"Of all the potential threats posed by climatic variability and change, those associated with water resources are arguably the most consequential for both society and the environment."

*Water – the Nation's Fundamental Climate Issue:* A White Paper on the U.S. Geological Survey Role and Capabilities USGS Circular # 1347, 2010

# Being Prepared: Water Infrastructure & Climate Change

NJ Climate Change Workshop Rutgers University R New Brunswick 29 November 2011



Jessica Rittler Sanchez, PhD Delaware River Basin Commission & NJ Clean Water Council Being Prepared: Water Infrastructure & Climate Change

- I. Climate-related threats to water & infrastructure: supply, waste & storm
  - 2009 NJCWC Public Hearing
     NJ and DRBC concerns
- II. Management Options

## What we can expect:

Greater variability/extremes in 1. precipitation amounts & timing a) More wet days/ storms (winter?) b) More dry/drought days (summer?) Higher temperatures 2. Sea level rise **Synergistic effects** 

# More frequent storms/wet days

## more stormwater/ more flooding in vulnerable locations

3 record-breaking floods in 22 mos: Sept 2004 April 2005 June 2006

water quality impairment (TSS, nutrients, etc.)
infrastructure impacts
service disruption

# Lambertville Sewage Treatment Plant: **April 2005**

Aerial photo used with permission of www.elevated-images.com

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April 2005

New Hope, Pa.

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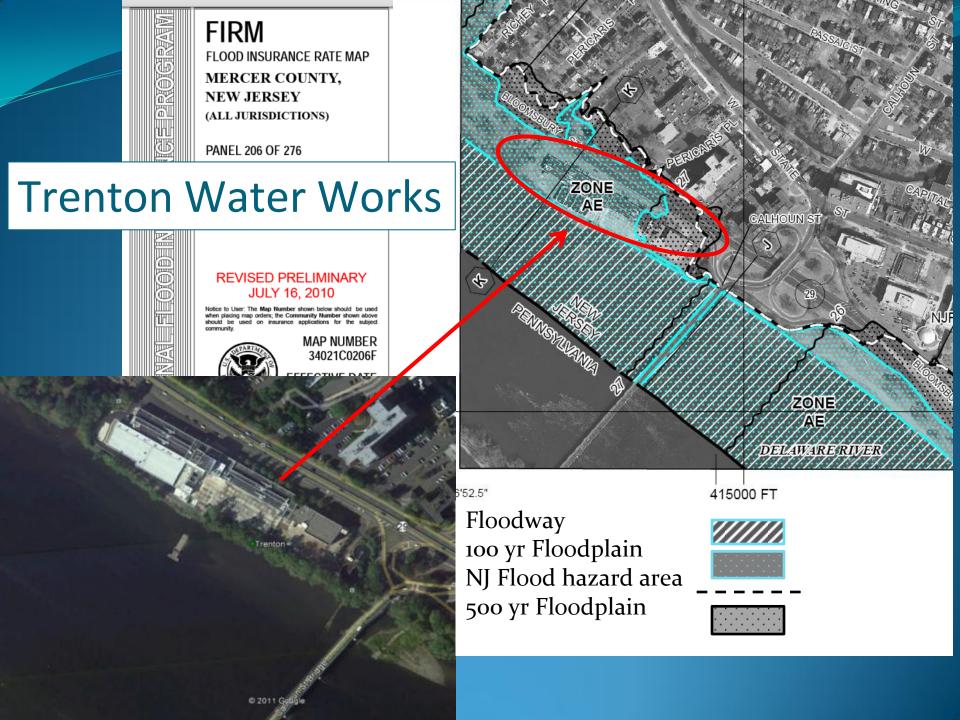
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## Water Infrastructure & Climate Change Source impairment, infrastructure disruption

#### Hurricane Irene - August 2011

#### The breach of the canal wall south of Lambertville.

This photograph was taken on August 28th, by Tim Kasony.

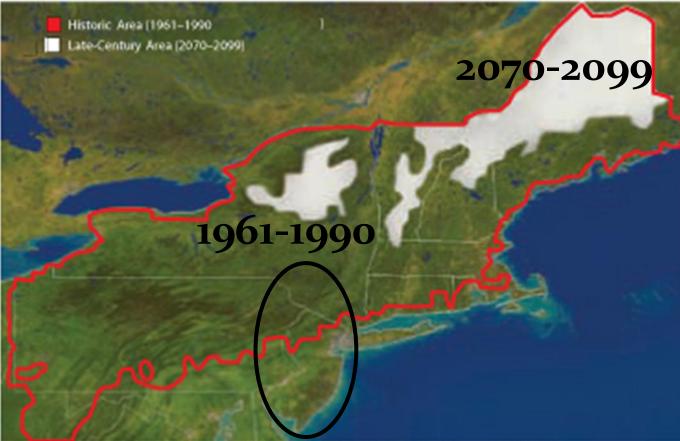


#### More drought days, higher temps, greater water & energy demand

NYC's Cannonsville Reservoir December 2001

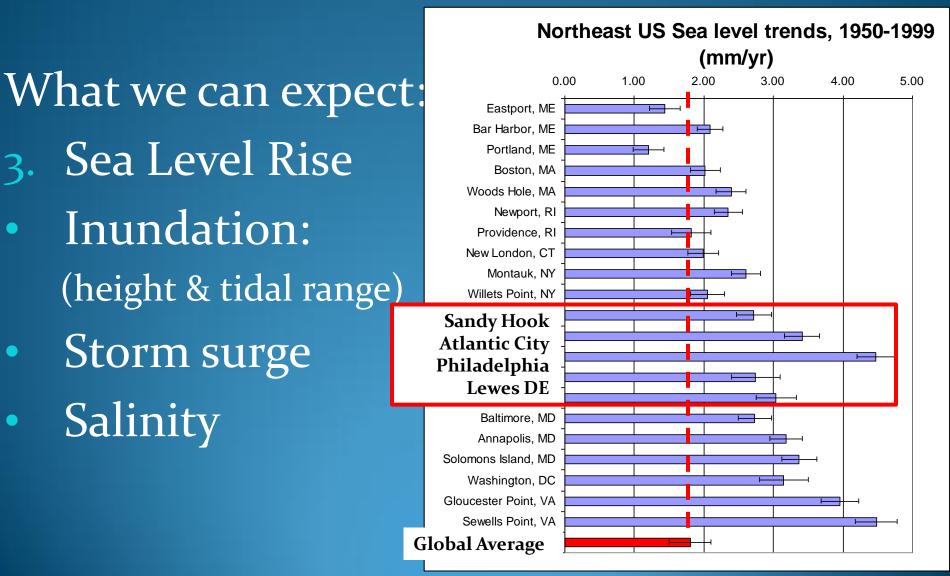
## **Seasonal Delivery Changes**

#### The Changing Face of Winter - High Emissions Scenario



from Confronting Climate Change in the U.S. Northeast, 2007 Northeast Climate Impacts Assessment Implications for reservoir operations, instream flows, aquatic habitat, assimilative capacity, water quality.

Source – Ray Najjar



# What's vulnerable?

- All coastal & waterfront infrastructure
- Fresh water intakes on tidal rivers
- Unconfined aquifer wells (storm surge)
- Confined aquifer wells (saltwater intrusion)
- Systems in need of repair

## Water Intakes at Risk 2008 PennDesign Studio: Projected locations of the salt line 2050 & 2100

#### 2050 +0.48 m SLR 2100 +1.06 m SLR RM 114 = projected 2050 high tide at high tide & drought RM 110 = water supply conditions

PHILADELPHIA

**Public Supply Torresdale Water Intake** (~60% of Philadelphia's water supply

New Jersey American Water **Co. Tri-County Water Treatment: Burl-Camden-Gloucester counties** 

CAMDEN

RM 102 = record drought

RM 117 = projected 2100 high tide

RM 100 = Benjamin Franklin Bridge

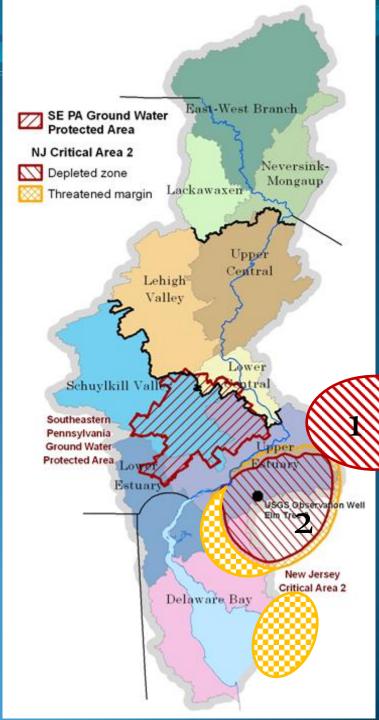
RM 98 = DRBC limit

Public Supply Intakes

1.5

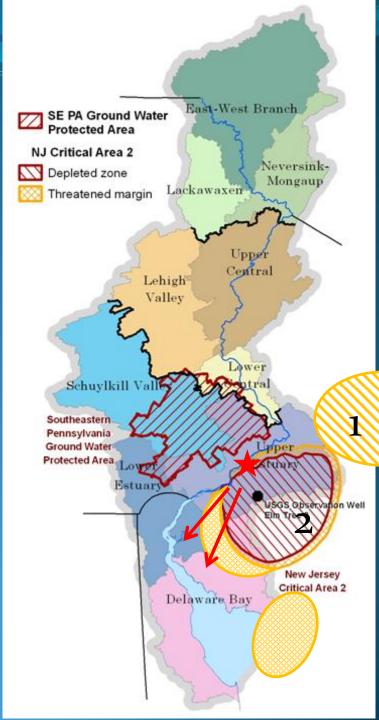
Existing problem: Critical Areas -Ground Water Supply

- 2 NJ Critical Areas plus additional areas of concern
- Emphasis on conjunctive use: surface water alternative is crucial
- Coastal wells vulnerable to saltwater intrusion & overwash



Existing problem: Critical Areas -Ground Water Supply

Planned alternative supply: **Delaware River water** Intake vulnerable to: SLR decreased flow from major Ο tributaries (increased consumptive use)



2009 NJ Clean Water Council Public Hearing: Water Policy & Climate Change

The over-arching message :

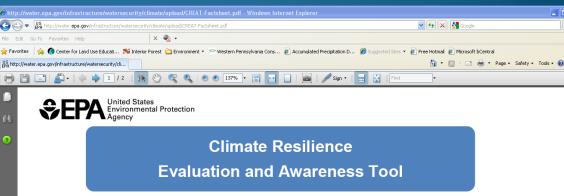
"New Jersey should integrate consideration of the effects of changing climatic conditions into its planning, assessment and regulatory programs to:

- increase program flexibility,
- avoid foreseeable negative impacts, and
- maximize programmatic and fiscal efficiency."

http://www.nj.gov/dep/cleanwatercouncil/

## EPA: CREAT for Utilities Climate Resilience Evaluation & Awareness Tool

- Assets
- Threats
- Adaptive Measures
- Baseline Analysis
- Resilience Analysis
- Implementation Planning
- Results & Reports



#### Purpose

Climate change impacts pose a challenge to the ability of the Nation's drinking water and wastewater systems (water sector) to fulfill their public health and environmental mission. Extreme weather events, sea level rise, shifting precipitation and runoff patterns, temperature changes, and resulting changes in water quality and availability all have potentially significant implications on water utility operations.

EPA has developed the Climate Resilience Evaluation and Awareness Tool (CREAT) software to assist drinking water and wastewater utility owners and operators in assessing their risk to potential climate change impacts. CREAT uses the most current scientific understanding of climate change to increase drinking water and wastewater utility owners and operators' awareness of potential impacts to utility operations and missions by assessing climate change impacts and consequences.

#### Features

Serves as a stand-alone risk assessment product that raises utility awareness of the potential impacts of climate change and assesses the implementation of climate change adaptation options and their effectiveness in reducing risk to climate change impacts;



- 60

**CREAT** is available for download at

http://water.epa.gov/infrastructure/watersecurity/climate/creat.cfm

# Water Infrastructure & Climate Change 21st Century water management



Aerial view of a typical wastewater treatment pla

#### Old paradigm

- Highly specialized
- Centralized
- Segregated
- Linear
- Extractive

#### New paradigm

- Multifunctional
- Decentralized
- Integrated
- Systemic
- Restorative
  - Adaptive

"Adaptation to climate change is now inevitable . . . The only question is will it be by plan or by chaos?"

Roger Jones, CSIRO, Australia; Co-author of IPCC



4.

Synergistic & systemic effects

