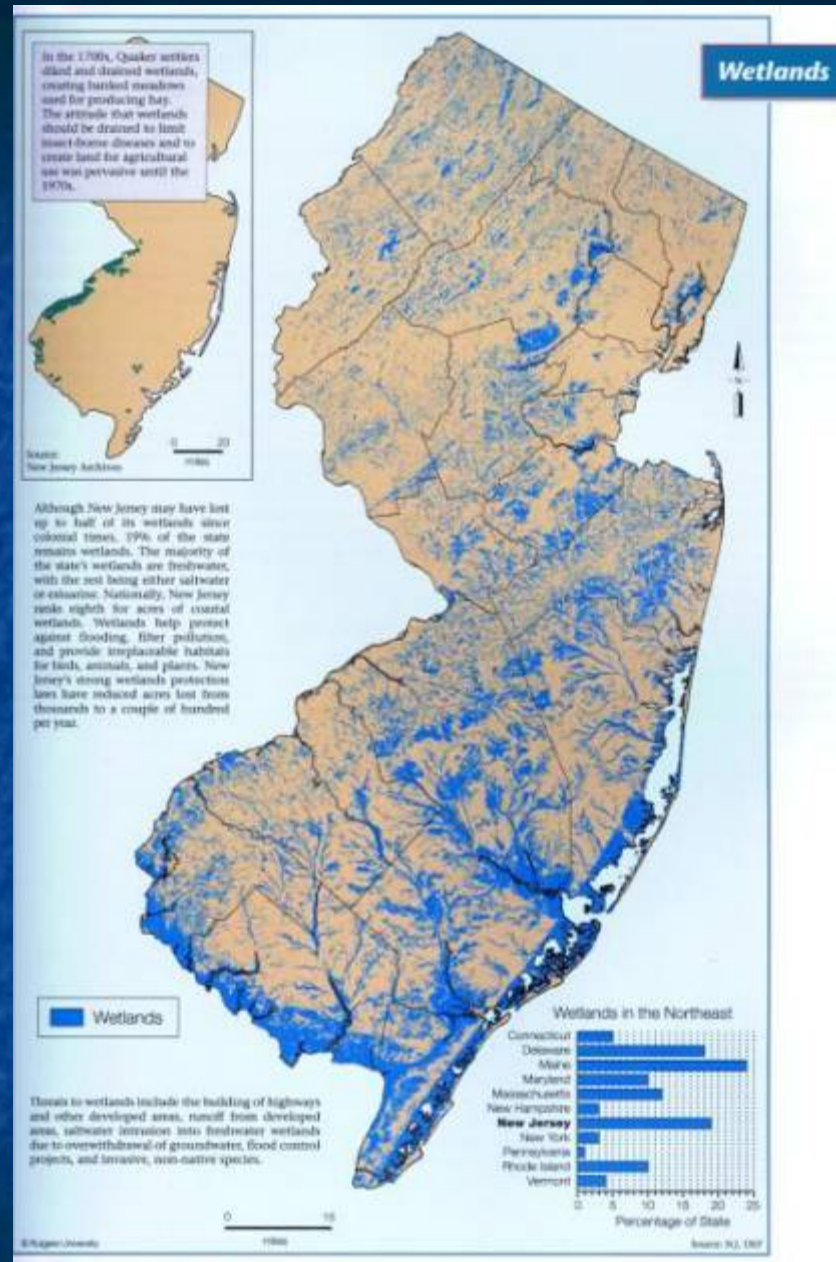
**Pinelands:
May 2007**



Delaware River: November 1963

Enough to:

Sustain freshwater
wetlands

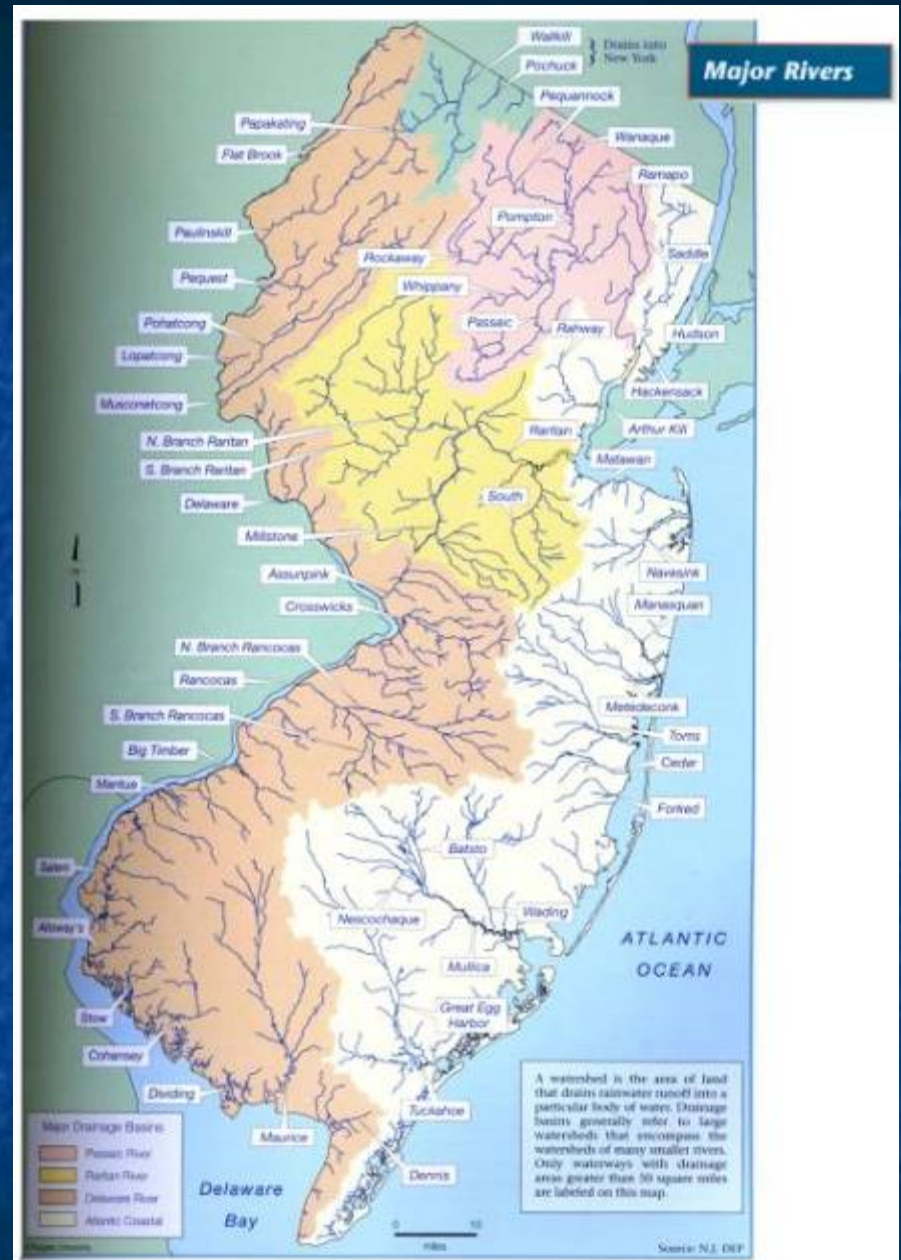


Mapping NJ, 2009



RUTGERS
UNIVERSITY

Sustain river flows



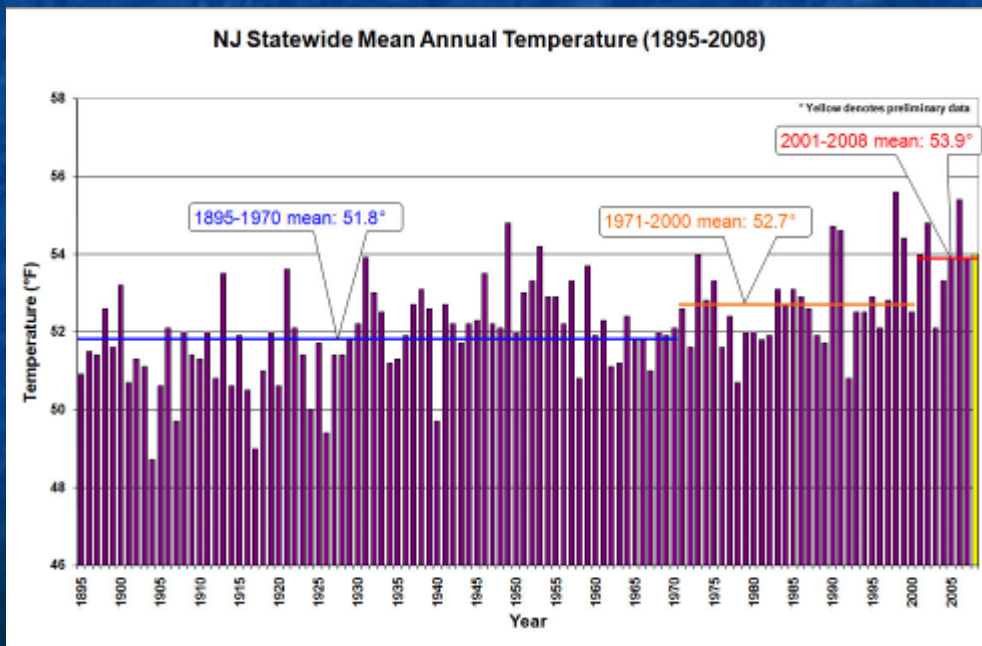
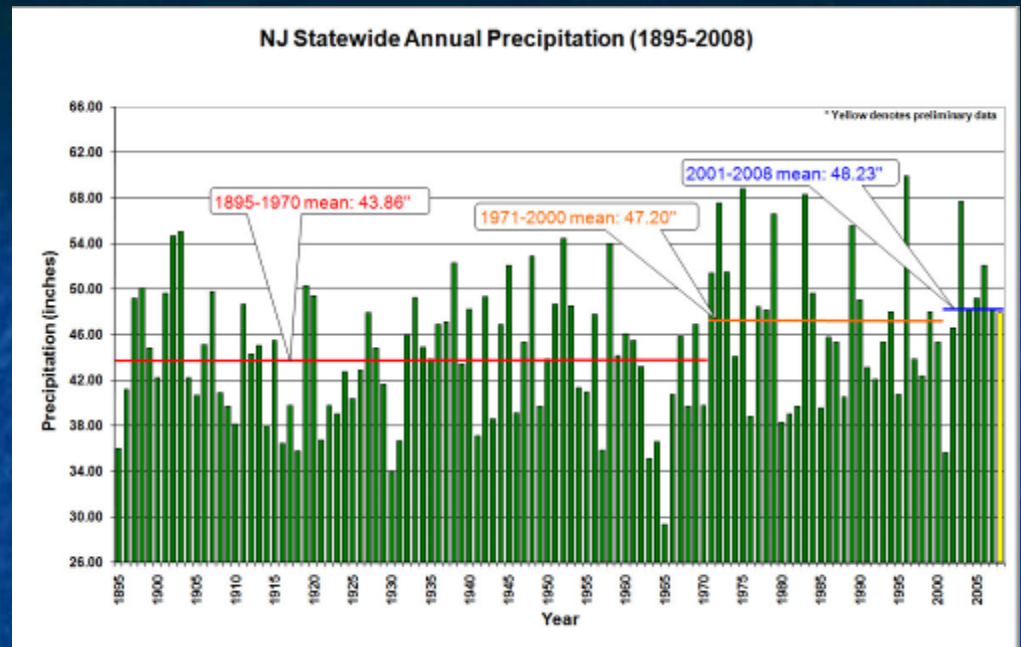
Sustain ground water and surface reservoirs



**But at what levels.....
yesterday,
today,
and tomorrow?**



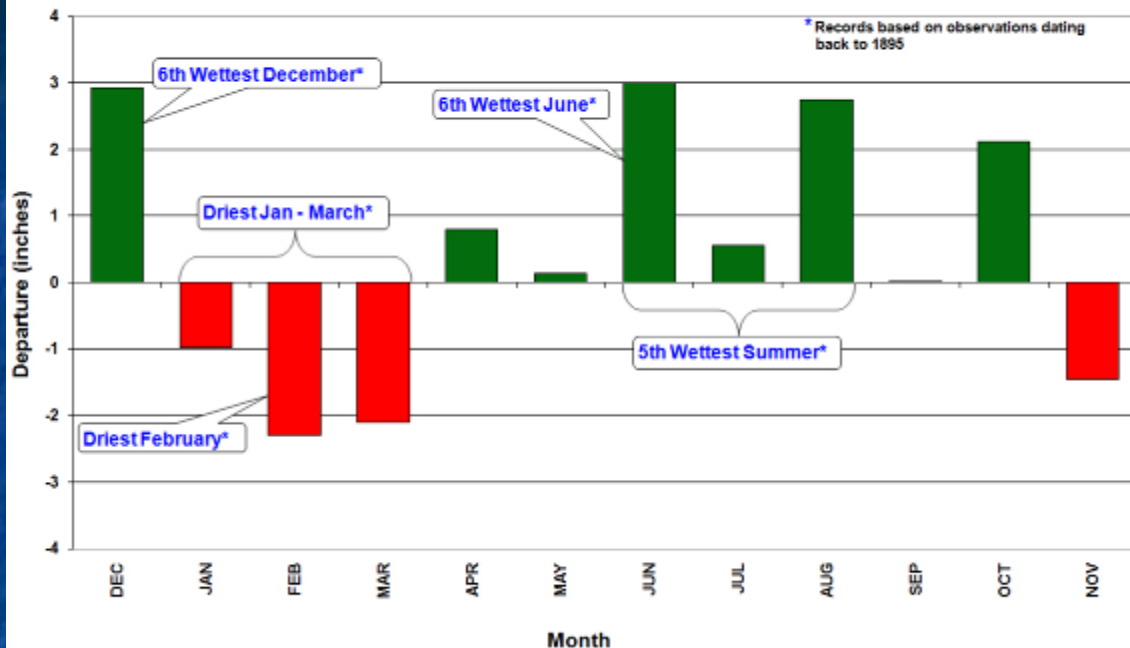
Where have we been?



Past century of NJ climate variability

NJ Monthly Precipitation Departures (December 2008 - November 2009)

Departures calculated from differences between observed monthly precipitation and 1971-2000 monthly averages



Where are we today?

<http://climate.rutgers.edu/stateclim>

Northwest Drought Region

Updated: November 25, 2009

Drought Status Indicators

90-day precipitation	90-day stream-flow	DRBC Res.	ground water	
				near or above normal
				moderately dry
				severely dry
				extremely dry

Res=reservoir DRBC=Delaware River Basin Commission

ground water refers to unconfined ground water

= The number in each colored dot is the number of weeks the specific indicator in that region has been in that status.

Declared Drought Status

	normal
	watch
	warning
	emergency

[Printing Note](#)

<http://www.njdrought.org>

Where are we headed?

THE 21st CENTURY IN NEW JERSEY

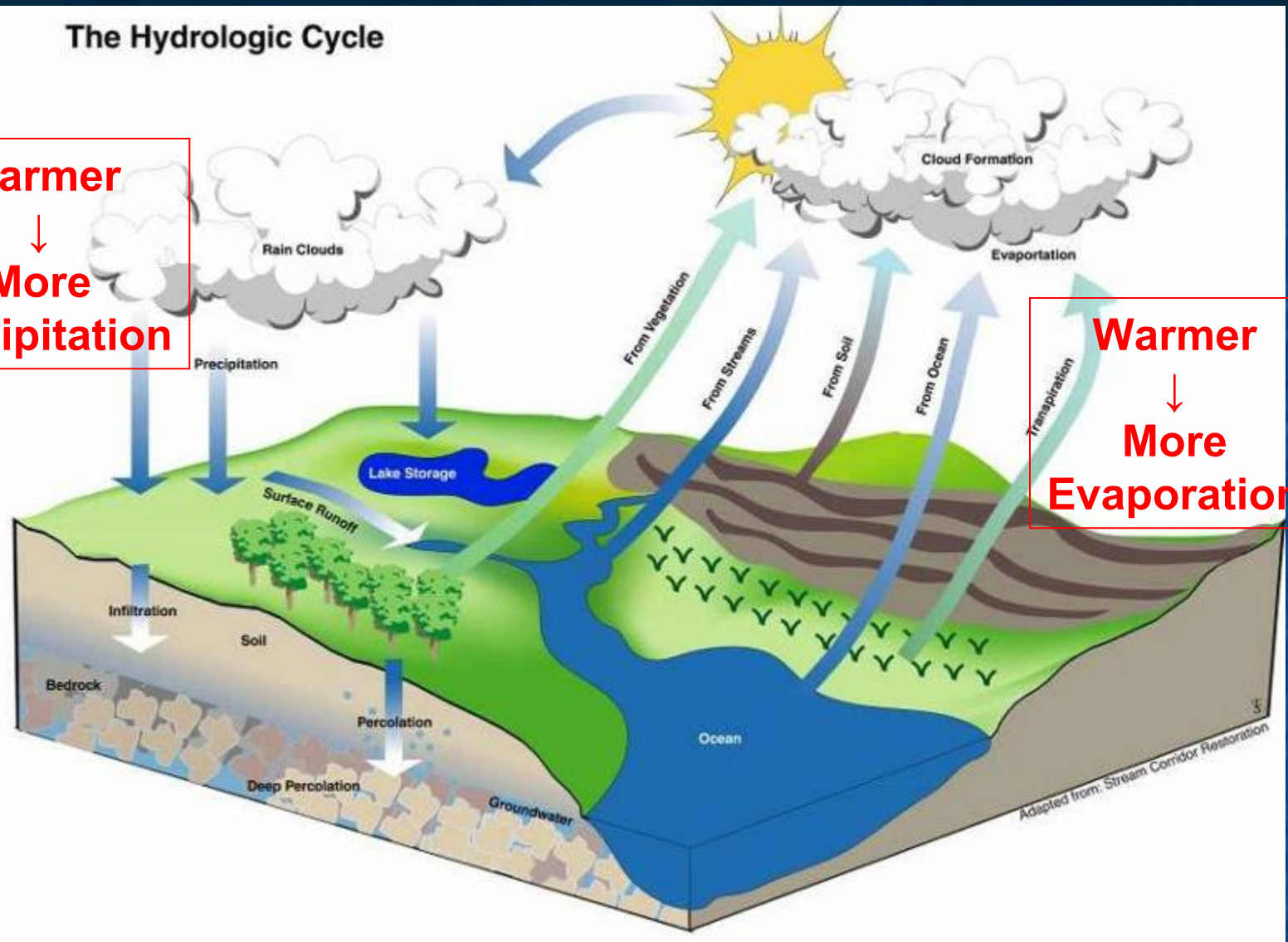
- **General agreement in model studies:**

- | <u>Temperature (C)</u> | <u>Precipitation (%)</u> | <u>Runoff (%)</u> |
|------------------------|--------------------------|-------------------|
| +3 to +5 C | 0 to +20% | -25% to +20% |

Less confidence in regional precipitation/runoff than temperature

The Hydrologic Cycle

Warmer
↓
More
Precipitation



Warmer
↓
More
Evaporation



THE 21st CENTURY IN NEW JERSEY

- | | | |
|------------------------|--------------------------|-------------------|
| <u>Temperature (C)</u> | <u>Precipitation (%)</u> | <u>Runoff (%)</u> |
| +3 to +5 C | 0 to +20% | -25% to +20% |

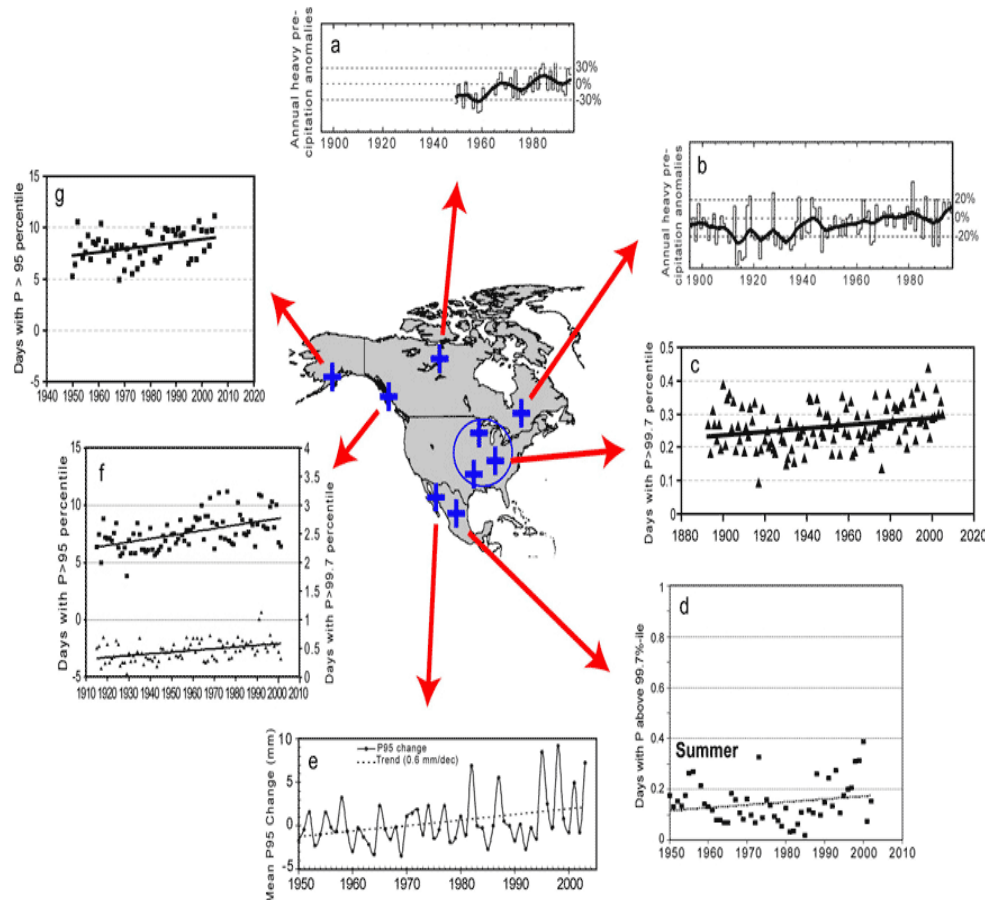
Less confidence in regional precipitation/runoff than temperature

- **Regardless of sign of precipitation change, significant changes expected in:**

annual streamflow cycle, soil moisture, and snowpack;
more hot days; more variability

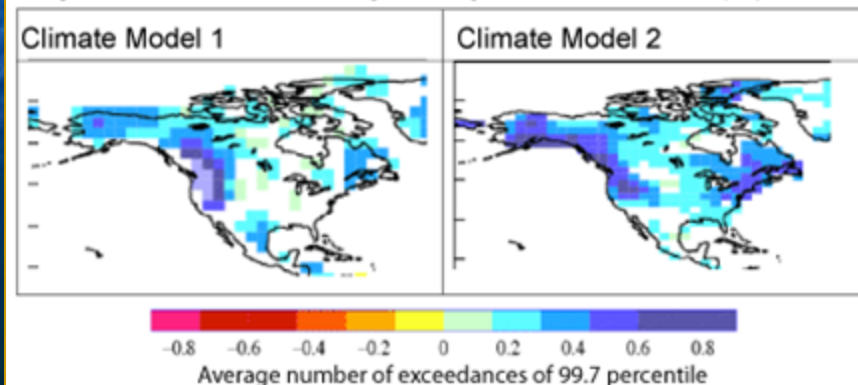
Precipitation Extremes

Regions of N. America where Heavy and Very Heavy Precipitation has Increased



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

Projected Increase in Very Heavy Rainfall Events (top 0.03%)



More floods and droughts



Spruce Run Reservoir:
March 2002

Easton-Phillipsburg
Bridge: June 2006



Delaware River: Sept. 2004



THE 21st CENTURY IN NEW JERSEY

- **General agreement in model studies:**

- | <u>Temperature (C)</u> | <u>Precipitation (%)</u> | <u>Runoff (%)</u> |
|------------------------|--------------------------|-------------------|
| +3 to +5 C | 0 to +20% | -25% to +20% |

Less confidence in regional precipitation/runoff than temperature

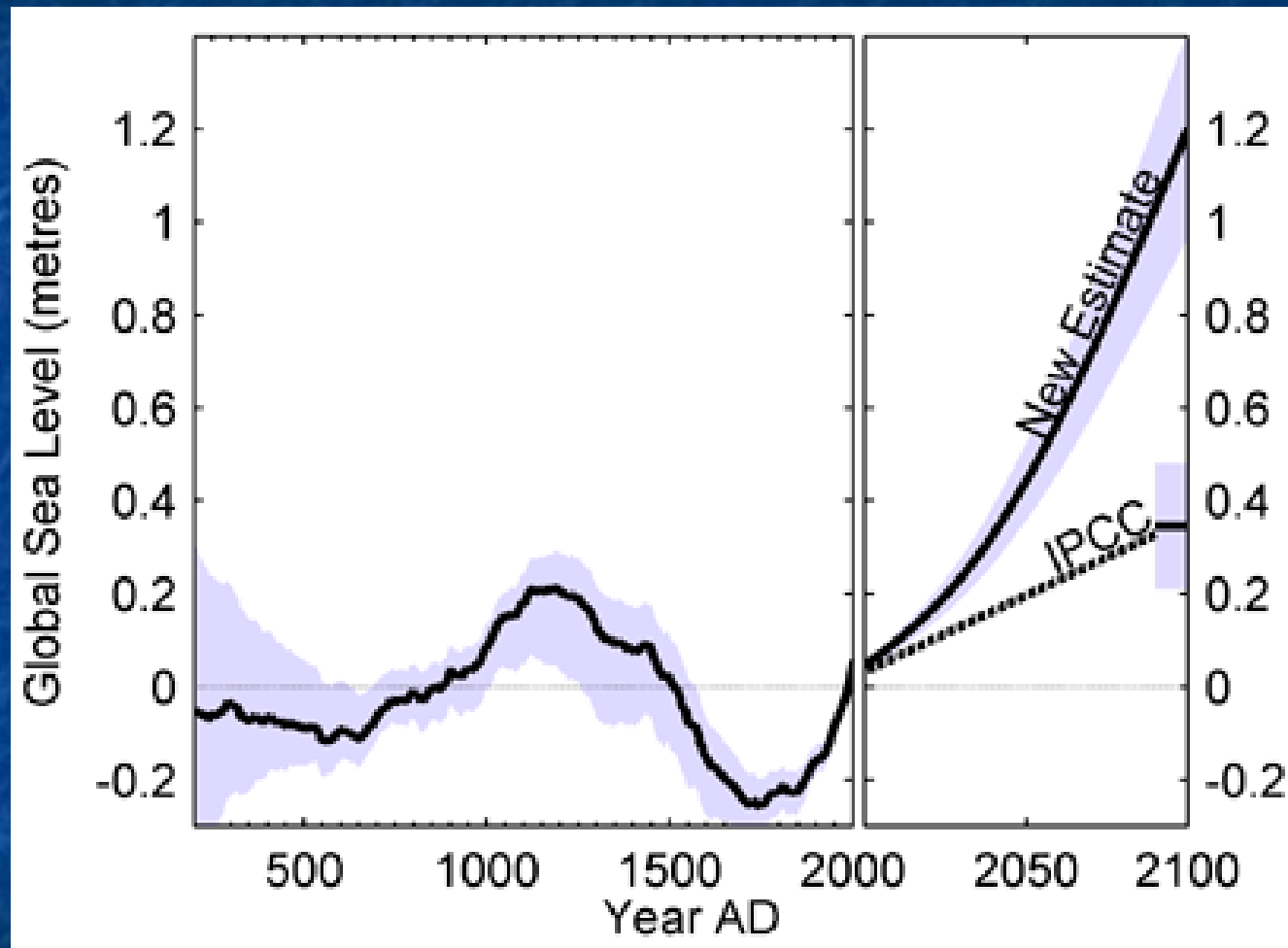
- **Regardless of sign of precipitation change, significant changes expected in:**

annual streamflow cycle, soil moisture, and snowpack;
more hot days; more variability

- **Main Uncertainties:**

1. Will it rain enough to make up for increased evapotranspiration under warmer conditions?
2. How much will sea level rise?
3. Will water demand change?
4. Economic, ecological, and other effects?

A recent view of global mean sea level changes



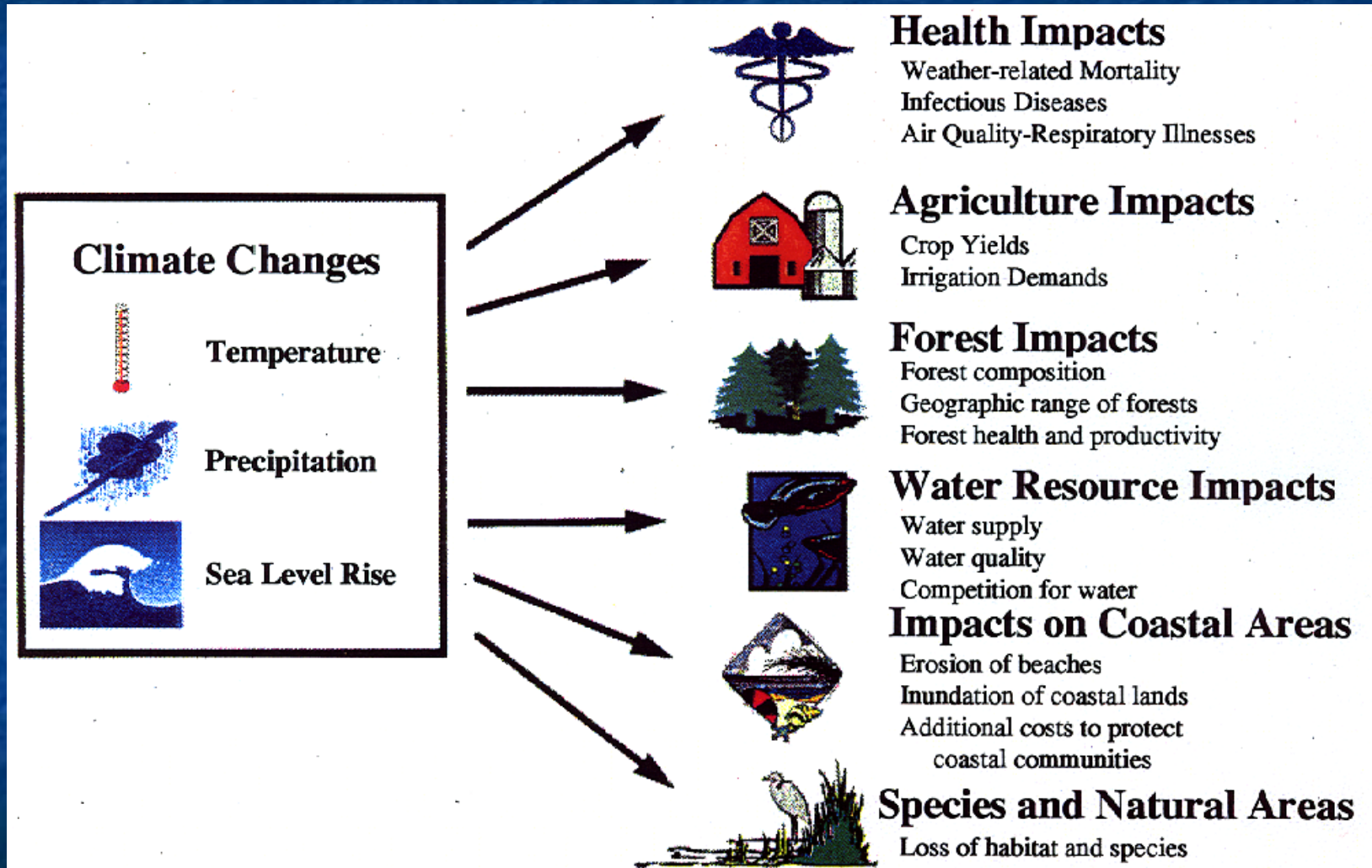
Reconstructing sea level from paleo and projected temperatures 2000 to 2100 AD

Grinsted, Moore and Jevrejeva, Climate Dynamics, 2009



RUTGERS
UNIVERSITY

Potential climate change impacts



Water Quality Risks from a Changing Climate

Variability of ground water, base flow, surface flow

Sustaining an adequate supply

Movement of non-point source pollutants into streams

Stream chemistry changes

Ecosystem effects

Increasing erosion

Sea level rise

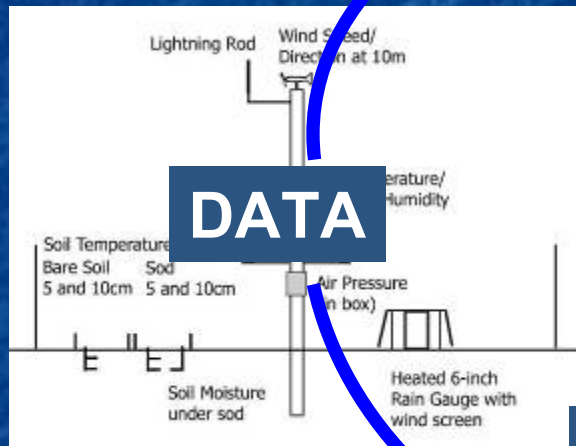


The ONJSC: Keeping a watchful climate eye

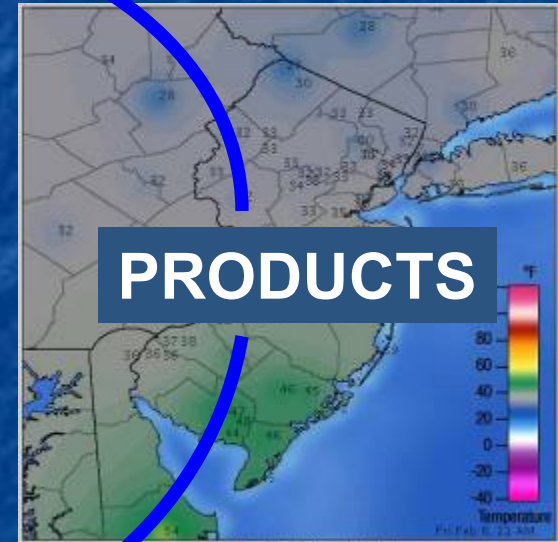
DECISION MAKERS



DATA



PRODUCTS



OUTREACH & TRAINING



Office of the
NJ State Climatologist
RUTGERS UNIVERSITY



RUTGERS
UNIVERSITY



http://climate.rutgers.edu/stateclim_v1/njwaterwatch.html

NJ Weather & Climate Network



NJWXNET

Home
myWxnet

TABULAR DATA

Network Hourly
Network Daily
Station Hourly
Station Daily

MAPS & IMAGERY

NJ Statewide
Current Maps
Daily Maps
Animated

NJ Regional
Current Maps

Mid-Atlantic
Current
Animated

CHARTS & GRAPHS

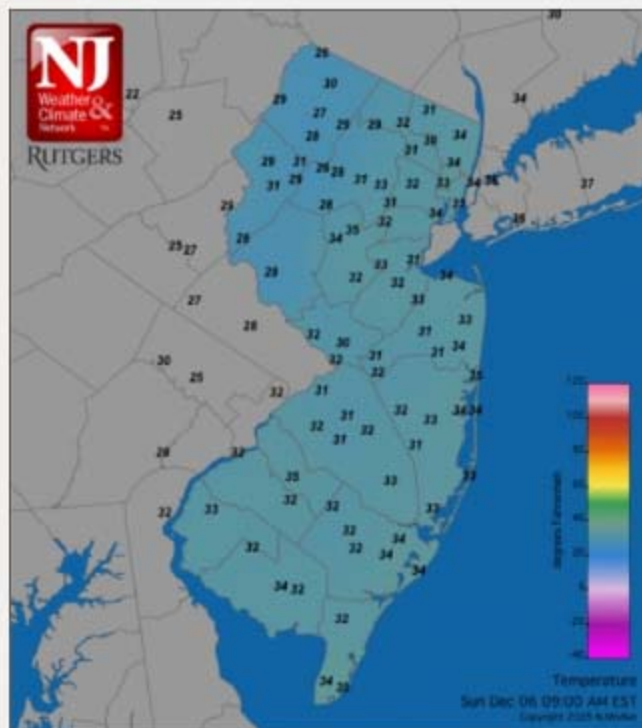
24 Hour Charts
Climatologies

METADATA

Station Locations
Webcam Locations

FAST LINKS

Current Conditions



The image above is the latest color-filled interpolated temperature map generated by the NJWxnet. To view more maps, click [here](#). For a mid-Atlantic temperature map, click [here](#).

NJ Extremes

NJ Hot Spots

City, State	Temp
West Cape May, NJ	36
Lower Township, NJ	35
Point Pleasant, NJ	35
Sicklerville, NJ	35
Jersey City (LSC), NJ	35

NJ Cool Spots

City, State	Temp
Netcong, NJ	26
Mount Olive Township, NJ	26
Wantage, NJ	26
High Point, NJ	27
Lafayette, NJ	27

most current information as of Sun Dec 6 09:15:07 2009

Customize

Want to jump right to the conditions nearest you?

Enter a ZIP code:

OR pick from the list below

Your custom station is
Hillsborough, NJ

[View myWxnet](#)

Feedback

How often do you use the NJWxnet?

For what reasons do you use the NJWxnet?

Have comments, questions, or suggestions?

[Send Feedback Now](#)

<http://climate.rutgers.edu/njwxnet>



RUTGERS
UNIVERSITY

NJ Community Collaborative Rain, Hail and Snow Network



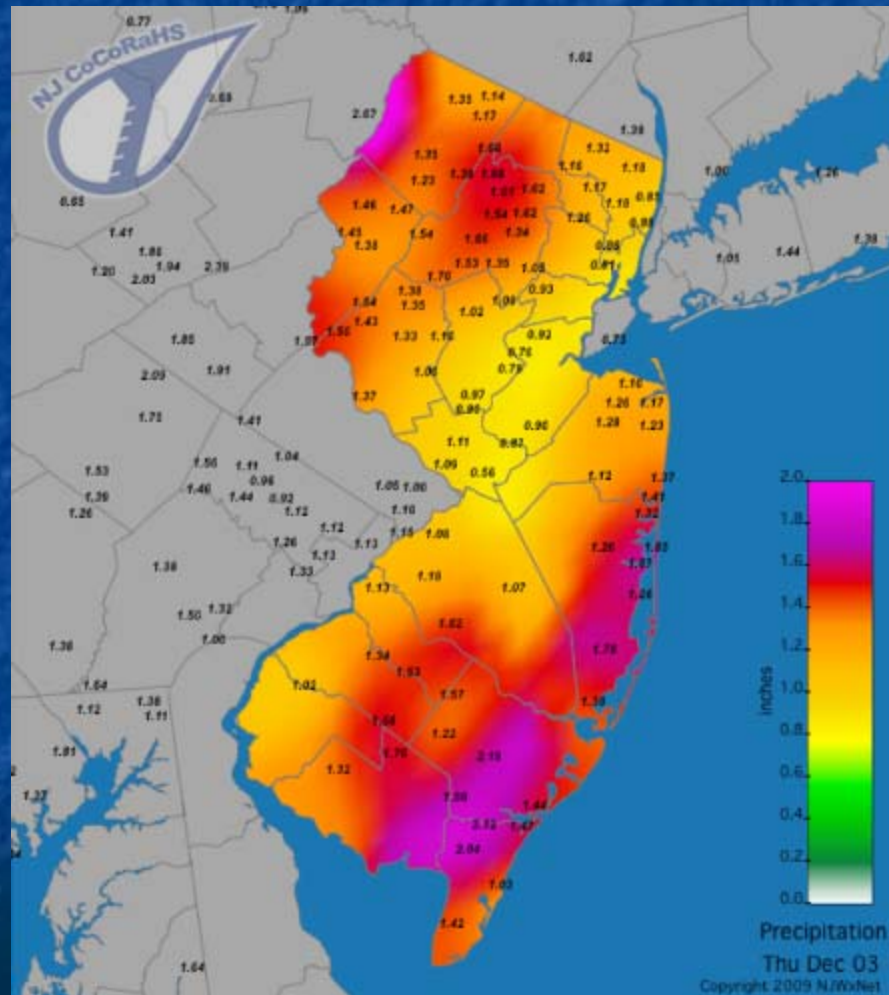
**Daily observations by
trained volunteers of
all ages**



**Augmenting automated
precipitation observations**

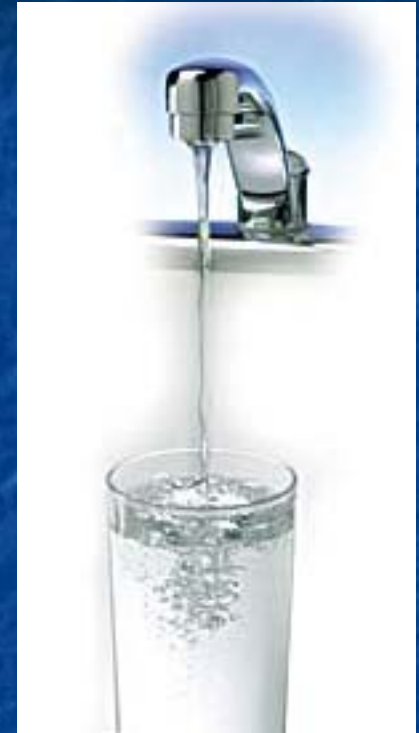
CoCoRaHS

<http://cocorahs.org>



RUTGERS
UNIVERSITY

Thank you for the opportunity to speak this morning



Forrest Toms



Jerry McCrea, The Star-Ledger

Dave Robinson
drobins@rci.rutgers.edu

