Climate Change, Water Supplies and Policy

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Fourmile Canyon Fire, 2010
Colorado River Basin

- 7 States, 2 Nations
- 8% of area of the Lower 48
- Annual Flow 16.4 MAF
  = Hudson River
- 40 M People
- All of the Major Cities in Southwest
- 4.5m Irrigated Acres
- Fully Allocated in 1922
- Withdrawals equaled Supplies ~2000
- Large New Projects still contemplated
- No longer reaches the ocean
Climate Change is Water Change

• Heat Drives the Water Cycle
• As the Atmosphere Warms it Holds More Moisture
  ~5% more moisture already
• Heating Up the Earth (and uneven heating) => Water Cycle changes
• All Kinds of Water Changes Already Noted
  • More rain/less snow, Earlier Runoff, More Intense Rain

Millennium Drought 2000—2018

- 2000-2017 is the worst drought in the gaged record
- ~ 20%/yr decline
- Long-term trend, too

Udall and Overpeck, WRR, 2017
Millennium Drought 2000—2018

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- Lakes Powell and Mead have lost 50% of their volume
Millennium Drought 2000—2018

- Precipitation declines only partially explain
- ~ 66% of the loss
Millennium Drought 2000—2018

- Precipitation declines only partially explain ~66% of the loss
- Temperature increases explain the remainder ~33% of the loss
- Why?
  - More Evaporation
  - Temperature-Induced Losses
    - Now = ~6%
    - 2050 = ~20%
    - 2100 = ~35%

Udall and Overpeck, WRR, 2017

- [Graphs showing Colorado River Basin Precipitation and Temperatures with highlighted periods for 1950s and 2000s droughts]
Larger Floods

- 5% more atmospheric moisture now
- For a given ‘return period’ bigger floods
Fires

- More Fires
- Longer Season
- Larger Fires
- Water Quality Degradation
- Impacts to Water Provider Operations
Water Supply Implications

- Aridification vs. Drought
- More Competition
  - East vs. West Slope
  - Agriculture vs. Municipalities
- North (Wet?) vs. South (Dry?)
- Agricultural Challenges
  - Drought
  - Floods
- Environmental Challenges
  - Endangered Species
- Recreation Challenges
  - Rafting & Fishing & Skiing
- Water Quality
Water Policy Center Potential Topical Areas

• In light of a rapidly changing climate how do we...

• Manage to reduce risk?
• Ensure resiliency and reliability of our Water Supply Systems?
• Provide for watershed health?
• Modify water law to minimize harm, consider equity?
• Minimize and manage for water quality impacts?
• Operate existing infrastructure?
• Build new infrastructure?
Unprecedented 21st century drought risk in the American Southwest and Central Plains

Benjamin I. Cook, 1,2* Toby R. Ault, 3 Jason E. Smerdon 2

In both Central Plains and Southwest, Multi-decadal Drought Risk* exceeds 80% in 21st Century

* Defined as Drought lasting 35 or more years