

RECLAMATION

Managing Water in the West



TRUCKEE BASIN STUDY

Reclamation Mid-Pacific Region

Truckee Meadows Water Authority

April 15, 2015

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

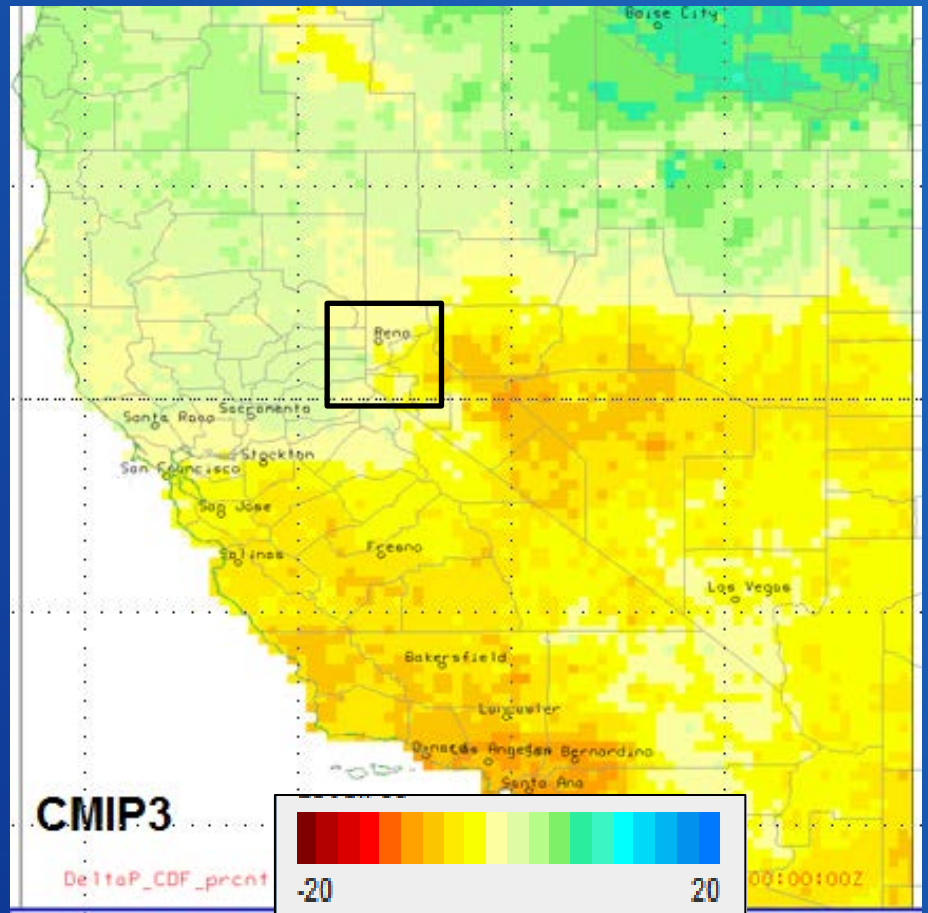
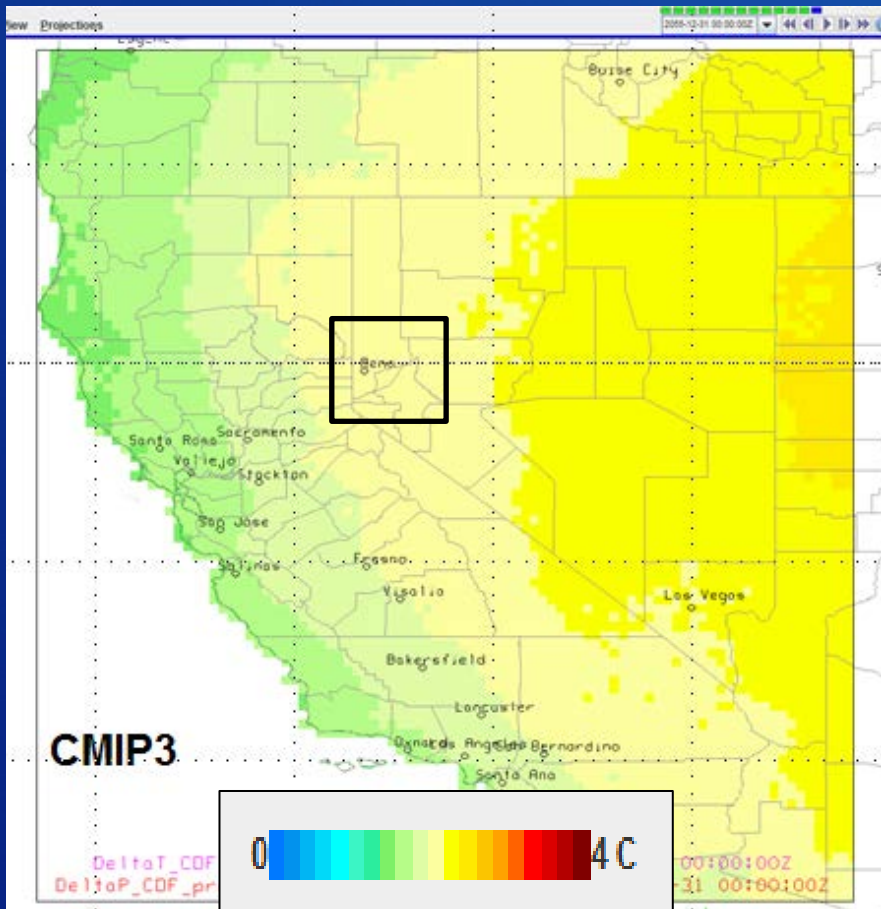


Quick Orientation



- 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

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

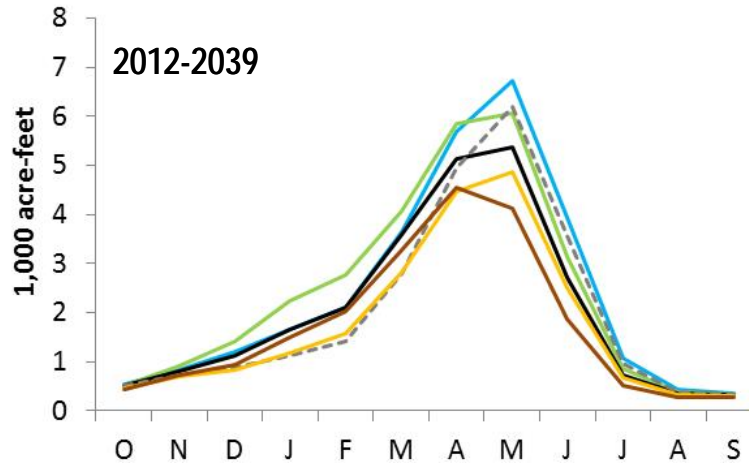


Changes in the Truckee Basin that Drive Key Vulnerabilities



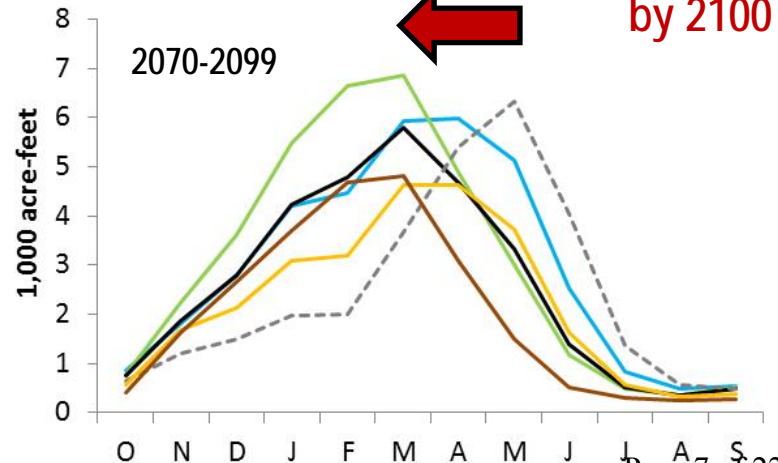
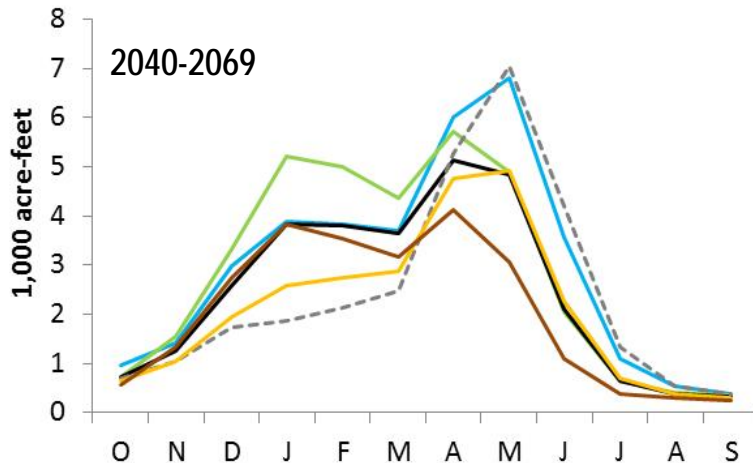
- **Changes in Supplies**
 - Less snow and earlier runoff
 - Higher rates of reservoir evaporation
- **Changes in Demands**
 - Earlier growing season
 - Potential changes in ecosystem needs

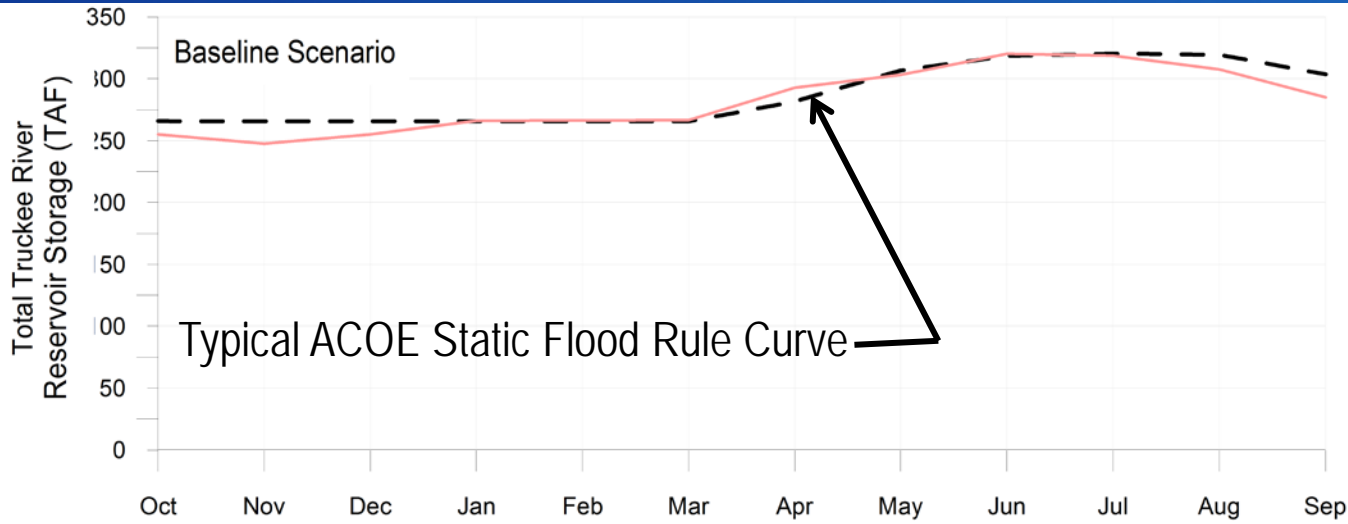
Seasonality Shifts Appear Certain, and Will Challenge Existing Infrastructure



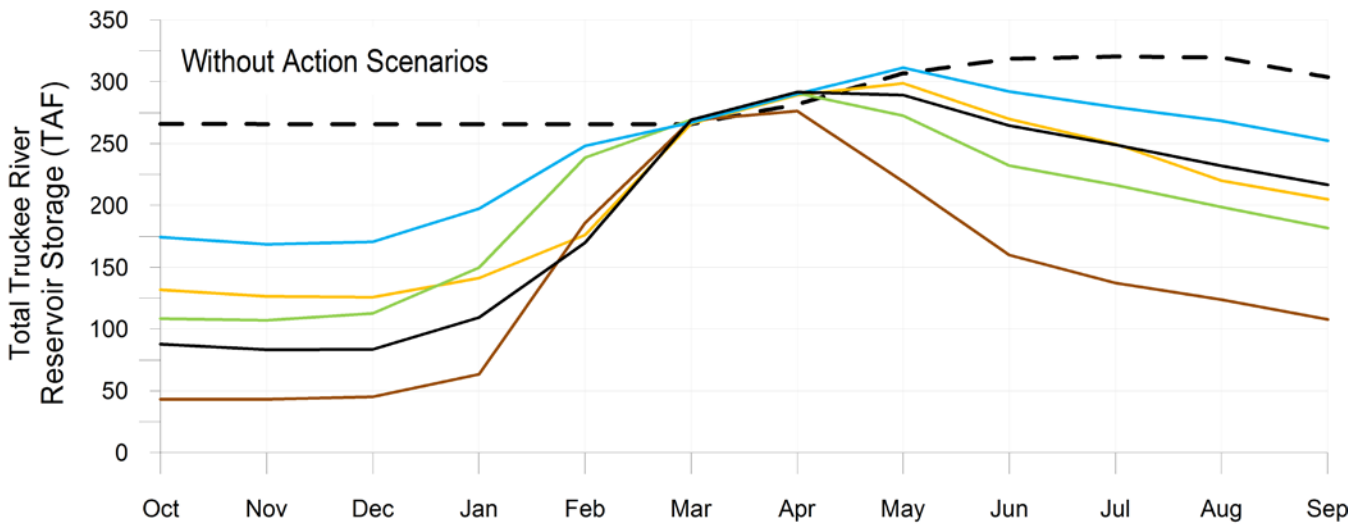
— warmer, wetter
 — hotter, wetter
 — central tendency
- - - no climate change
 — warmer, drier
 — hotter, drier

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

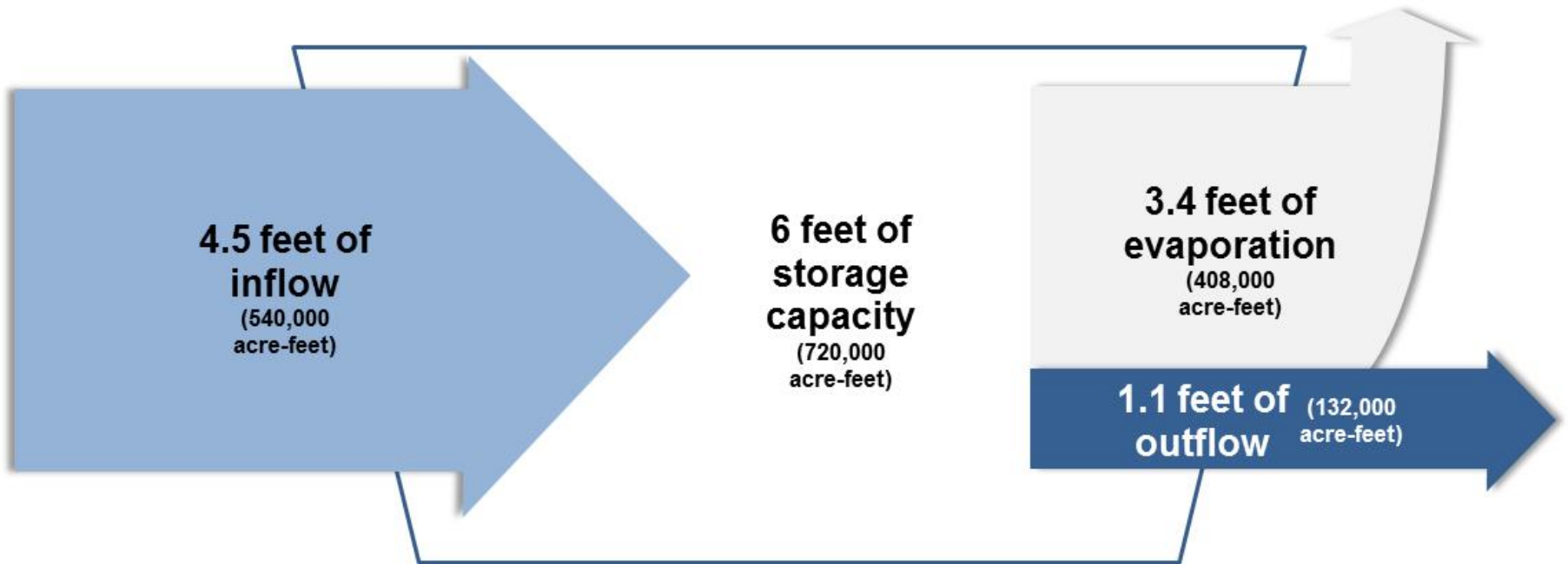
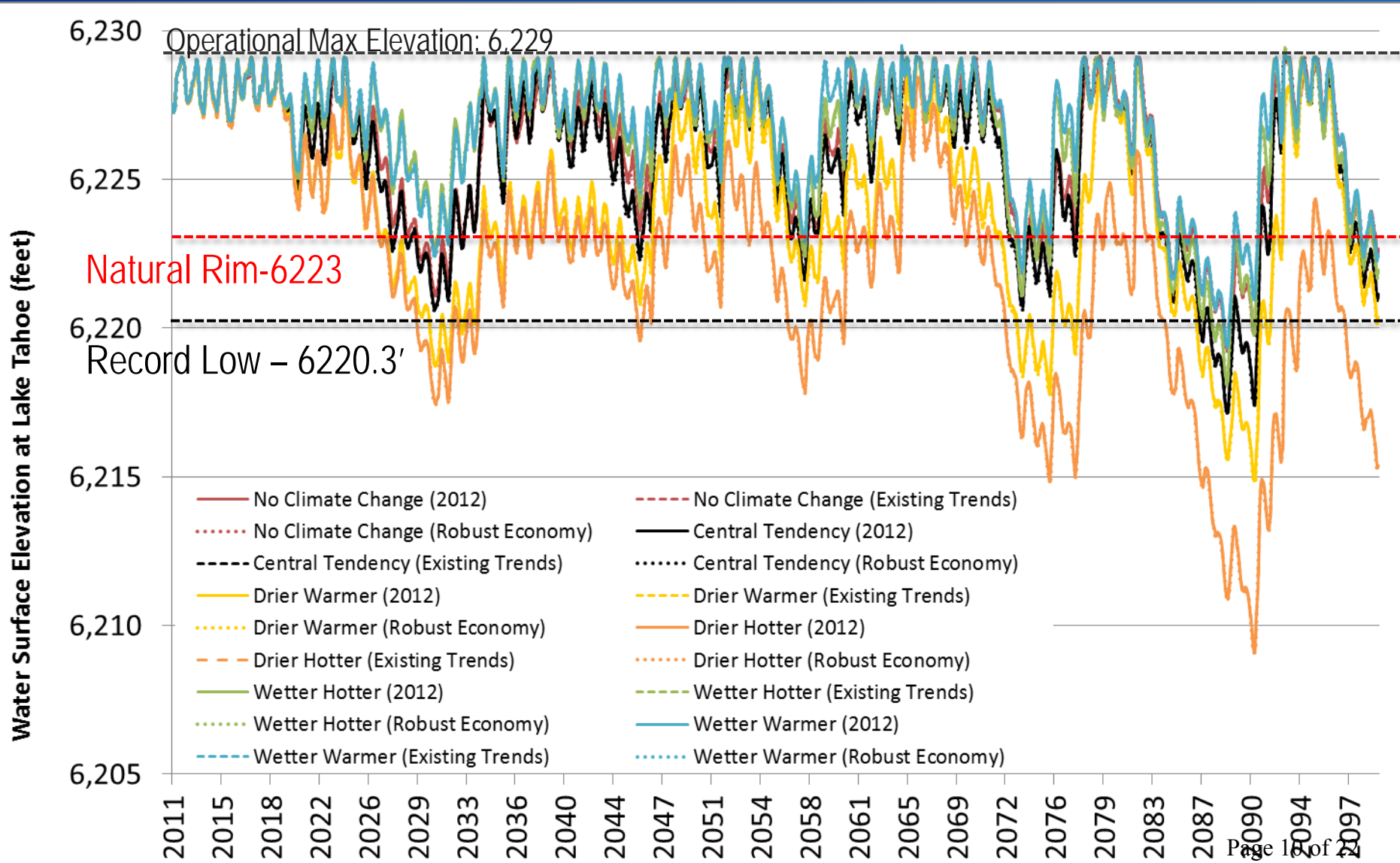


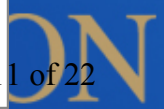
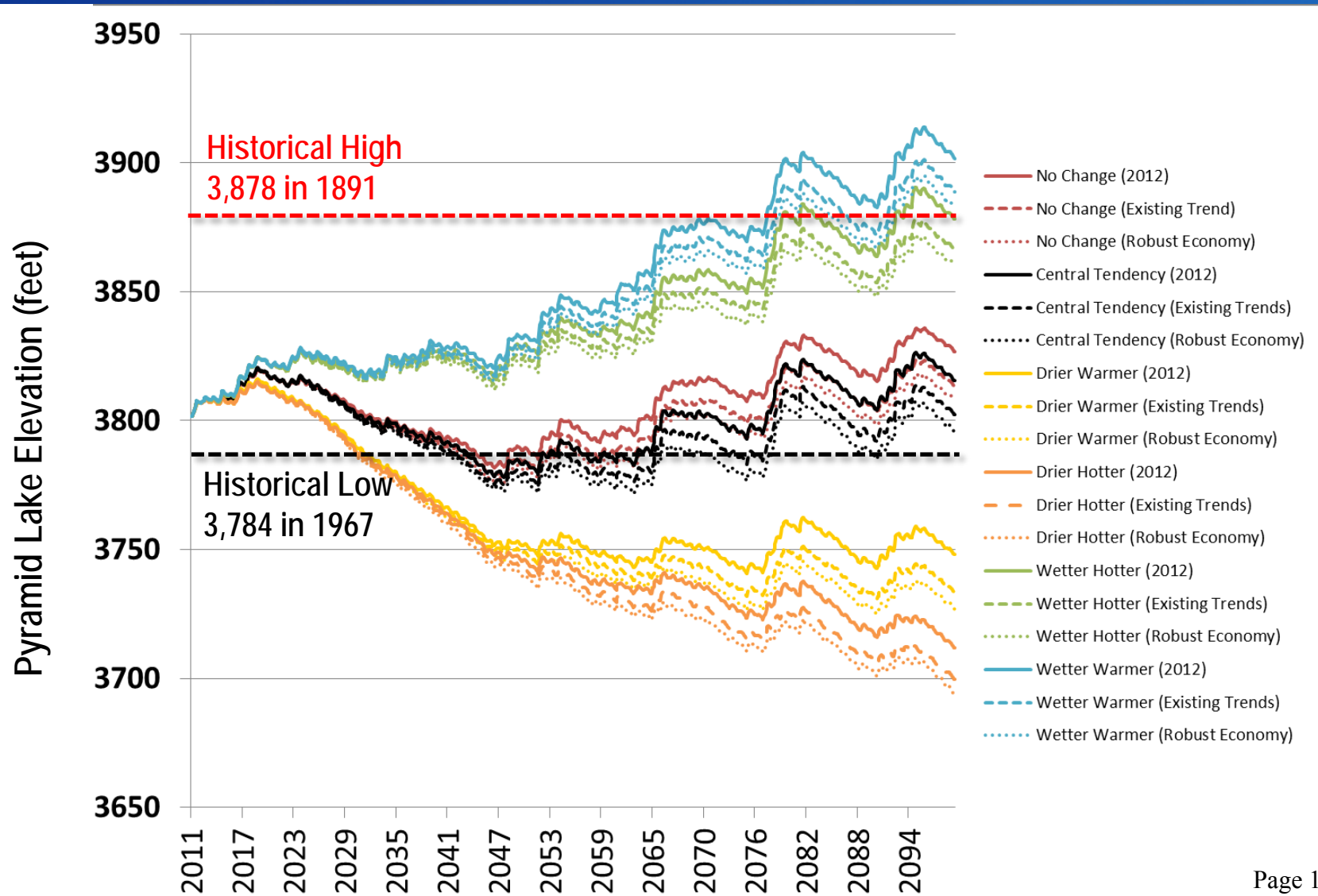
Diagram depicts historical relationships.

Tahoe accounts for approximately one third of Truckee River flows.

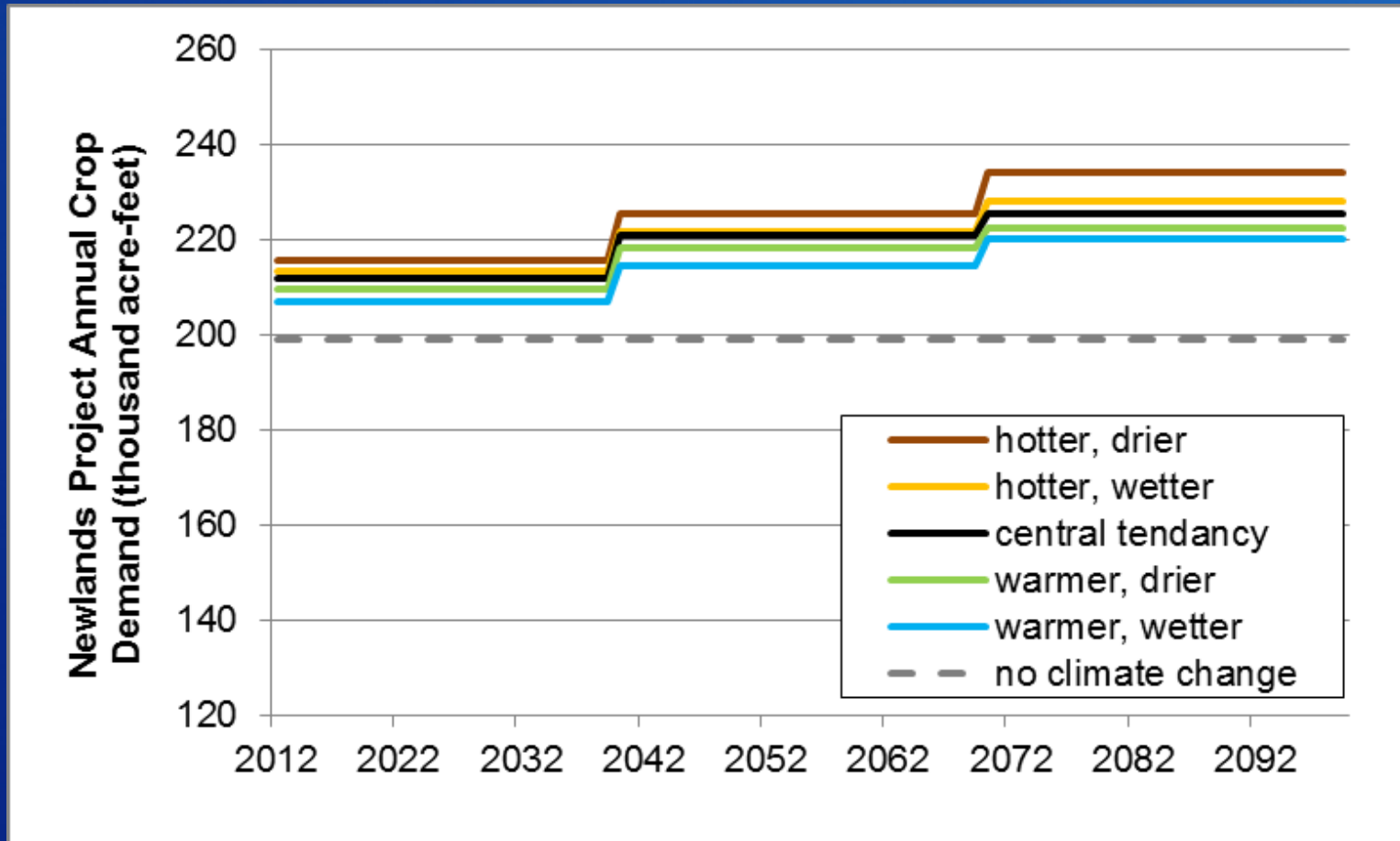
Lake Tahoe Surface Elevations Under Future Climate Scenarios



Pyramid Lake Reveals the Importance and Uncertainty in Future Conditions

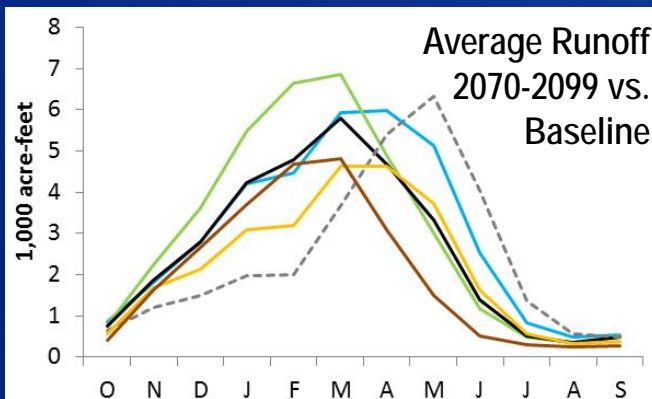
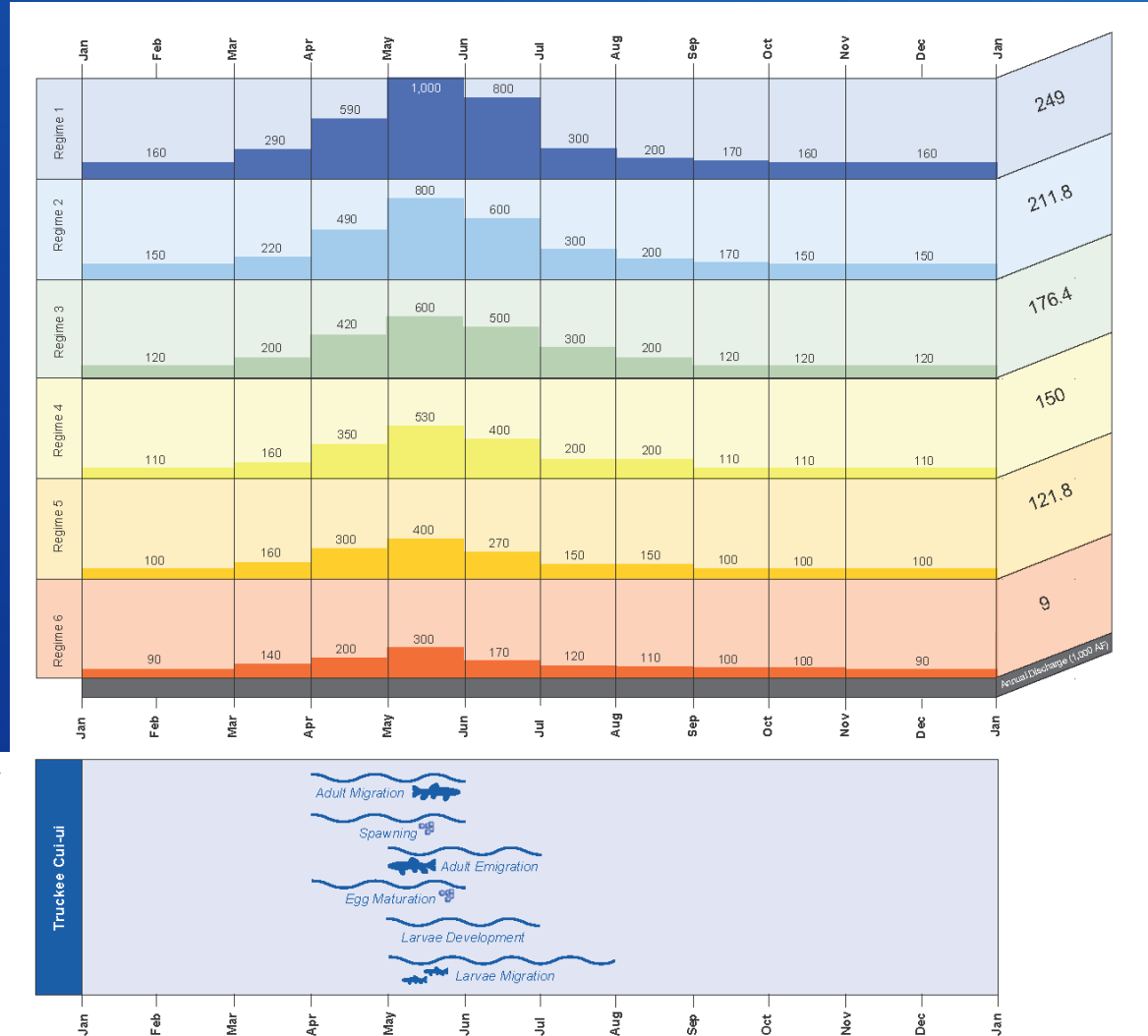


Irrigation Demands Will Increase with Rising Temperatures



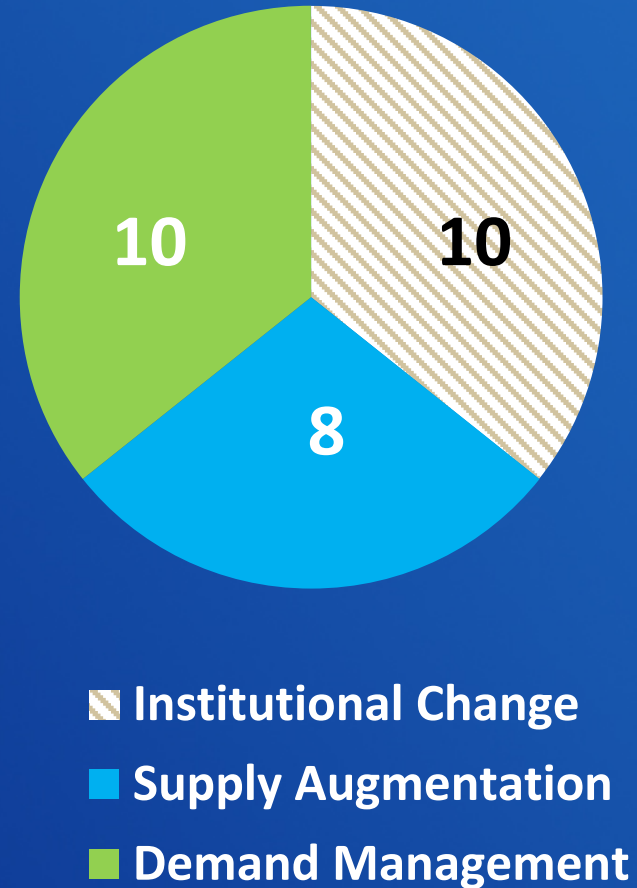
Fish Life-Cycles May Follow Seasonality Shifts in Hydrology

Pyramid Lake fisheries may respond to cues in the natural hydrology, which will occur earlier because of seasonality shifts.



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

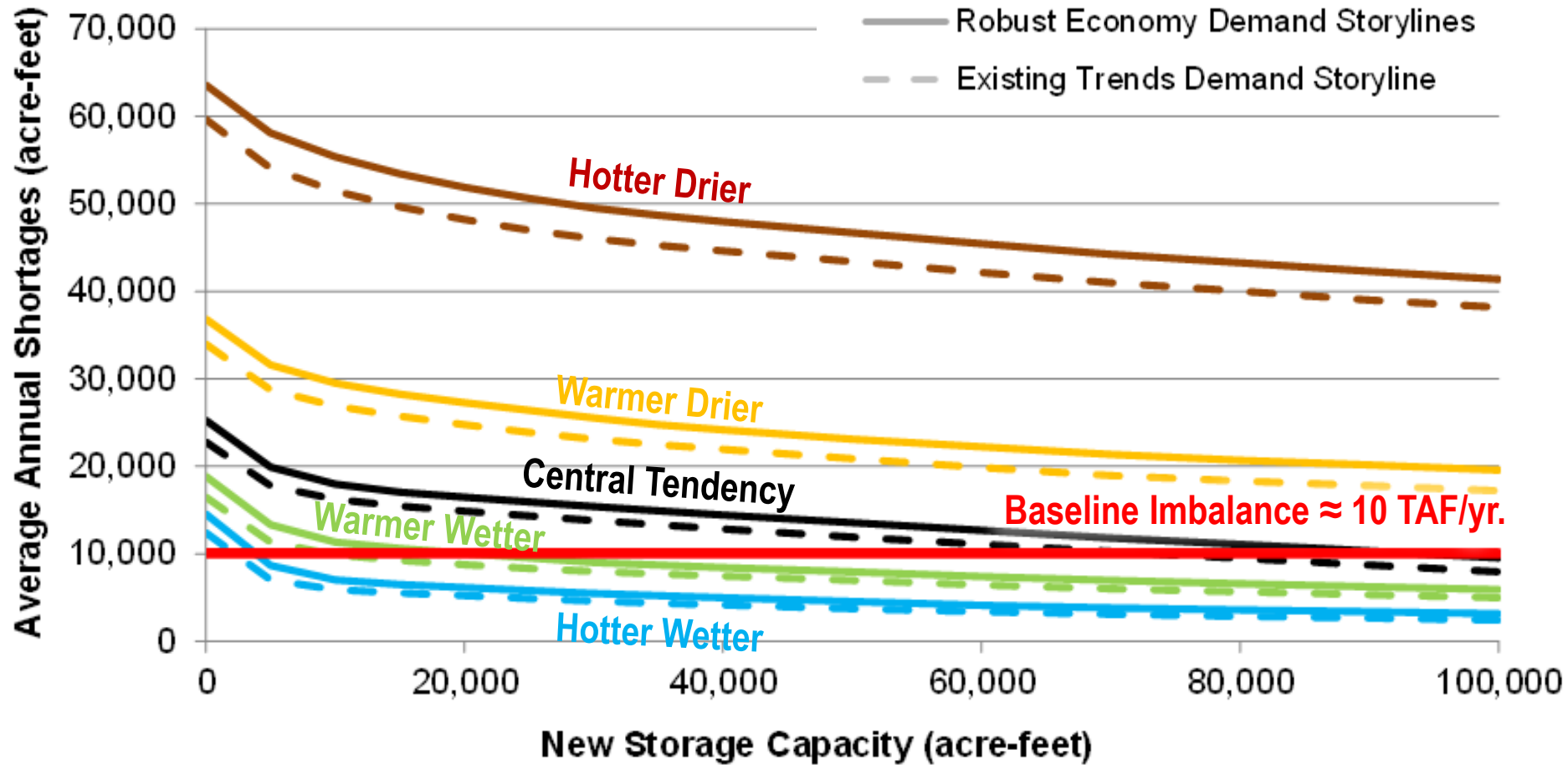
Example Option: Additional Storage

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 of any 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
- 800,000 AF of new storage (equivalent to four Stampede Reservoirs) would be needed to achieve Baseline-level shortages for the driest climates
- Achievements could be relevant for any new storage project (ground, surface reservoirs, pump-back, etc.)
- 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 changes will alter both demands and runoff patterns, changing the way that reservoirs must be operated and decreasing their reliability.
- Climate changes 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 – 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.)**