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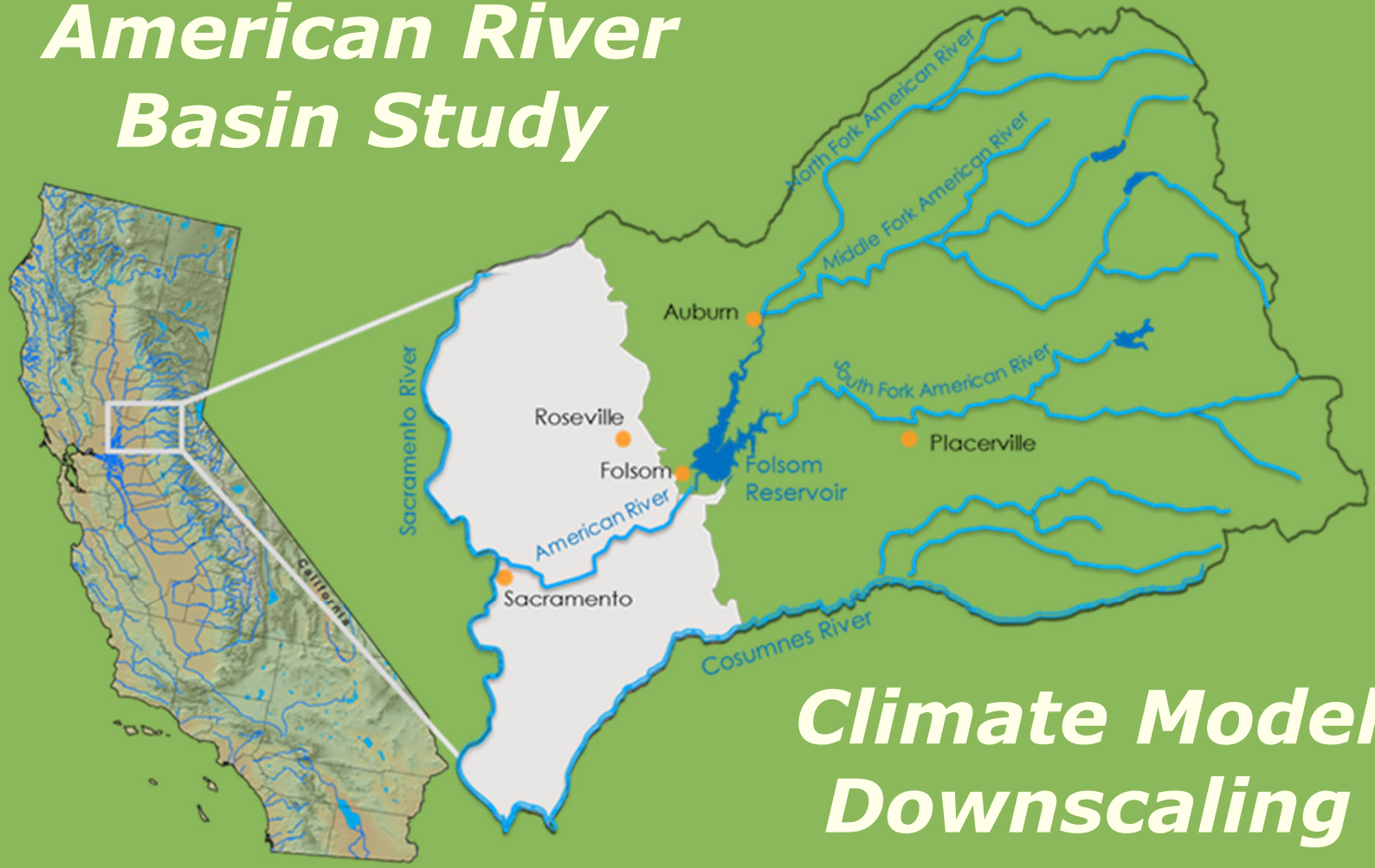
American River Basin Study



Climate Model Downscaling

ARBS Study Objectives

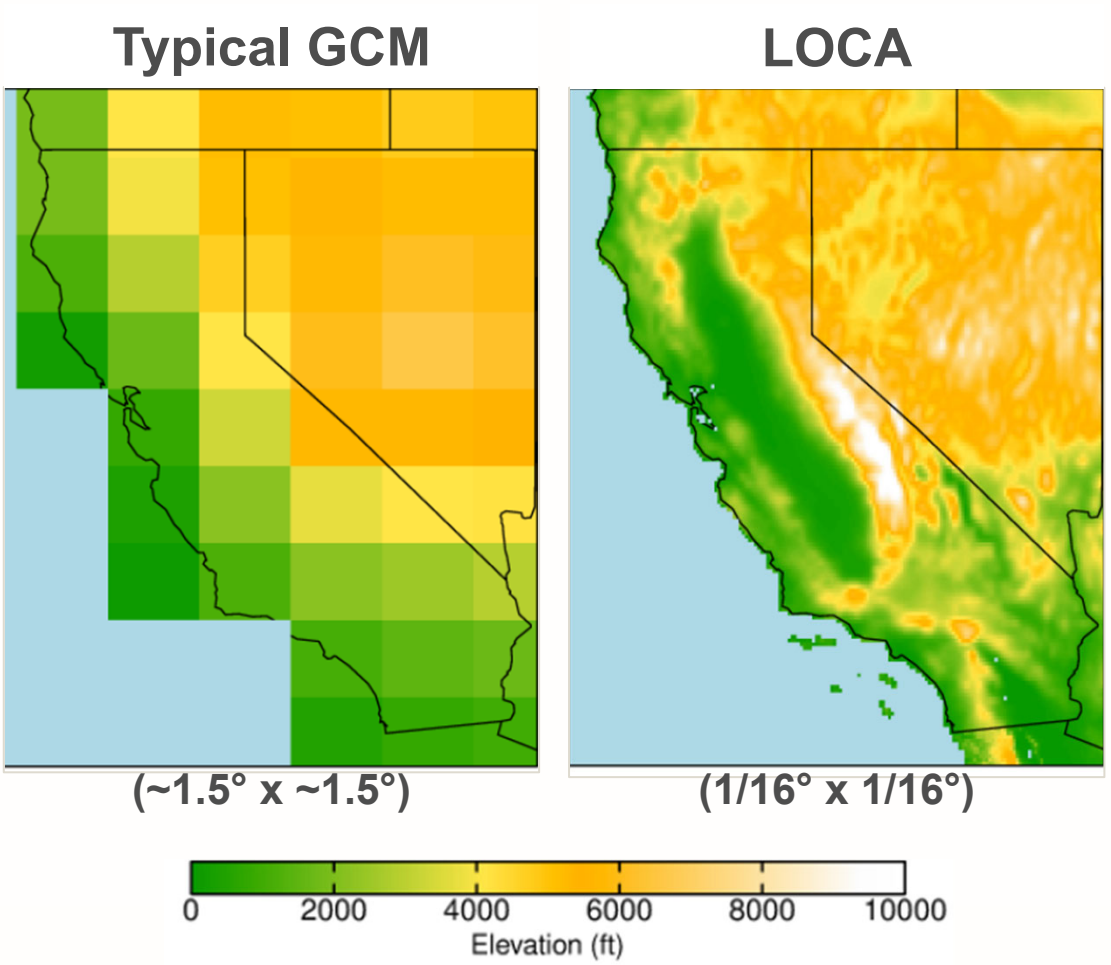
- Further refine the assessment of water supplies and demands for the American River Basin
- Address regional **supply-demand imbalance** and infrastructure deficiencies under the existing and **future climate change conditions**.
- Improve **coordination of local and Federal water management**.
- Align **water management tools**, strategies, and planning efforts of Reclamation and water agencies in the basin.
- Identify water management strategies and actions which remain functional across multiple future potential climate and socioeconomic conditions to 2100 AD.

Downscaled Climate Projections

LOCA Multi-Model Dataset

- 32 Global Climate Models
- 2 long-term emissions scenarios
- Developed at Scripps, publicly available through web-portal
- Recommended by DWR and CWC for long-term planning in California

Spatial Downscaling



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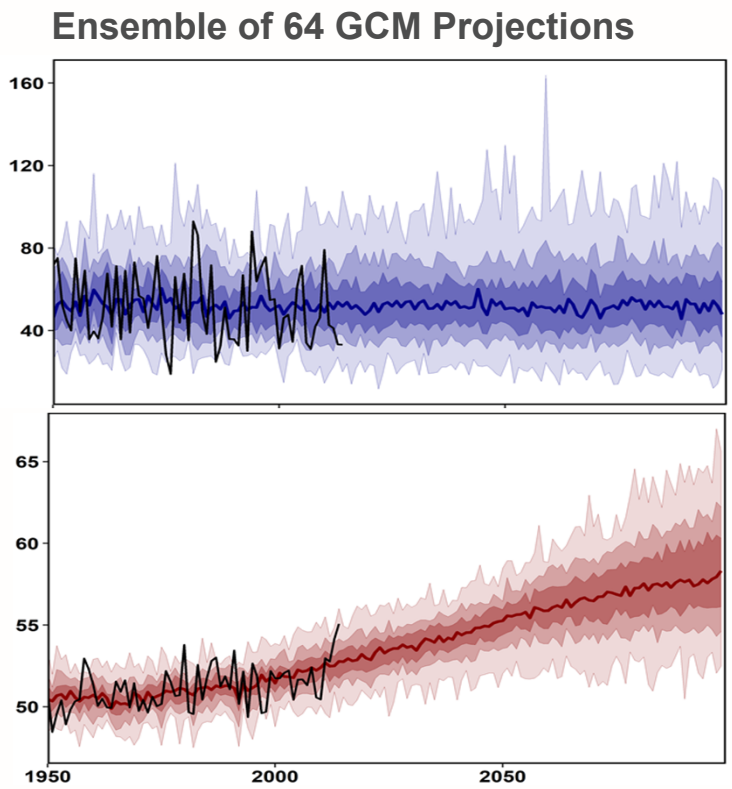
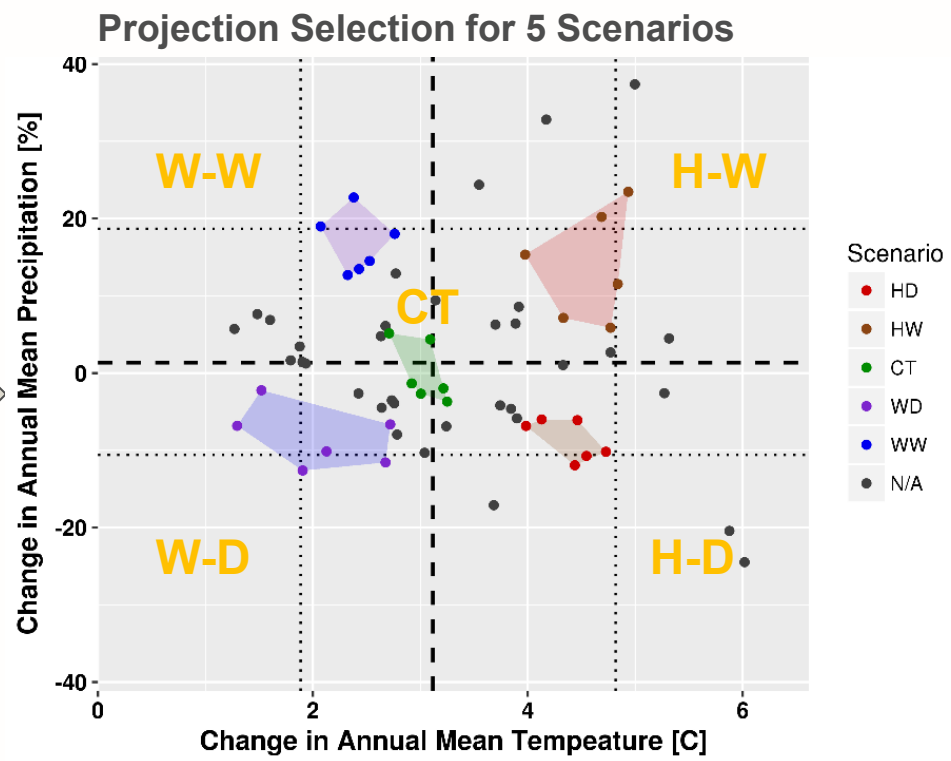
Climate Scenarios

Development of Climate Scenarios for ARBS





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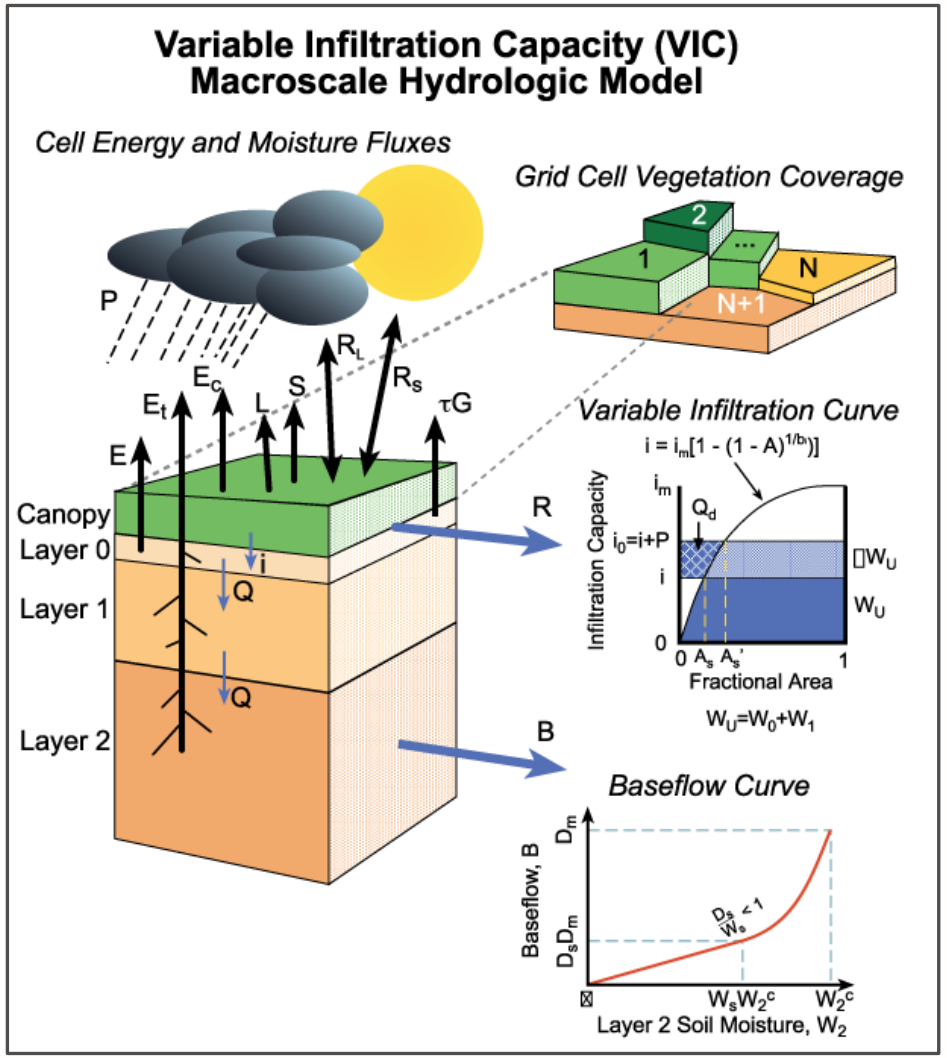
Hydrology Scenarios & CalSim Scenario Inputs

Hydrology Development

- Climate scenarios used to force VIC, a physical process hydrology model used to develop basin hydrology

CalSim Scenario Inputs

- Simulated runoff and potential ET used to re-scale CalSim3 inputs to reflect climate scenarios



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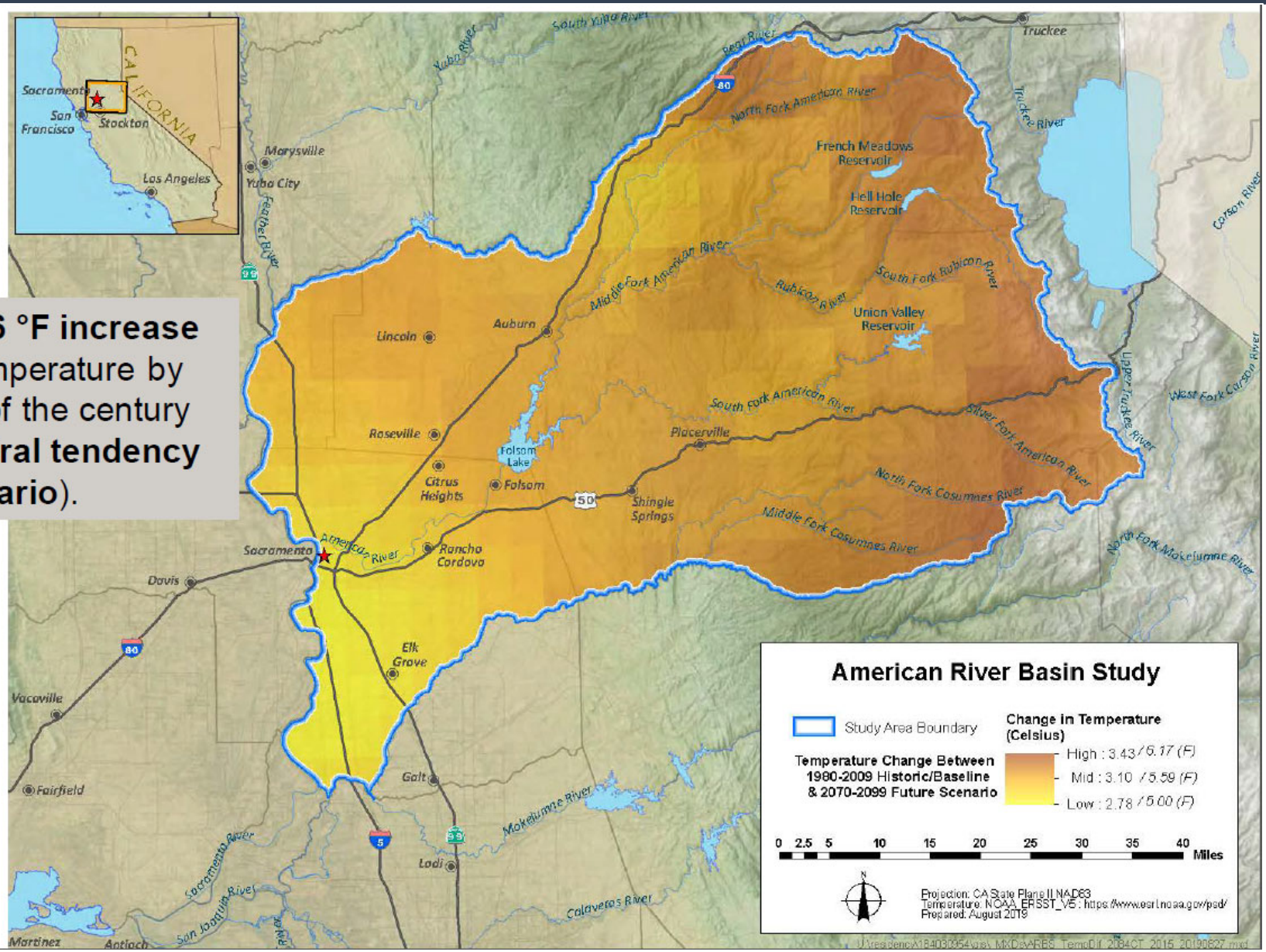
CLIMATE CHANGE PROJECTIONS

ARBS Projection of Temperature Increases by Elevation

5 to 6 °F increase in temperature by end of the century (**central tendency scenario**).



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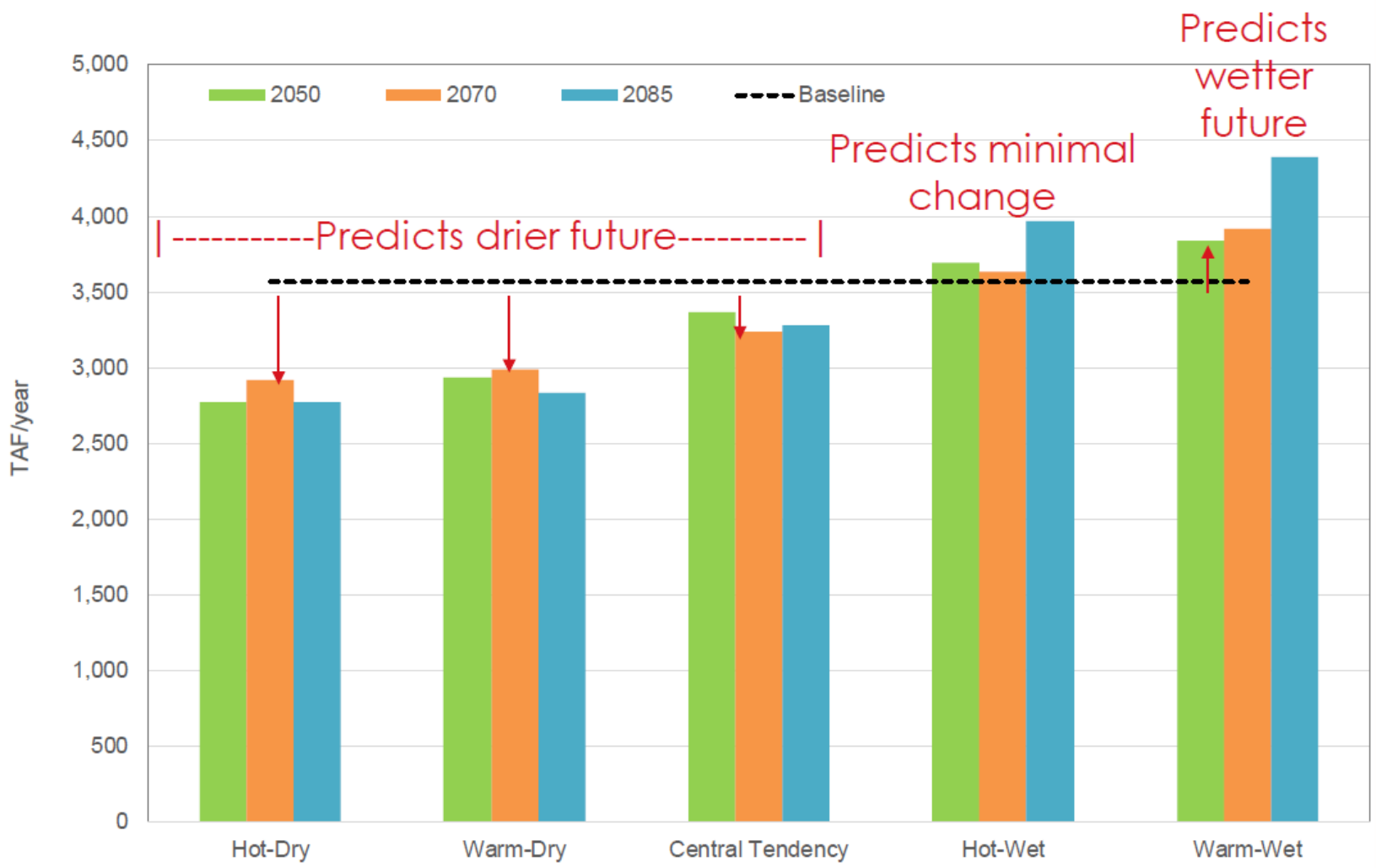
Supply: ARBS Projected Changes in Unimpaired Flow



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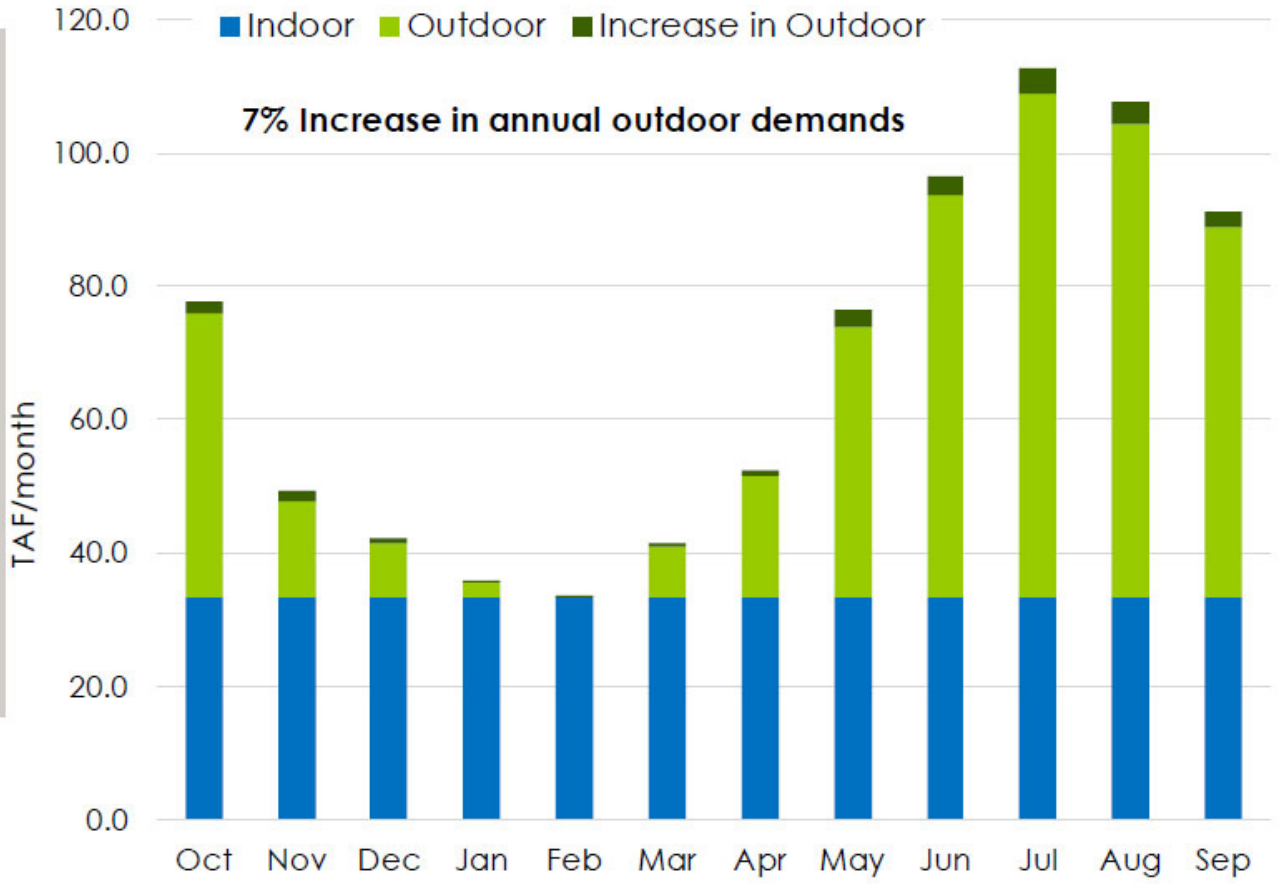
Demands: Increase in irrigation

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)



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Changes in Timing of Runoff

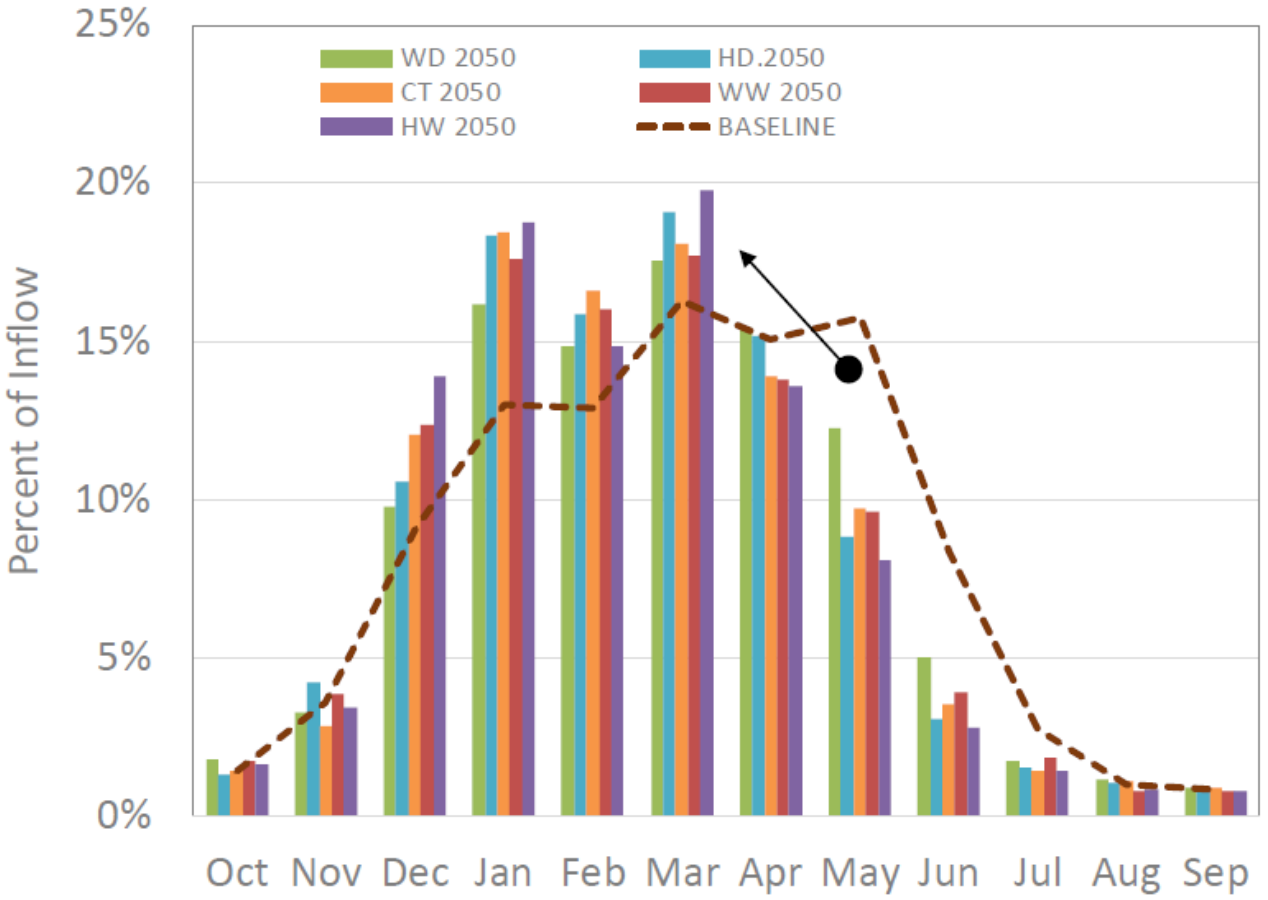
Early snowmelt and less precipitation as snowfall

↓

Runoff will occur earlier in the year

↓

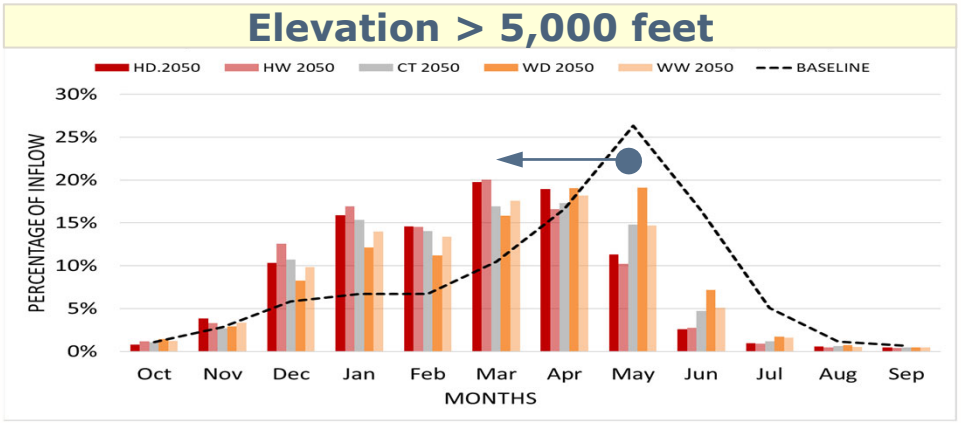
Lower spring runoff



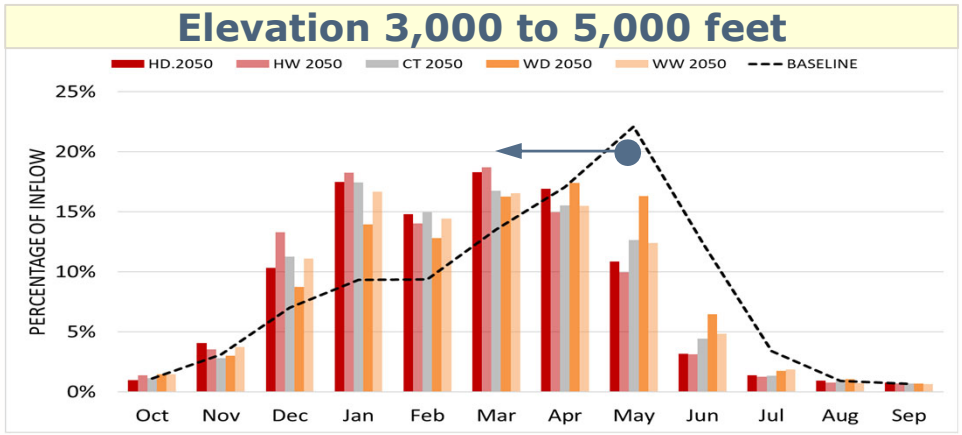
Earlier runoff would **increase the chance of spills** from Folsom reservoir during flood season.

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

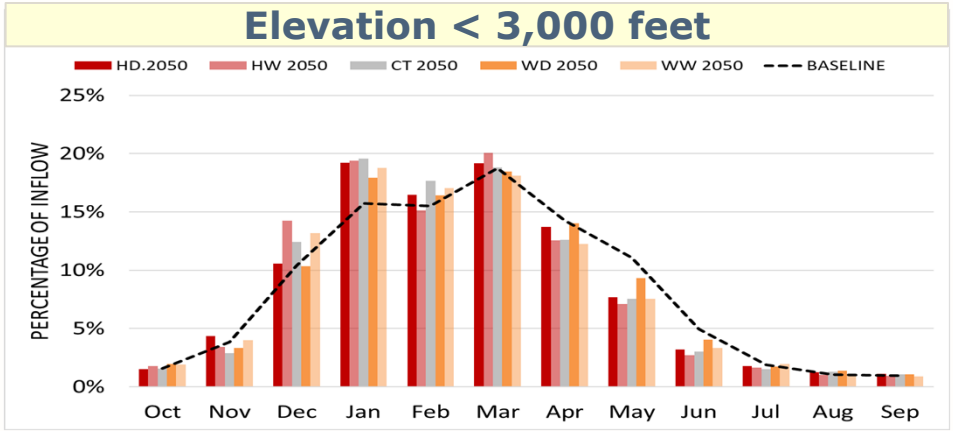
Changes in Timing of Snowmelt



Under future conditions, runoff is **expected earlier** at elevations above 3,000 feet, with peak snowmelt **30-60 days earlier**.



Under historical conditions, runoff occurs in **late spring** at elevations above 3,000 feet, peaking around May.



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ADAPTATIONS

We Can Adapt

Preparing for present-day droughts and preparing for a warming climate involve the same adaptations.

1. Improve Operational Flexibility
   - Increase upstream storage
   - Modified carryover storage targets and timing
   - Develop groundwater bank/expand conjunctive use
   - Relocate diversions to less sensitive locations
   - Implement forecast based flood operations
2. Improve Demand Management
   - Increase water use efficiency
3. Improve Resource Stewardship
   - Improve Headwaters and Forest Health
   - Improve Lower American River Ecosystem
4. Secure Institutional Agreements to Enable Flexibility
   - Resolve water supply contracts
   - Develop water marketing supporting tools and management framework

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QUESTIONS?