

# RECLAMATION

*Managing Water in the West*

## **Climate Change Assessments And Adaptation Planning in Mid Pacific Region**

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Arlan Nickel – Basin Study Program Coordinator  
September 2011**



U.S. Department of the Interior  
Bureau of Reclamation

# Climate Assessment & Adaptation Planning Drivers

Federal mandates, policies and programs are consistent with and speak to the need climate change assessments

## Secure Water Act (2009)

- Public Law 111-11, Title 9, Subtitle F

## DOI Secretarial Order 3297 & 3289 (2009)

## Basin Study Program (2009)

- WWCRA , BSPs

## P&Gs & NEPA

- Executive Order 11747 (EO11747)

## BDCP, CALFED & CVP IRP

- Public Law 102-575, Section 3408(j)

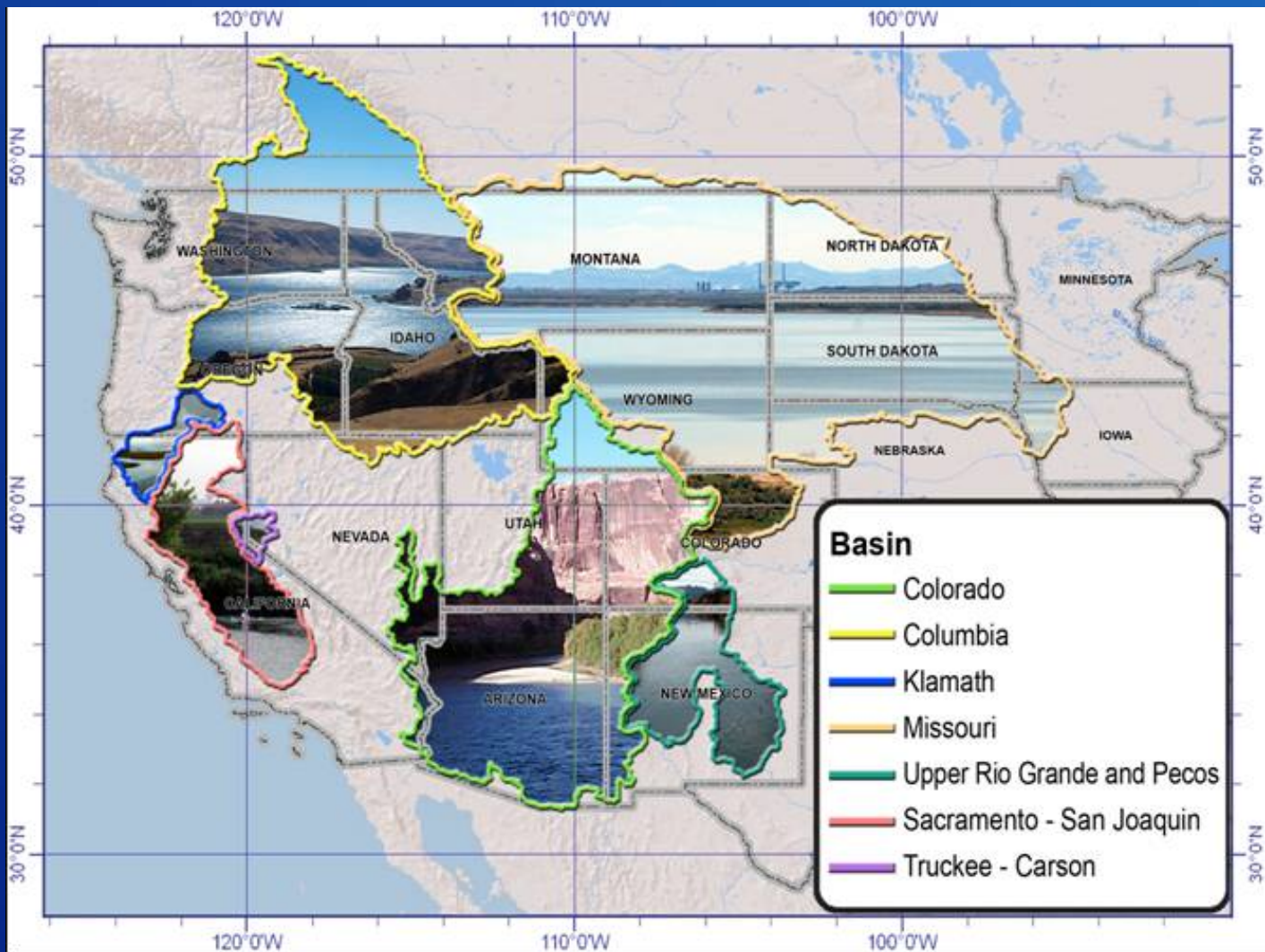
- Public Law 108-361, Title 1

*Maintain 21<sup>st</sup> Century  
Project Sustainability*

Long-term  
Planning  
Studies



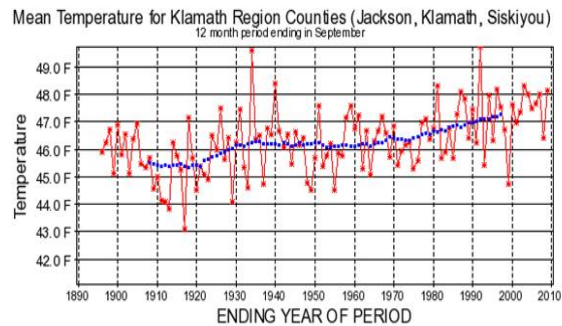
# SECURE Water Act Section 9503(c) – Reclamation Climate Change and Water – April 2011



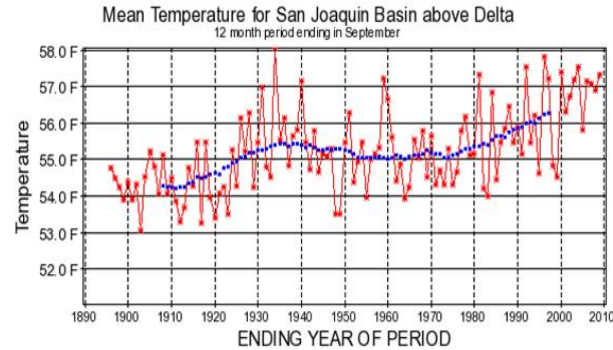
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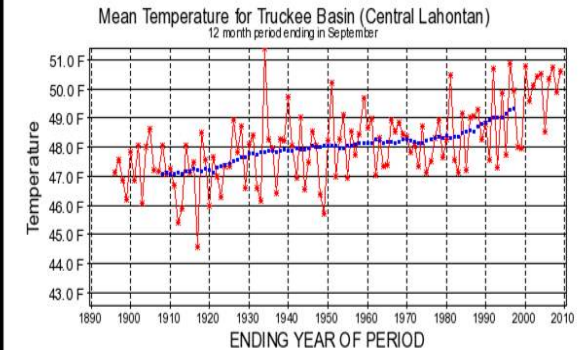
## Klamath Basin



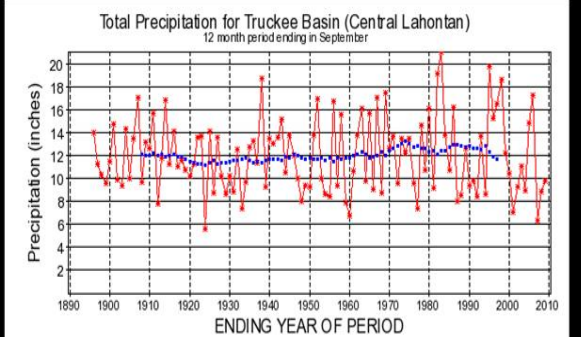
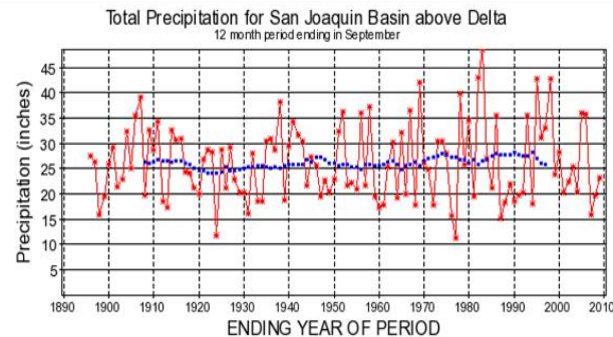
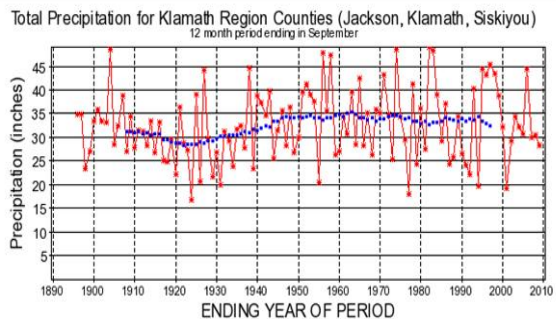
## Sacramento-San Joaquin Basins



## Truckee-Carson Basins



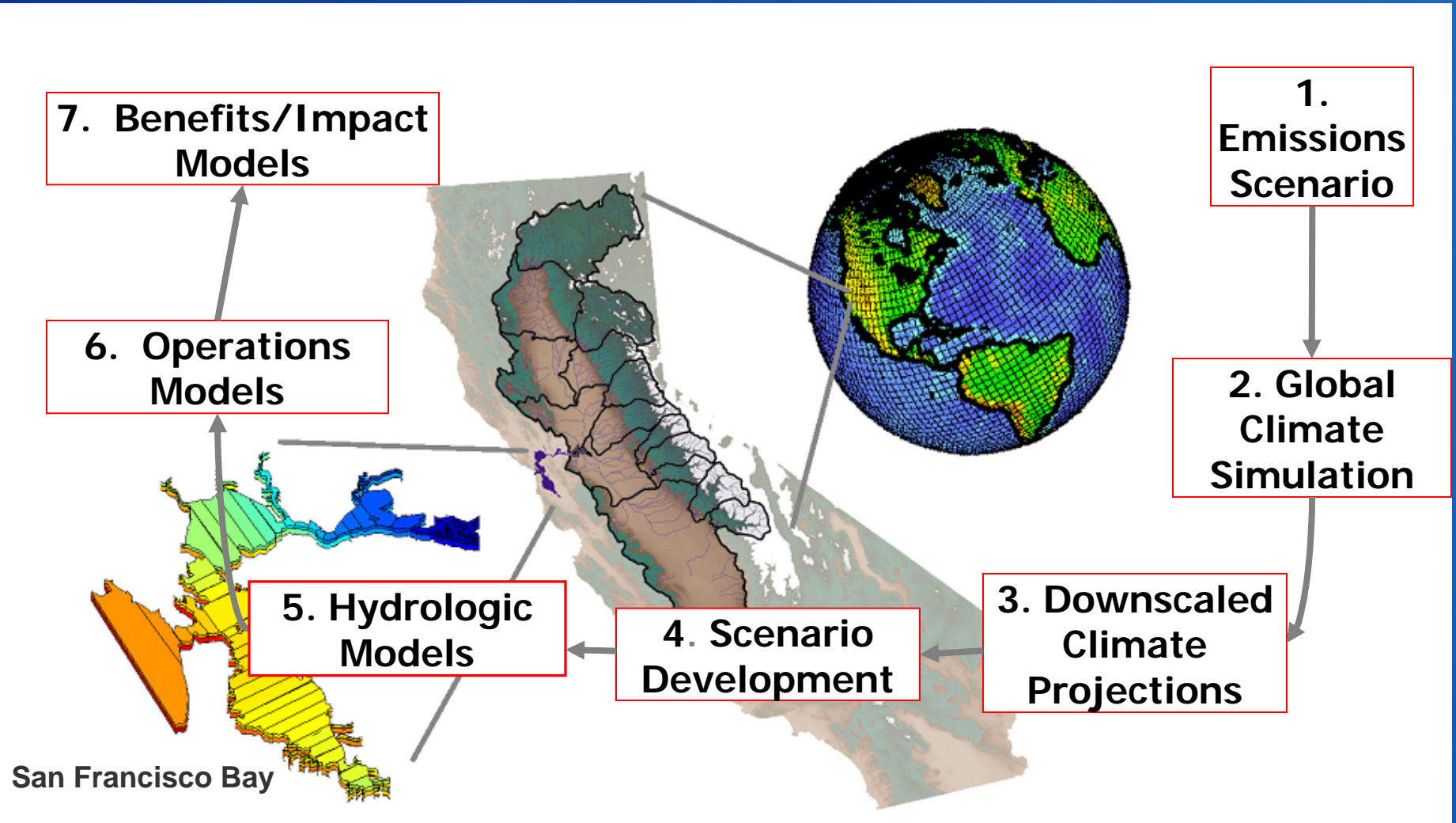
Observed Historic Mean Annual Temperature (°F) and 25 year moving average



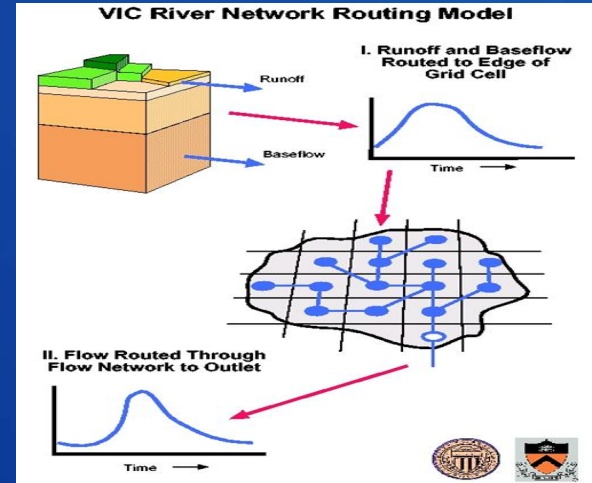
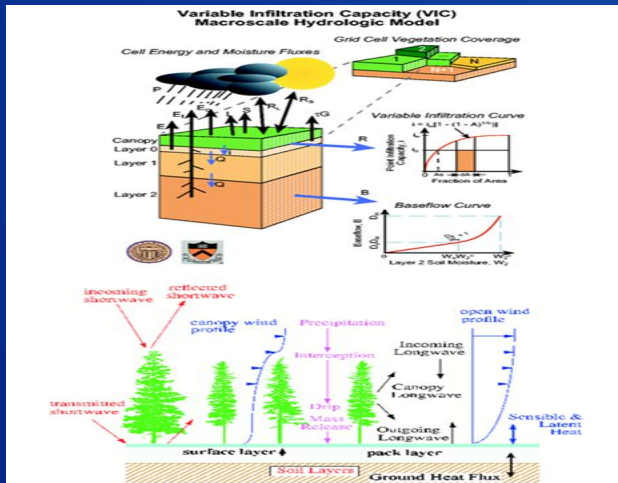
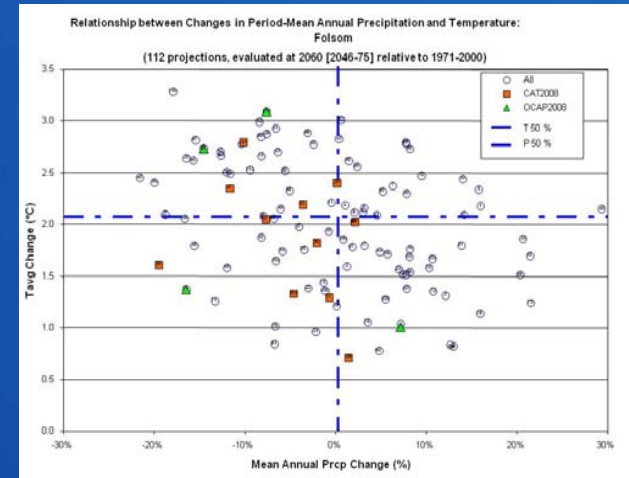
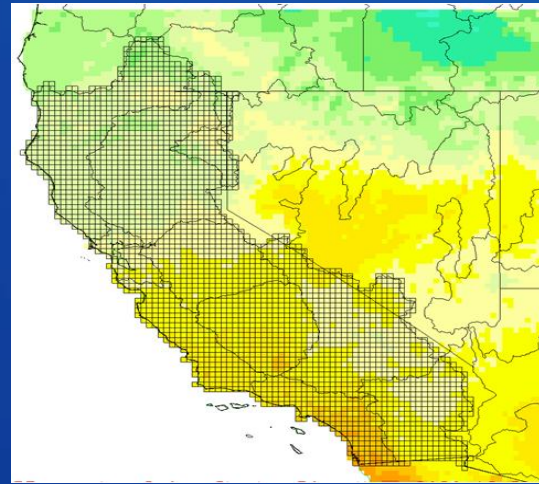
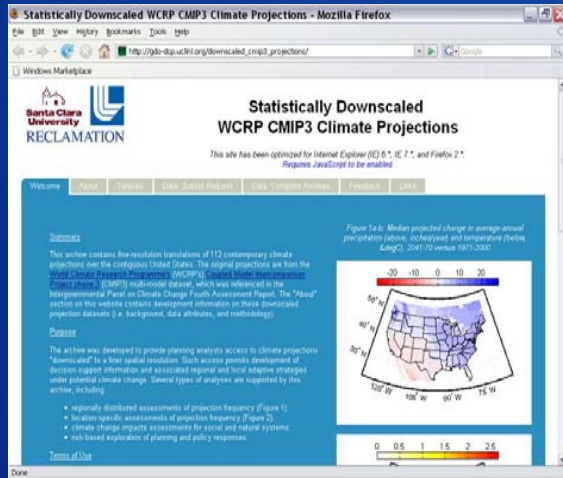
Observed Historic Mean Annual Precipitation (in) and 25 year moving average

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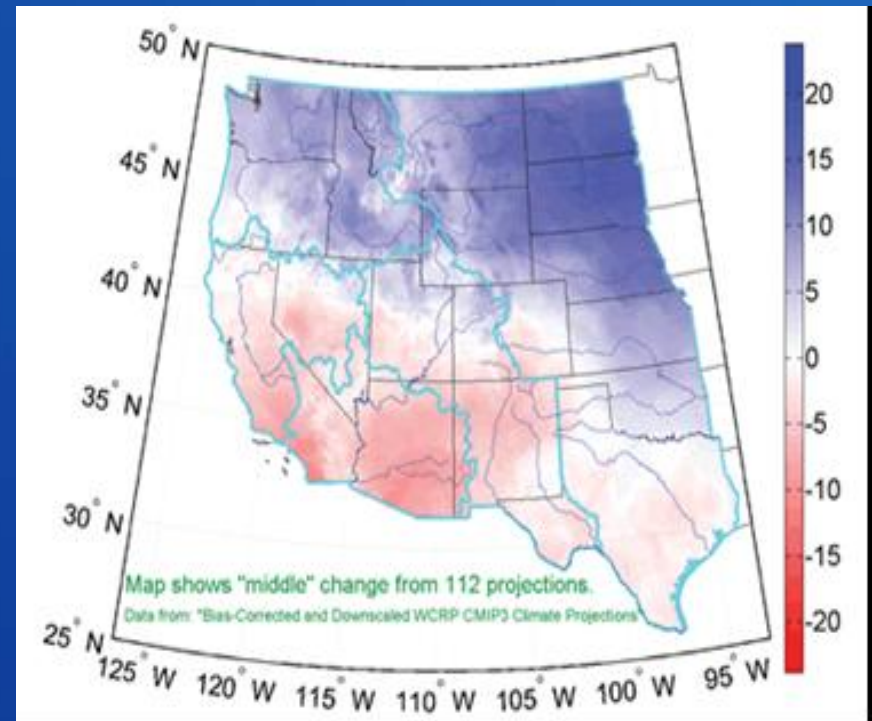
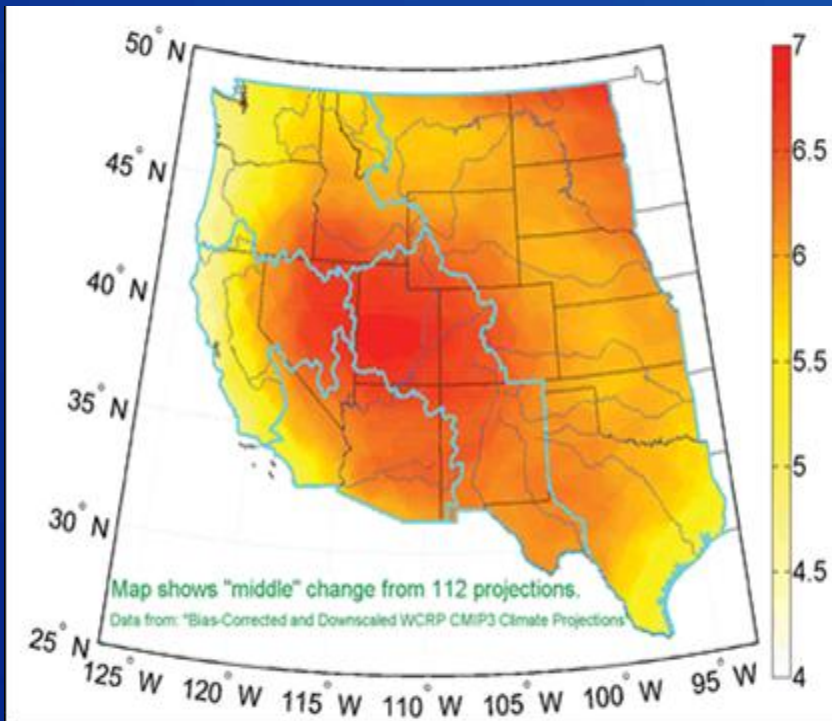
# West-Wide Climate Risk Assessments: Bias-Corrected and Spatially Downscaled Surface Water Projections



# West-Wide Climate Risk Assessments: Bias-Corrected and Spatially Downscaled Surface Water Projections



# SECURE Water Act Section 9503(c) – Reclamation Climate Change and Water – April 2011



Projected median temperature (°F) and precipitation (%) changes at the end of 21<sup>st</sup> century (2070–2099) relative to historic conditions (1950–1979)

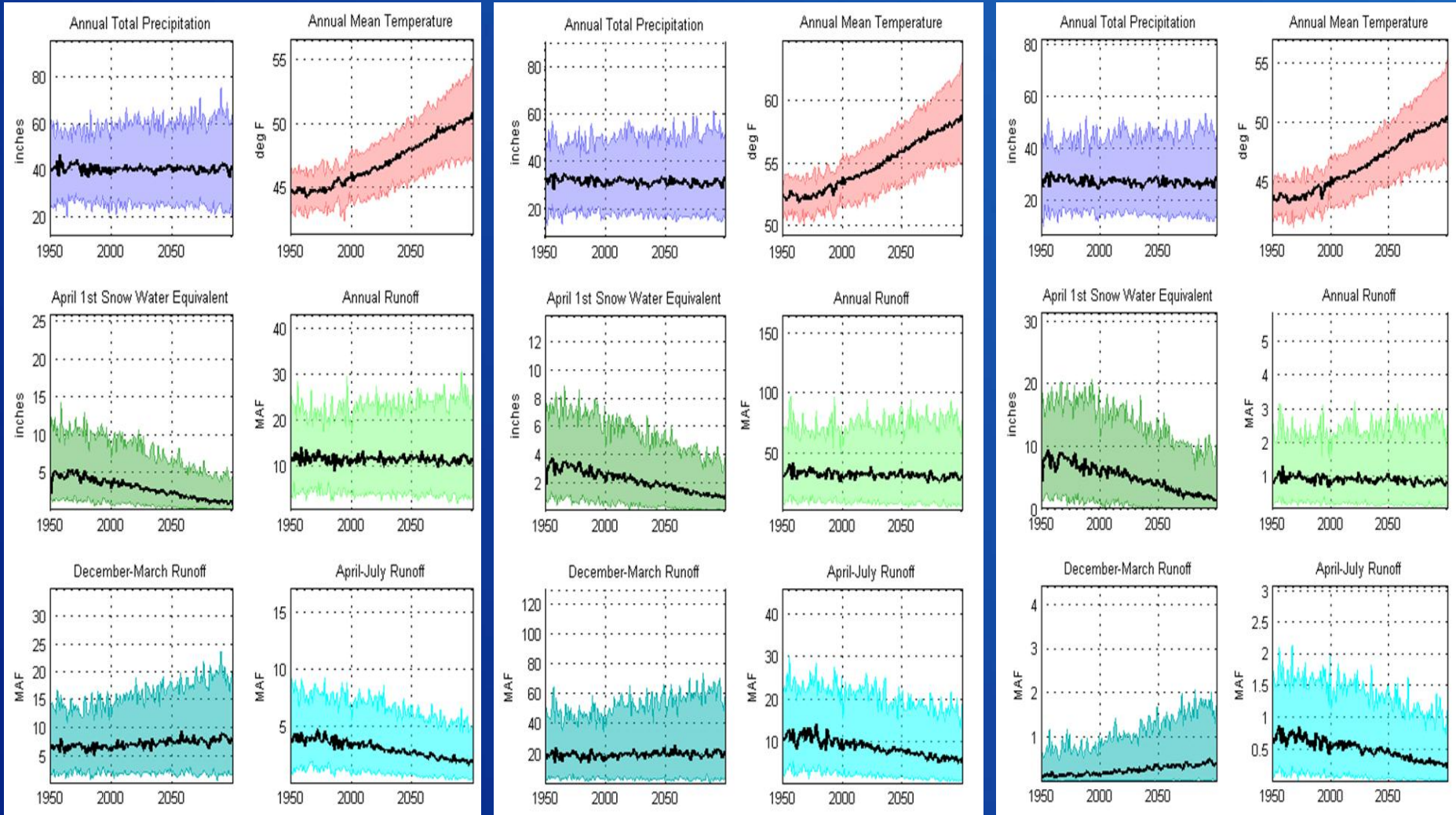
# RECLAMATION

# Mid Pacific Region Hydro-Climate Projections

## Klamath Basin

## Sacramento-San Joaquin Basins

## Truckee-Carson Basins



Note: Runoff Scales Vary By Basin

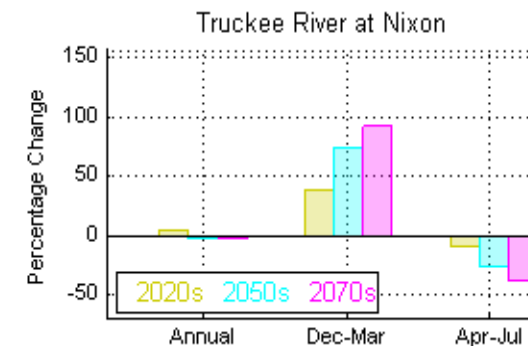
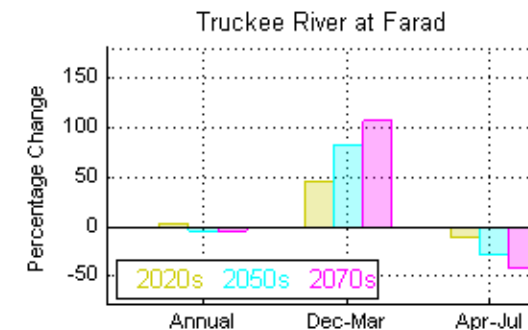
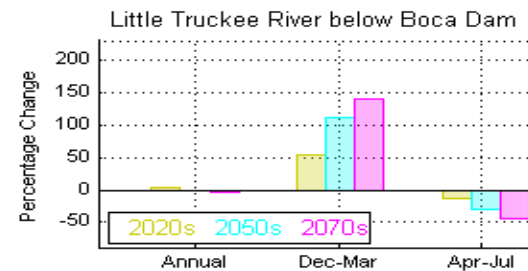
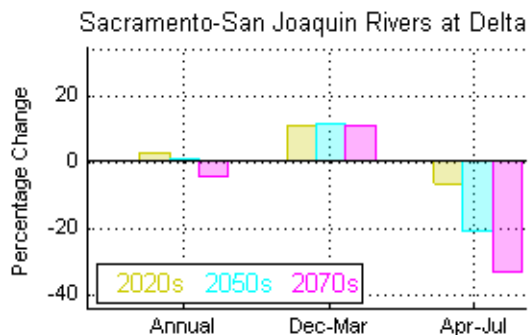
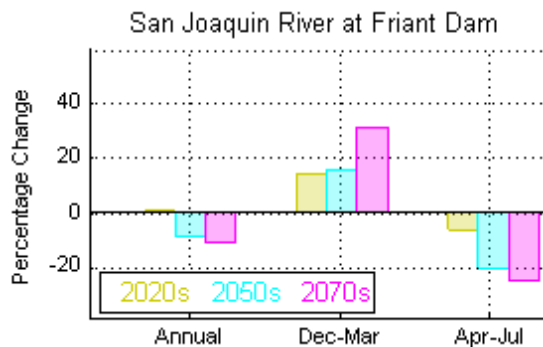
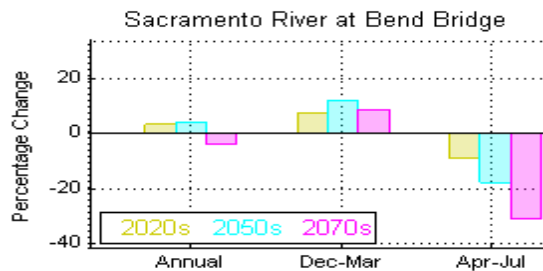
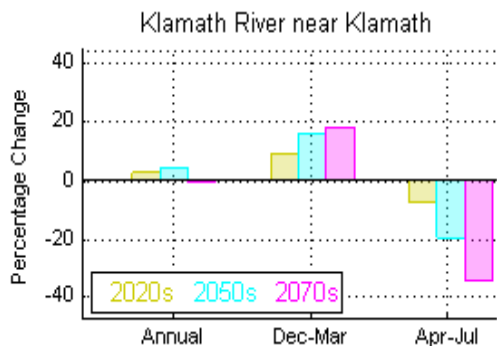
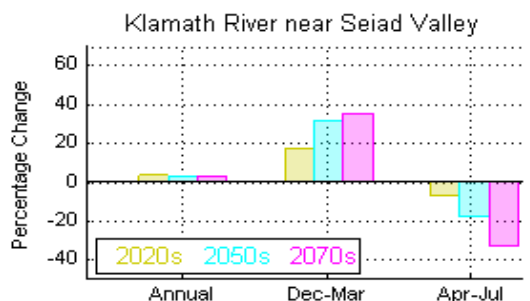
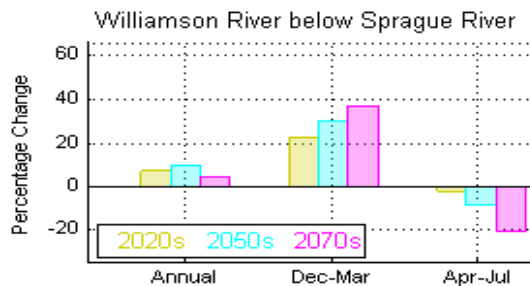
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# SECURE Water Act Section 9503(c) – Reclamation Climate Change and Water – April 2011

- 1) **Water Supply, Reservoir Operations and Flood Management** - Reduced supply under current flood control constraints due to changes in seasonal runoff timing and increased reservoir evaporation.
- 2) **Water demands** – Increased demands due warming climate and increasing population. May be moderated by CO2 and technology changes.
- 3) **Groundwater** – Increased watershed ET could reduce recharge but changes in seasonal runoff timing could offset recharge reductions. Demands for groundwater likely to increase due reduced surface water supplies.
- 4) **Surface Water Quality** – Decreasing water quality due increasing water temperature, DO and eutrophication. Lack of mixing in Lake Tahoe could result in anoxic conditions in bottom waters and increased loading of nutrients.
- 5) **Fish and Wildlife** - Increased stress on fisheries that are sensitive to a warming aquatic habitat. Trigger synergistic effects in ecosystems and exacerbate invasive species problems.
- 6) **Hydropower** - Hydroelectric generation sensitive to climate changes that affect basin precipitation, river discharge (amount and timing), and reservoir water levels. Increased demands from climate warming.

**That's All Folks**

**Questions?**

**RECLAMATION**

# Mid Pacific Region Hydro-Climate Projections

## ATMOSPHERIC RIVERS

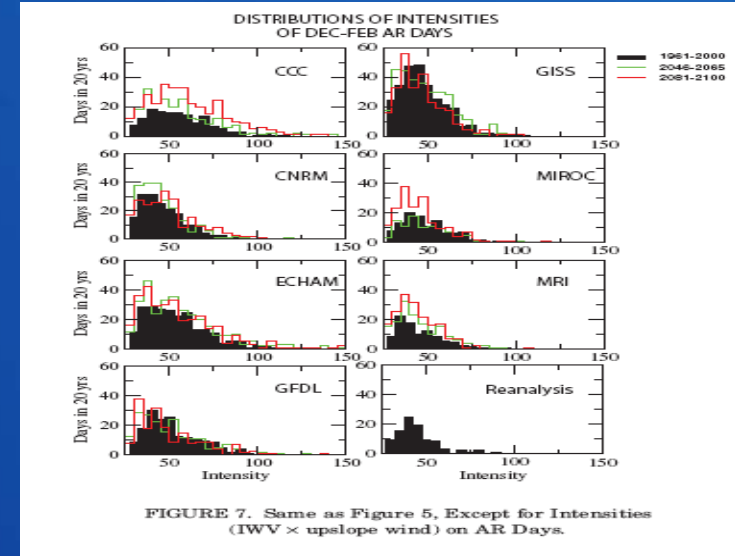
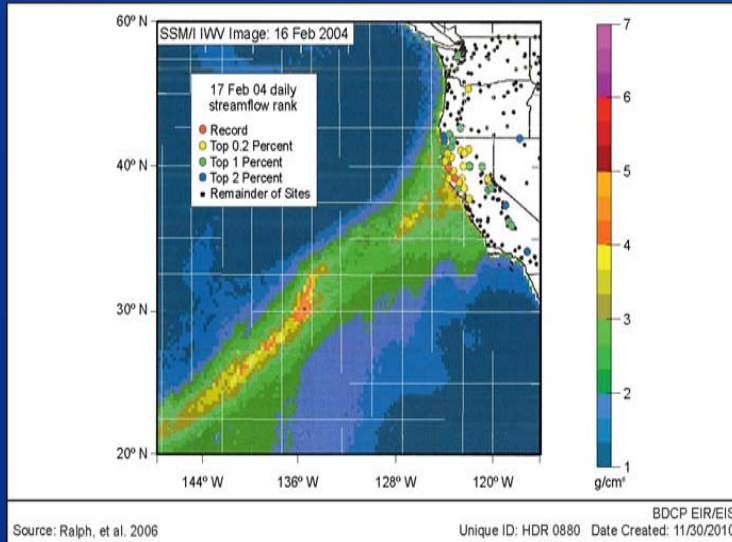
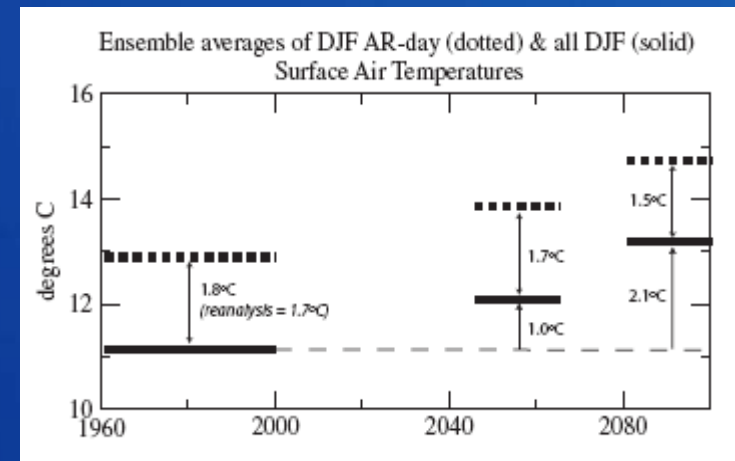


TABLE 2. Trends in Intensity (IWV × upslope wind speed) of AR Days/100 Years From Seven Climate Models, With Highlighting as in Table 1.

Climate Model	Change/100 Years	% Change/100 Years	R <sup>2</sup> (in %)
CCC	+5.7 cm H <sub>2</sub> O m/s	+11%	12
CNRM	+4.0	+9%	8
ECHAM	+3.8	+7%	6
GFDL	+0.1	0	0
GISS	+1.6	+4	3
MIROC	-0.3	-1	0
MRI	+2.1	+5	3*



# Mid Pacific Region Hydro-Climate Projections

## DROUGHTS

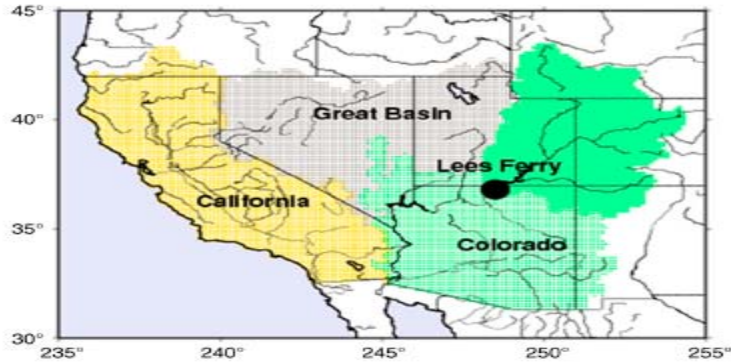
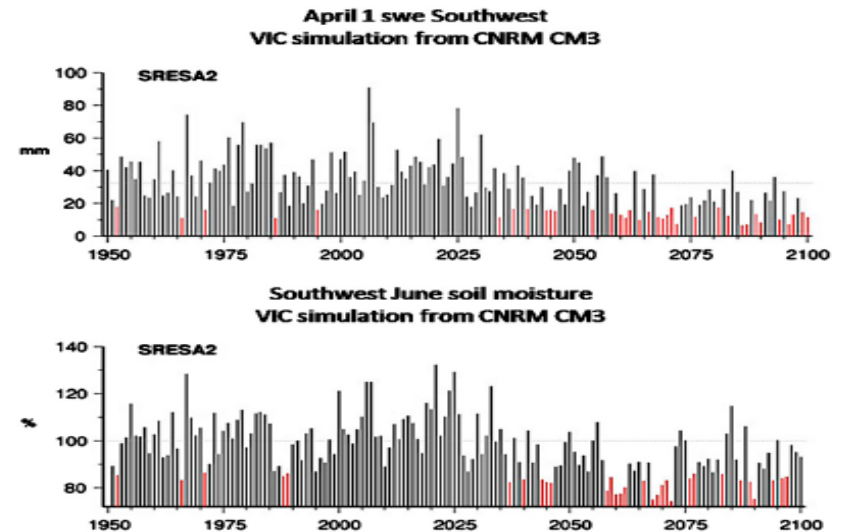
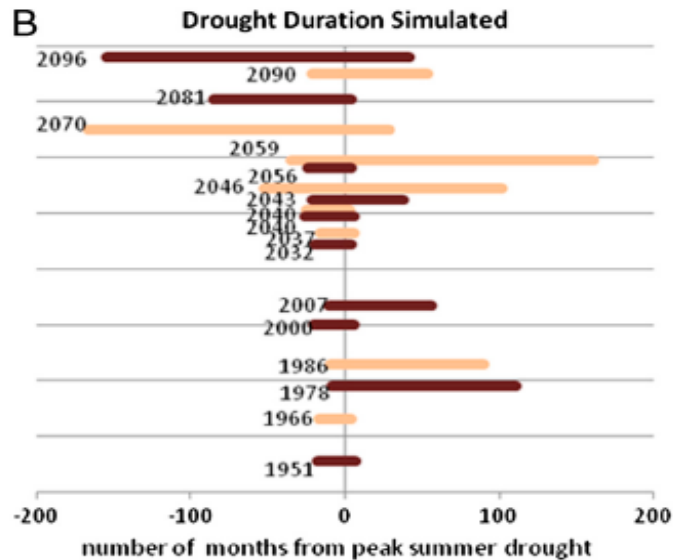
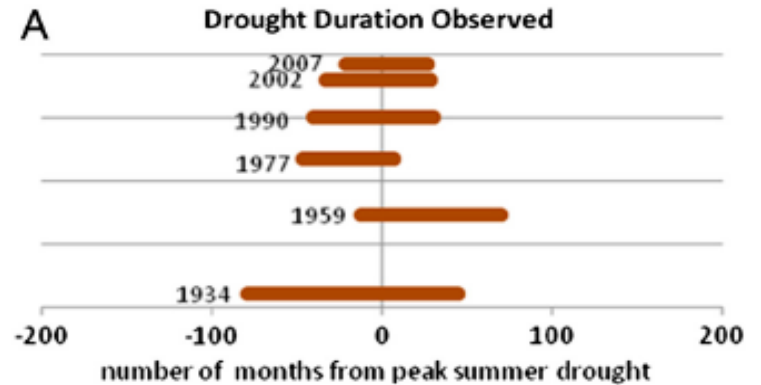


Fig. 1. The study area consists of three regions: California, Great Basin, and Colorado River Basin. Together these are called the "Southwest."



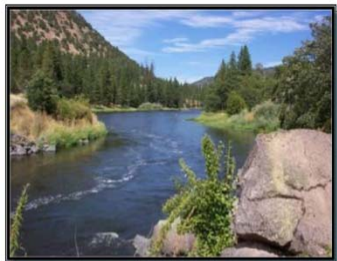
# Mid-Pacific Climate Change - Basin Studies

## KLAMATH BASIN STUDY PROPOSAL

A COOPERATIVE PROPOSAL SUBMITTED BY

STATE OF OREGON – WATER RESOURCES DEPARTMENT

STATE OF CALIFORNIA – DEPARTMENT OF WATER RESOURCES



## SACRAMENTO-SAN JOAQUIN BASINS STUDY Letter Proposal



A Collaborative Proposal From

State of California - Department of Water Resources  
Stockton East Water District  
California Partnership for the San Joaquin Valley



## Truckee River Basin Study

Climate Change and Water Resources Assessment

Plan of Study



With Cost-Share Participation by these Major Study Partners:



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