

RECLAMATION

Managing Water in the West



TRUCKEE BASIN STUDY

Reclamation Mid-Pacific Region

Truckee Meadows Water Authority

August 15, 2018

Reno, NV



Basin Studies - Mandated Elements

P.L. 111-11 *The SecureWater Act*:

- Each Basin Study “will assess specific climate-related risks to water supplies in each Basin including”:
 - Changes in snowpack
 - Changes in timing and quantity of runoff
 - Changes in groundwater recharge and discharge
- Any increase in:
 - Demand for water due to increasing temperatures
 - Rates of reservoir evaporation



Basin Study Partners



Quick Orientation



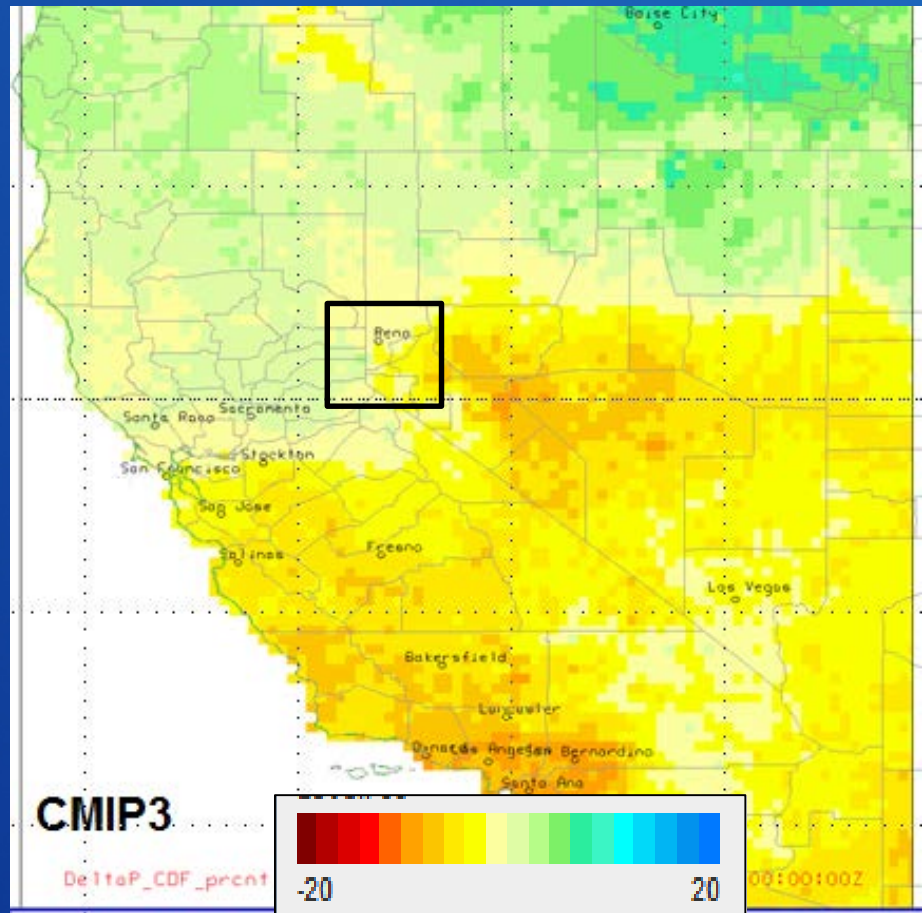
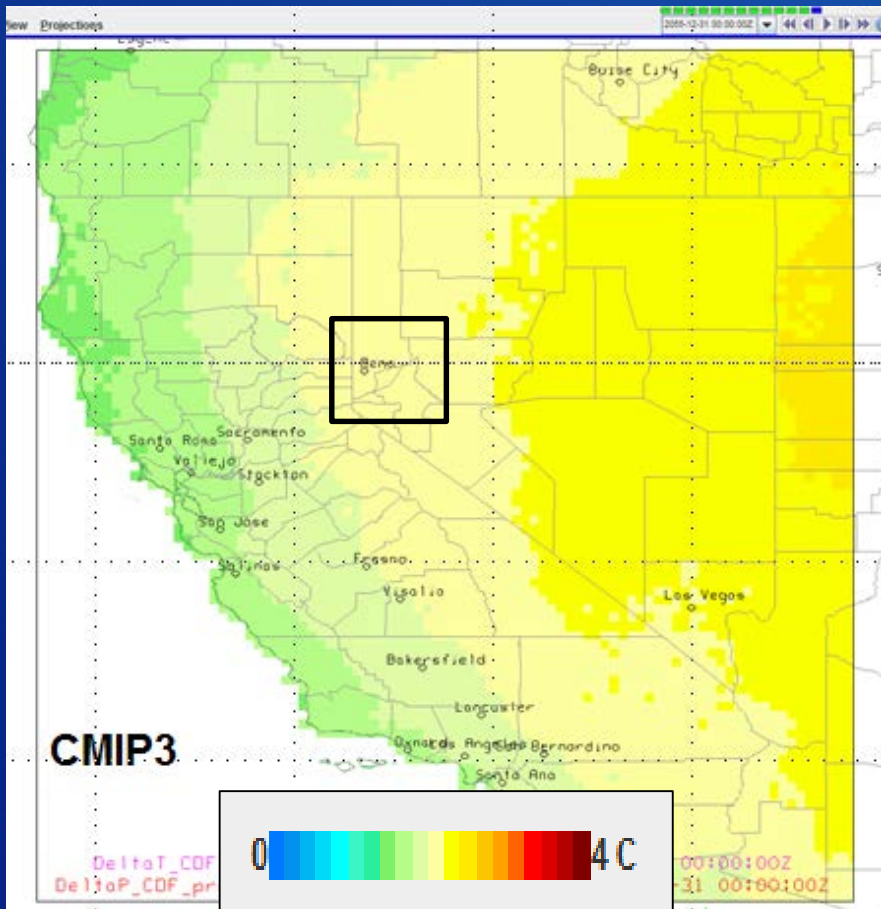
- 3,060 sq. miles
- 90% of flow originates in California
- 121 miles from Lake Tahoe to Pyramid Lake
- Derby Dam & Truckee Canal link the Truckee and Carson basins

Changes in the Truckee Basin that Drive Key Vulnerabilities

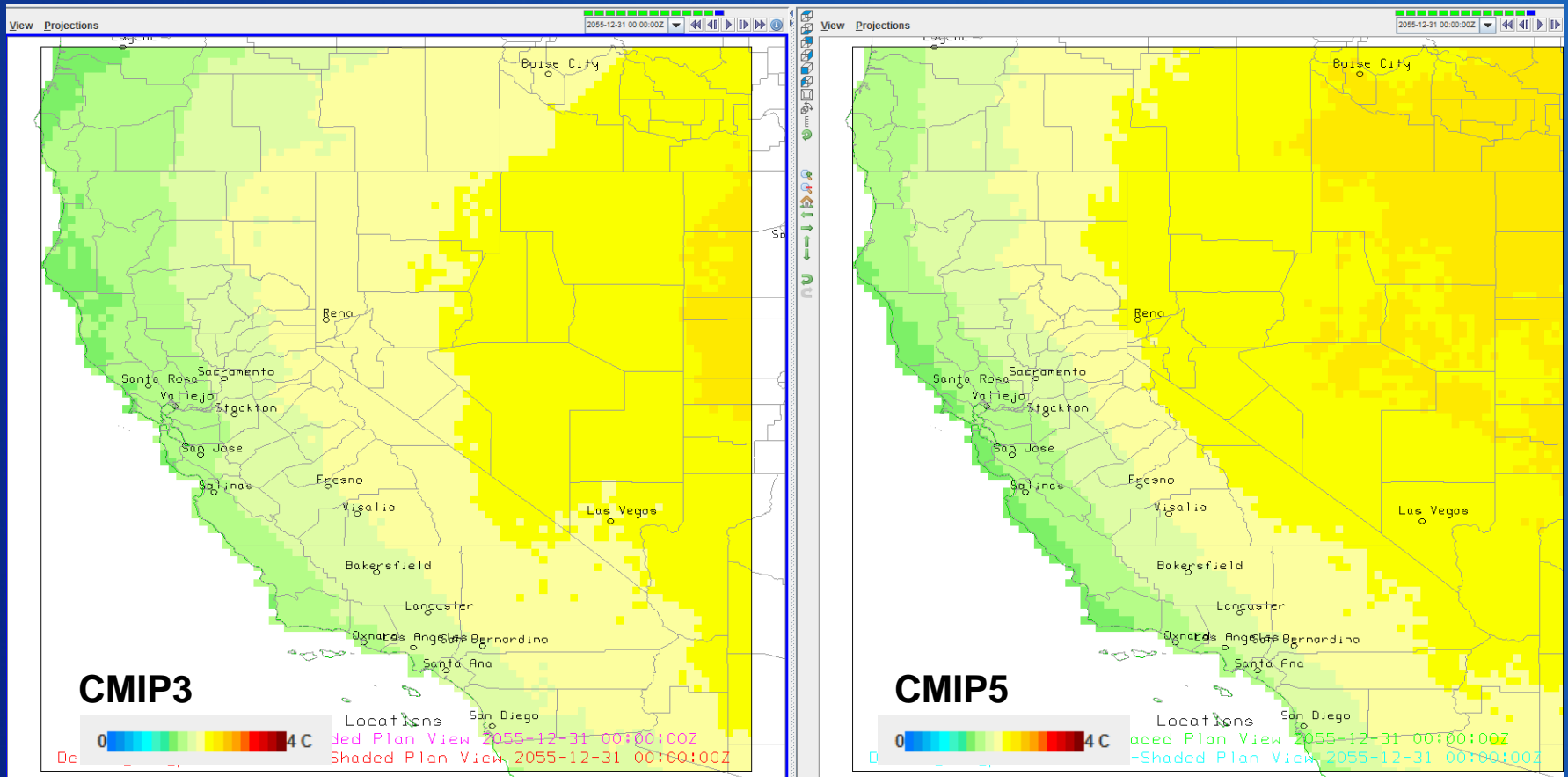


- **Changes in Supplies**
 - Less snow and earlier runoff
 - Higher rates of reservoir evaporation
- **Changes in Demands**
 - Earlier growing season
 - Potential changes in ecosystem needs

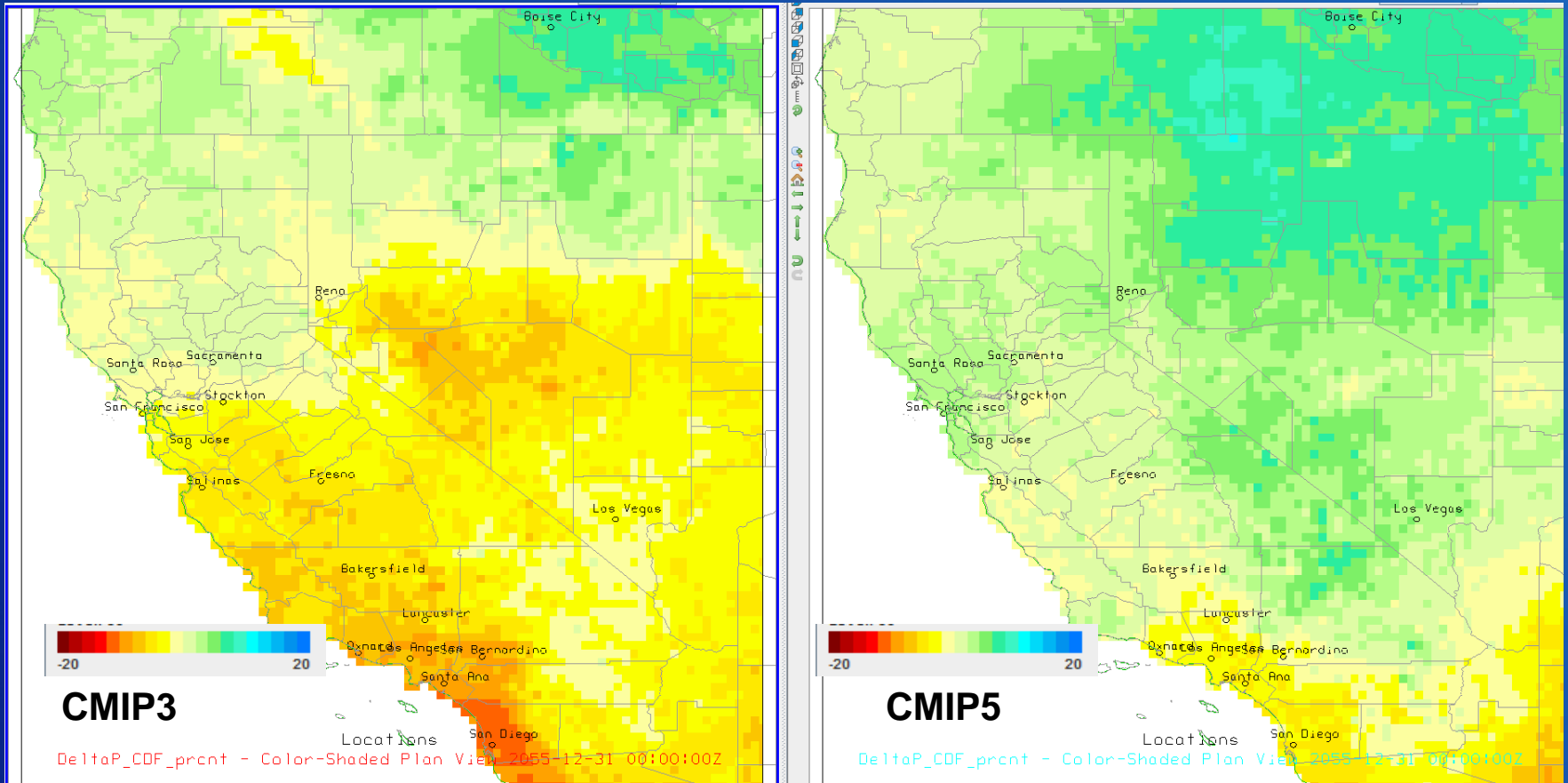
Median Projected Changes in Annual Temperature (C°) and Precipitation (%) by Mid-Century - CMIP3 Projections



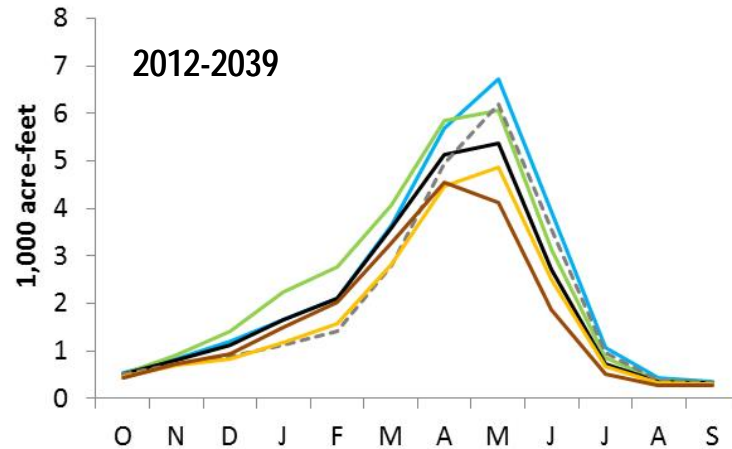
CMIP3 Vs CMIP5: Comparison of Median Projected Changes (°C) in Annual Mean Temperature by Mid-Century between CMIP3 (left) and CMIP5 (right) Ensembles



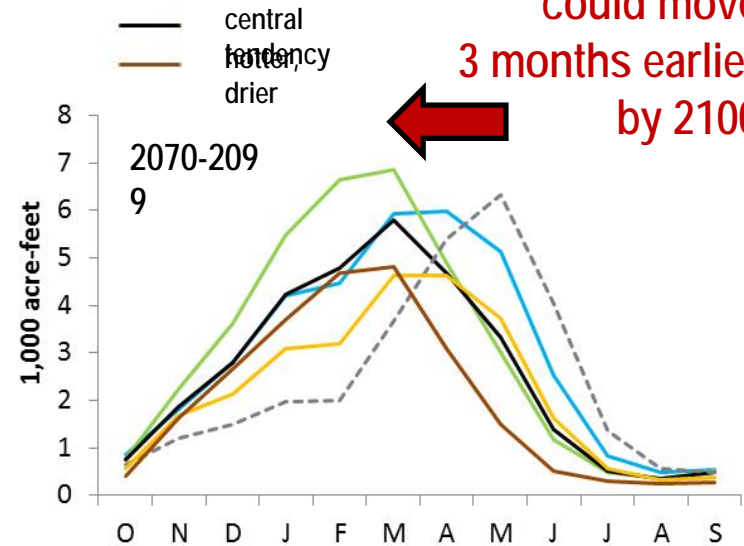
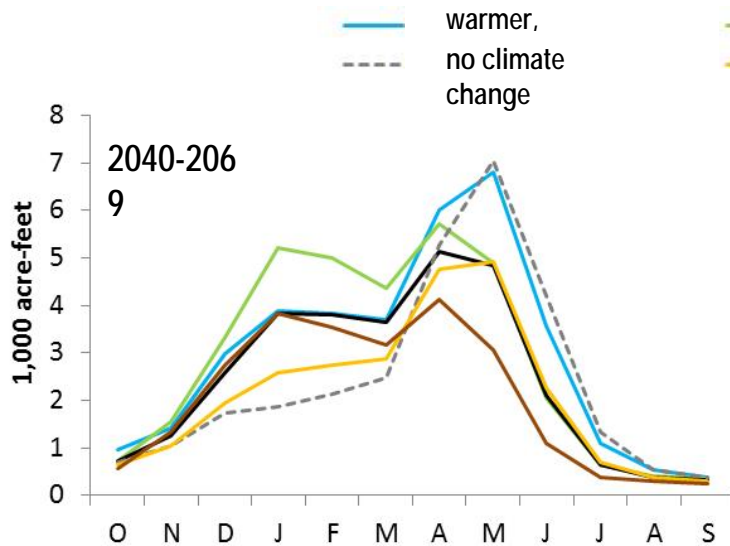
CMIP3 Vs CMIP5: Comparison of Median Projected Changes (%) in Annual Precipitation by Mid-Century between CMIP3 (left) and CMIP5 (right) Ensembles

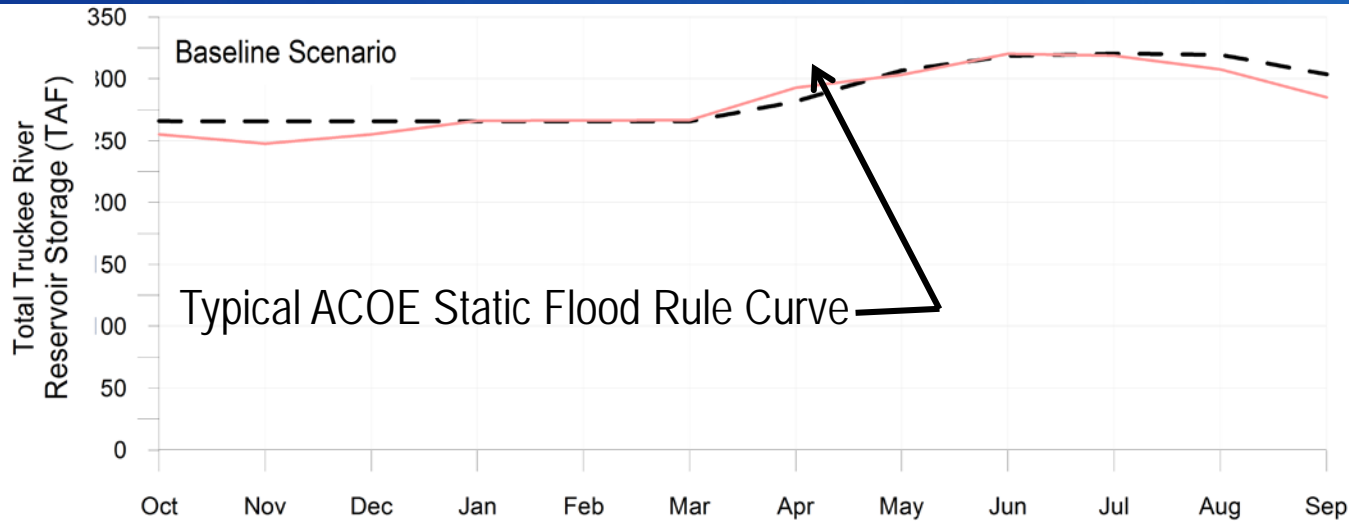


Seasonality Shifts Appear Certain, and Will Challenge Existing Infrastructure

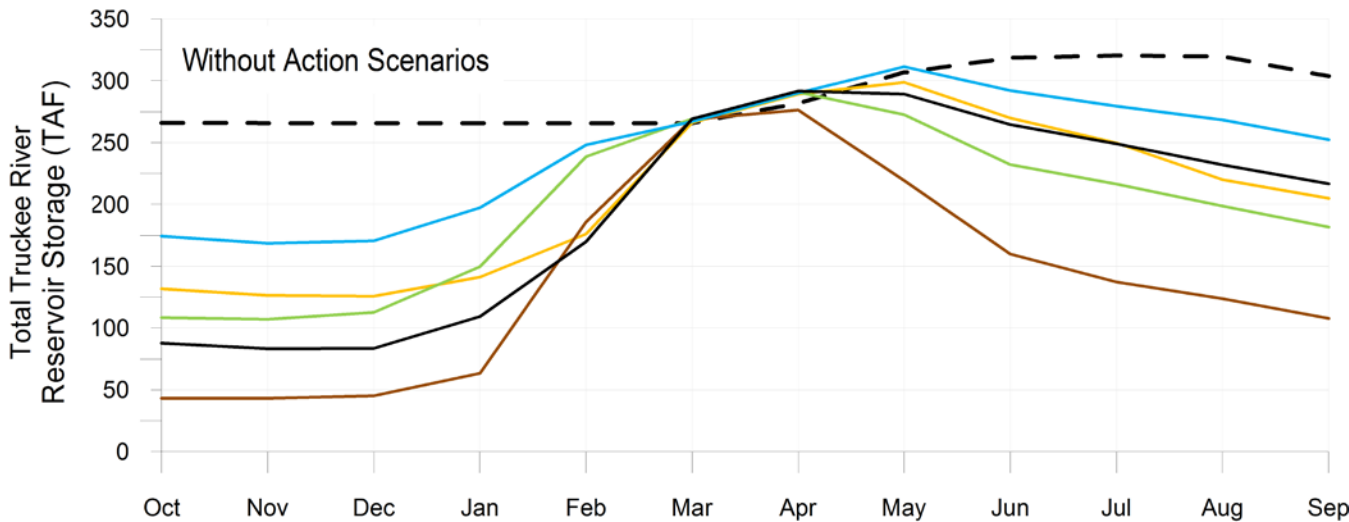


Peak Runoff could move 3 months earlier by 2100





Historically, Basin reservoirs have refilled in April and began drawdown in late summer



Shifts in the timing of runoff:

- Challenge the refill of reservoirs,
- Causes earlier drawdown of storage, and
- Reduces carry over storage.

Lake Tahoe is Especially Sensitive to increases in Evaporation

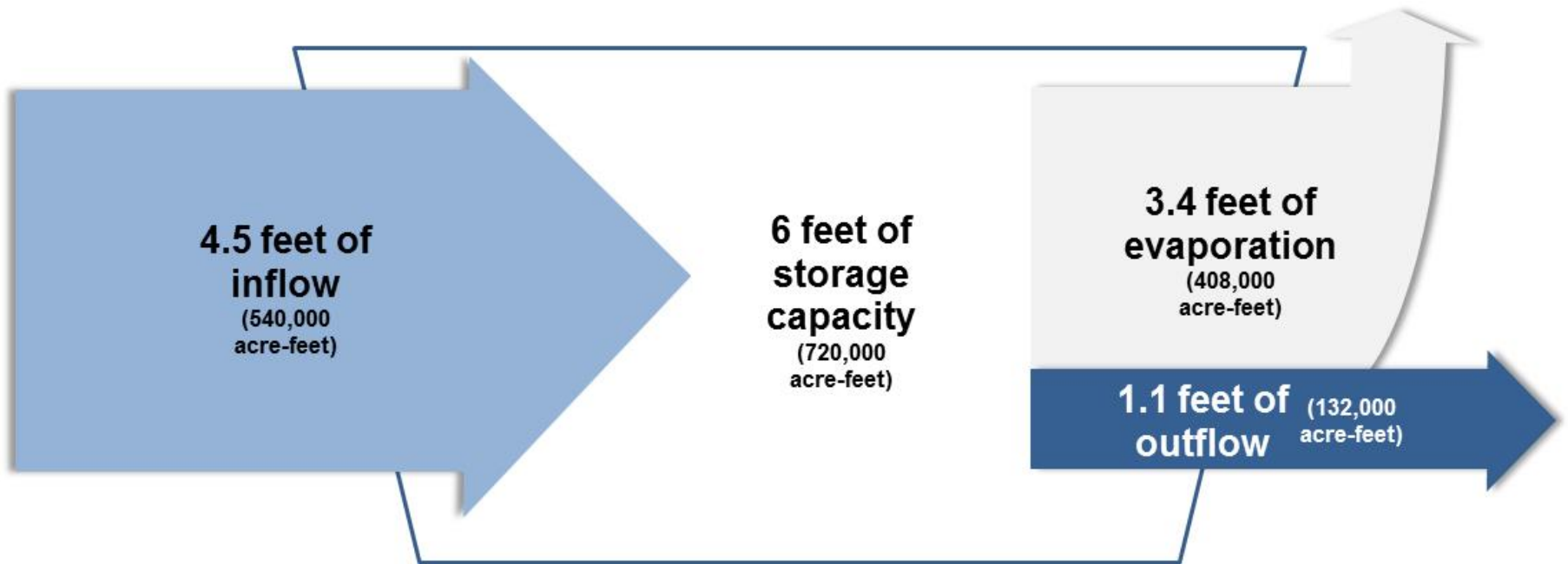
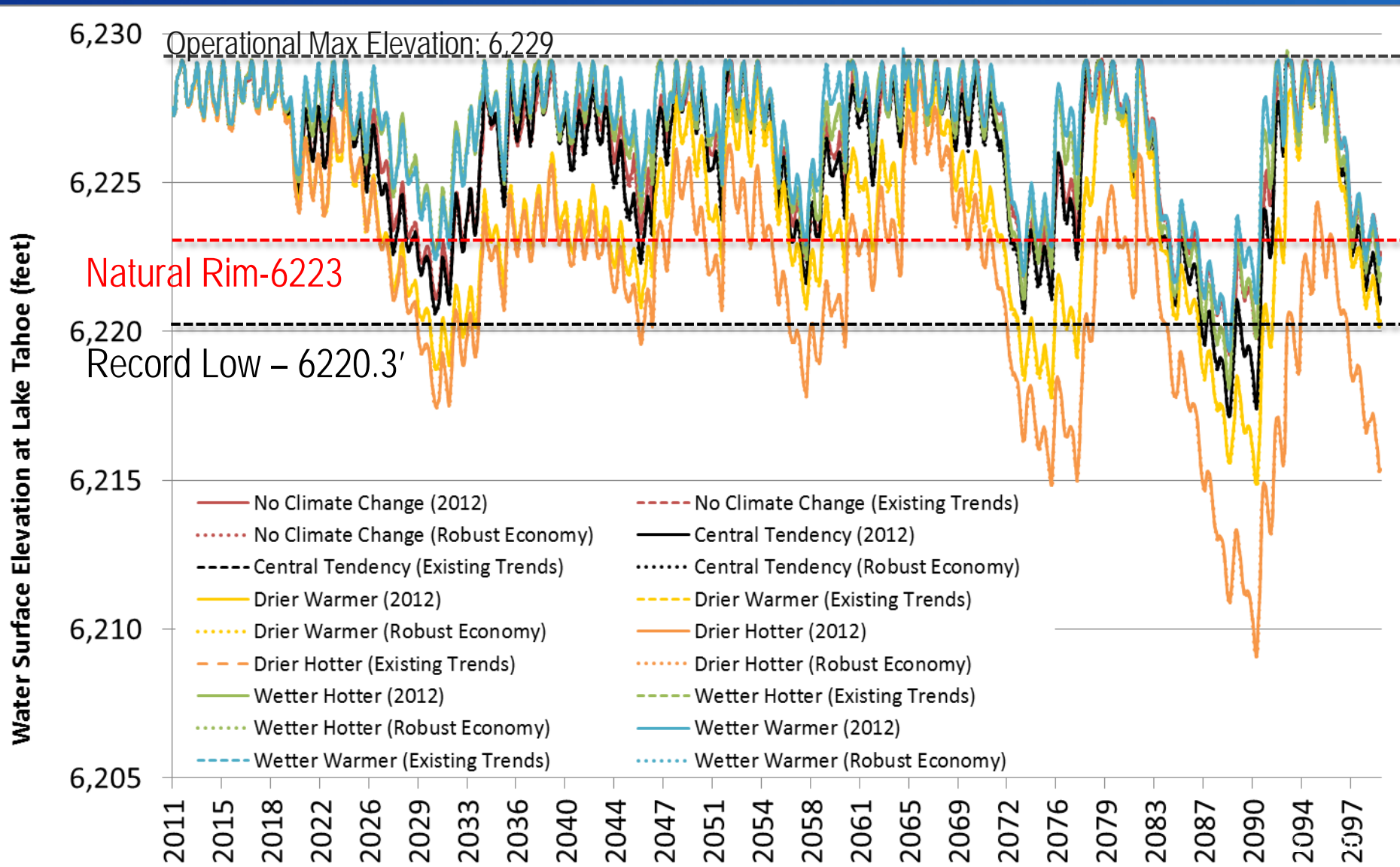


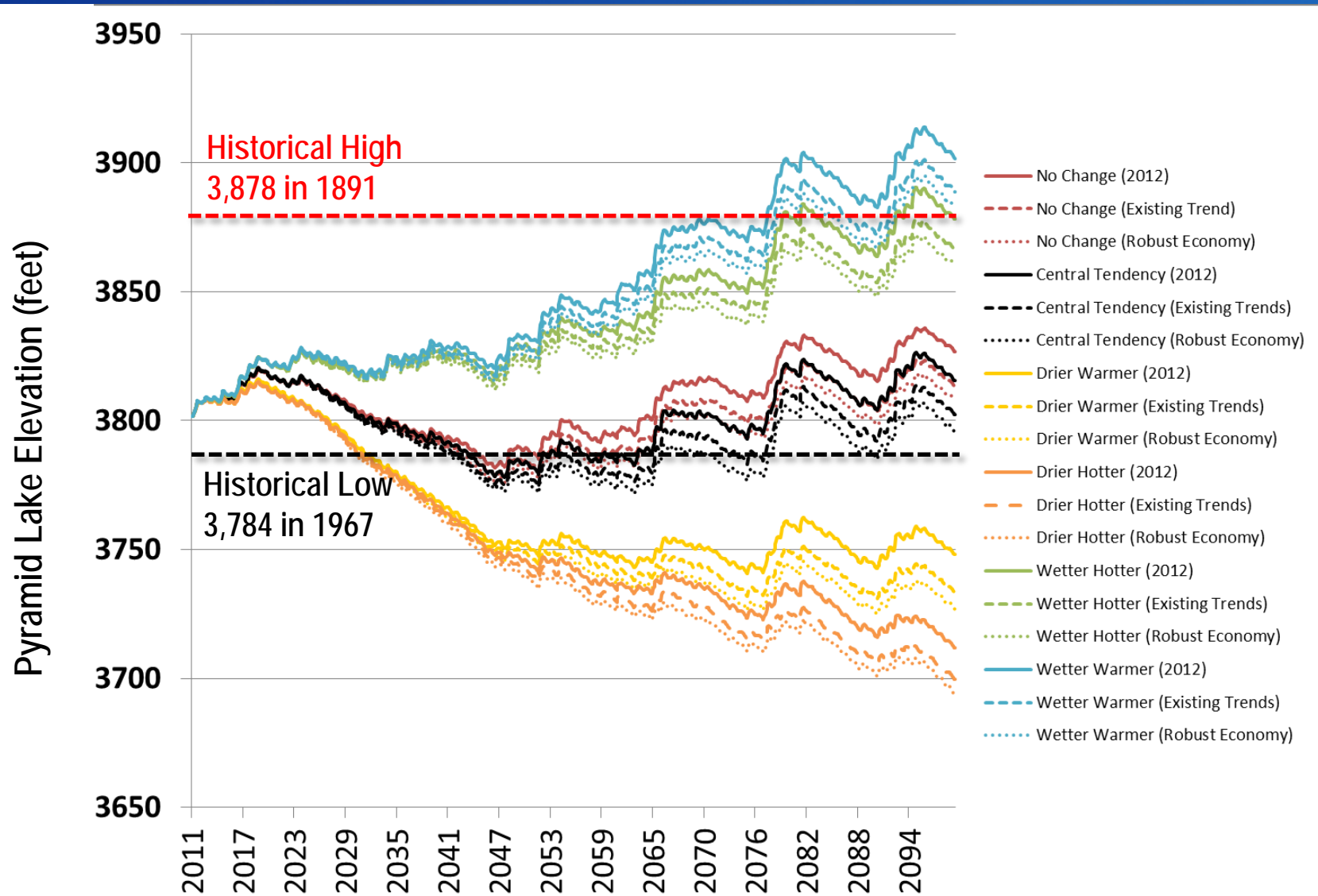
Diagram depicts historical relationships.

Tahoe accounts for approximately one third of Truckee River flows.

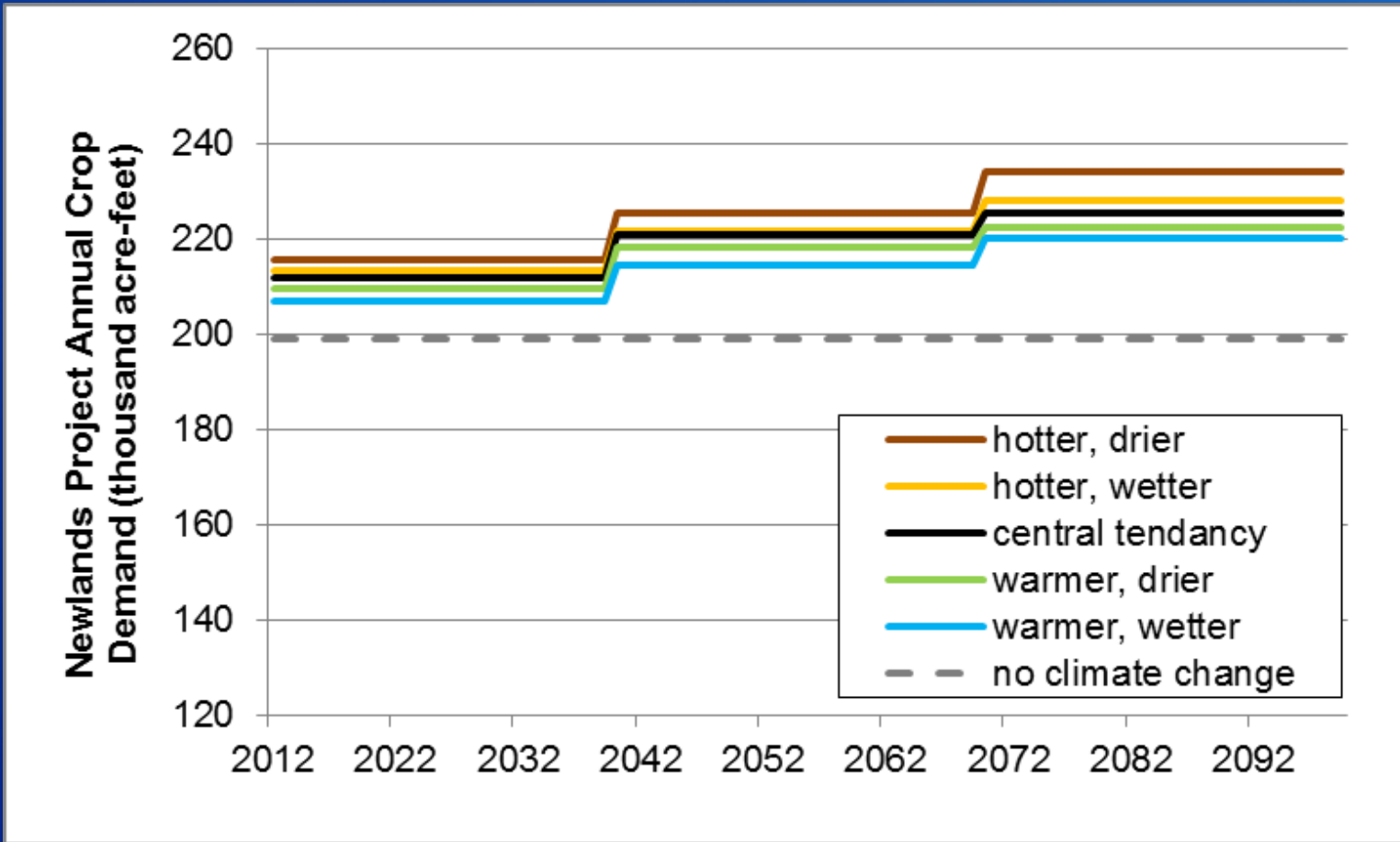
Lake Tahoe Surface Elevations Under Future Climate Scenarios



Pyramid Lake Reveals the Importance and Uncertainty in Future Conditions

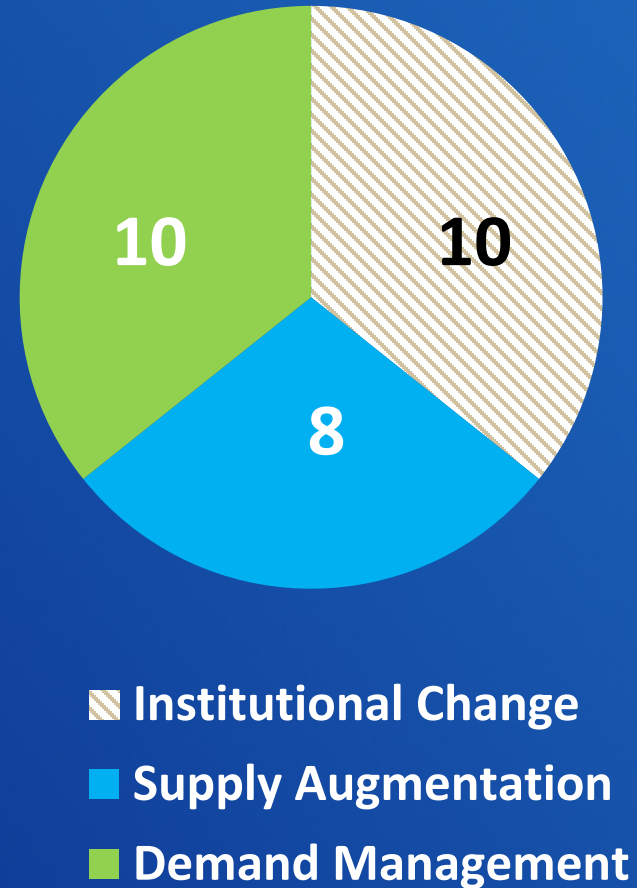


Irrigation Demands Will Increase with Rising Temperatures



Basin Study Process Used a Scoping-Level Assessment of Options Identified by Partner Agencies and Stakeholders

- 140+ individual suggestions collected from Basin stakeholders
- Organized thematically by “Adaptation Strategy”
 - **Institutional Change** –
“operate what we have better”
 - **Supply Augmentation** –
“obtain more water”
 - **Demand Management** –
“shift or reduce demands”



Institutional Change

Adaptation Strategy	Grouping	Option
Institutional Change	Basin-wide Planning	Define regional priorities and goals for water use
	Surface Water Reservoir Management	Eliminate prior appropriation
		Allow TCID carryover storage in Truckee River reservoirs
		Change balance of credit storage available to users at Truckee River reservoirs
		Remove storage limits at Truckee River reservoirs
		Modify flood control curves to adapt to climate
	Modify OCAP criteria at Lahontan Dam to improve success of refill	
	Surface Water Rights Management	Allow management of water between Pyramid Lake fisheries and Lahontan Valley wetlands
		Create open water markets
		Consolidate agricultural water rights

Demand Management

Adaptation Strategy	Grouping	Option
Demand Management	Agricultural Use	Convert to low water-use crops
		Reduce conveyance losses
		Transfer agricultural water rights to municipal and industrial uses
		Water rights retirement
		Water use efficiency improvements
	Environmental Flows	Revise flow targets to correspond with peak flows under climate change
	Municipal & Industrial Use	Increase outreach and education on conservation
		Mandate efficiency improvements
		Outdoor use efficiency improvements
	Water Quality	Water quality improvements for the lower Truckee River

Supply Augmentation

Adaptation Strategy	Grouping	Option
Supply Augmentation	Alternative Sources	Interbasin Transfer of Groundwater
	Conveyance Facility Improvements	Augment Truckee Canal capacity
	Groundwater Storage	Aquifer storage and recovery
	Modifications to the Hydrologic Cycle	Forestry-based watershed management
		Weather modification
		Wetland, meadow, and stream corridor restoration
	Surface Storage	Additional Carson River storage
		Increase Truckee River reservoir storage

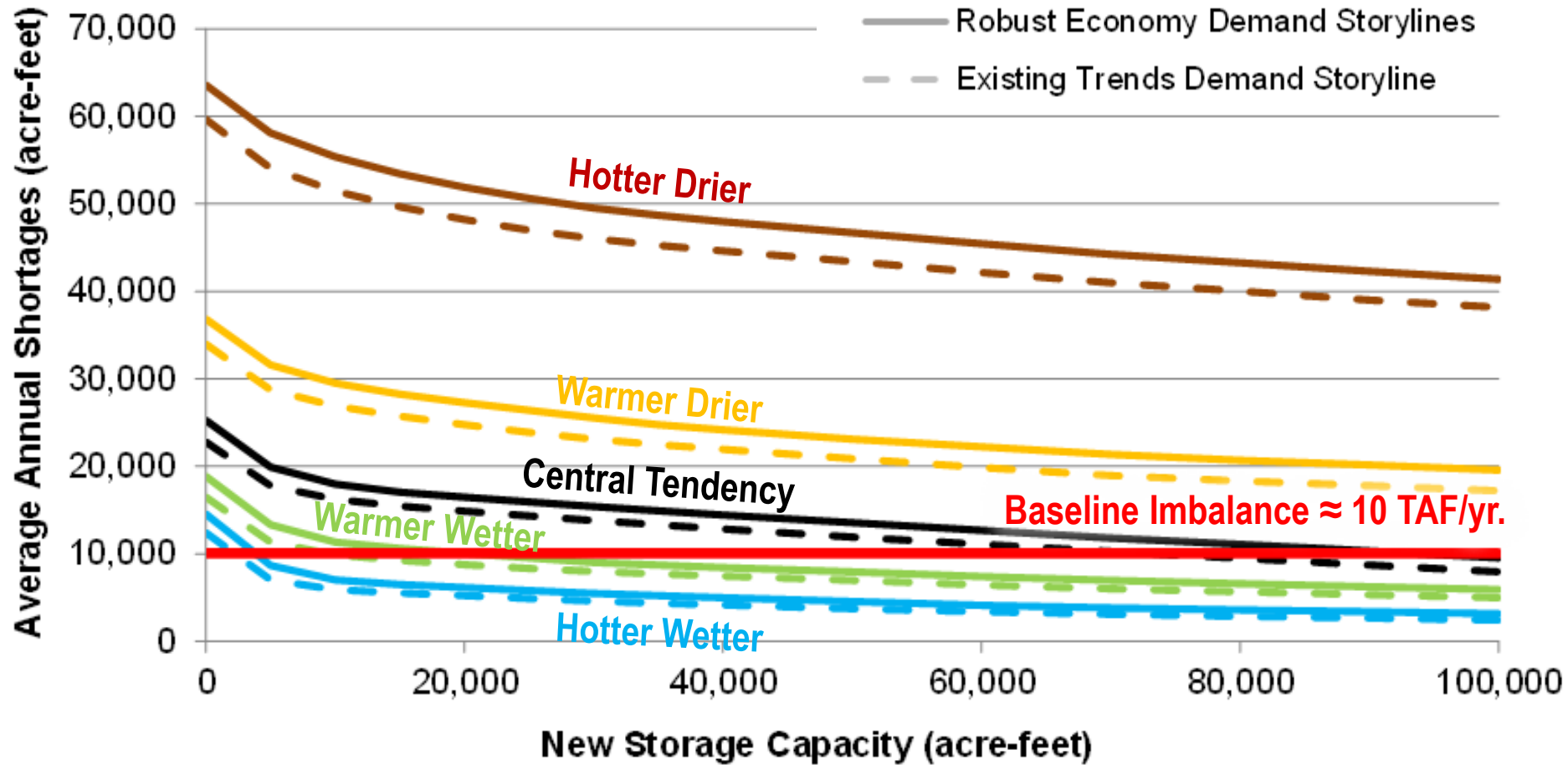
Example Option: Additional Storage

Basin Study investigated new storage for capture of spills from Truckee River reservoirs, with the intent of reducing shortfalls for all water users.

This option assessed:

- **Capture spills from Donner, Prosser Creek, Martis Creek, and Boca reservoirs**
- **Reservoir performance (storage/evaporation) similar to Stampede Reservoir**
- **The ability of captured spills to restore the supply-demand imbalance for all water users downstream of Lake Tahoe**

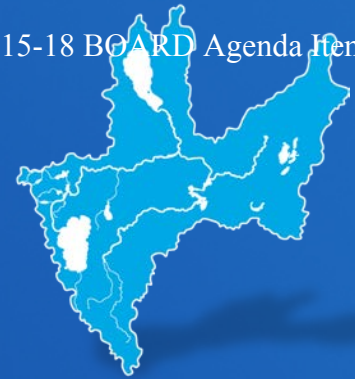
Performance of Additional Storage varied by Future Climate



Additional Storage Option: Key Findings

- Storage helps address seasonality shifts for all scenarios
- Up to 800,000 AF of new storage (equivalent to four Stampede Reservoirs) would be needed to achieve Baseline-level shortages for the driest climates
- Any new storage project (ground, surface reservoirs, pump-back, etc.) should be considered
- Institutional considerations (i.e. water rights) and location of the reservoir are important potential limitations, and were not considered in this evaluation

Key Findings in the Truckee Basin



- **Climate change will alter both demands and runoff patterns, changing the way that reservoirs must be operated and decreasing their reliability.**
- **Climate change will likely disrupt the present balance between water users, potentially requiring adaptation by all water users in the Basin.**
- **Potential changes in the climate have far greater impact than projected human demands, finding a balance between water users may require extensive adjustments and/or investments.**

Truckee Basin Study – Findings of the Truckee River Flood Frequency Analysis:

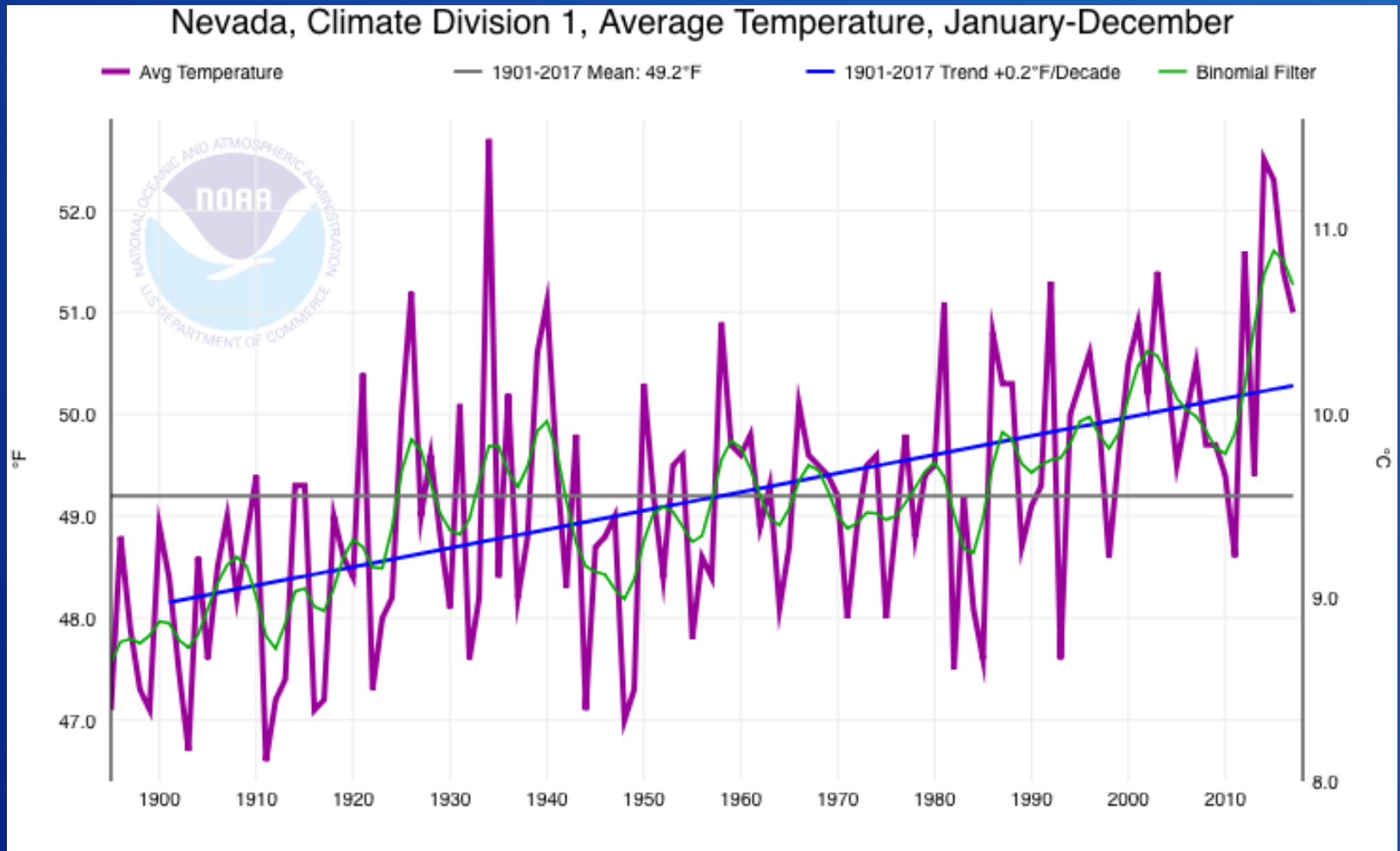
- Flood Risk - defined as the probability of a 1-Day maximum Truckee River flow exceeding a design flood magnitude of 37,600 cfs.
- Flood Risks were assessed at both the Farad and Reno Gauge locations
- For the 2000-2049 period, flood risk increased at both the Farad and Reno Gauge locations by 10-30%
- For the 2050-2099 period, flood risk increased at both the Farad and Reno Gauge locations by 30-50%

Truckee Basin Study – Potential Follow-up Steps:

- **Continue to improve existing models of the Truckee River to assist in evaluating future strategies**
 - Expand TROA water supply operations model into CA
 - Consider coupled surface and groundwater model
 - Improve Carson River supply and demand representation
- **Focus additional research efforts on key uncertainties and vulnerabilities (e.g., changing needs of listed fish, paleo drought, changing flood control needs)**
- **Consider forming a basin-wide water planning forum- To evaluate water supply risks and vulnerabilities and cooperatively investigate and sponsor promising strategies (e.g., Resource Investment Optimization Model (RIOS), etc.)**

Truckee Basin Study –

Updated Temperature Trends in the Reno Area



Truckee Basin Study –

Updated Precipitation Trends in the Reno Area

