RECLAMATION

Managing Water in the West

Snowpack and Water Supply

Kenneth Nowak

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U.S. Department of the Interior
Bureau of Reclamation

Presentation Outline

- Snow and Water Supply
- Factors Impacting Water Availability
- Climate Modeling Considerations

Western United States

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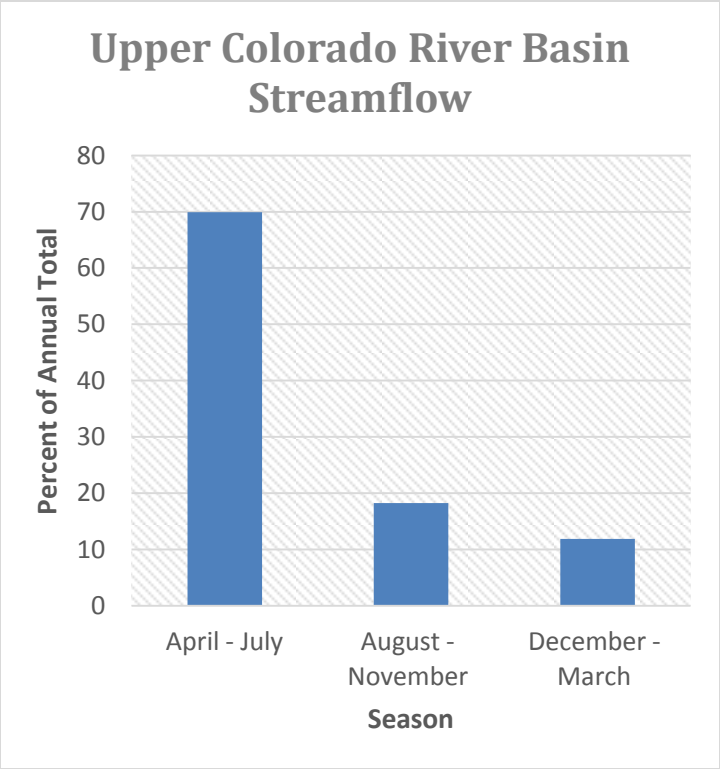
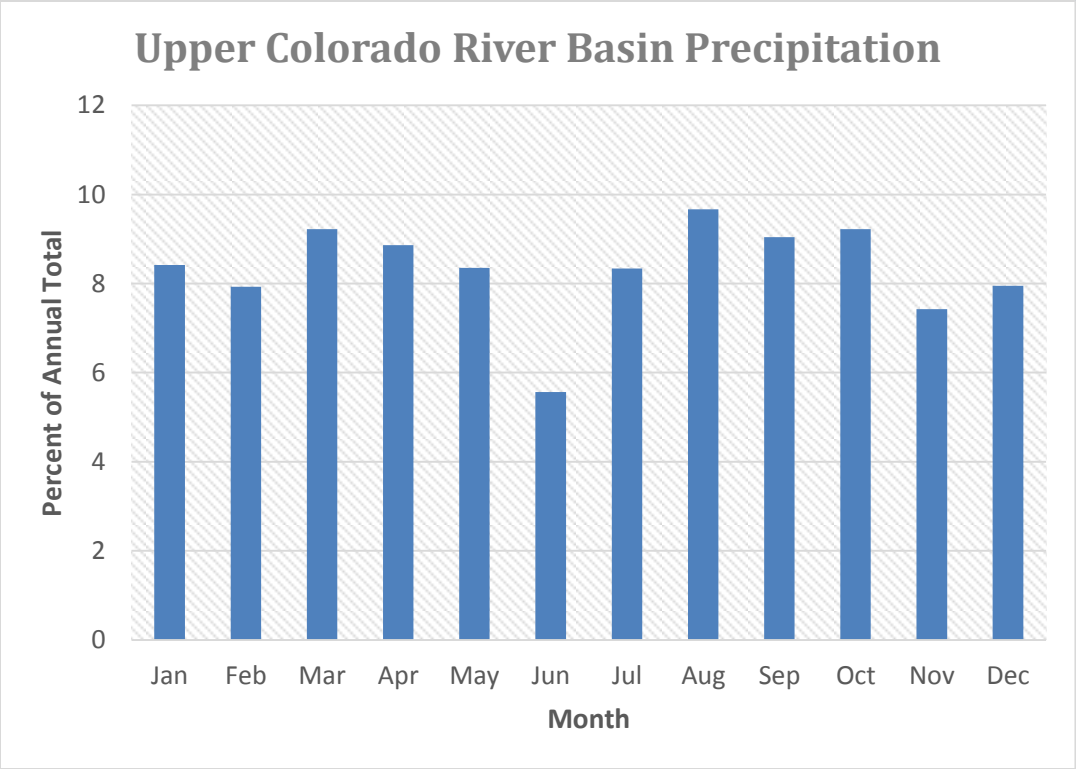
Snow and Water Supply





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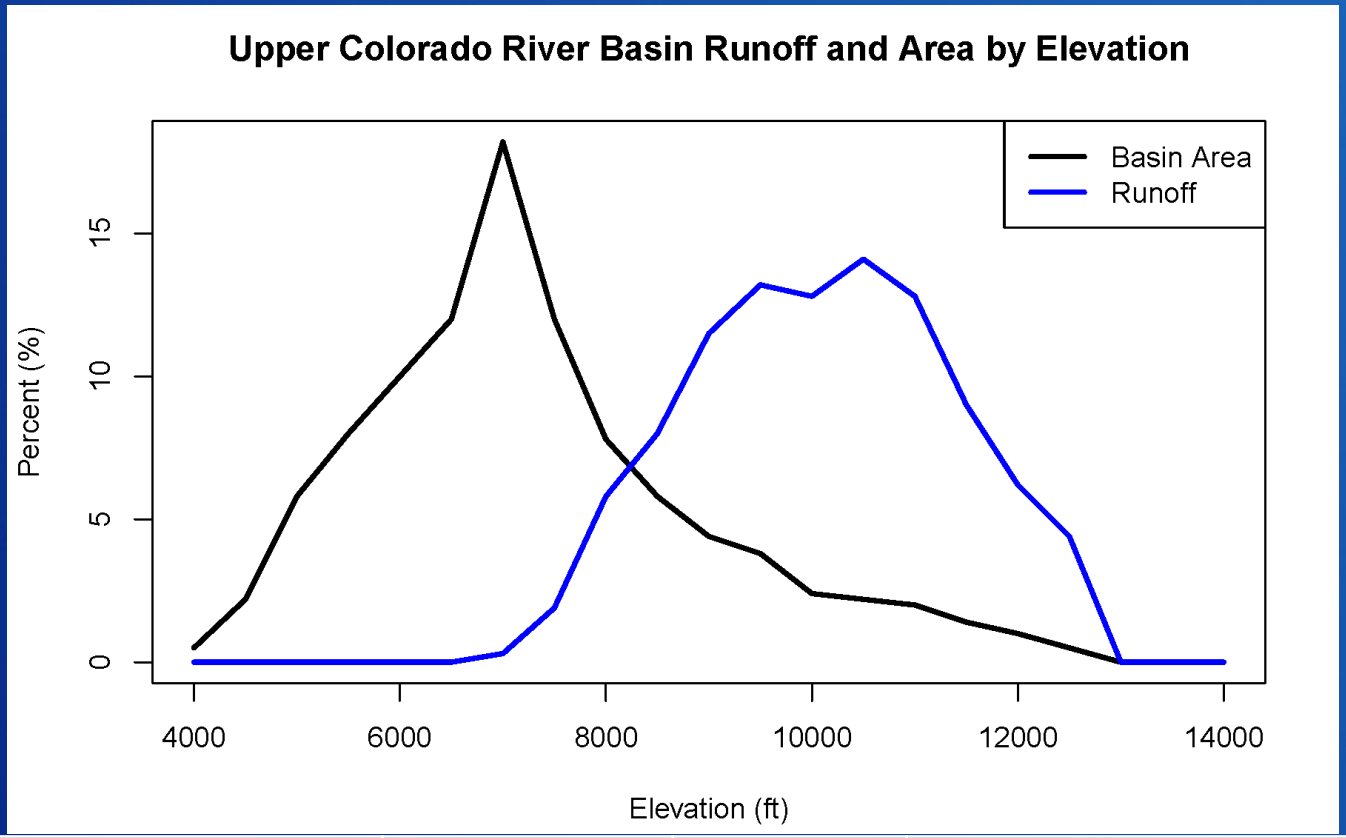
Snow [Topography] and Water Supply



	Basin Area	Runoff	Runoff per Area
Below 9000 ft	82 %	16%	0.2
9000 ft and Above	18%	84%	4.75

*From Physical Scales of Runoff Production in the Colorado River Basin (Hoerling and Eisheid)

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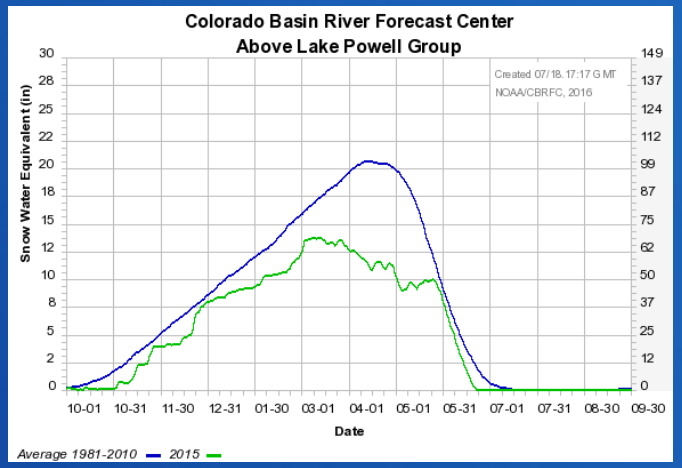
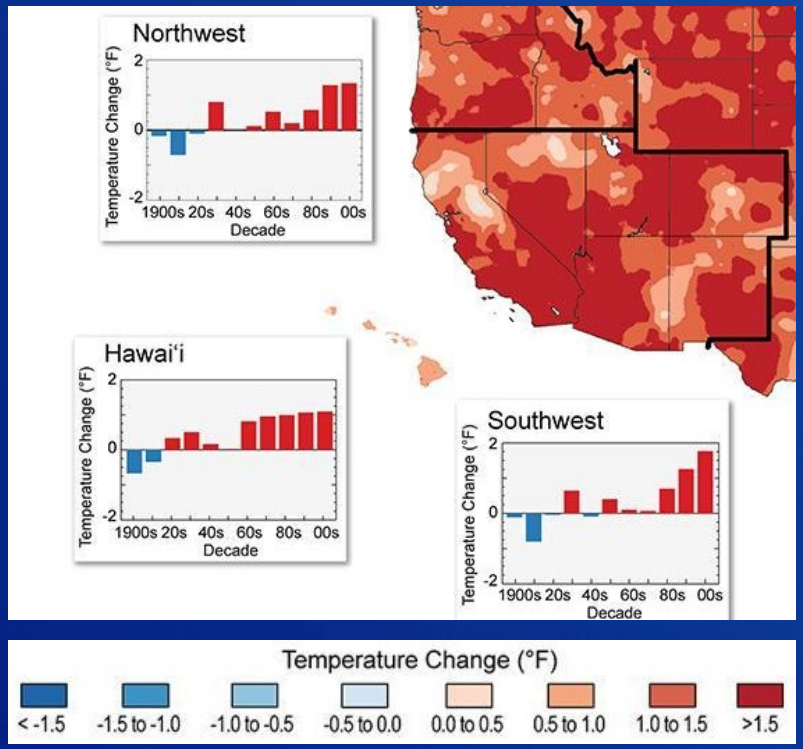
Factors Impacting Water Availability

- Warming
  - Runoff Timing
  - Runoff Efficiency
  - Evapotranspiration

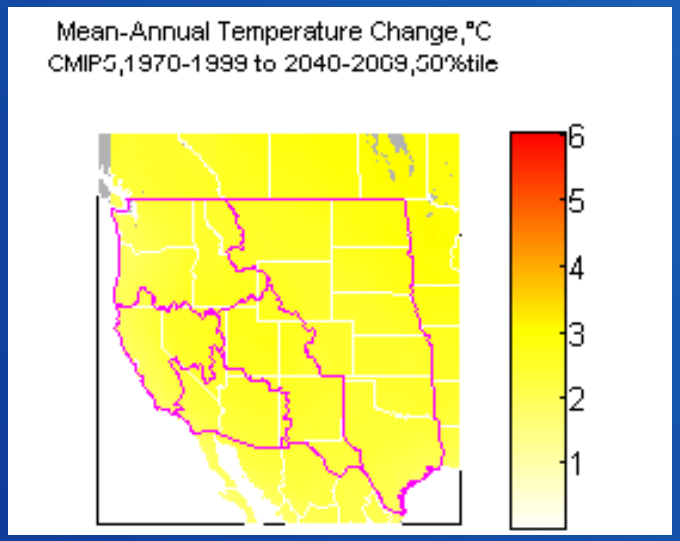
Colorado River Basin SWE



Historical Warming



Projected Warming



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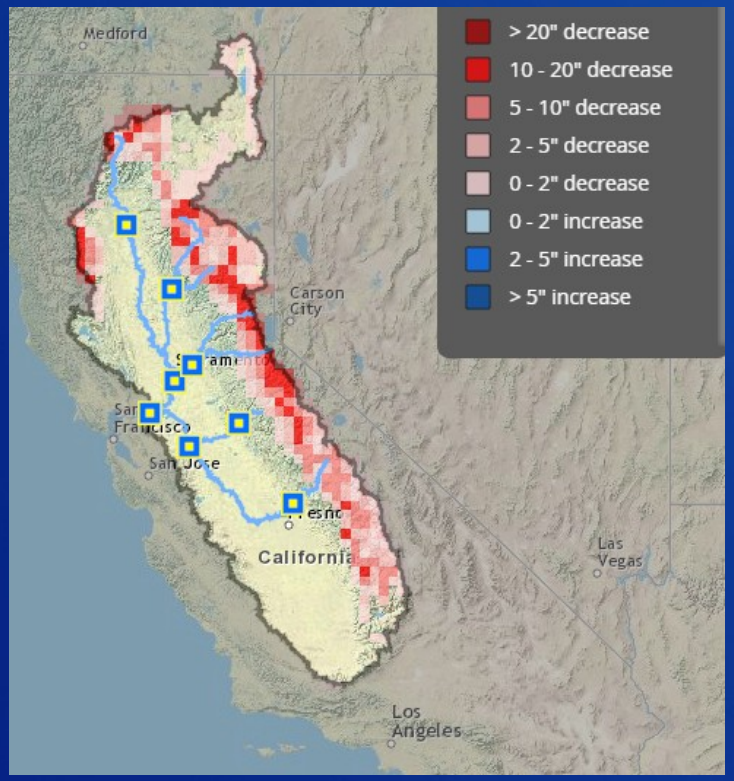
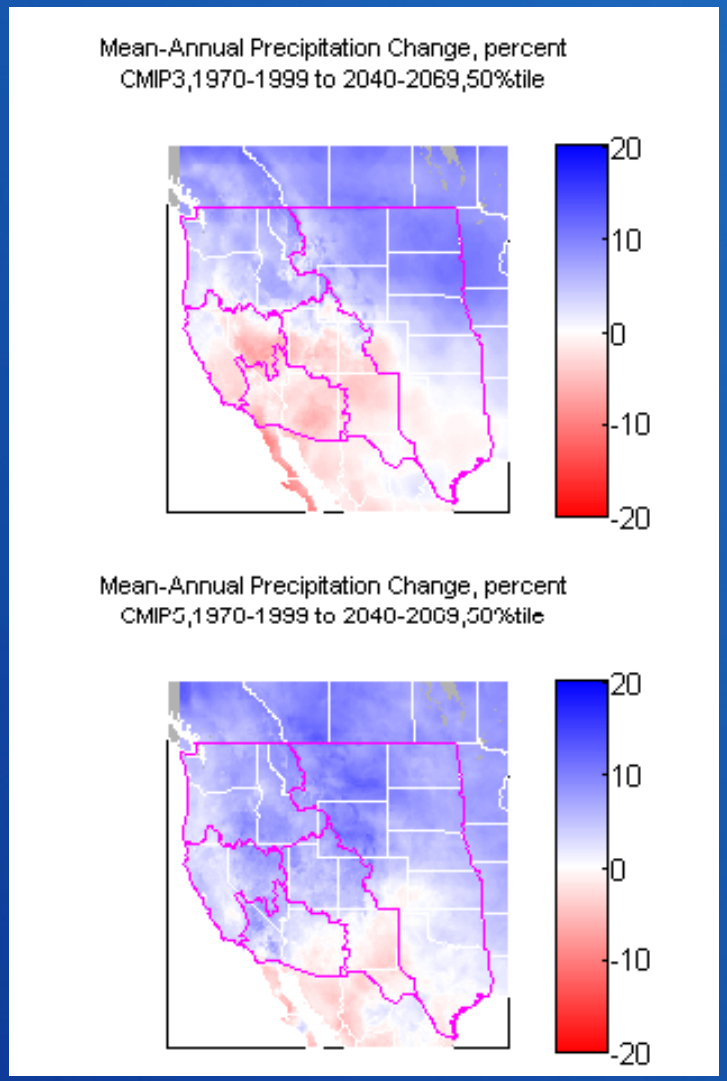
Factors Impacting Water Availability

- **Changes in Precipitation**
  - **Amount**
  - **Phase**

Sacramento San Joaquin Basins
Late Century Change in April 1 SWE





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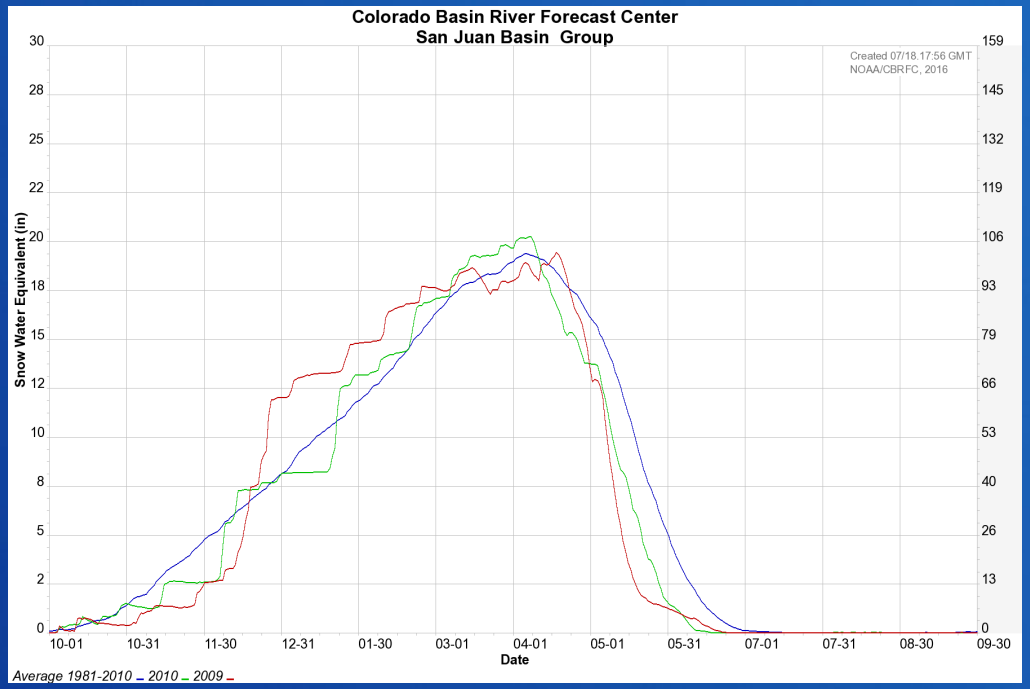
Factors Impacting Water Availability

- **Dust on Snow**
  - **Runoff Timing**
  - **Runoff Amount**



~ 3 weeks

Photos Courtesy of the Center for Snow and Avalanche Studies

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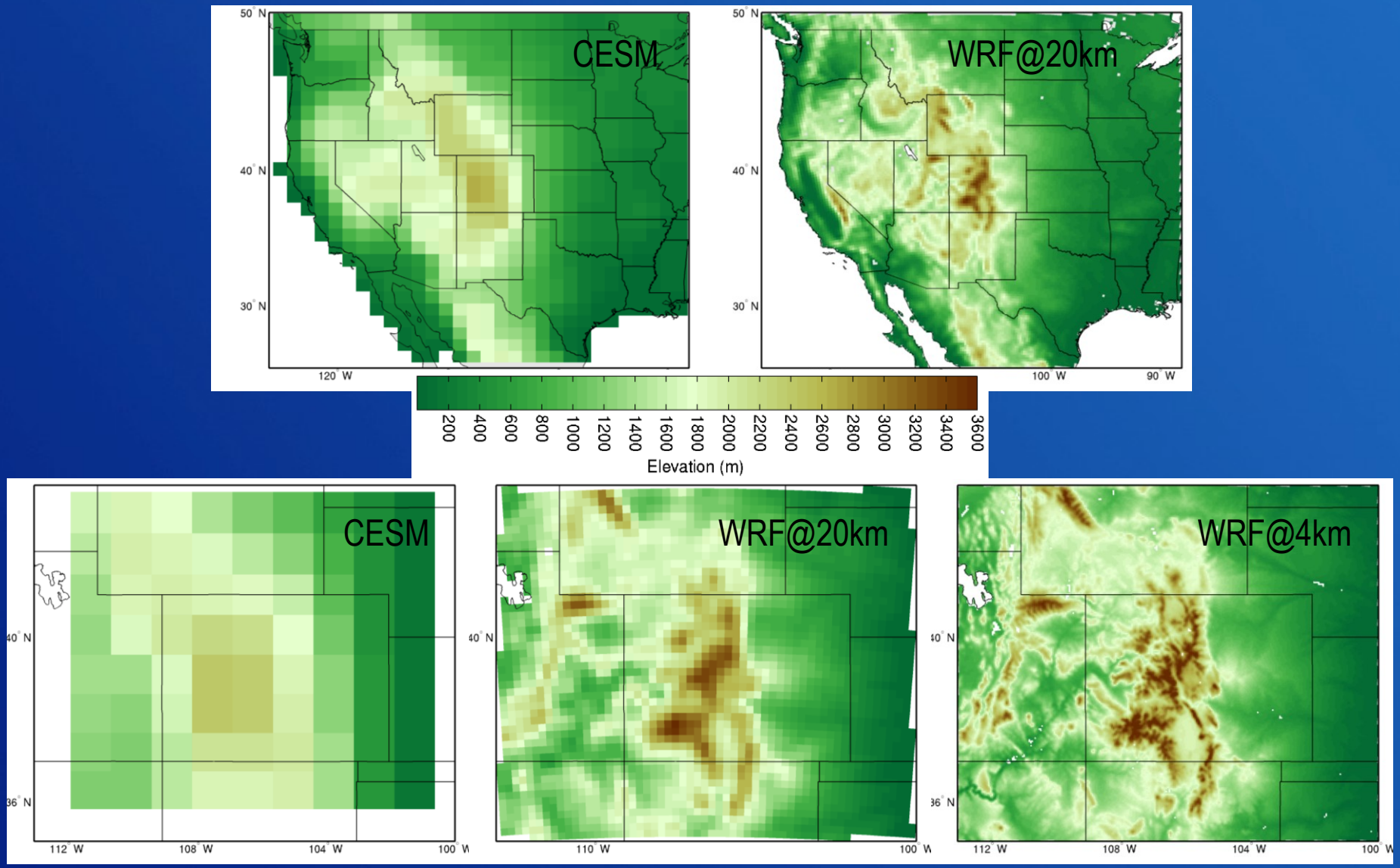
Topography from CESM and WRF



Courtesy of NCAR

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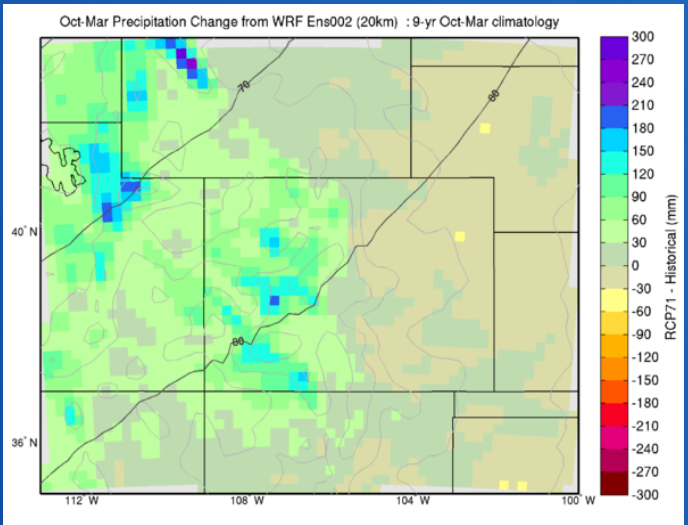
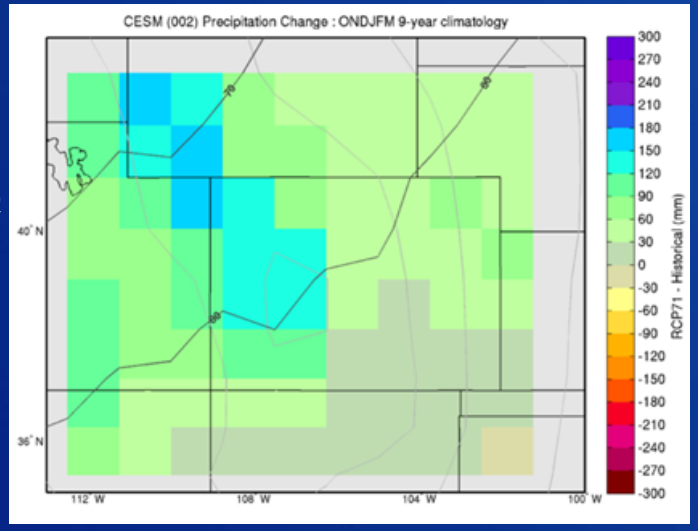
Role of Resolution and Topography

- CESM Projected Cool Season Precipitation Change (ONDJFM)
- WRF Downscaling

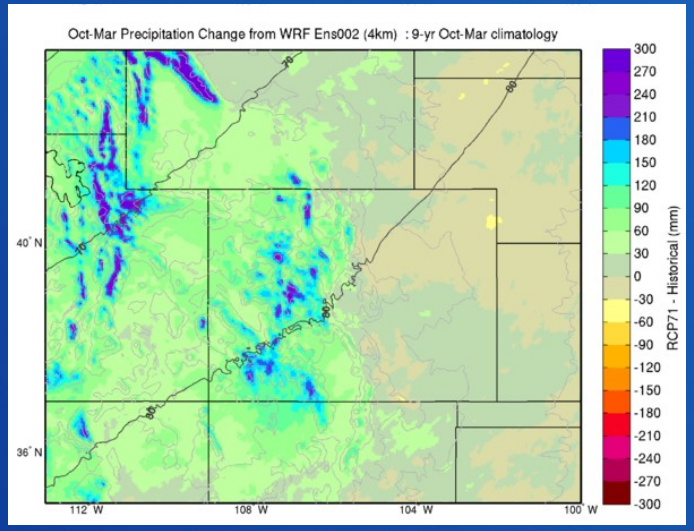
WRF @ 20km



CESM @ ~100km



WRF @ 4km



Courtesy of NCAR

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Summary

- Snow and snowmelt runoff are fundamental components of western water management
  - Snow at high elevations contributes a significant portion of annual runoff
  - Snowmelt runoff efficiency is an important part of water availability
  - From a climate modeling perspective, topography is critical for projecting future conditions