

Water: Too Much or Not Enough?

Ensuring Adequate, Clean Public & Private Drinking Water Supplies
in the Face of a Changing Climate

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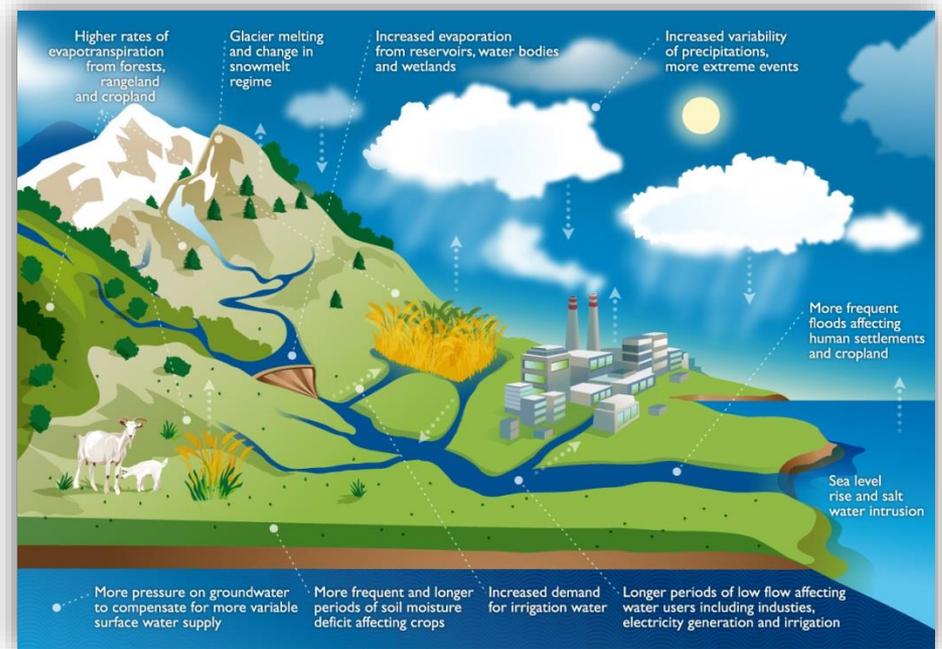
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CT Department of Public Health

Rockfall Foundation March 31, 2017

“The Times They Are a-Changin’...”

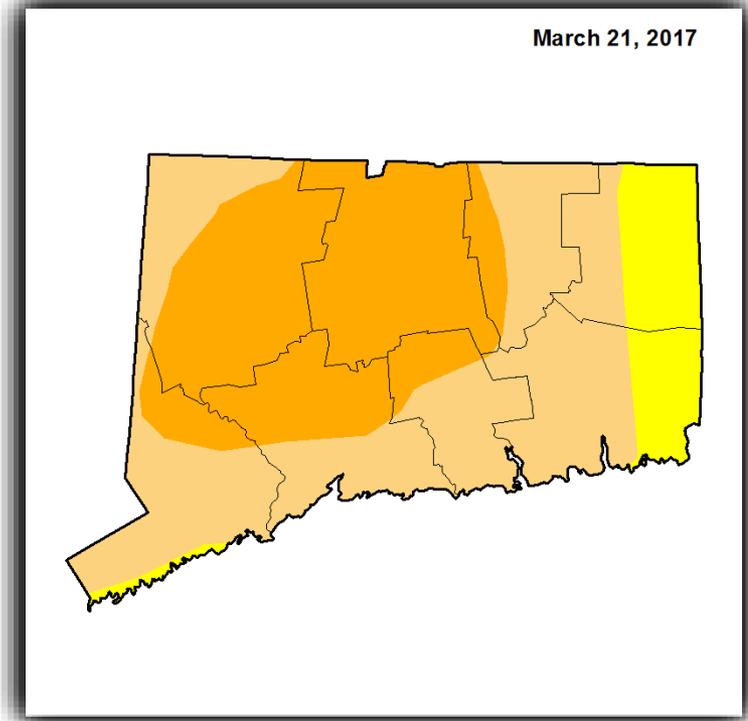
“Climate change is projected to continue to follow already observable trends. Temperature rise, shifts in precipitation patterns and timing, and altered hydrologic cycles can be expected.” (US EPA, 2015)

- Extreme Weather Events
- Drought
- Flooding
- Coastal Storm Intensity & Sea Level Rise
- Variability & Seasonality



Temperature & Drought

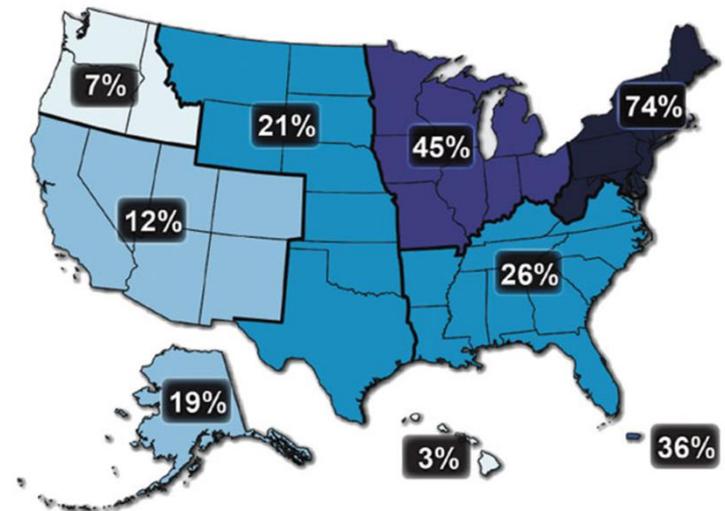
- Higher temperatures, especially in summer
 - ✓ Avg and extreme heat days
- Longer heat waves and increased evaporation
- Changes in Runoff and Loss of Snowpack
- Decline in summer precipitation
- Increased Drought Frequency & Duration
 - ✓ Short-term droughts as frequently as each summer



Rain Bombs & Flooding



- Increase in precipitation: + 5"
- Extreme Precipitation (heaviest 1% of all daily events) up 74%
 - ✓ More 2+ inch storms
- Winter precipitation as rain
- More development, paved areas
- Increase in frequency of Category 4 and 5 hurricanes
- Fewer buffering marshes and estuaries
- Sea Level Rise – 1 to 4'



Water Supply Challenges

“The biggest challenges for water utilities are forecasting demand from a growing population, planning for extreme weather events and updating aging infrastructure. At the same time, the industry has to deliver consistent and clean water to its users at an affordable rate.” (Barclays and the Columbia Water Center, 2017)

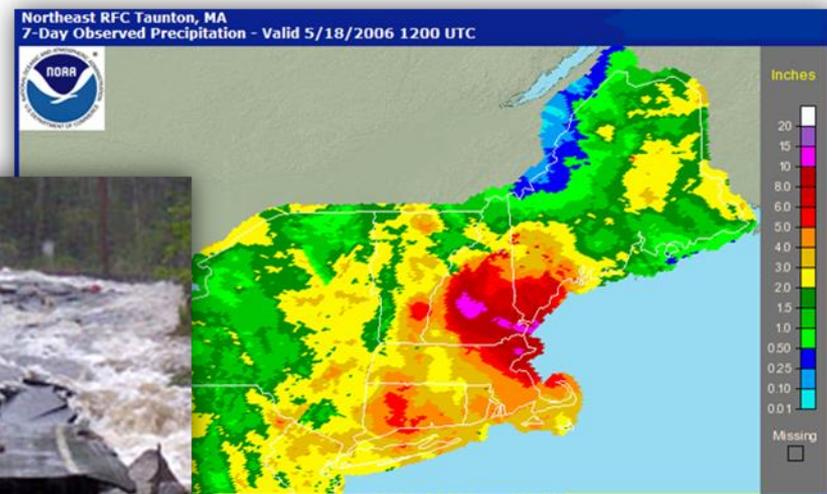
- Physical Infrastructure
- Water Quality Degradation
- Safe Yield & Available Supply
- Managing Uncertainty



Challenges – Infrastructure

Physical Infrastructure

- Flooding, Hurricane/Coastal Storm Impact, Sea Level Rise
- Dam Safety
- Supply, Treatment & Distribution System Integrity
 - ✓ Failure, Flooding, Power Loss
- Drainage infrastructure overwhelmed during heavy precipitation and high runoff events
- Wastewater treatment plant failure



Challenges – Water Quality

Water Quality Degradation

- Flooding: erosion, sedimentation, nitrogen, herbicides, pesticides, turbidity and pathogens
- Watersheds and natural ecosystems degraded
- Salt-Water infiltration and impacts to freshwater systems
- Thermal stratification of reservoirs increasing
 - ✓ Mixing may be eliminated in shallow lakes, decreasing dissolved oxygen and releasing excess nutrients, metals, etc.
- Reservoirs less likely to freeze
 - ✓ Algae blooms increase
- Tap water temperature challenges
 - ✓ Disinfection byproducts



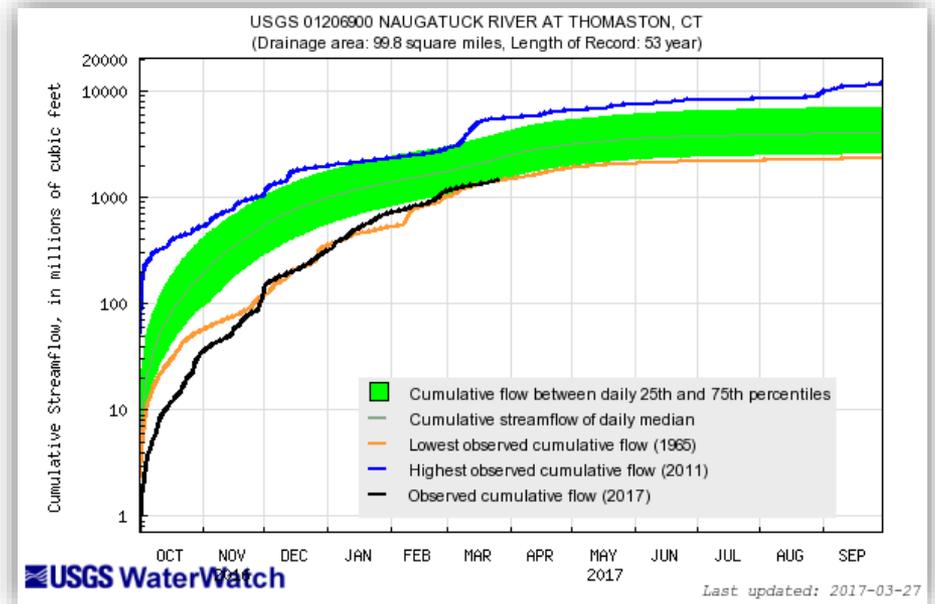
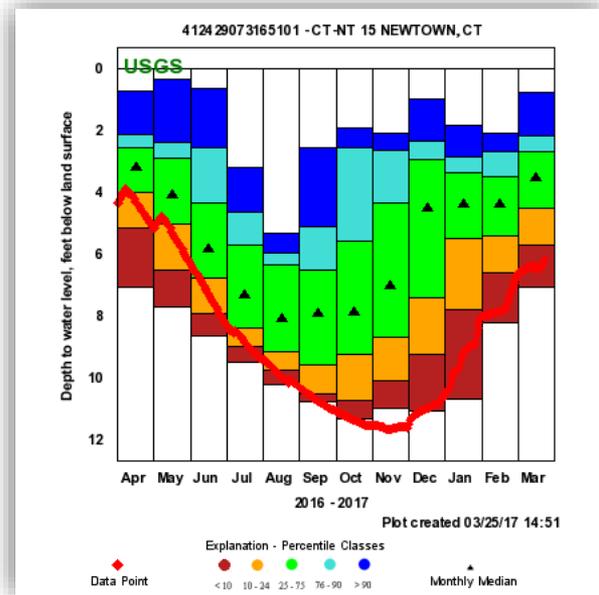
Challenges – Ability to Meet Demand

Safe Yield & Available Supply

- Lower Res Levels
- Reduced GW Recharge

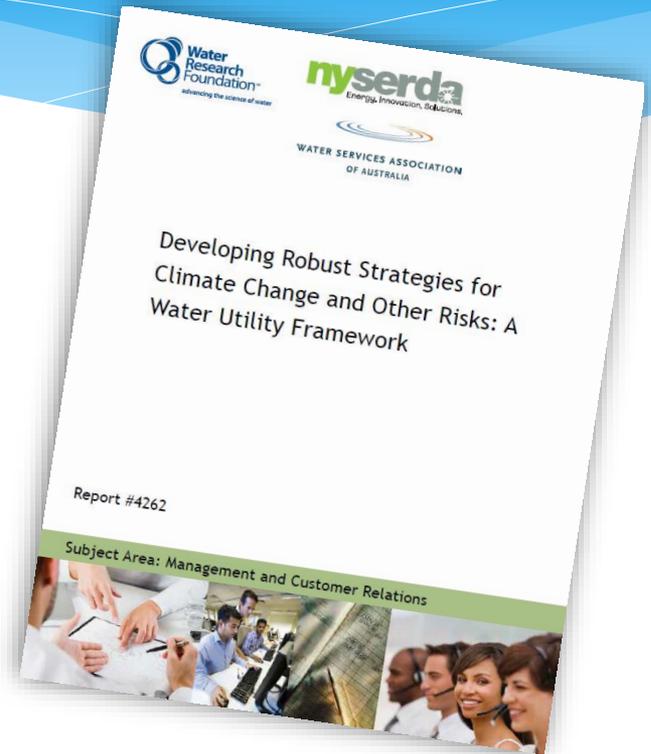
Water Demand

- Increased Seasonal Demand
- Environmental Pressures



Mitigating Risk

- Supply & Demand Management
- Redundancy
 - ✓ Critical Infrastructure
 - ✓ Interconnections
- Emergency Response Planning
 - ✓ ECPs
 - ✓ CT WARN
- Managing Uncertainty
 - ✓ Adaptive Management



“Water agencies have always faced uncertainty when planning for the future. Traditional planning methods are based on the assumption of hydrologic stationarity—that future hydrologic conditions will be statistically similar to those recorded in the recent historical record... Scientific evidence is mounting, however, that future climate and hydrologic conditions will be significantly different from those in the past.” (Water Research Foundation, 2014)



Looking Ahead

*“Generally, the past decade has seen **considerable interest by the water utility community in exploring the potential impacts of climate change.** This period has been referred to... as an era of assessment, as there are very few examples of water utility actions or adaptations directly linked to “climate change”. **The next era will be one of action, as water utilities grapple with large infrastructure investment decisions, and include climate change in their risk management and decision processes.**” (Water Research Foundation, 2014)*

