Simulating Future Runoff and Water Use in the Carson River Basin

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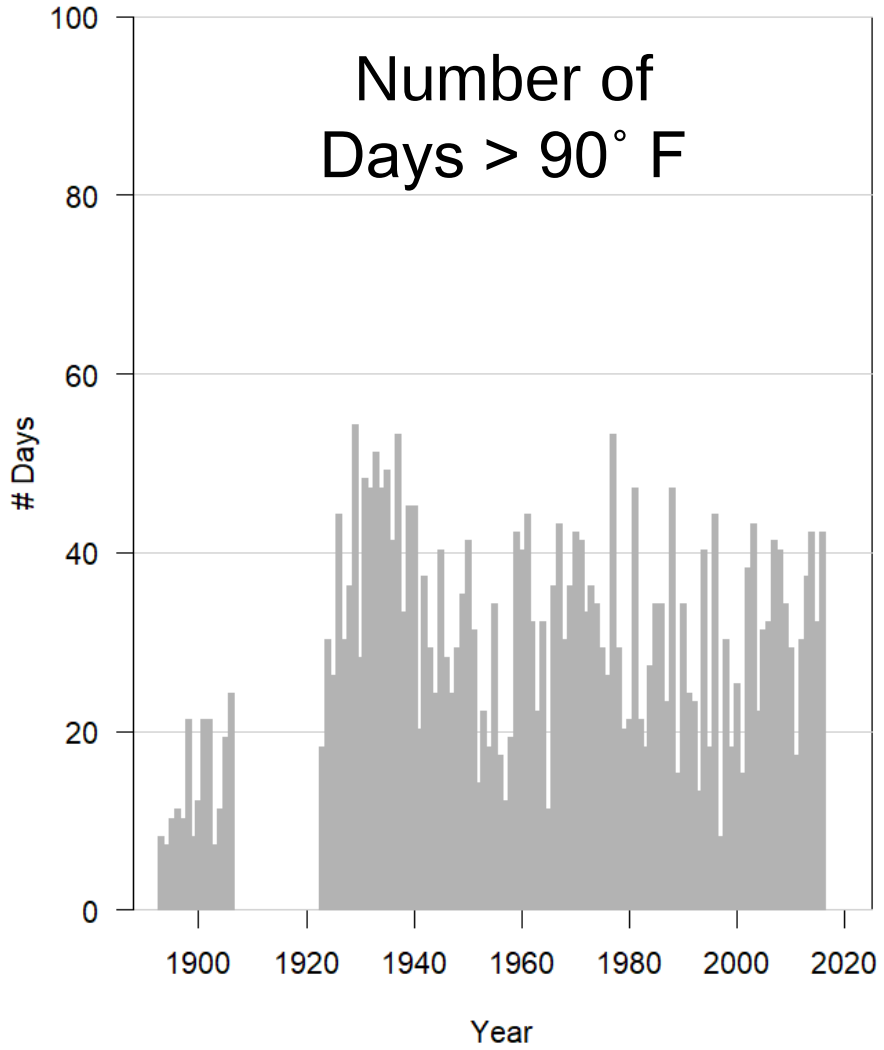
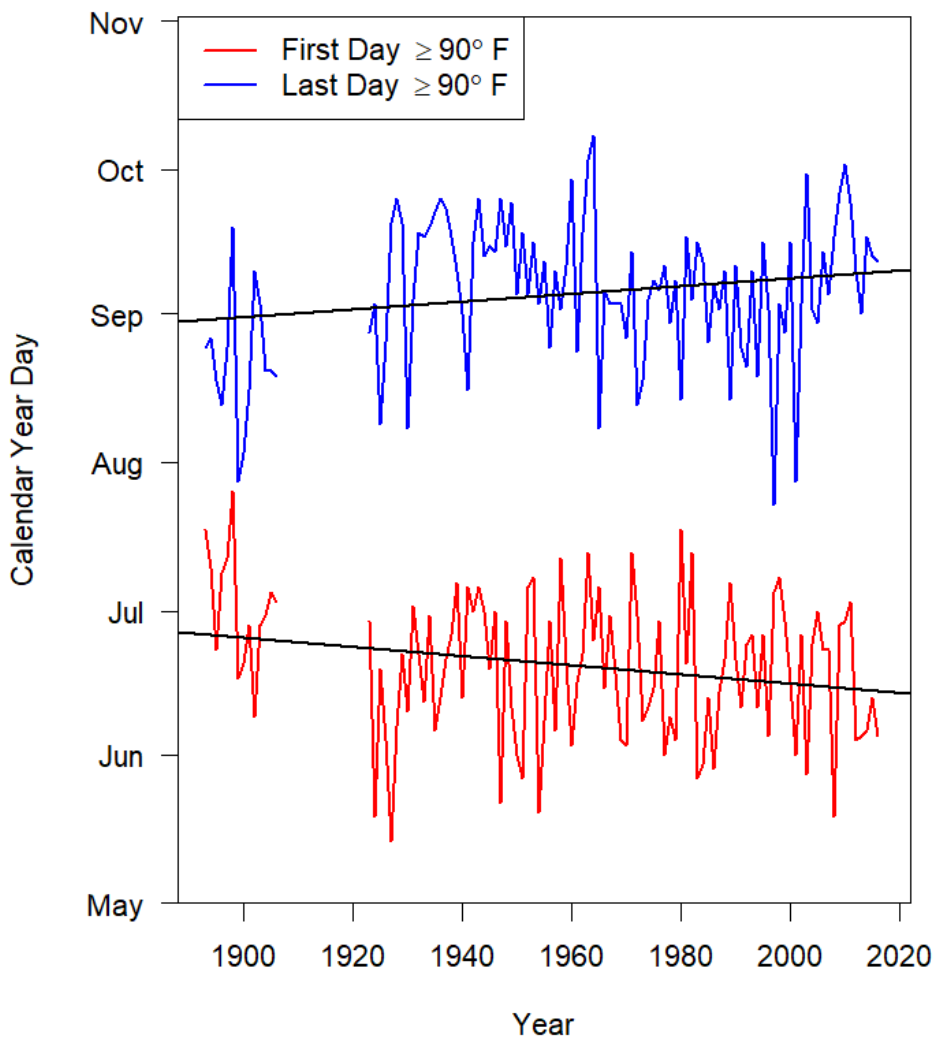
Overview

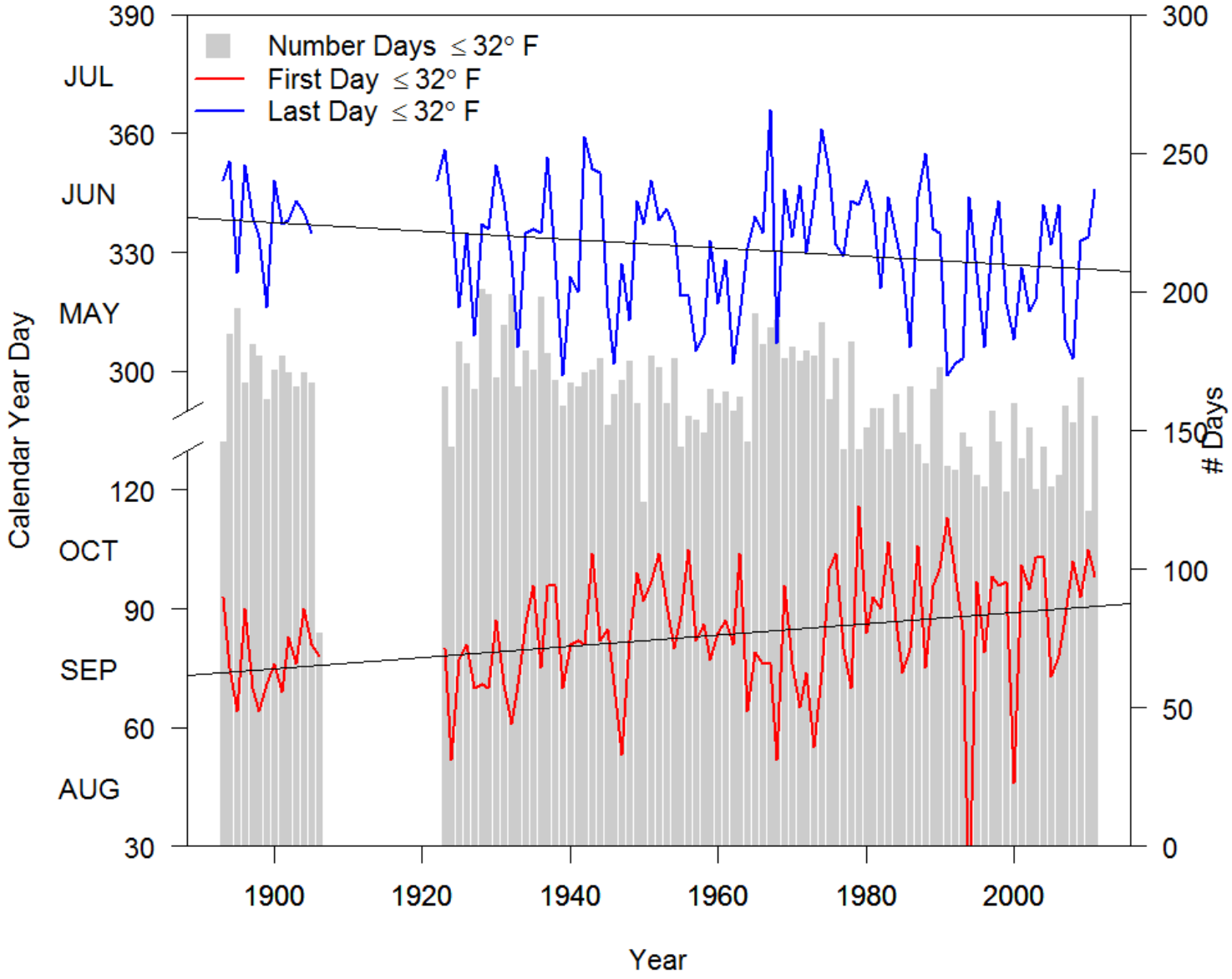
- What does the historical data suggest?
- What adjustments do our models need to account for changing runoff patterns?
- How does the system respond?
- Who is affected?

More “hot” days





Fewer “cold” days



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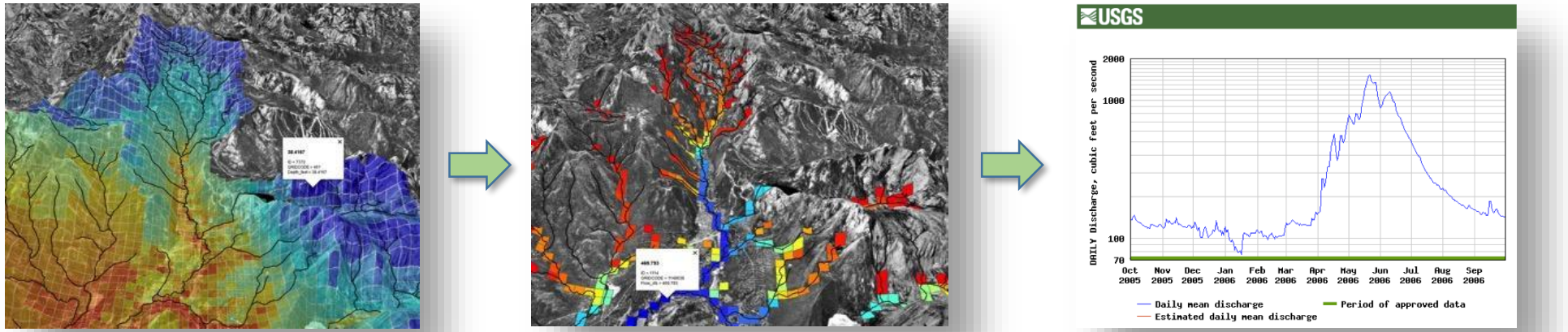
Modeling Introduction

2-prong modeling approach

1. Focus on hydrology



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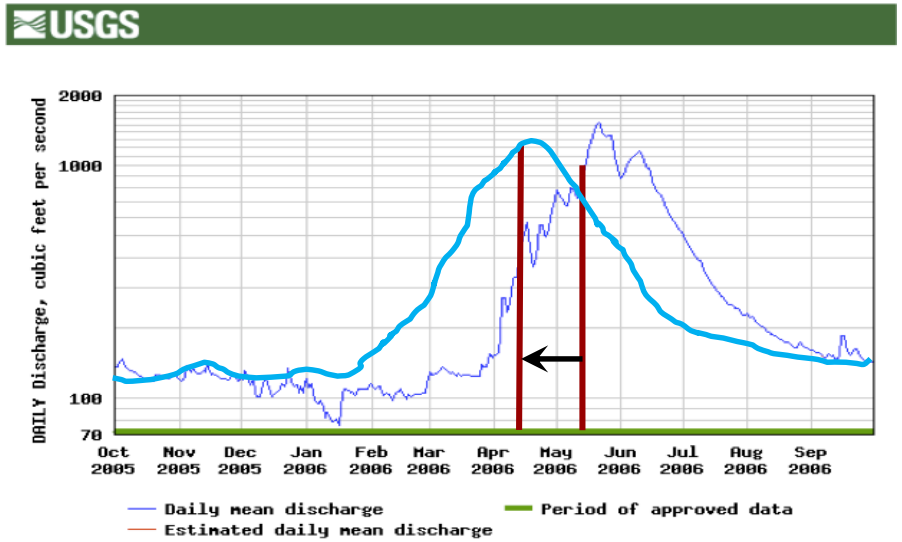
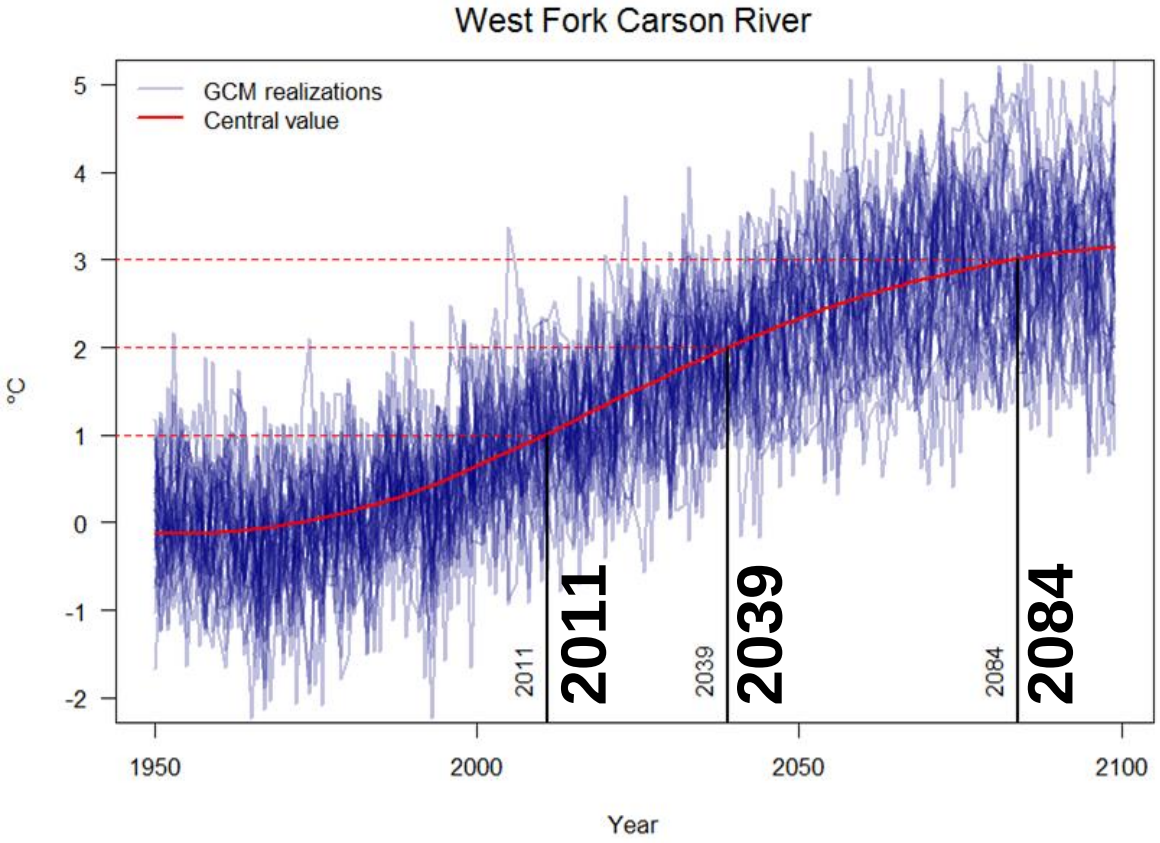
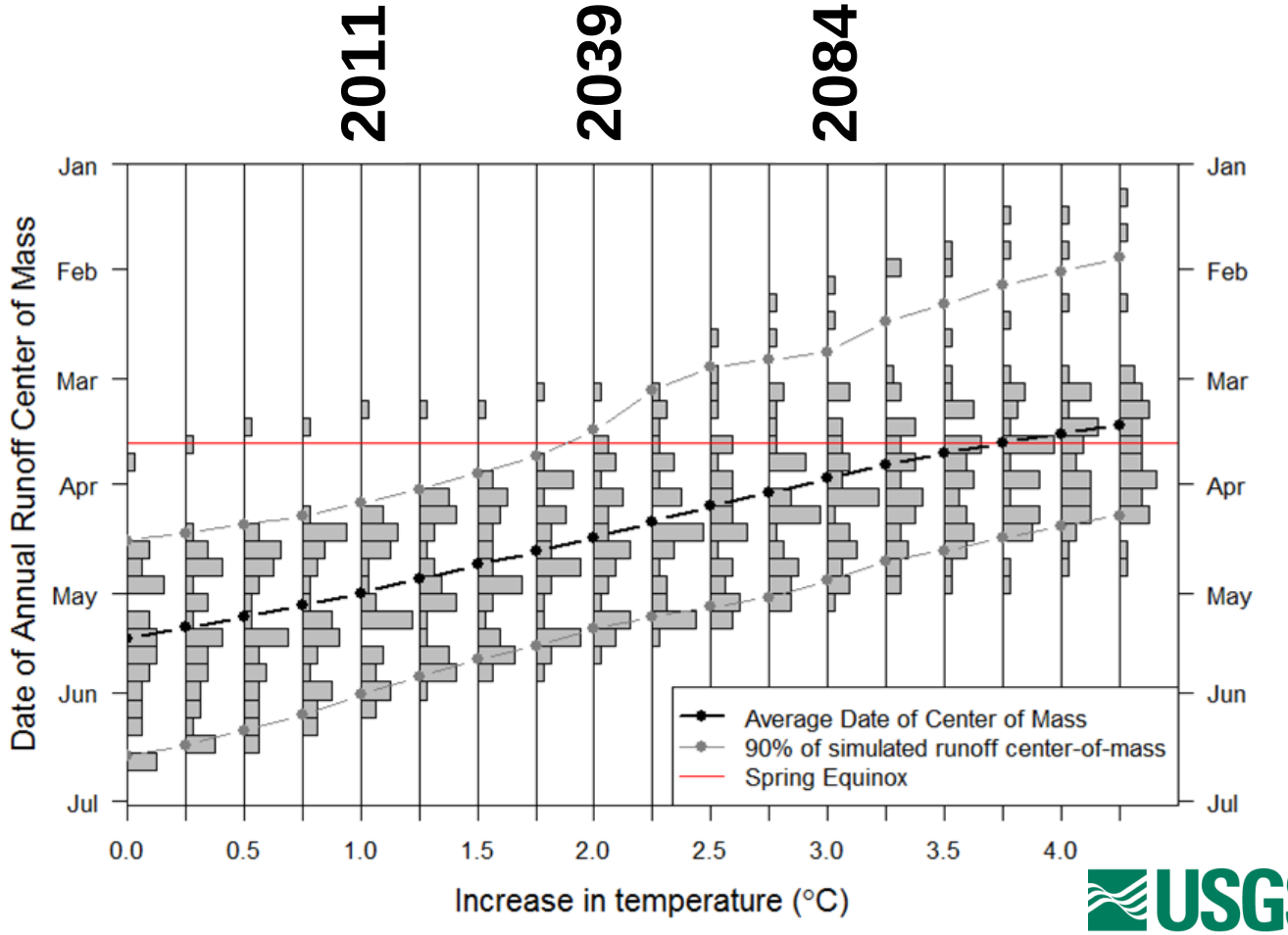
Julian day of 50% of total annual runoff for different levels of warming







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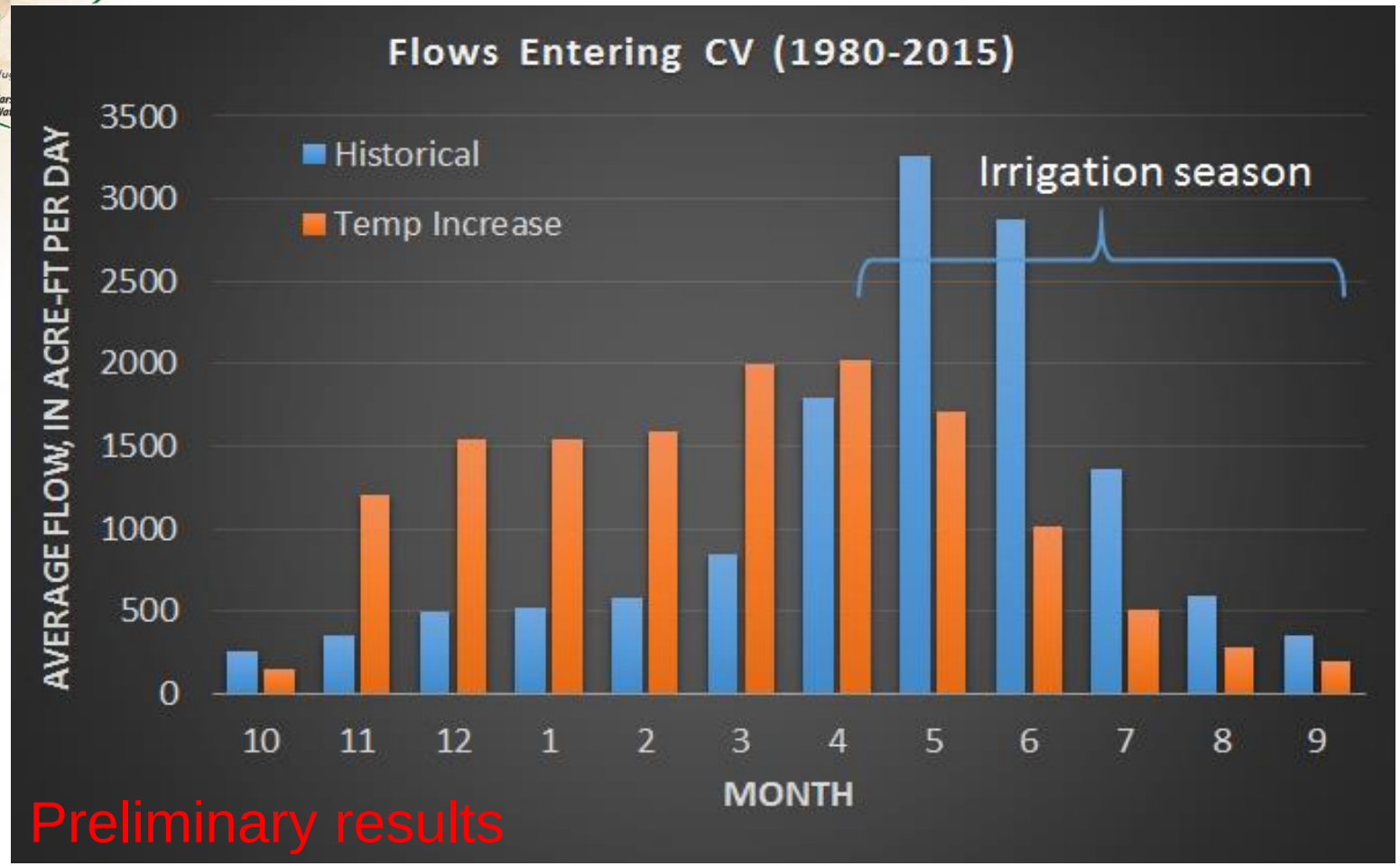
Impacts of Warming on Inflows to Carson Valley



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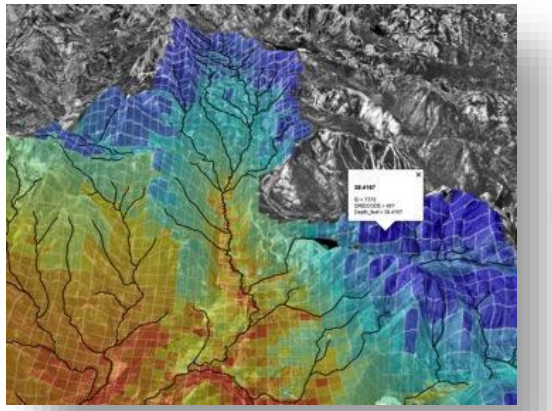
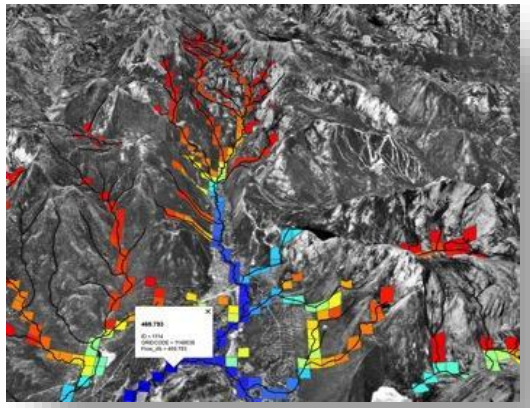
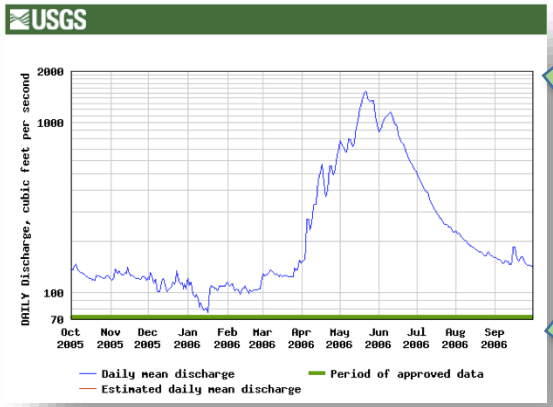
Modeling Operations

2-prong modeling approach

1. Focus on hydrology

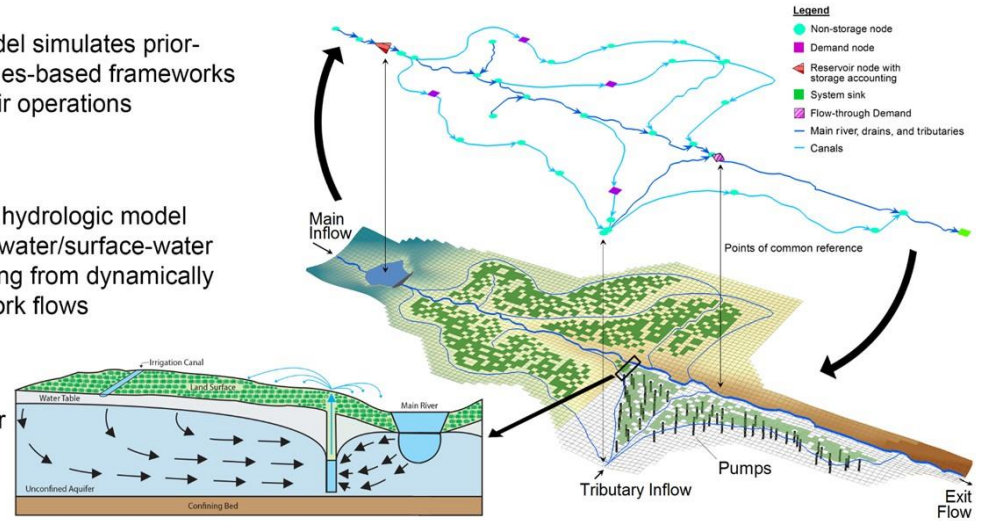






2. Focus on river operations

- Network flow model simulates prior-appropriations/rules-based frameworks including reservoir operations
- Physcially-based hydrologic model simulates groundwater/surface-water interaction resulting from dynamically determined network flows
- Conjunctive water use modeling



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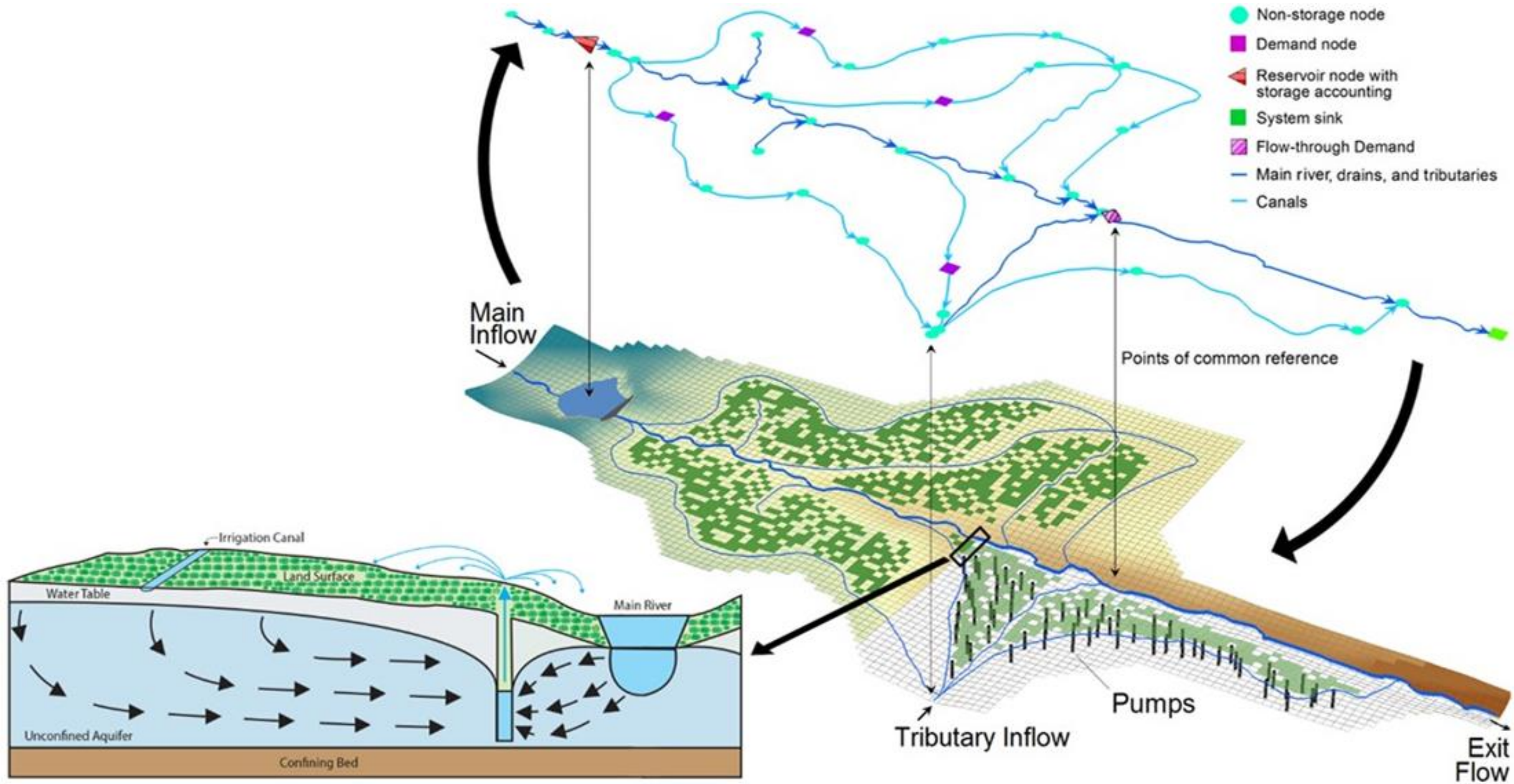
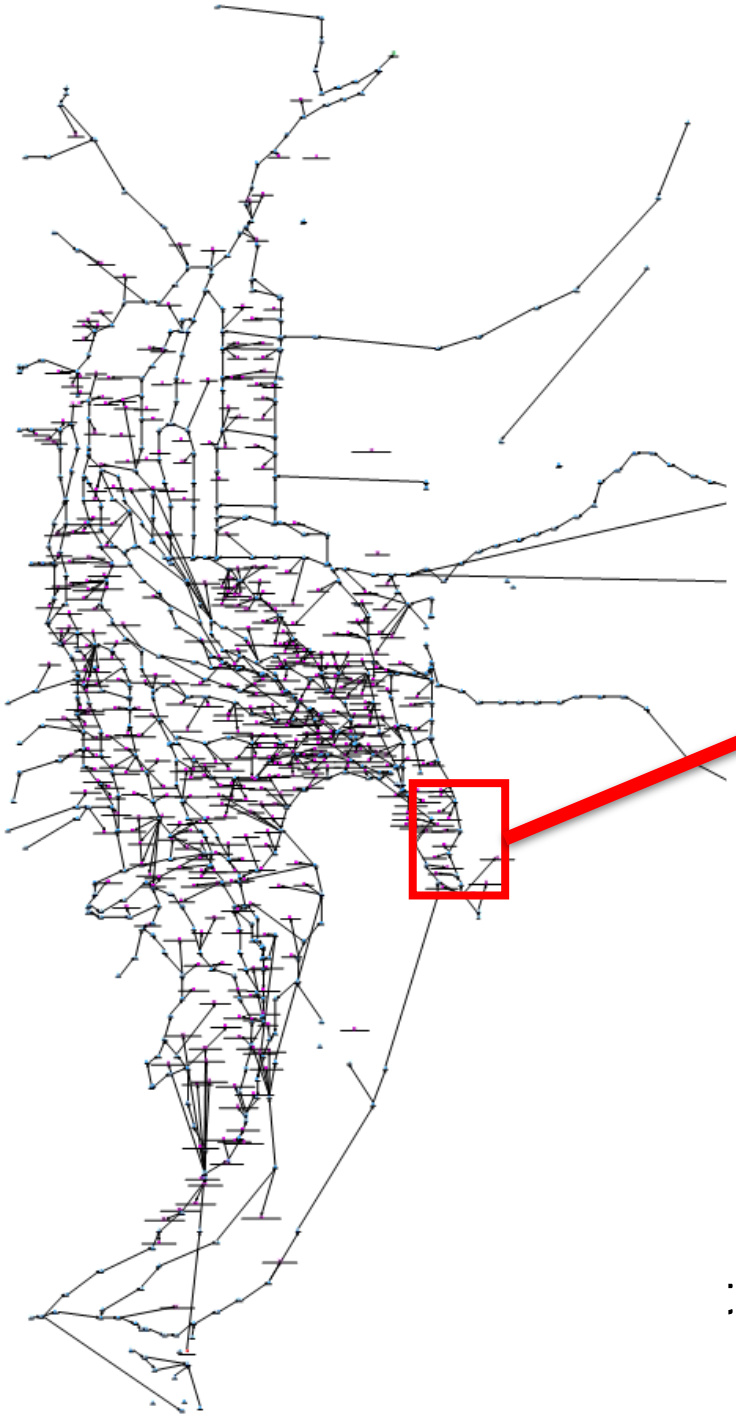
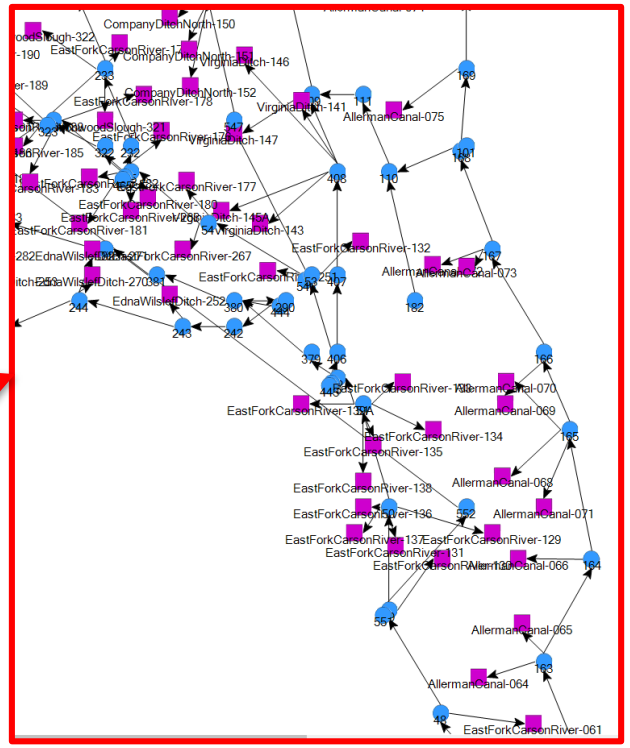
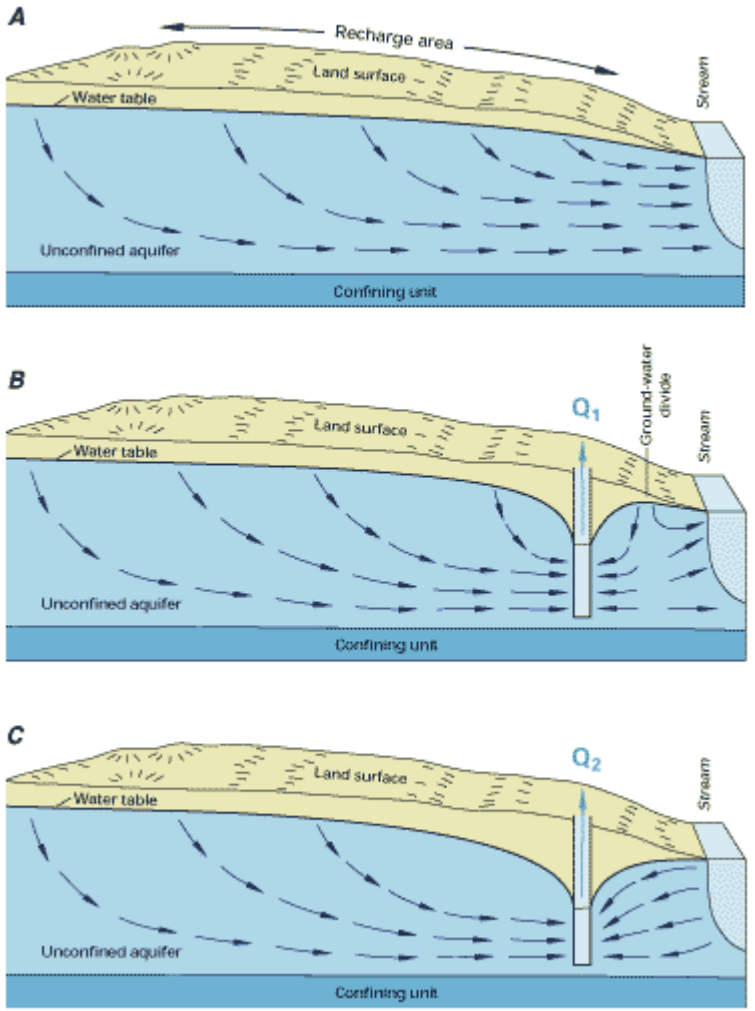

Non-storage node
Demand node
Reservoir node with storage accounting
System sink
Flow-through Demand
Main river, drains, and tributaries
Canals
Main Inflow
Points of common reference
Irrigation Canal
Land Surface
Water Table
Main River
Unconfined Aquifer
Confining Bed
Tributary Inflow
Pumps
Exit Flow

Carson River Operations Model







MODSIM

:p://modsim.engr.colostate.edu/

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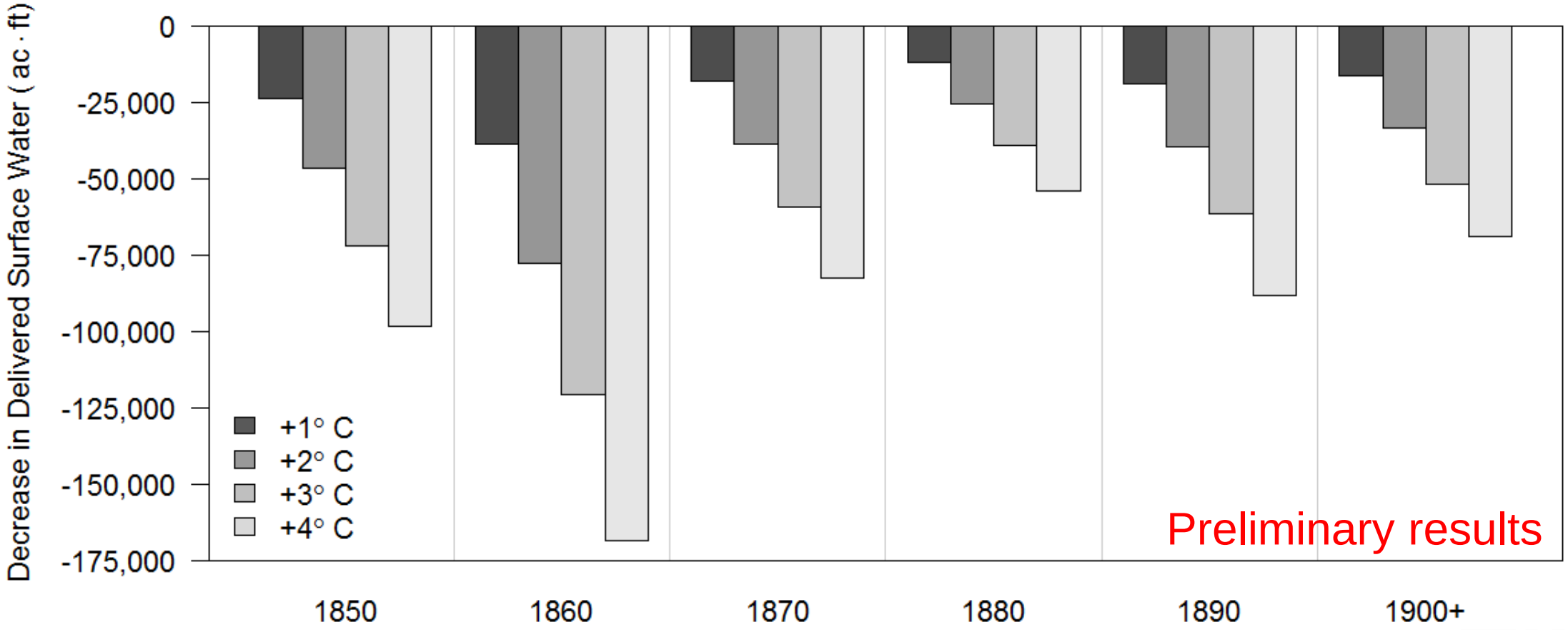
Total Delivery – All Decades
Simulations for 1980-2015
All Results are differenced from Historical +0C



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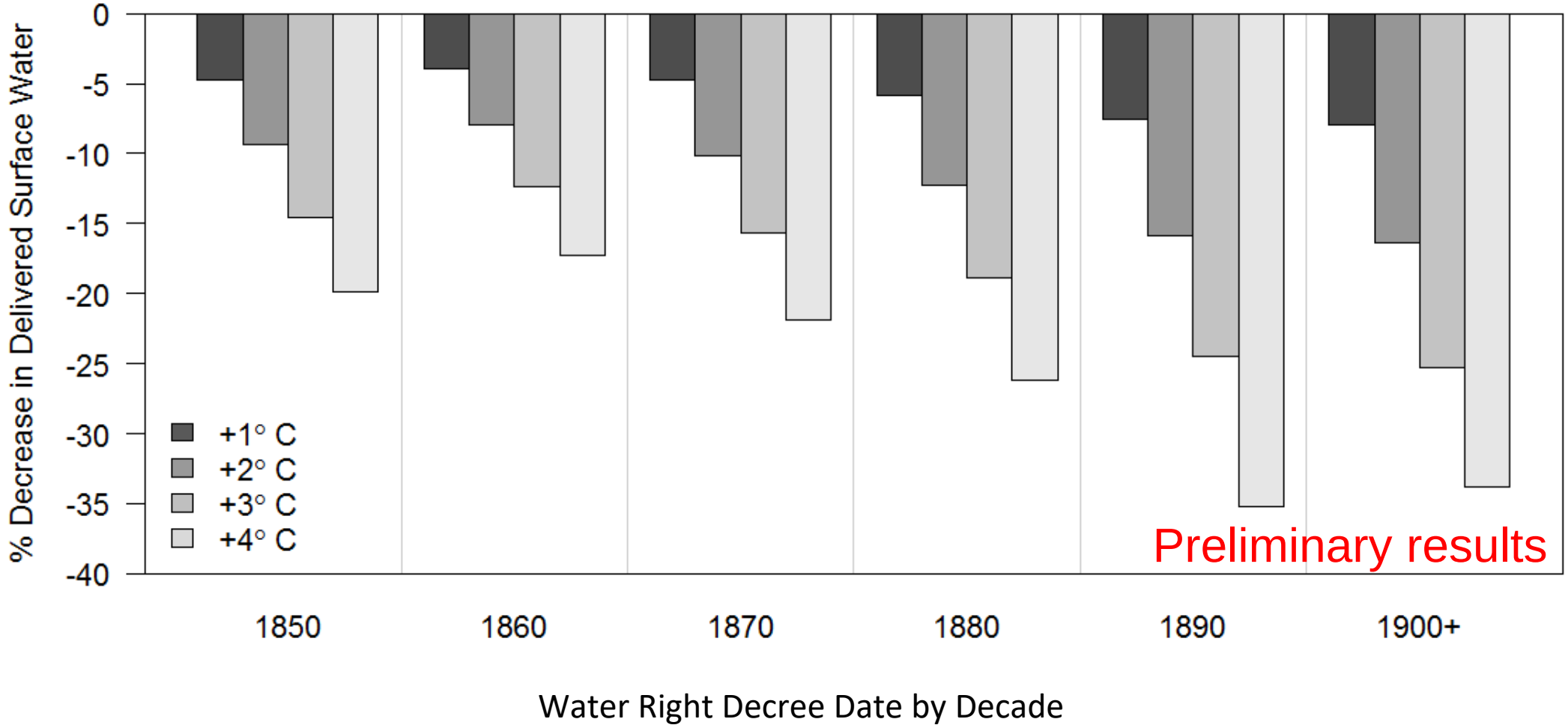
% Change in Delivery – All Decades



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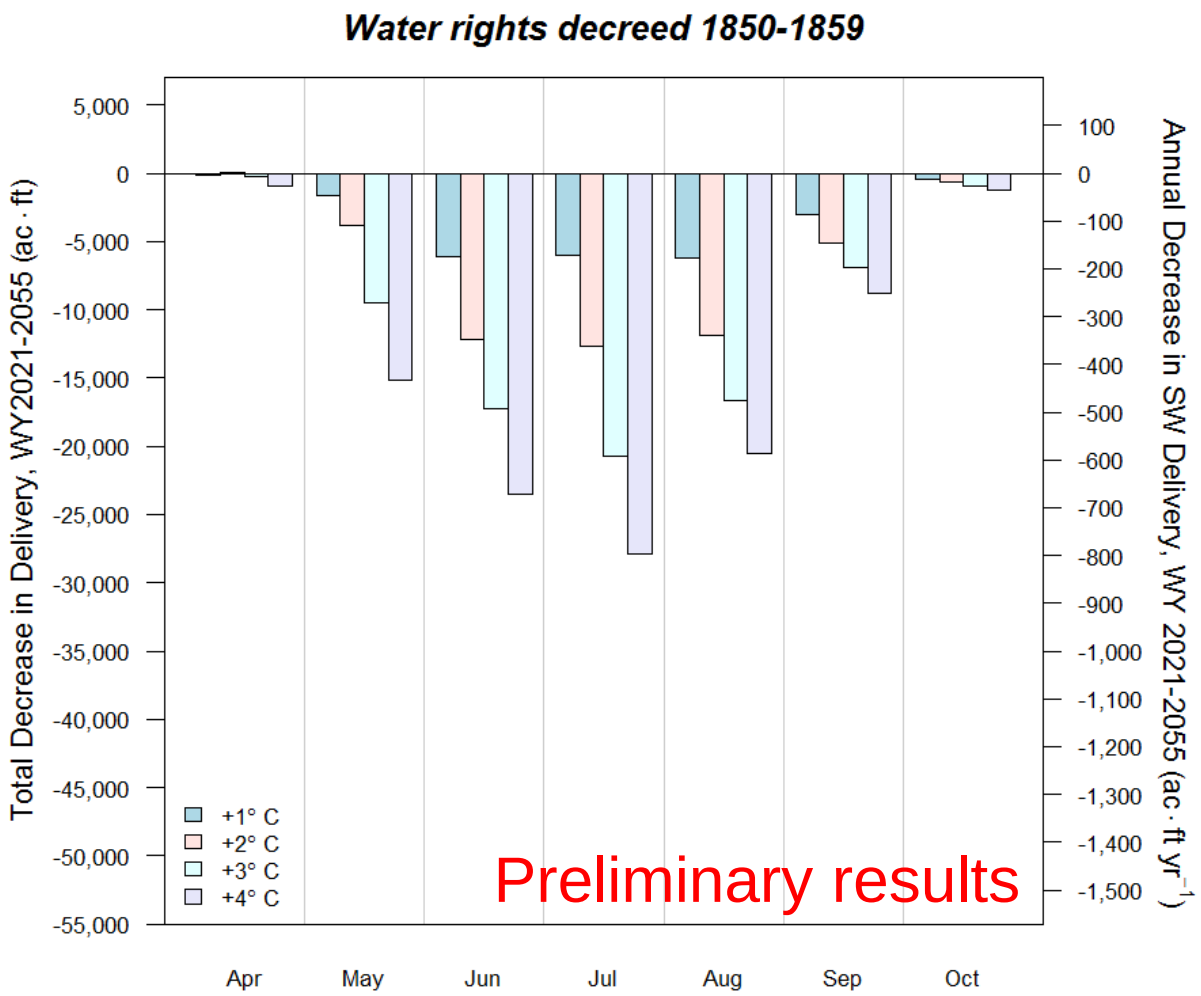
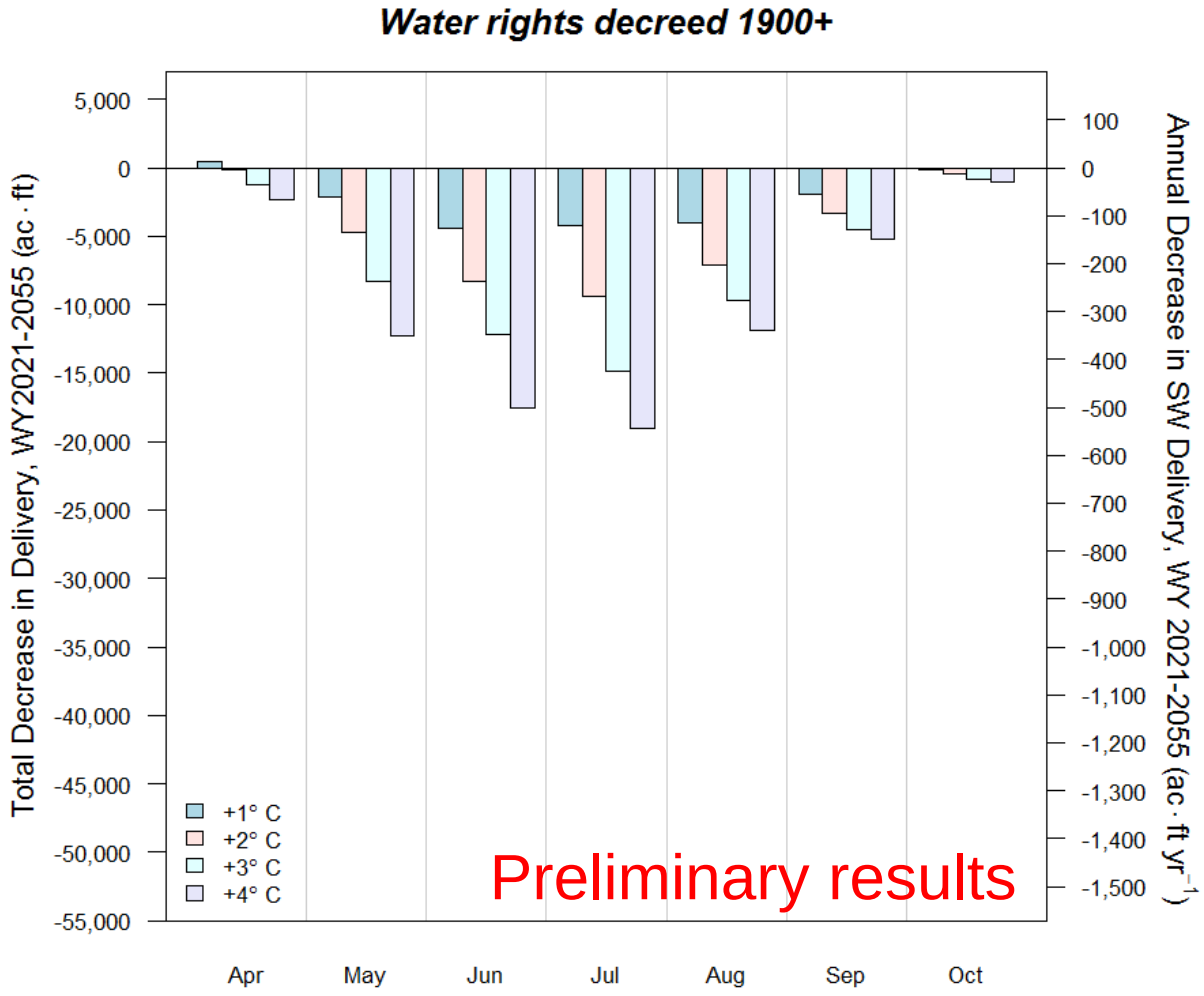
Total Delivery – first/last decade of decreed WRs





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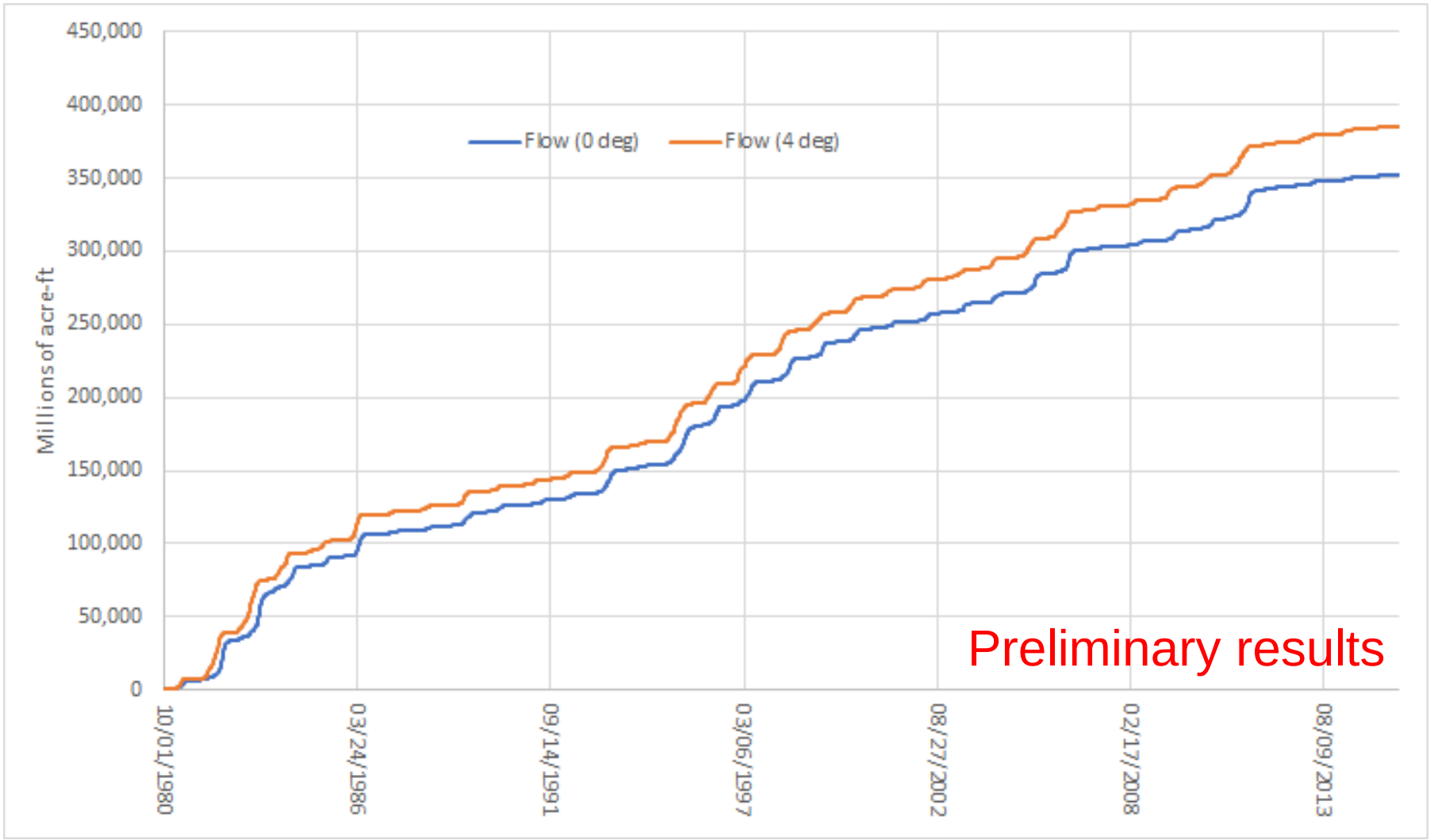
Cumulative Flows at Ft. Churchill



Average increase of 22,000 acre-ft per year of water flowing to Lahontan

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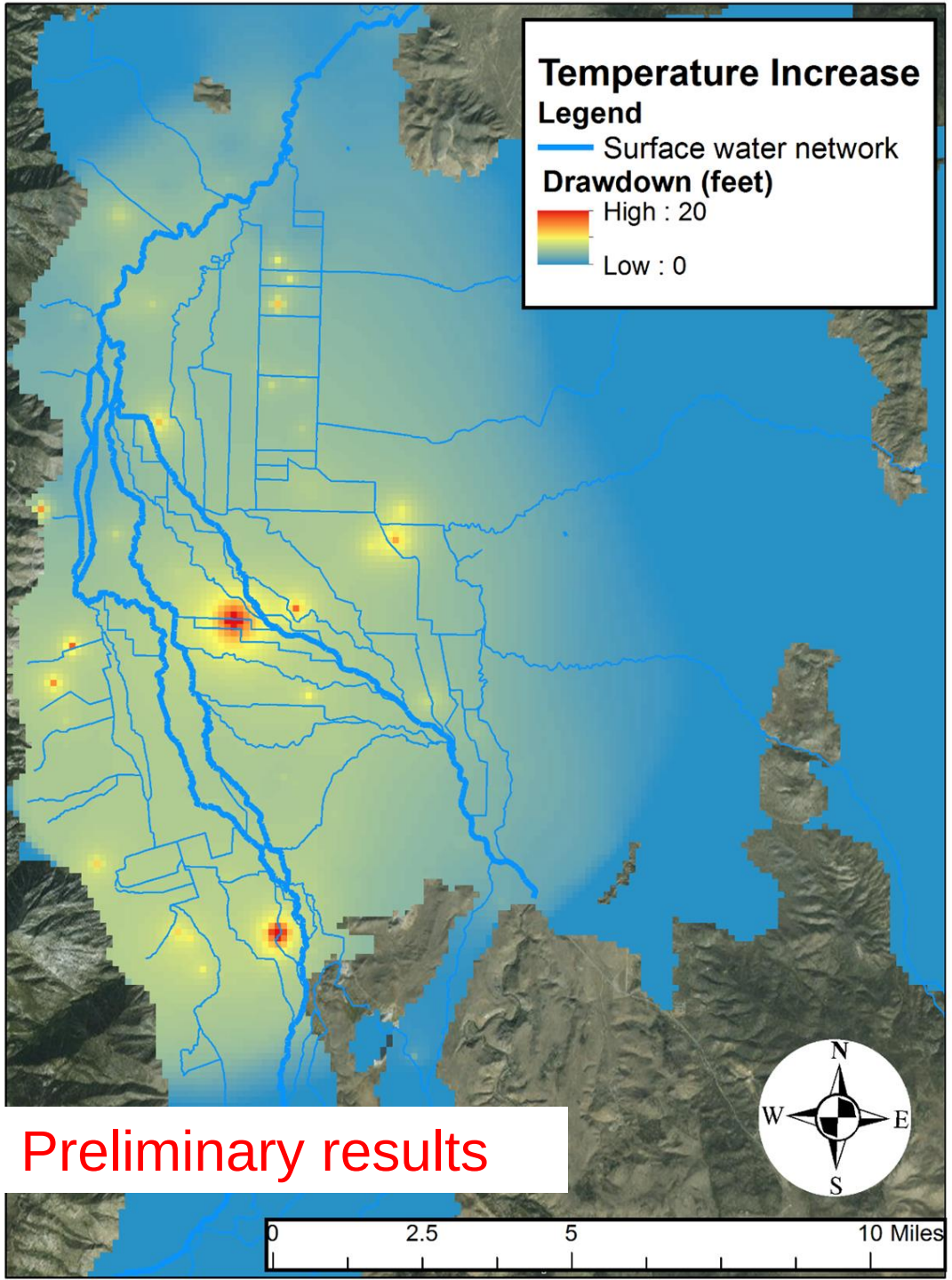

Preliminary results

Differences in GW drawdown (+4.3C)

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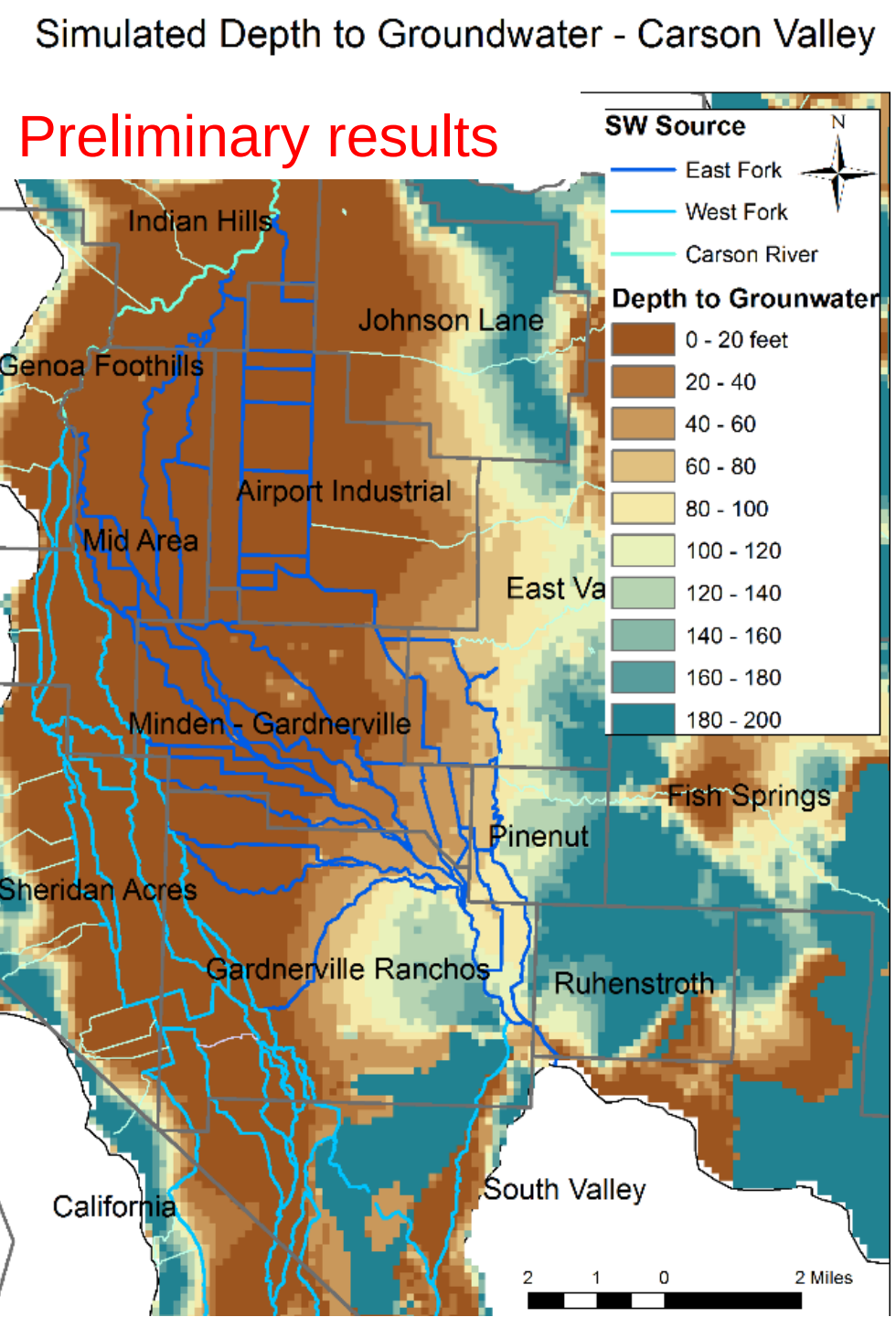

Potential for Managed Aquifer Recharge

- Where can groundwater be stored?
  - Gville Ranchos, Pinenut, E. Valley, Johnson Lane
- How much can be stored?
  - Currently being evaluated
  - Rough estimate is a several thousand acre-ft
  - How much will go in and how long will it stay?
- Does the necessary infrastructure exist?
  - Little room west of the Allerman
  - More room east of the Allerman
  - Less suitable aquifer east of the Allerman
- What changes to operations would need to be made?

Thank you

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