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VIC-perturbed CalSim Rim Inflows for Future Climate Scenarios

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Ruian Dong, Jianzhong Wang,
Mohammad Hasan, James Polsinelli, Z.Q Richard Chen

Outline

- Project Background
- VIC-perturbed Rim Inflows Analysis

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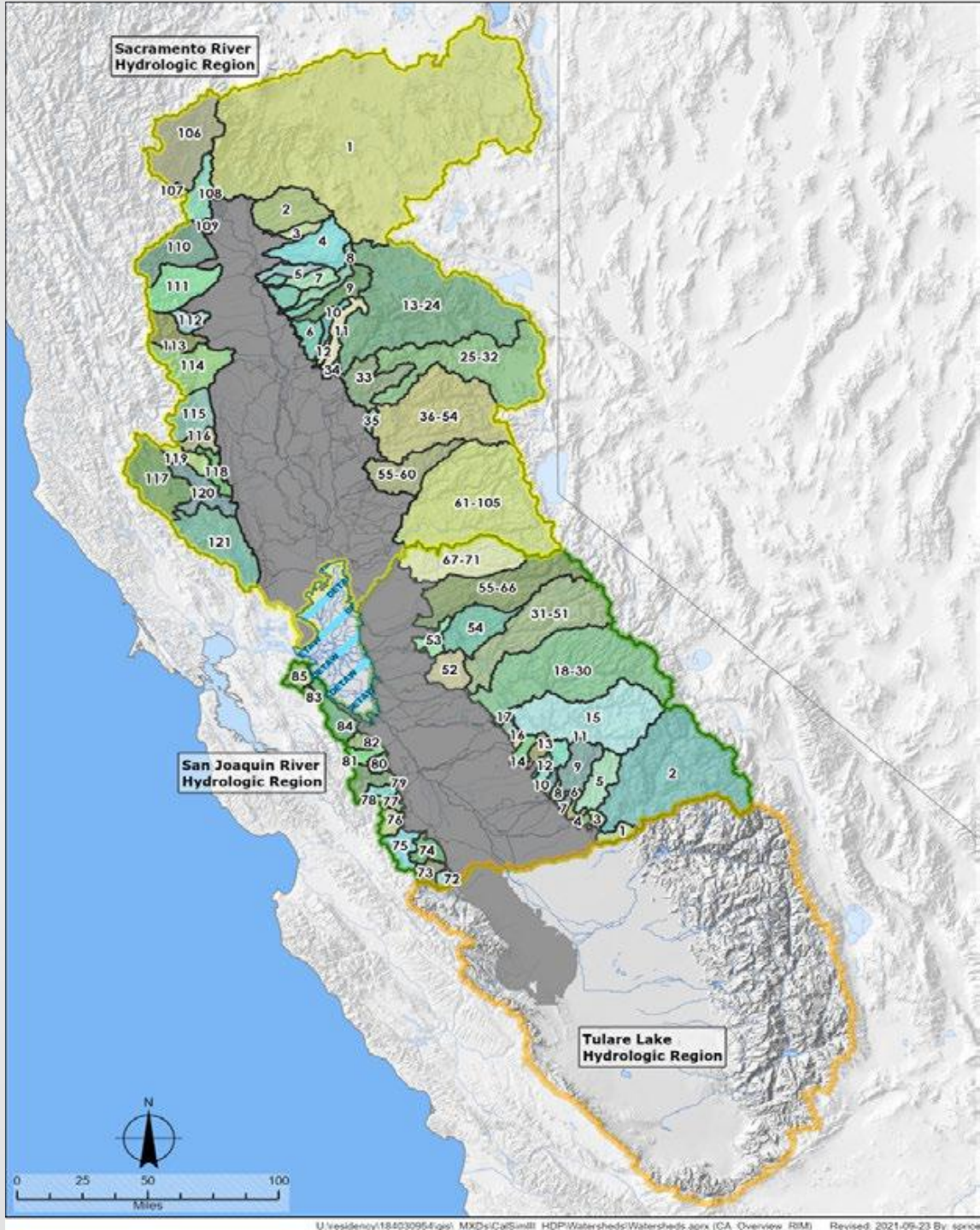
CalSim3 Rim Watersheds

- The foothill and mountainous ‘rim’ watersheds surround the Central Valley in Sacramento River, San Joaquin, and Tulare Lake Hydrologic Regions
- **Rim inflow** includes both runoff and baseflow
- **Runoff** at higher elevations is largely determined by the snowfall and snowmelt cycle.
- Some of the **Precipitation** percolating to groundwater quickly returns to streams as **baseflow**.



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CalSim3 Hydrology Development of Rim Inflows

- CalSim3 **adjusted historical rim inflows** represent the "***baseline conditions***" for the current climate.
- DCR 2023 studies use the risk-informed future climate scenarios at "Levels-of-Concern" to construct **three future climate datasets** as described in the report "Risk-Informed Future Climate Scenario Development for the State Water Project Delivery Capability Report" (DWR, 2023a).
- For DCR 2023, three combinations of changes from the baseline (***Base***) of mean temperature and mean precipitation were selected to represent future climate scenarios under 2043 future conditions at 50th percentile level-of-concern (***LOC50***), 75th percentile level-of-concern (***LOC75***), and 95th percentile level-of-concern (***LOC95***).

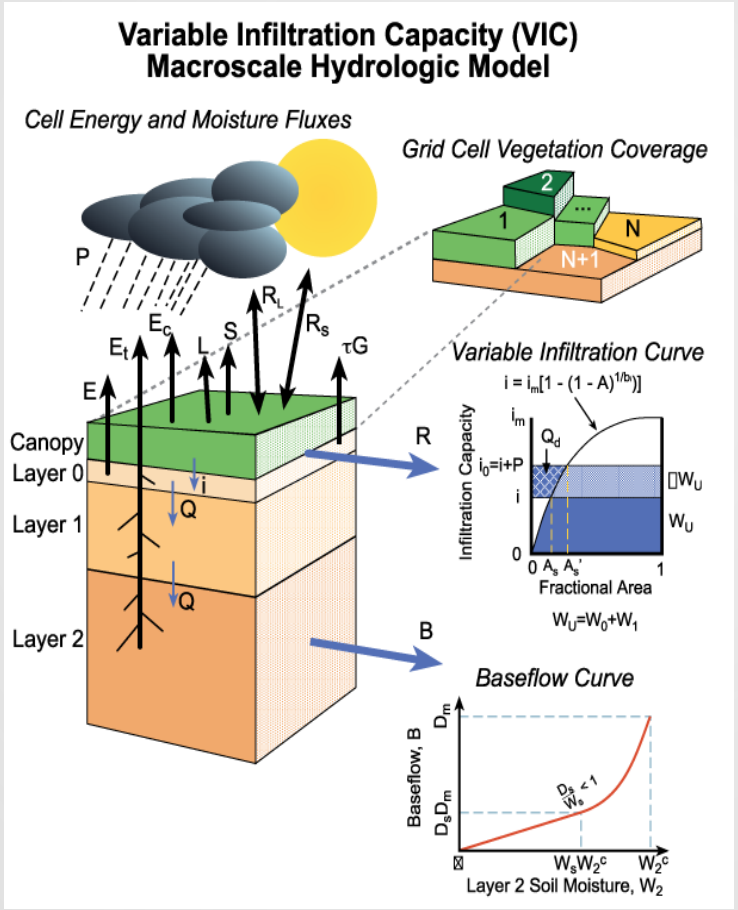
Table 20-1. List of Climate Scenarios

Climate Scenario	Change in Temperature (°C)	Change in Precipitation (%)
Base	0	0
LOC50	1.5	1.50%
LOC75	1.7	0.10%
LOC95	1.8	-1.80%

Rim Inflows Development for CalSim3 Future Climate Scenarios

VIC Inputs

- Grided daily precipitation
- Maximum daily temperature
- Minimum temperature
- Wind speed



VIC Simulation Results

Perturbation

$$Ratio\_LOC50 = F(VIC\_LOC50, VIC\_Base)$$

$$CS3\_LOC50 = CS3\_Base \times Ratio\_LOC50$$

VIC Perturbation Results

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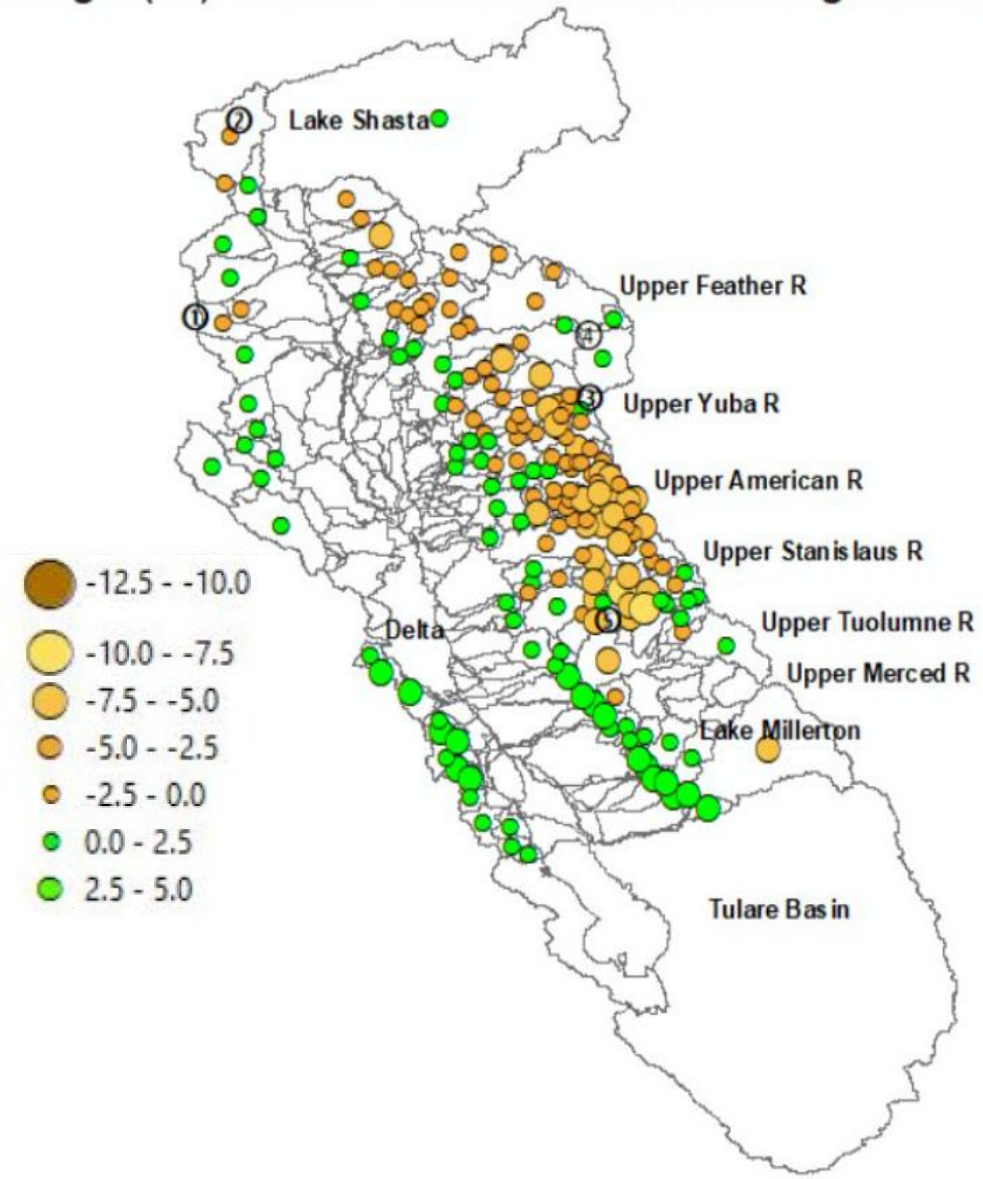
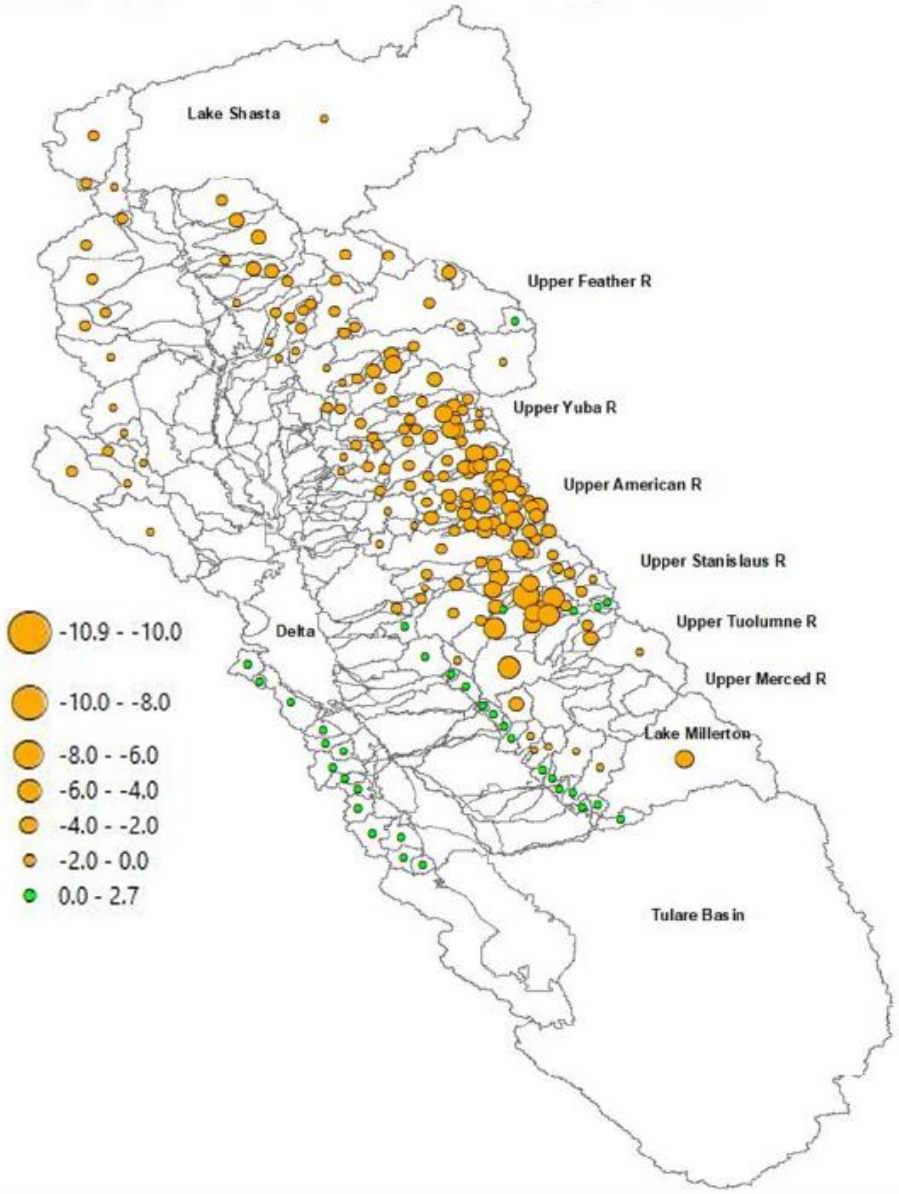
Rim Inflows Changes – LOC 50



LOC 50
1.5° C Temperature change
1.50% Precipitation change

- Most of the sub-watersheds in the foothills and coastal ranges show relatively small **increasing** trend.

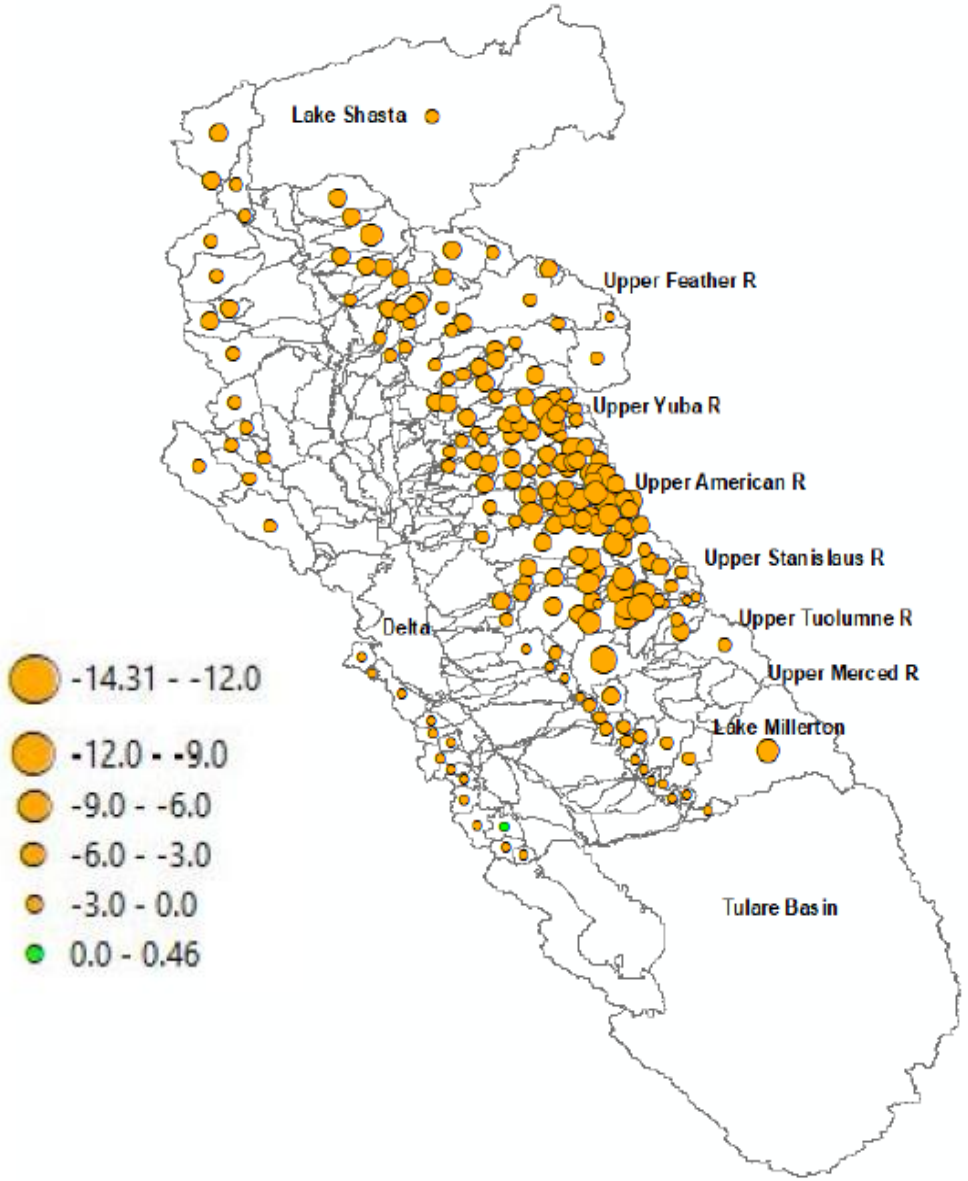
- Most of the higher-elevation sub-watersheds show **decreasing** trend.



LOC 75
1.7° C Temperature change
0.10% Precipitation change

Rim Inflows Changes – LOC 75

- Annual flow changes predominantly exhibits **decreasing** tends for sub-watersheds in the Sacramento and San Joaquin River basins.
- Some slight **increasing** trends remain.



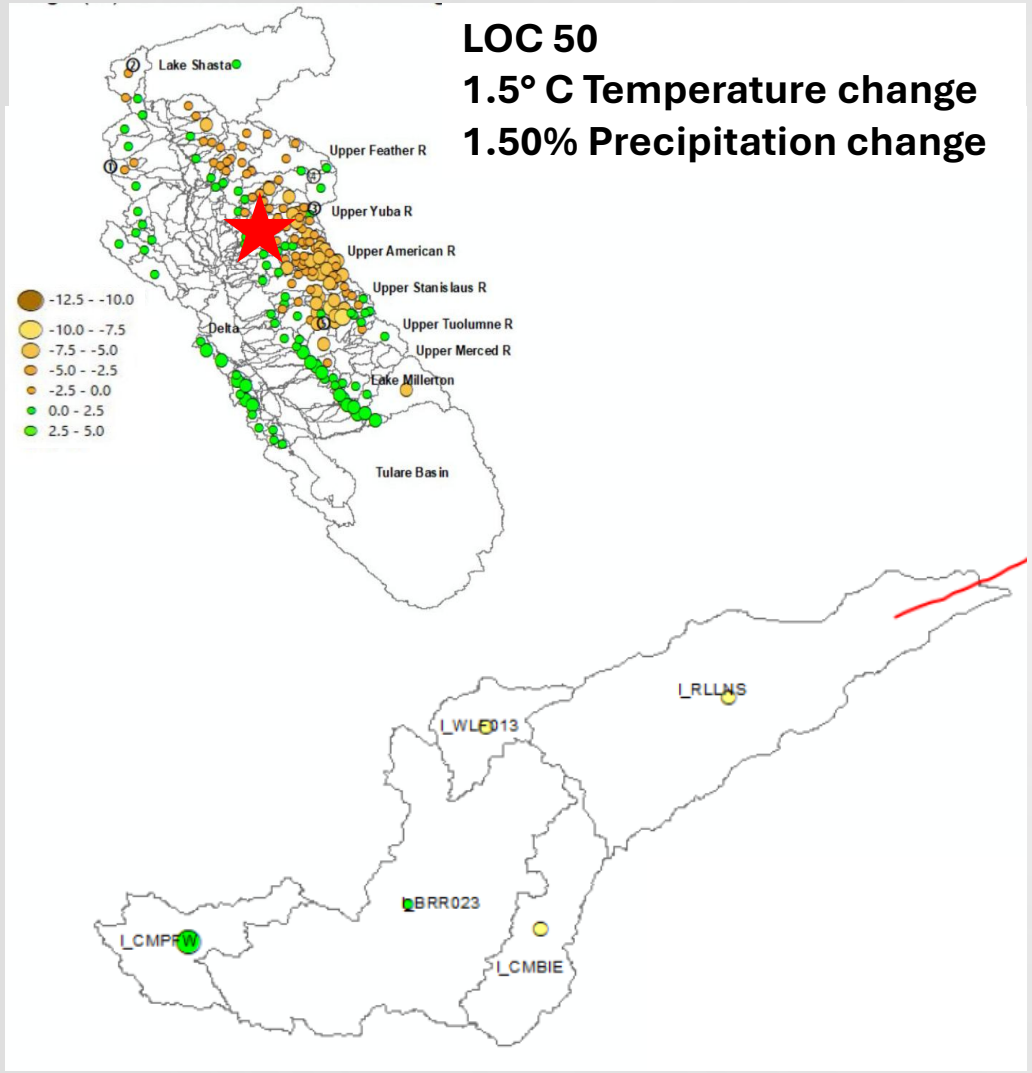
LOC 95
1.8° C Temperature change
-1.80 % Precipitation change

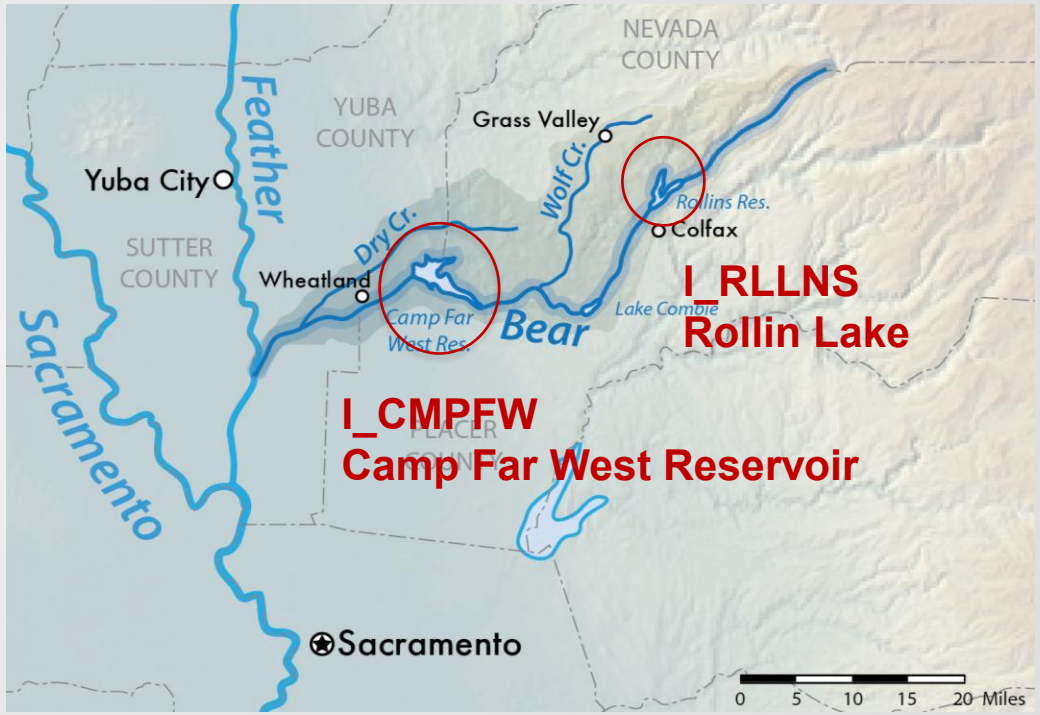
Rim Inflows Changes – LOC 95

- **Decreasing** trend prevails for all the sub-watersheds in the Sacramento River basin and San Joaquin River basin.

- One single watershed at the westside of San Joaquin, I_ORT014, which shows a relatively small **increasing** trend.

Rim Inflow Changes in Bear River Basin





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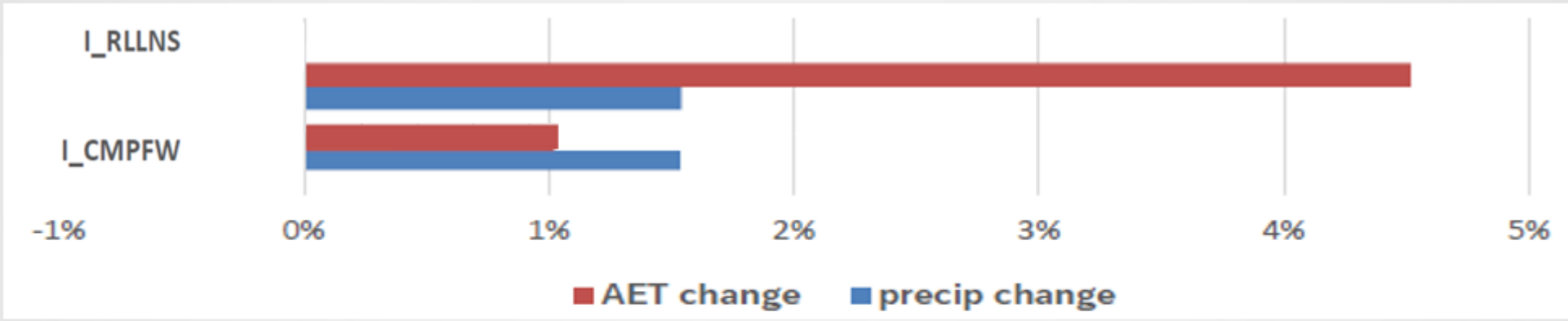
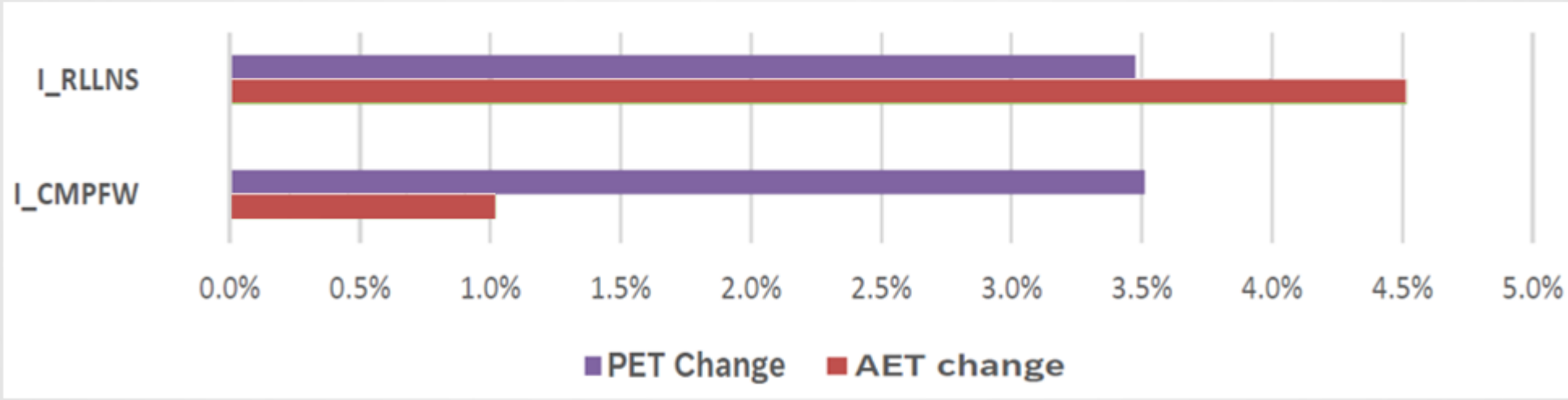
$$\textbf{\textit{Precipitation}}(P) - \textbf{\textit{Actual Evapotranspiration}}\ (AET)$$

$$= \textbf{\textit{Runoff}} + \textbf{\textit{Baseflow}} + \textit{Soil Moisure Change}$$





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Conclusion

- Rim inflows not only response to precipitation change signal in the future but also influenced by actual evapotranspiration.
- Potential evapotranspiration (PET) changes are very similar, but actual evapotranspiration (AET) changes can be so different across watersheds that result in the rim inflow trend are different, even opposite.

Questions