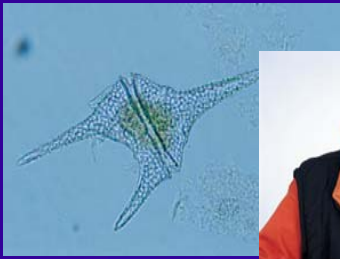




Awwa  
Research  
Foundation

# Climate Change Impacts and Solutions

2008 MSSC Salinity Summit  
Las Vegas, NV



# AwwaRF

**Mission: Advance the science of water to improve the quality of life**

- Centralized research program for drinking water utilities
  - Sponsor research
  - Develop knowledge
  - Promote collaboration
- Agenda is planned and guided by drinking water utilities
- Research covers a broad range of topics including source water, treatment, infrastructure, and management for drinking water utilities



# Climate Change

- Climate change interest generated from grass roots
  - Little government influence
  - High degree of interest from utilities
- AwwaRF research driven by utilities wanting answers
  - What hydrological impacts of climate change will affect water utilities?
  - How can we scale down global models of climate change processes to a watershed level?
  - How can we plan for reliable water quality and supplies in the face of climate uncertainties?

# Hydrological Impacts of Climate Change

Warming intensifies the hydrologic cycle

Surface temperature increase



Increased water holding capacity



Increased atmospheric moisture



Changing Frequency



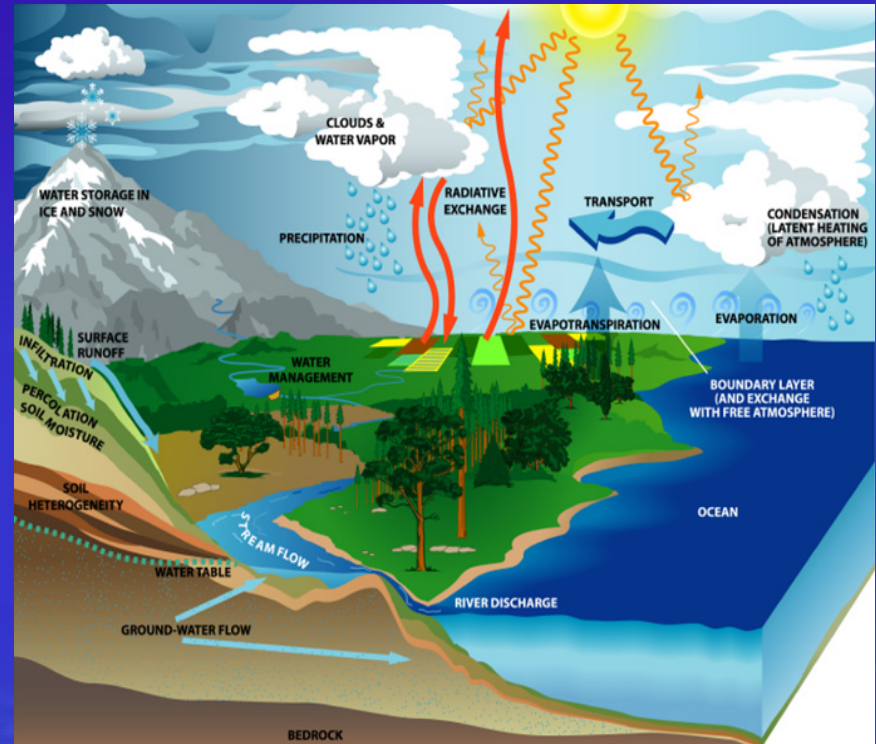
Increased Intensity



Droughts

&

Floods



# Hydrological Impacts of Climate Change

- Changes in average annual snow pack runoff
  - Shorter snow season, less volume
  - Earlier peak flow, so water stored in past as snow is lost unless water system storage capacity is increased
- Less frequent more intense rainfall events
  - Water quality degradation
  - Changes in vegetation of watersheds and aquifer recharge areas
- Rising sea levels
- Glacial recession
  - summer flow  $\uparrow$  near-term, but  $\downarrow$  long-term

# Climate Change Impacts on Water Utilities

## Quantity uncertainties

- Increasing unpredictability of precipitation
- More difficult to capture
- Increased evaporation from reservoirs

## Quality degradation

- Flooding - Increased erosion/turbidity
- Increased water temperatures
- Changes in watershed vegetation
- Salt-water intrusion

## Demand

- Increased due to higher temperatures

# Water Utilities Respond to Climate Change Conditions

- Developing adaptation plans to minimize water reduction impact
- Working closely with local and state officials designing water restriction guidelines
- Partnering resources with other utilities in the water community
- Requesting research to support climate change decisions



# AwwaRF's Climate Change Research Program

- Responding to need to maintain adequate drinking water supplies in face of climate change
- Major AwwaRF initiative
- Co-funding of climate change projects proposed by utilities
- Key partnerships with several coalitions

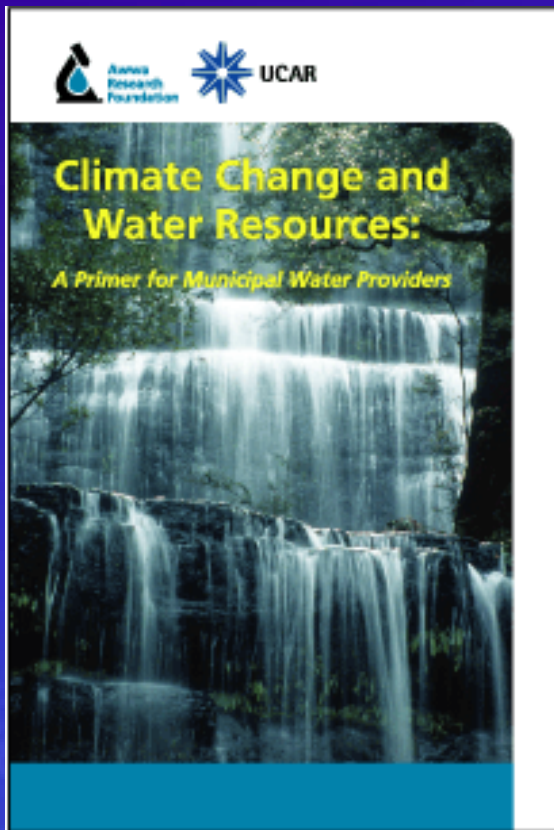


# Climate Change Partnerships- Coalitions

- National Center for Atmospheric Research (NCAR)
- UKWIR – UK Water Industry Research
- CUWA – California Urban Water Utilities
- Group of 8
- WSAA – Water Services Association of Australia
- WERF

# Climate Change and Water Resources: A Primer for Municipal Water Providers

AwwaRF publication 91120, 2006



- Partnership with NCAR
- Defines current state of climate change research
- Assesses water supply vulnerabilities
- Provides case studies of water utilities planning for climate change
- Summarizes lessons learned from extreme events such as wildfires, droughts, floods
- Develops range of adaptation strategies

# Current AwwaRF Coalitions

- West Coast Group: LADWP, Contra Costa Water District, Seattle Public Utilities and San Diego Water Authority
  - Effects of Climate Change on Water Utility Planning and Design Standards
- California Urban Water Agencies (CUWA)
  - Utility Greenhouse Gas Emissions

# Current AwwaRF Coalitions

- NCAR-Utility Alliance
  - Boston, MA
  - Raleigh/Durham, NC
  - Palm Beach County, FL
  - New York City
  - Colorado Springs, CO
  - Regional utility alliance in California
- Decision tool to incorporate climate change information in water utility planning



# Current AwwaRF Coalitions

- Global: UKWIR-CRC
  - Edinburgh workshop to review research needs regarding climate change
  - Climate Change Impacts on Source Water Quality

# AwwaRF, UKWIR, WERF Climate Change Workshop Issues

- Impacts of underground CO<sub>2</sub> sequestration on groundwater supplies
- Interpretation of climate change models for water supply
- Designing infrastructure systems of the future
- Vulnerability assessment and risk management tools
- Resource recovery and integrated process optimization

# Related AwwaRF Research

- **Energy Management**
  - Historically driven by cost savings; growing interest in minimizing carbon footprint, green operations
  - >15 research projects since early 1990s
  - Strategic partnership with California Energy Commission
- **Desalination**
  - Alternative water source as hedge against climate change impacts
  - >20 research projects
  - Partnerships with Water Reuse, USBR, Sandia National Laboratories, NWRI



# Conclusions

- **Drinking water utilities are keenly aware of climate change issues and are seeking answers**
- **Utility management is risk management and this is just another risk that must be assessed and added to long term planning and decision making**
- **Implementing adaptive strategies may be expensive but necessary**
- **Public communication will be essential to educate water users on the required changes necessary to ensure drinking water in the future**
- **Greater effort is needed to ensure quality research to support the needs caused by Climate Change**



# Thank You

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