

# American River Basin Study

Assessing
Climate
Change
Challenges





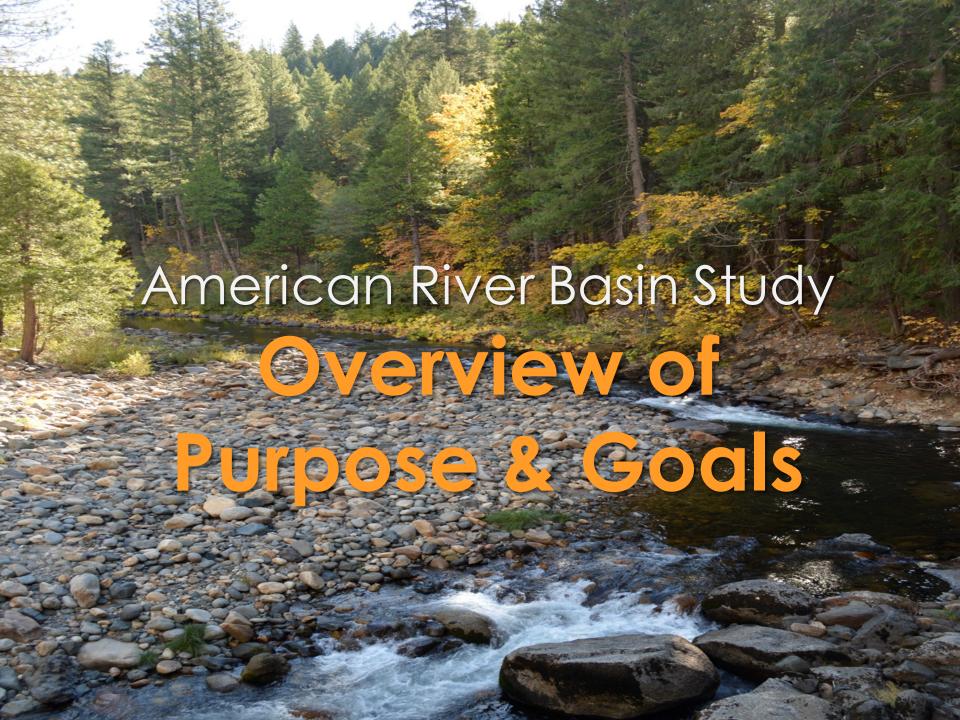




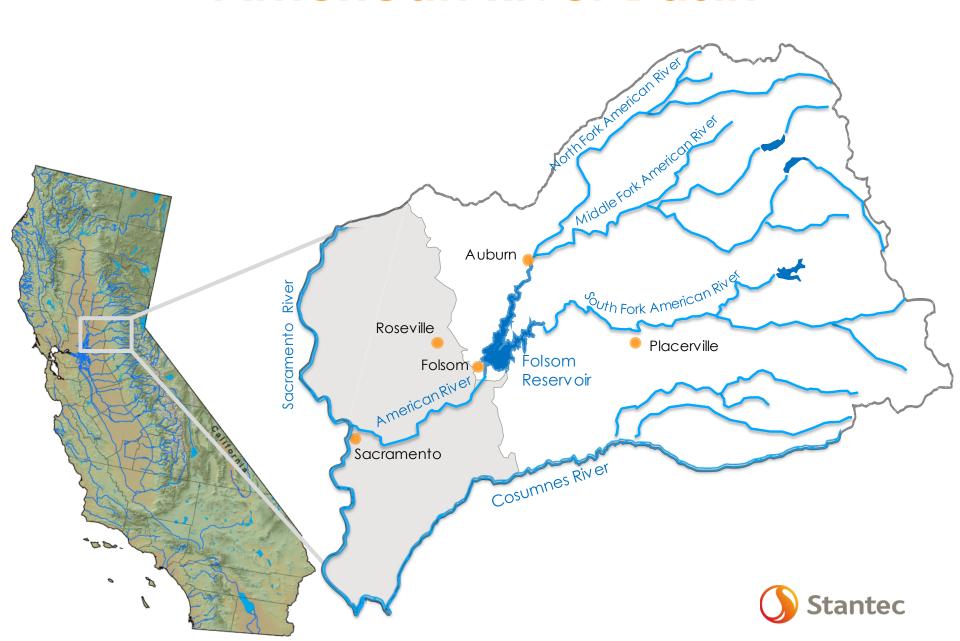


## Workshop Outline

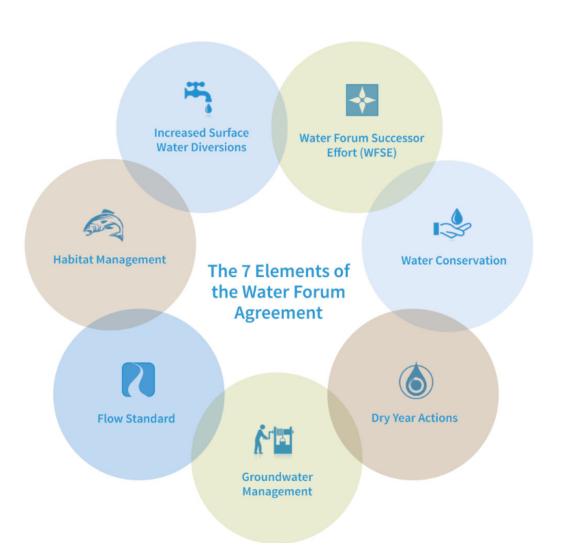
- American River Basin Study Overview
- Projected Future Climate Conditions
- Effect of Climate Change on Regional Water Management
- Regional Water Management Vulnerabilities
- Next Steps



## **American River Basin**



# History of Regional Collaboration and Self-Reliance

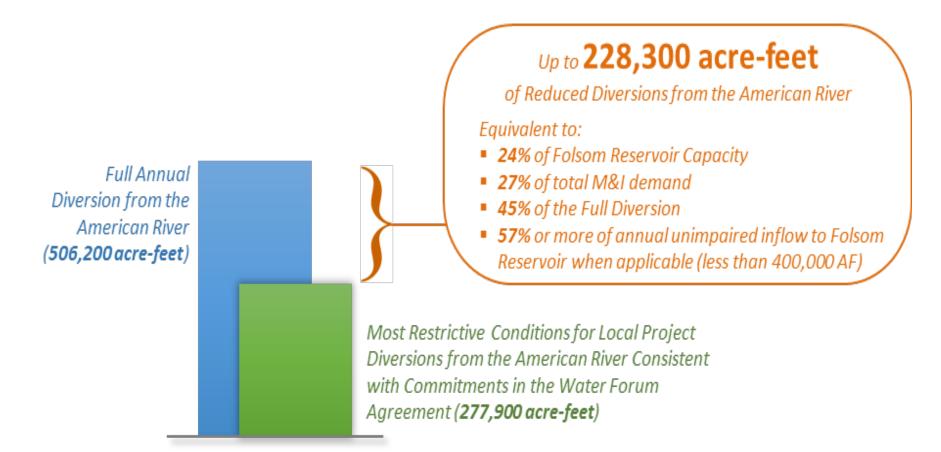








#### Regional Commitment for Sustainability





#### Yet, Vulnerabilities Remain ...

Folsom Reservoir, the primary storage in the basin, is operated by Reclamation as part of the Central Valley Project



Folsom Reservoir reached a record low of 135,000 acre-feet on December 5, 2015.





### WaterSMART Basin Studies

#### **Focus**

- Evaluate impacts of climate change and help ensure sustainable water supplies by identifying strategies to address imbalances in water supply and demand.
- Basins and subbasins in the 17 western states.

#### **Benefits**

 The resulting recommendations DO NOT constitute Federal decisions or authorization; however, further feasibility studies for such purposes are possible under the authorizing legislation.

# American River Basin Study (ARBS) Cost-Share Partners

Federal – Reclamation



- Non-Federal
  - Placer County Water Agency



- El Dorado County Water Agency
- City of Folsom
- City of Roseville
- City of Sacramento
- Regional Water Authority









# **ARBS** Objectives

- 1. Further refine water supply and demand assessment for the American River Basin
- 2. Address regional supply-demand imbalance and infrastructure deficiencies under the existing and future climate change conditions.
- 3. Improve coordination of local and Federal water management.
- 4. Align water management tools, strategies, and planning efforts of Reclamation and water agencies in the basin.
- 5. Identify water management strategies and actions that are functional under multiple future potential climate and socioeconomic conditions to 2100 AD.



## **ARBS Anticipated Outcomes**

- Consistent modeling data and tools for Federal and regional planning in the American River Basin (climate change hydrology, upper watershed operations, and water temperature).
- Projected supply-demand imbalance at build-out under climate change conditions
- Evaluation of adaptation measures and their ability to reduce imbalances





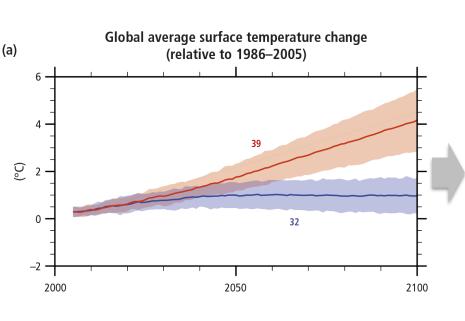
## **ARBS Schedule**

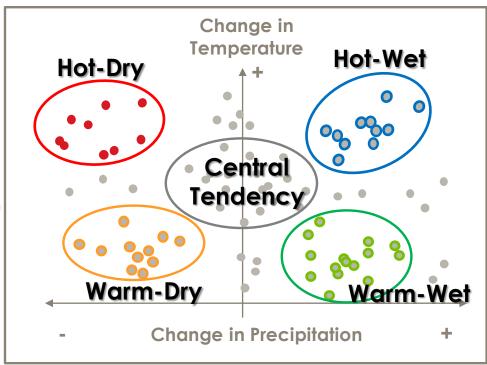
Task	2017	2018	2019	2020
MOA Signed	*			
Climate Change Data & Model Development	-			
Water Supply & Demand Assessment				
Adaptation Strategy Development		_		
Findings & Final Report				
Public Stakeholder Meetings			គង់ ខ	ii iii



#### **Future Climate Scenarios**

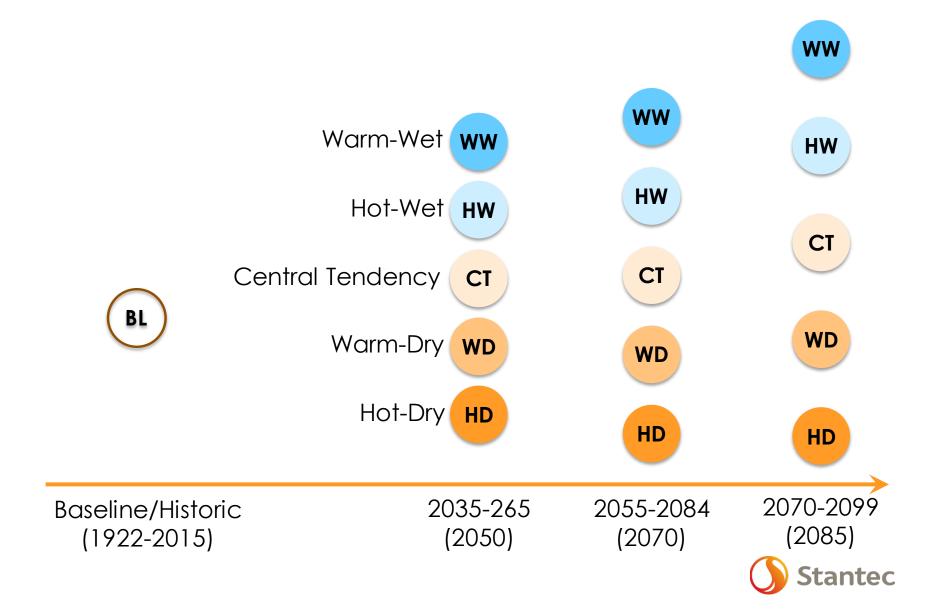
#### **Ensemble of Future Projections**



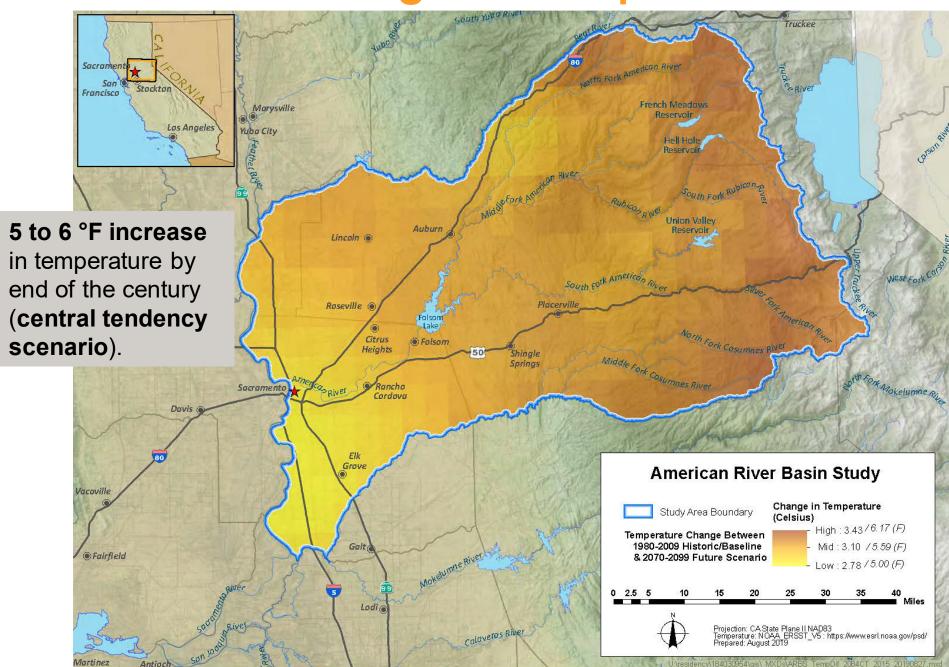




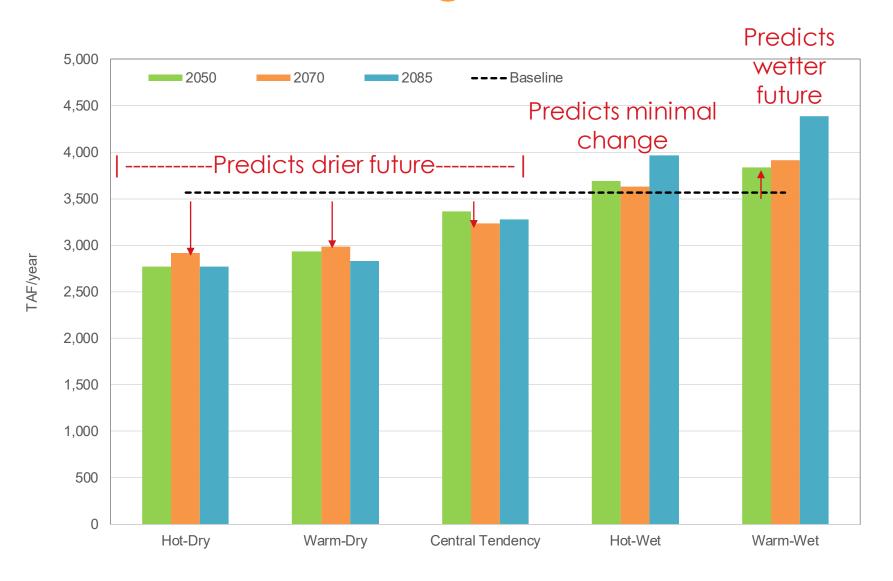
#### **Future Climate Scenarios**



#### **Future Changes in Temperature**



# **Future Changes in Runoff**



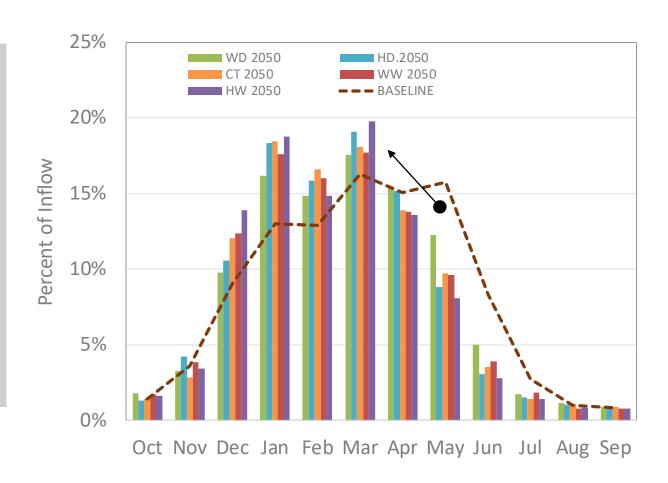


# Changes in Timing of Runoff

Early snowmelt and less precipitation as snowfall

Runoff will occur earlier in the year

Lower spring runoff

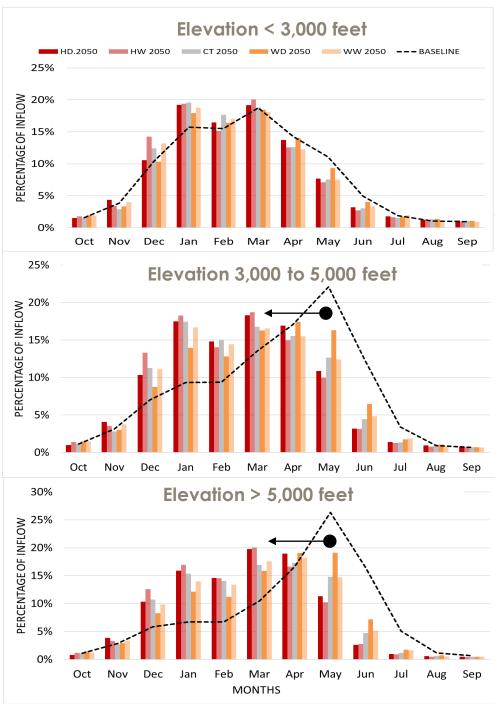




# Changes in Timing of Snowmelt

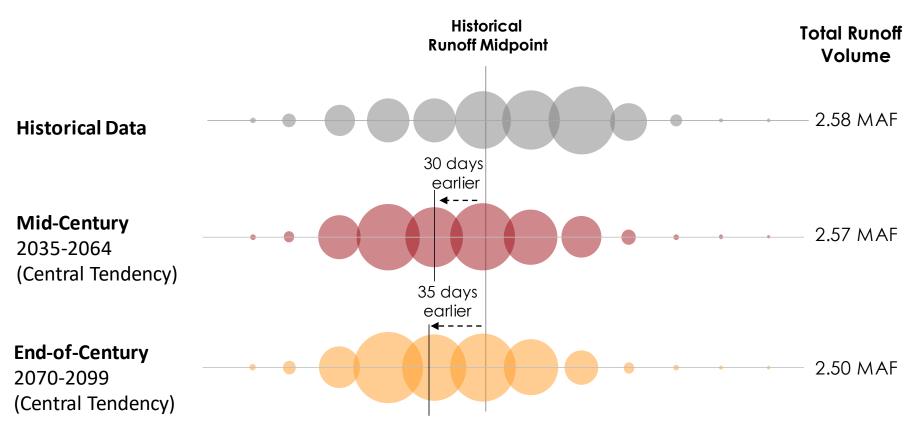
Historically, runoff occurs in <a href="Iate spring">Iate spring</a> at elevations above 3,000 feet, peaking around May.

Under future conditions, runoff is expected earlier, with <u>peak</u> <u>snowmelt 30-60 days earlier</u>.



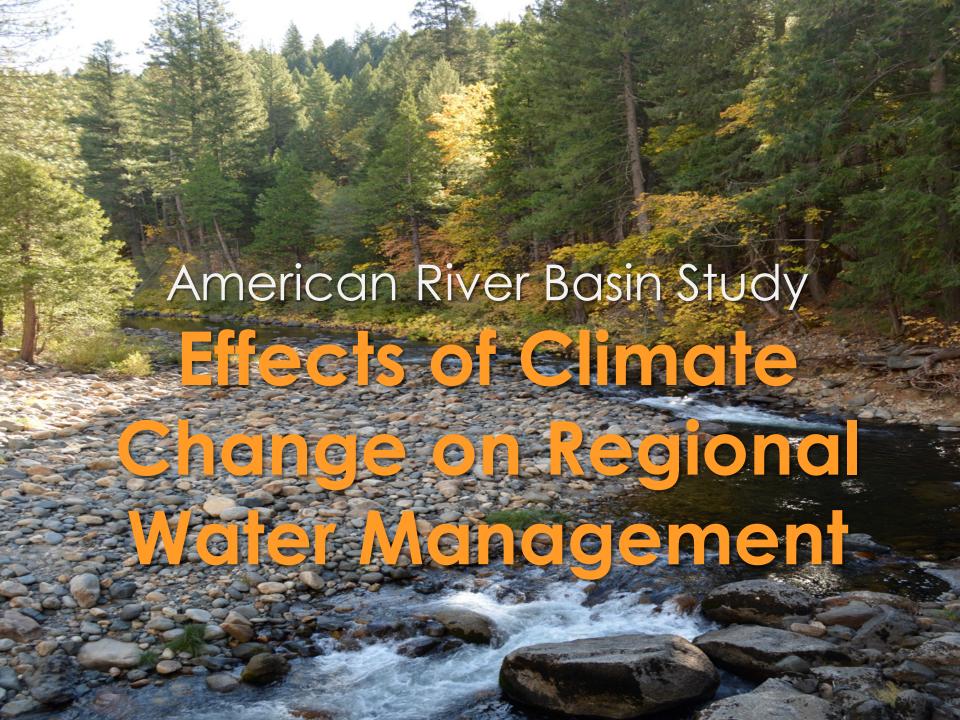
# Changes in Timing of Inflow to Folsom



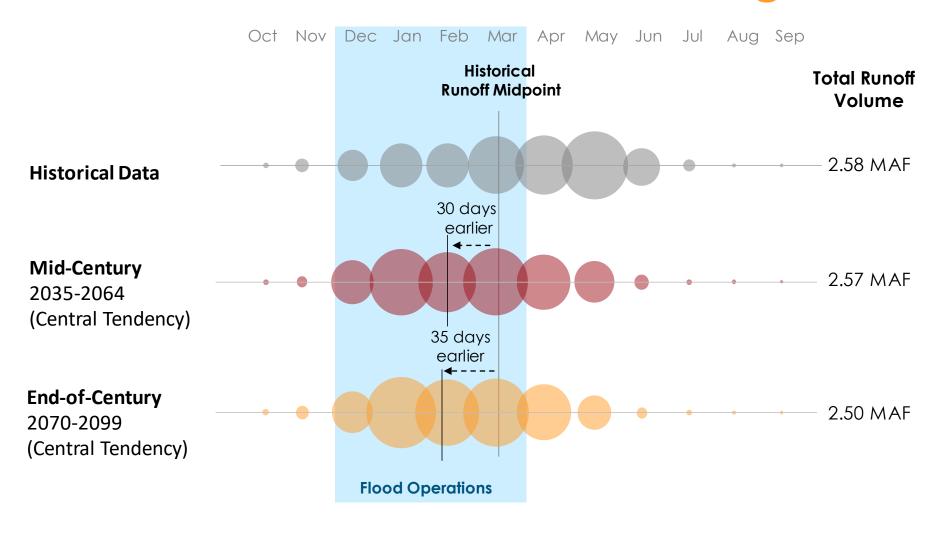


MAF = million acre-feet

Inflow to Folsom could occur 30 to 40 days earlier on average.

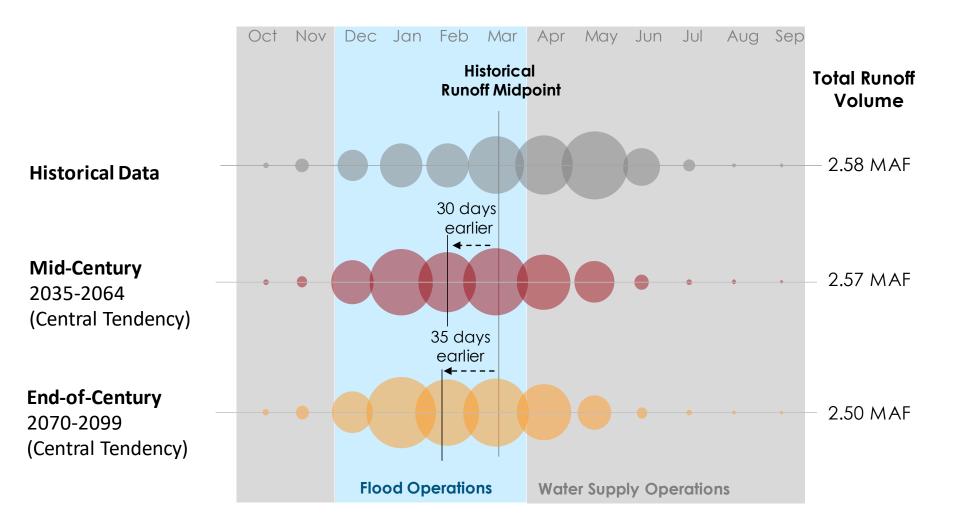


#### Potential Effects on Flood Management



Earlier runoff would increase the chance of spills from Folsom reservoir during flood season.

#### Potential Effects on Water Supply Availability

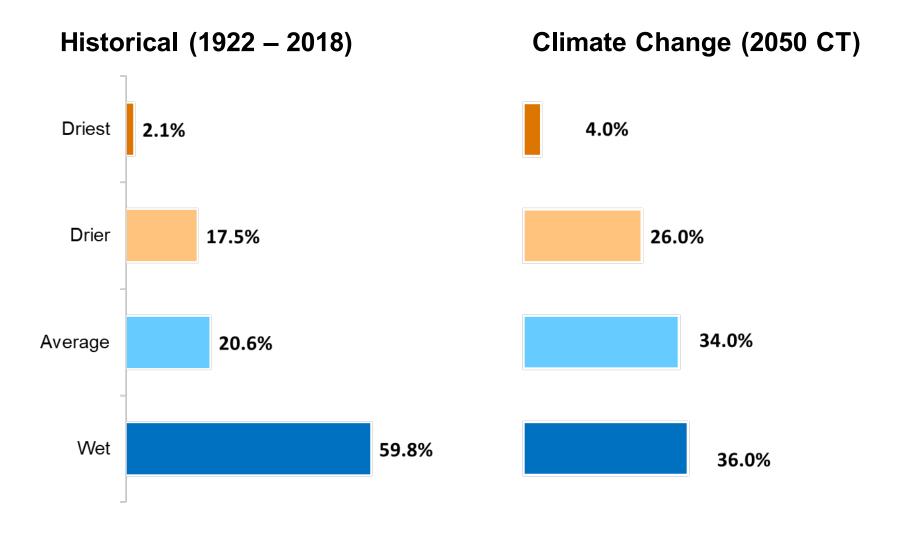


Earlier runoff would <u>increase the chance of spills</u> from Folsom reservoir during flood season.

Earlier runoff would <u>reduce water supply</u> available during summer and fall for M&I, ecosystem, hydropower, irrigation, recreation, etc.



#### Potential Effects on Water Forum Agreement



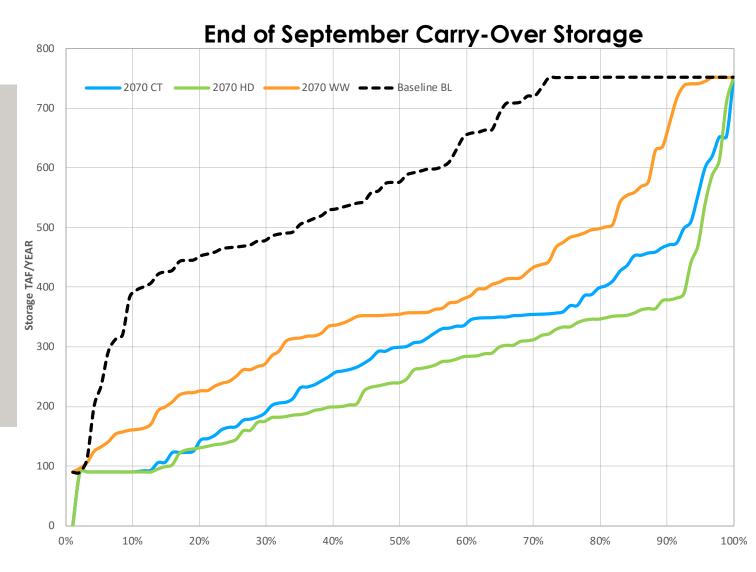
Earlier runoff means less unimpaired runoff March through November. Thus affecting available supplies during summer and fall for M&I, ecosystem, hydropower, irrigation, recreation, etc.

#### Potential Effects on Folsom Storage

Changes in runoff timing reduces Folsom Lake storage.

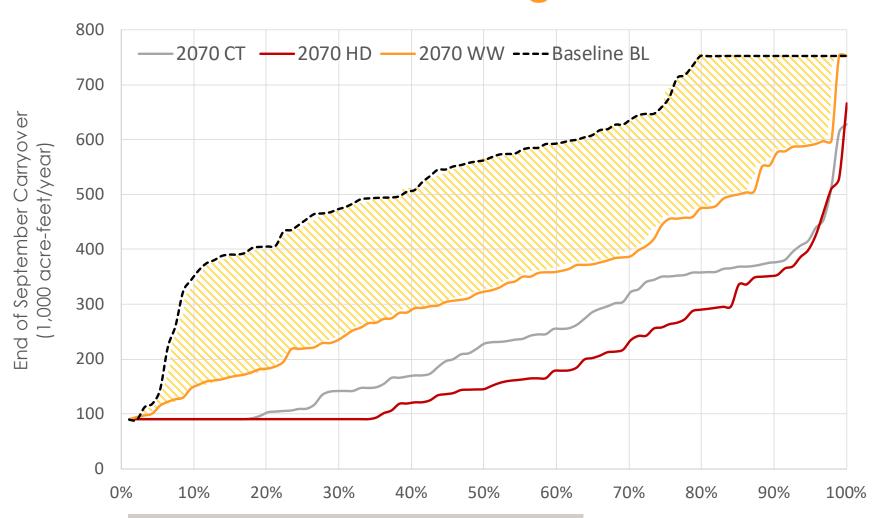
This affects ability to meet:

- Regional water demands
- Lower American
   River ecosystem
   needs





#### Changes in Runoff Timing Reduces Folsom Lake Storage



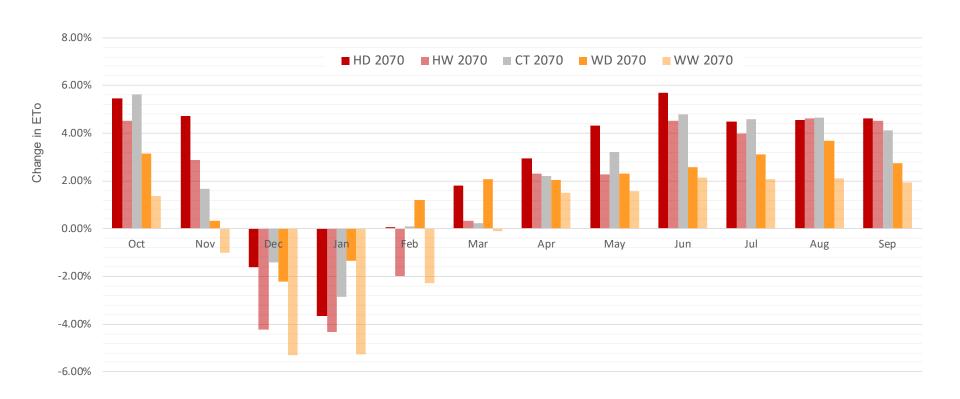
Lower storage affects ability to meet: Regional water demands Lower American River ecosystem needs



## Future Change in Evapotranspiration

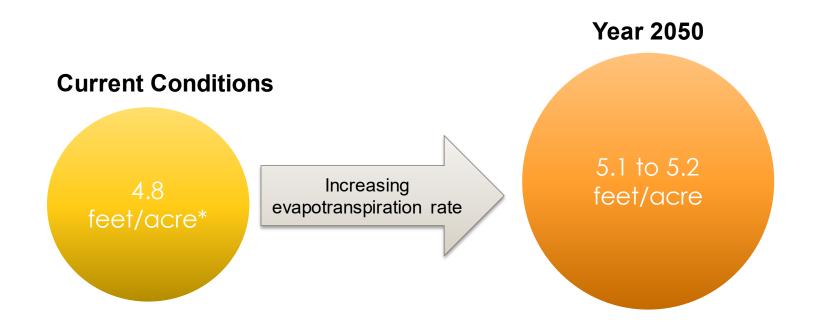
Future increase in temperature can result in higher evapotranspiration of 2% to 4% in the growing season (April to October).

Lower evapotranspiration is expected during rainy season (December to February).





#### Potential Effects on Agricultural Water Demand



Higher evapotranspiration rate results in higher agricultural water demands.

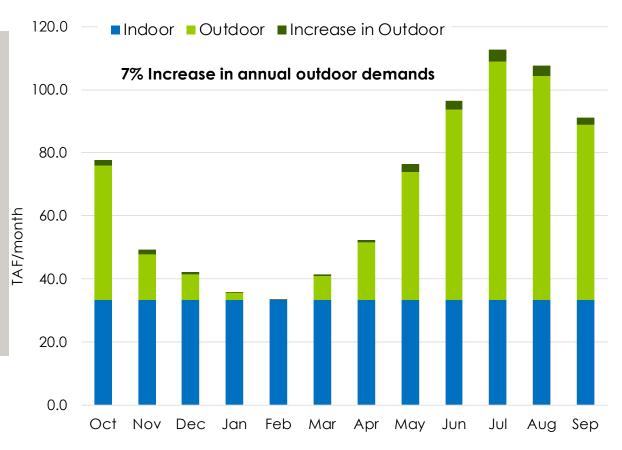
Under similar cropping patterns, irrigation water demands would increase 7.7% on average.



#### Potential Effects on Urban Outdoor Demand

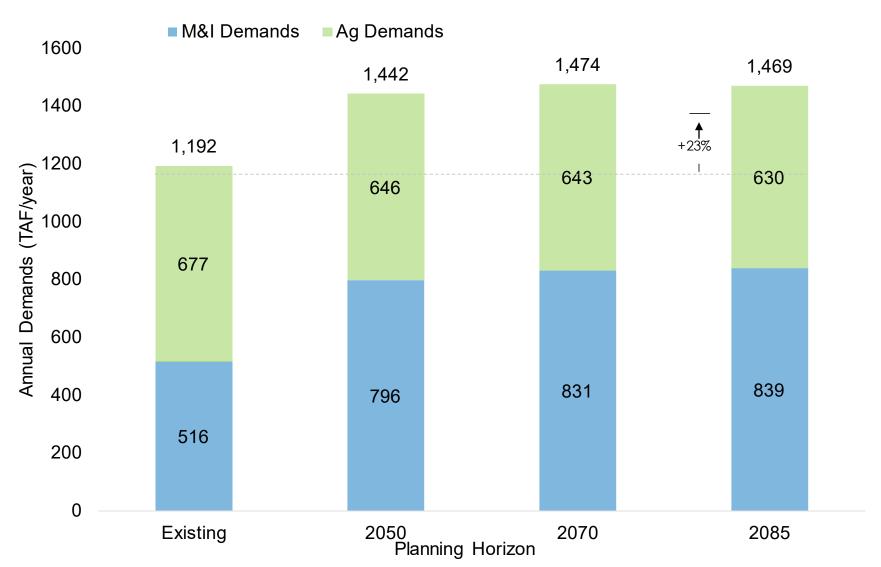
Higher evapotranspiration rate results in higher outdoor irrigation demand.

Under similar urban landscaping, irrigation water demands could increase up to 7%, about 3% in total demands (2050 Central-Tendency scenario)

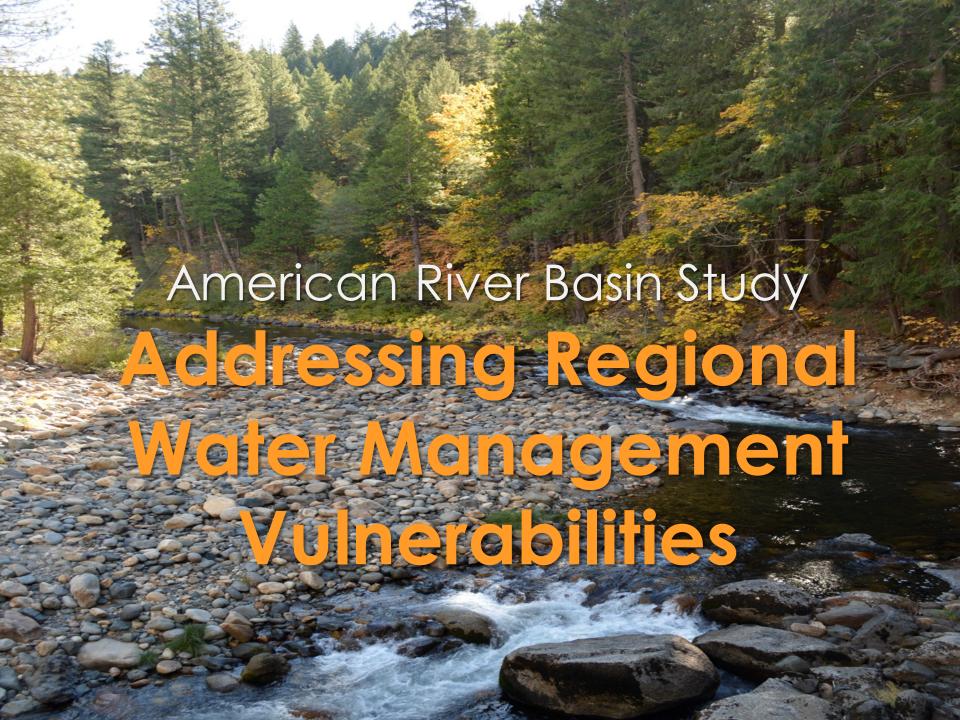




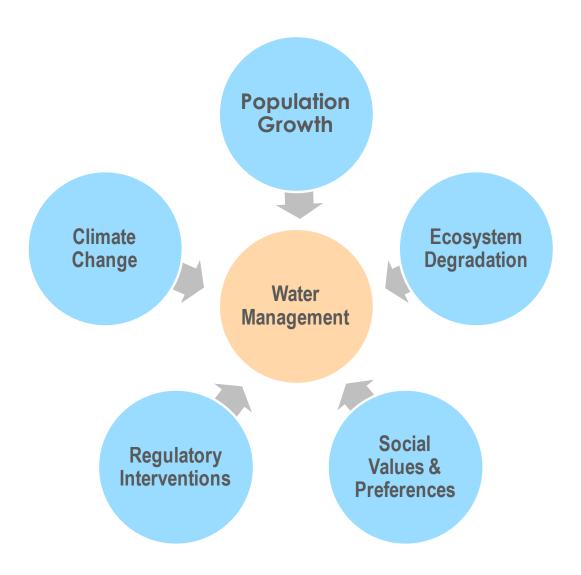
#### Overall Change increase in Demand



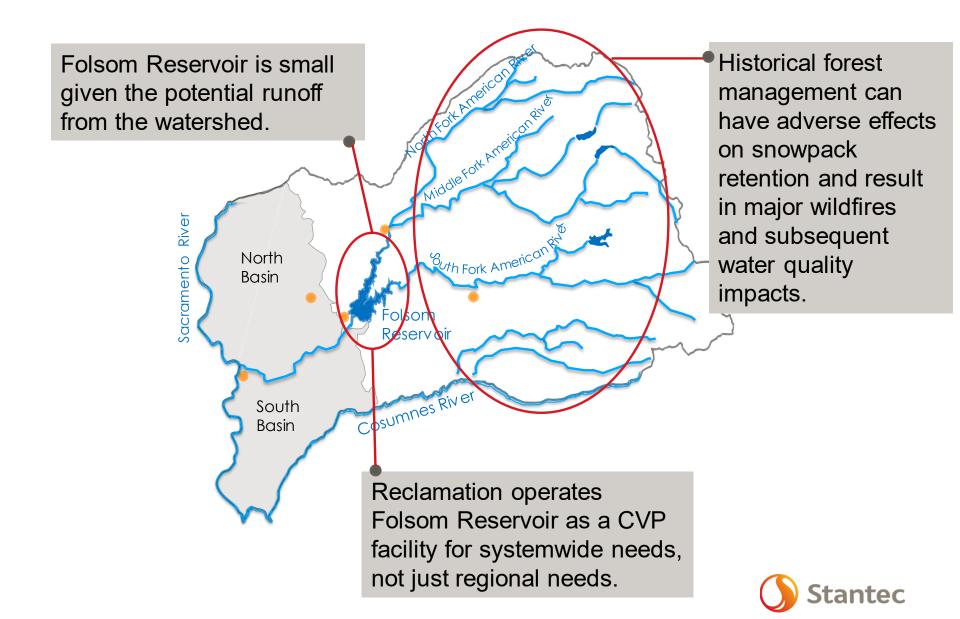




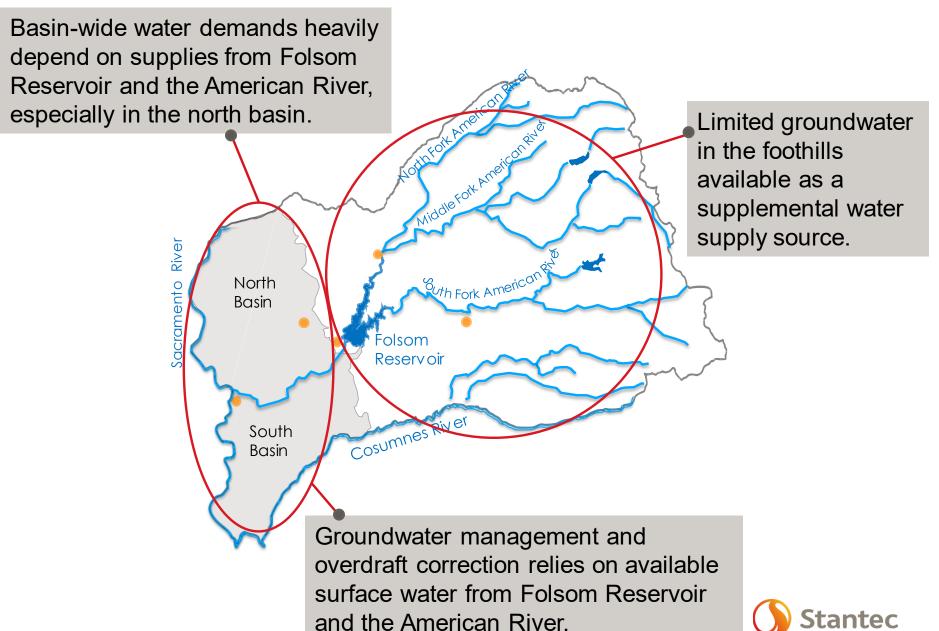
# Regional Water Management Stressors



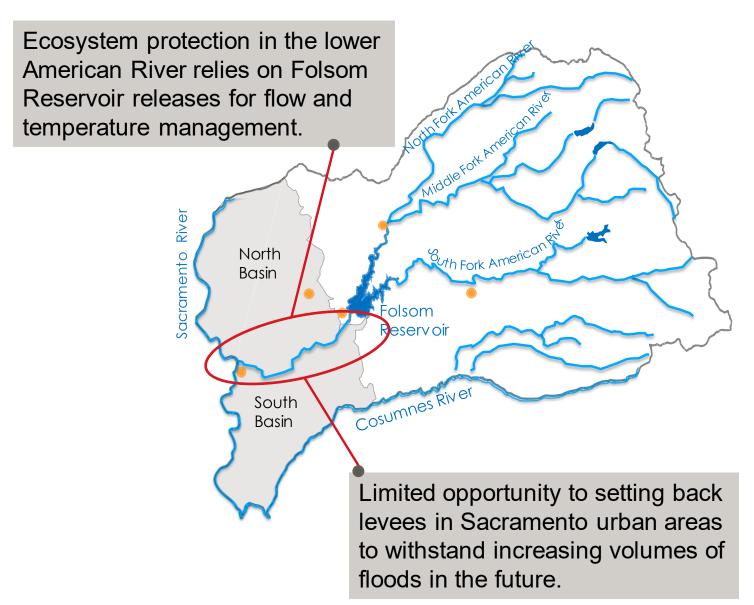
## Key Regional Water Vulnerabilities



# Key Regional Water Vulnerabilities



# Key Regional Water Vulnerabilities





# **Next Steps**

- Compile management actions to address regional vulnerabilities
  - Improve Demand Management
  - Diversify Water Supplies
  - Improve Operational Flexibility
  - Improve Resource Stewardship
  - Secure Institutional Agreements to Enable Flexibility
- Formulate and evaluate adaptation portfolios
- Develop recommendations for long-term regional strategy



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