Napa County Groundwater Sustainability Agency

Napa Valley Integrated Hydrologic Model Scenarios And Updates

April 10, 2025

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Consulting Engineers

Outline

Stream Depletion Scenarios

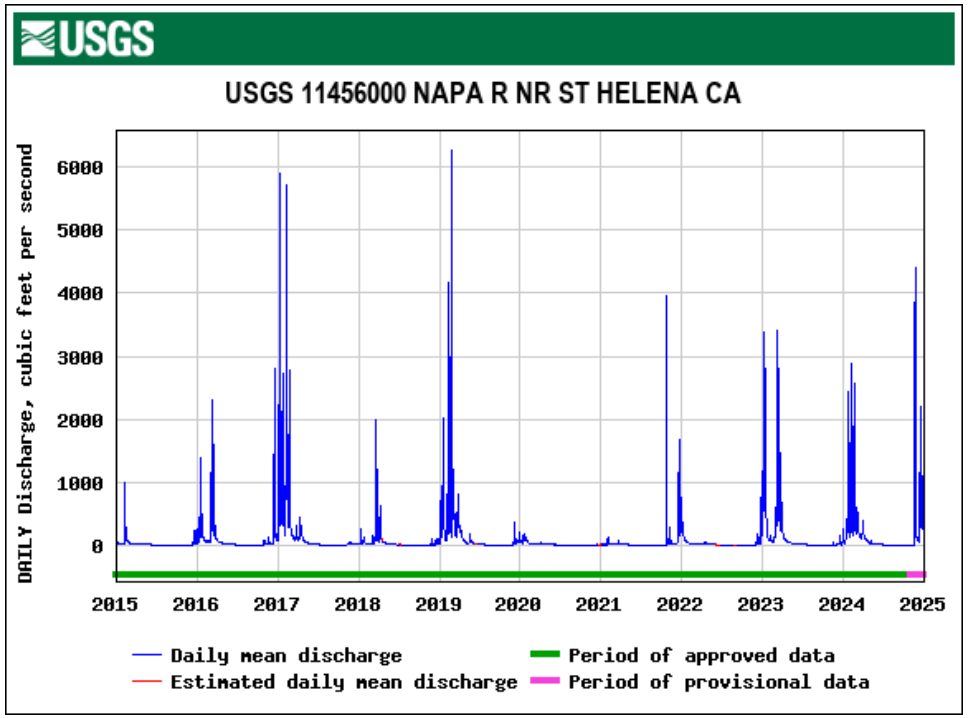
Model Updates

Questions and Discussion

Background

Streamflow in the Napa River

- No flow, very low flow, and disconnected pools observed in the Napa River near St Helena
- Desire to understand relationship between groundwater pumping and streamflow in this area
- Previous scenarios have looked at the effect of agricultural and landscape pumping in all the Napa Valley using Napa Valley Integrated Hydrologic Model (NVIHM)
- Recent interest in understanding how more localized pumping may affect streamflow in this reach



Depletion Scenarios

Approach

Compare streamflow in Baseline (calibrated) model (WY2005-2024) to various groundwater pumping scenarios

Scenario 1:

- No pumping for irrigation (agricultural or landscape) in the St Helena "Water Balance Region" (WBR)

Scenario 2:

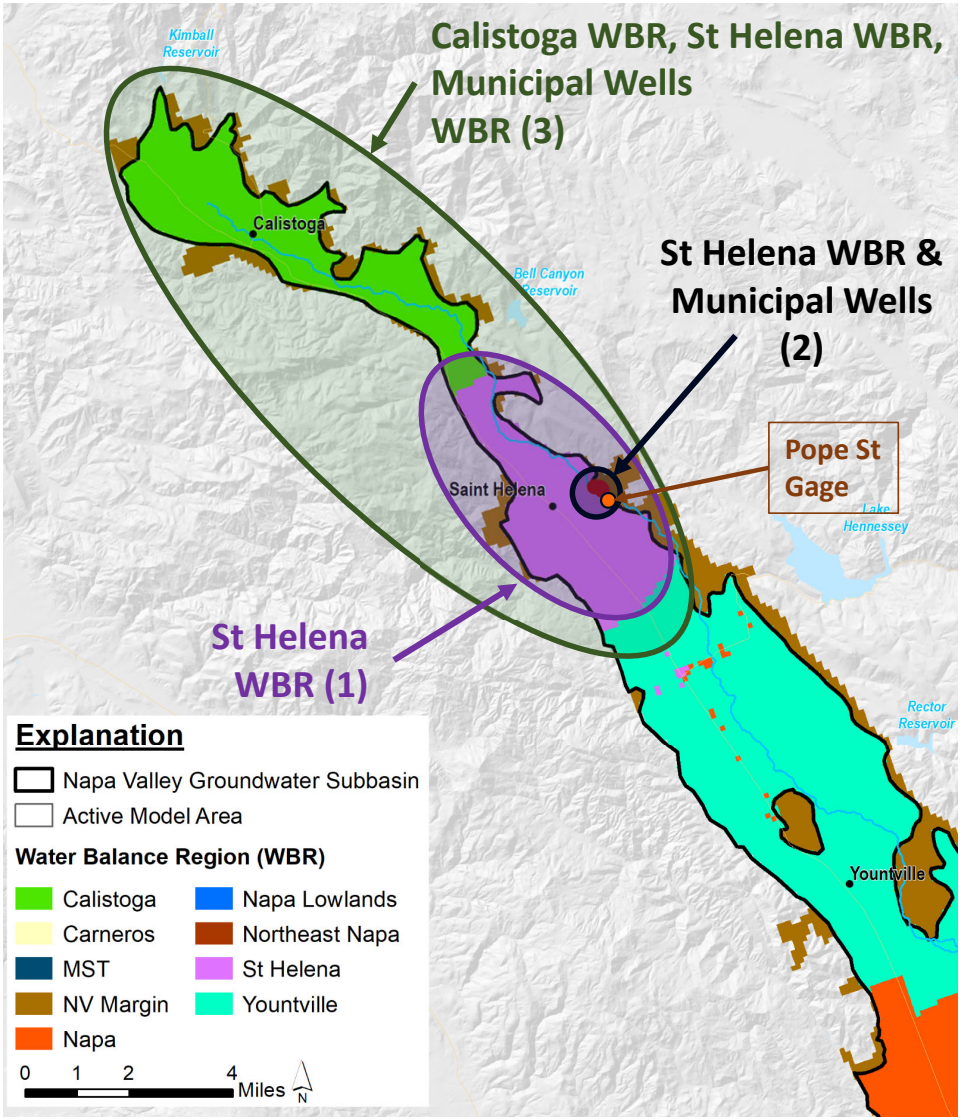
- No pumping for irrigation in the St Helena WBR
- No pumping in St Helena municipal wells

Scenario 3:

- No pumping for irrigation in the St Helena WBR
- No pumping in St Helena municipal wells
- No Pumping in the Calistoga WBR

Scenario 4:

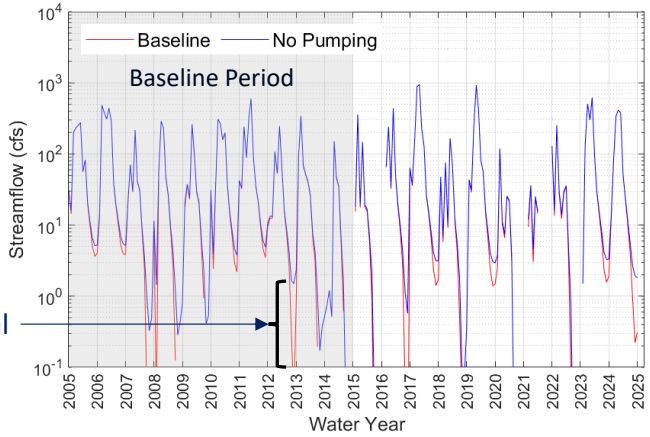
- No pumping for irrigation in the Napa Valley
- No pumping in St Helena municipal wells



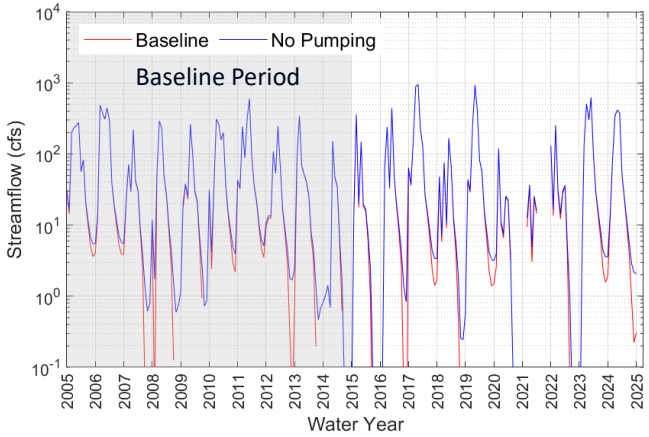
Streamflow in Napa River at Pope Street

Change in streamflow resulting from removal of pumping ("Stream Depletion")

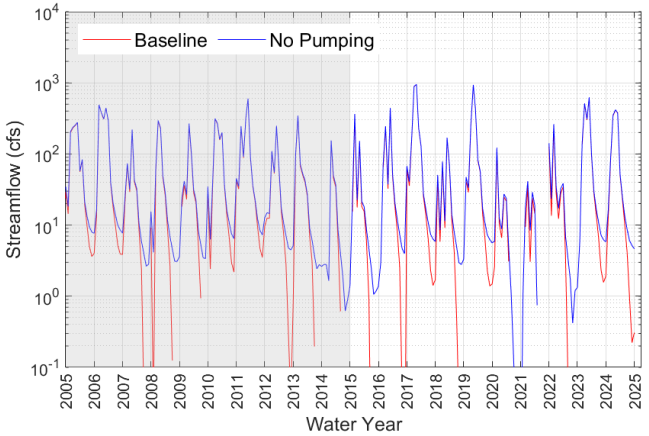
No Agricultural or Landscape Pumping (St Helena Water Balance Region)



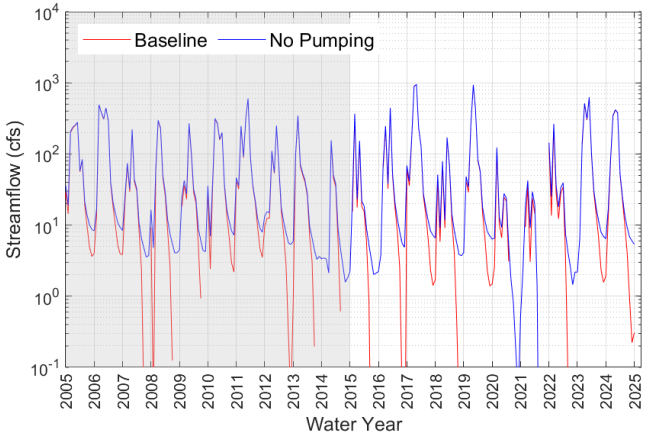
No Agricultural, Landscape or Municipal Pumping (St Helena Water Balance Region)



No Agricultural, Landscape or Municipal Pumping (St Helena & Calistoga Water Balance Regions)

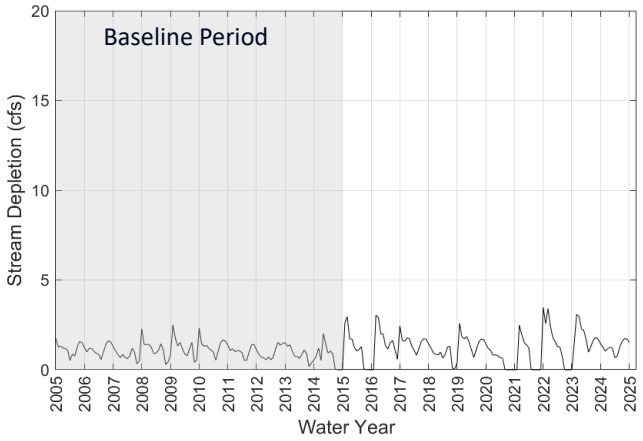


No Agricultural, Landscape or Municipal Pumping (Napa Valley)



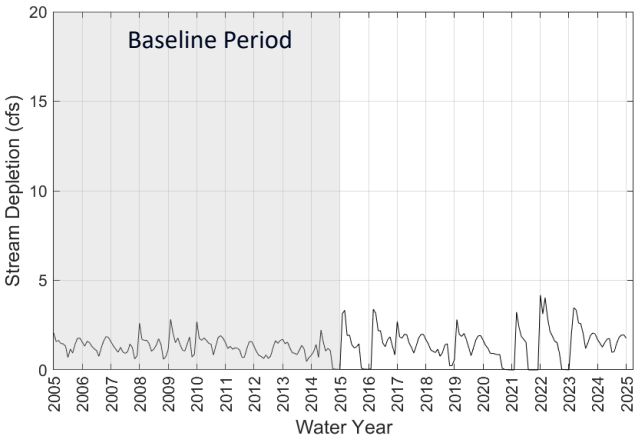
Stream Depletion in Napa River at Pope Street

No Agricultural or Landscape Pumping (St Helena Water Balance Region)



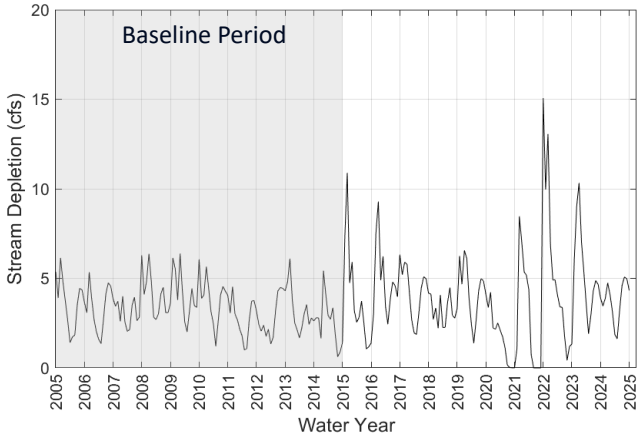
Minor (<~0.2 cfs) increase in stream depletion due to municipal pumping

No Agricultural, Landscape or Municipal Pumping (St Helena Water Balance Region)



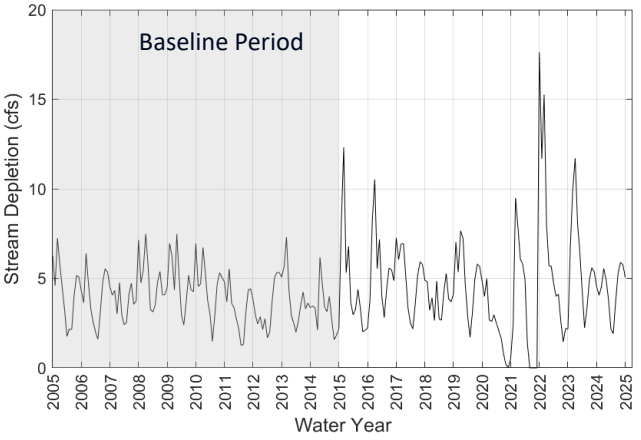
Substantial increase in stream depletion due to pumping in Calistoga WBR

No Agricultural, Landscape or Municipal Pumping (St Helena & Calistoga Water Balance Regions)



Minor increase in stream depletion at this gage due to pumping in rest of Napa Valley

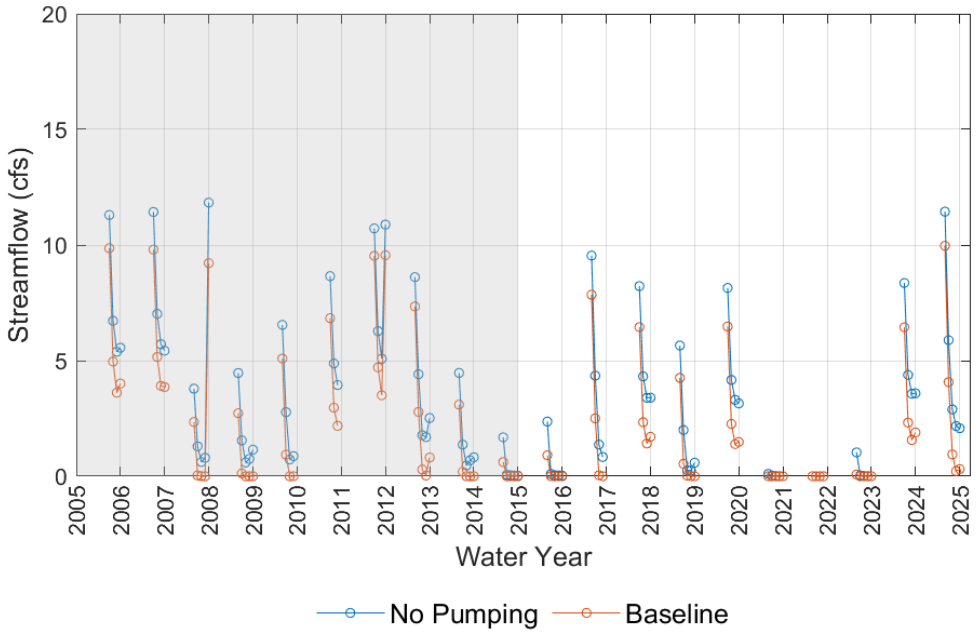
No Agricultural, Landscape or Municipal Pumping (Napa Valley)



Low Flow Analysis

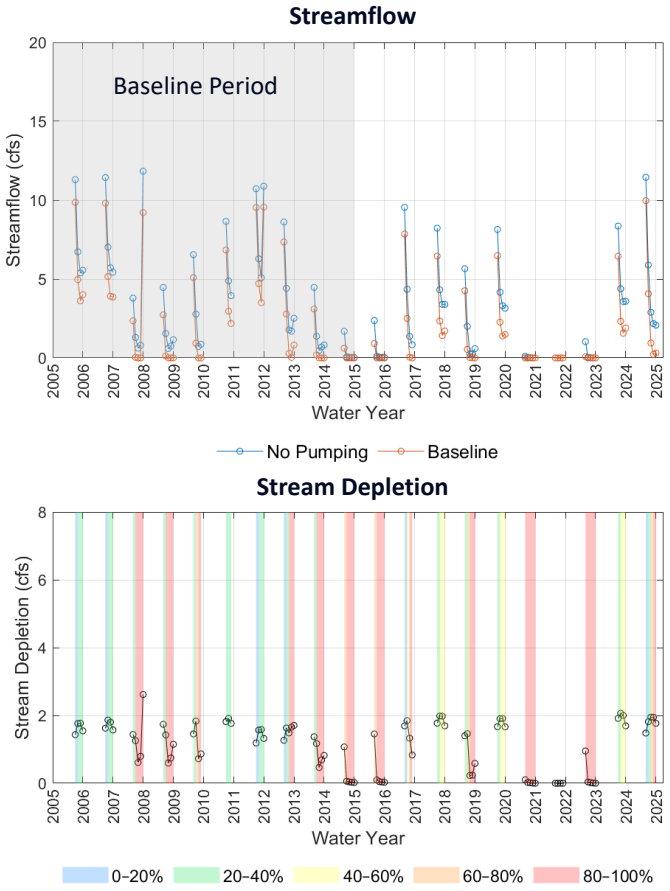
Approach

- Removed months that do not fall within typical low flow period (June – October)
- Only considered “low flows” within these period
  - For this purpose, we define “low flow” as less than or equal to 10 cubic feet per second (cfs)
  - Excludes high spring and fall flows due to early storms

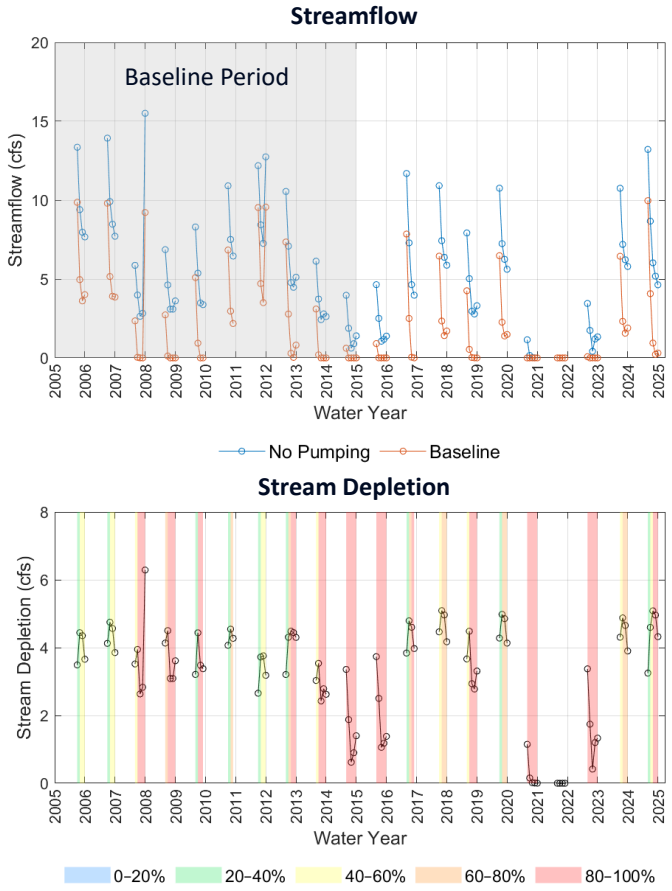


Low Flow Stream Depletion at Pope Street (June – October)

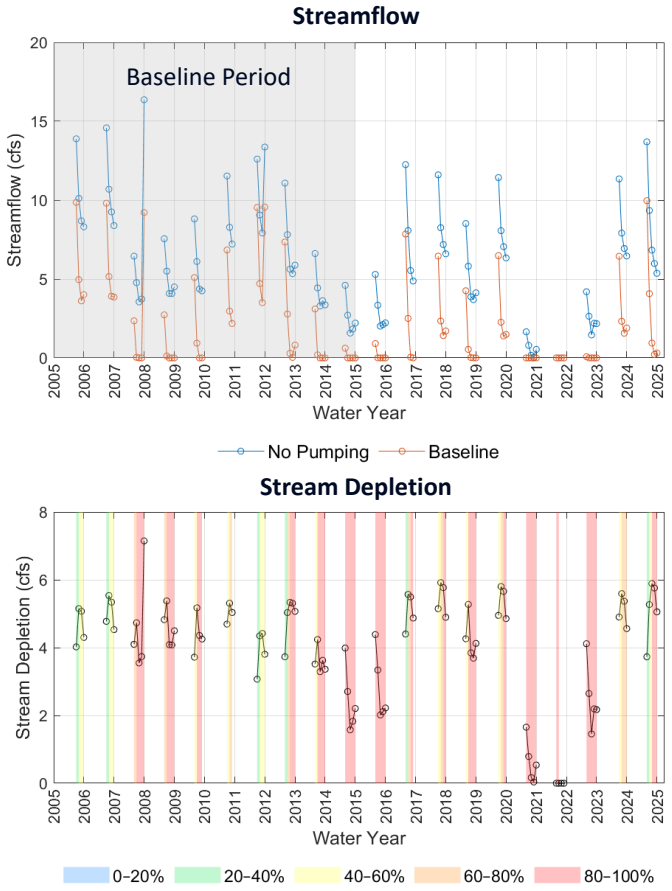
No Agricultural, Landscape or Municipal Pumping (St Helena Water Balance Region)



No Agricultural, Landscape or Municipal Pumping (St Helena & Calistoga Water Balance Region)

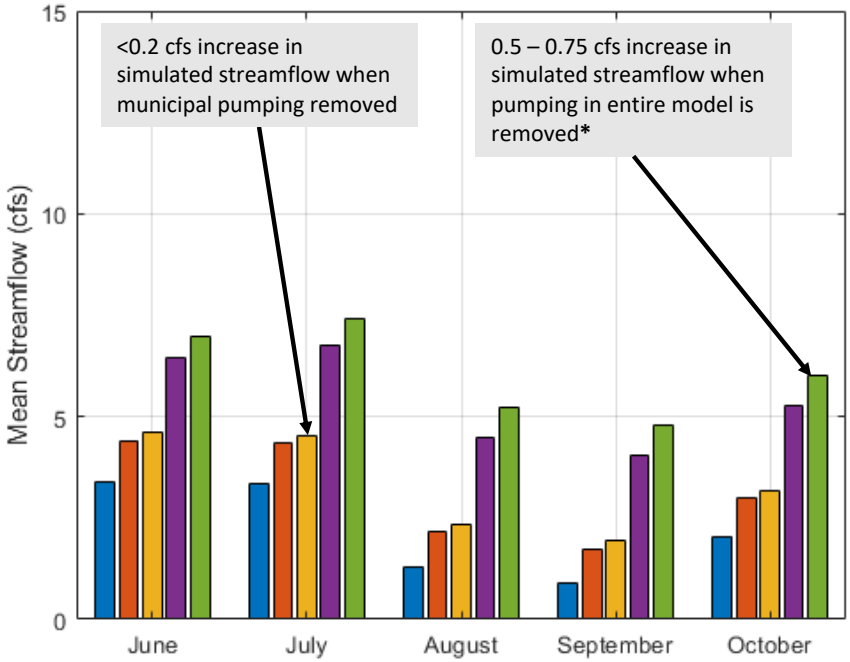


No Agricultural, Landscape or Municipal Pumping (Napa Valley)

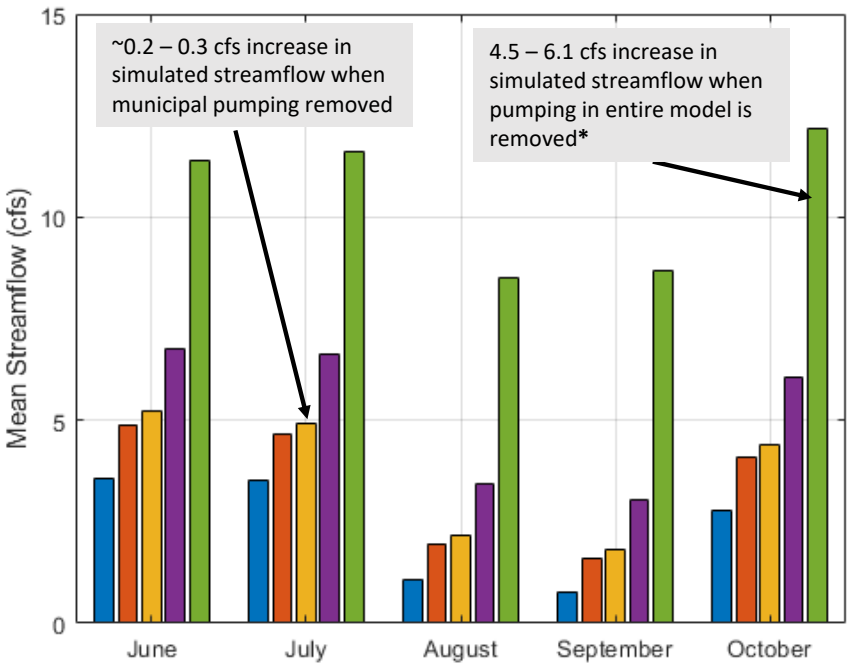


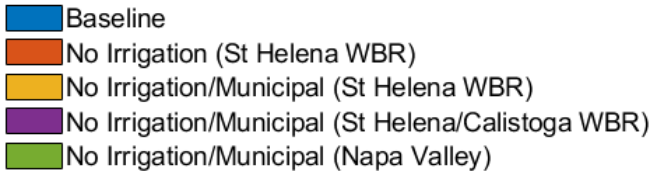
Low Flow Discharge Summary Statistics (Pope St and Oak Knoll)

Pope Street



Oak Knoll



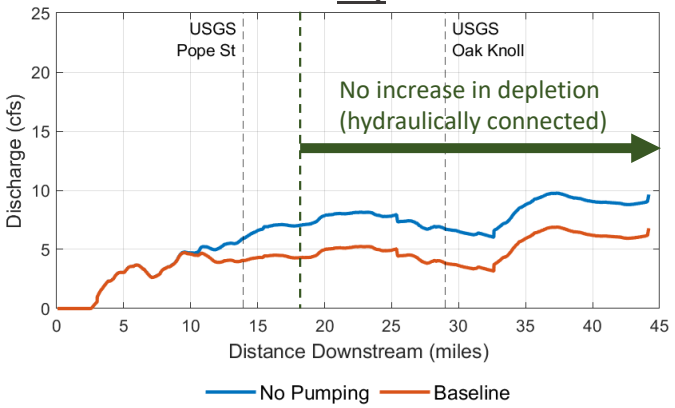


*** Includes the Napa Valley Subbasin and laterally adjacent areas included in model domain**

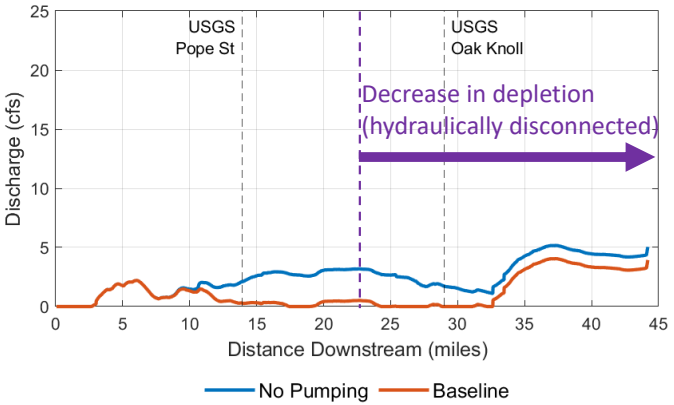
Stream Depletion on the Napa River (2024)

No Agricultural, Landscape or Municipal Pumping (St Helena Water Balance Region)

July

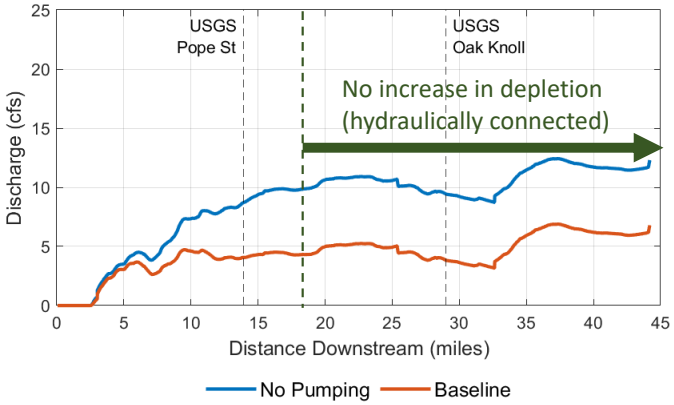


September

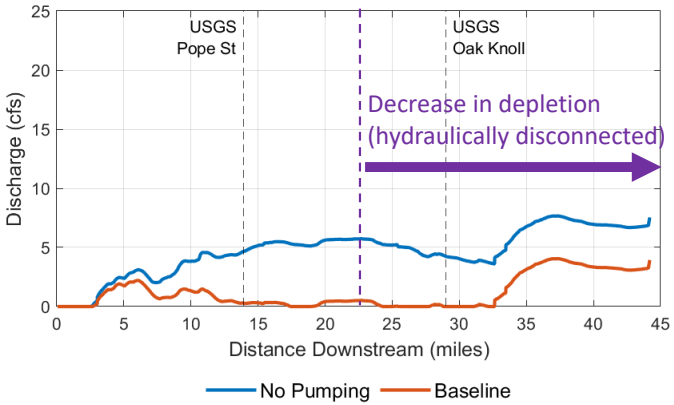


No Agricultural, Landscape or Municipal Pumping (St Helena & Calistoga Water Balance Region)

July

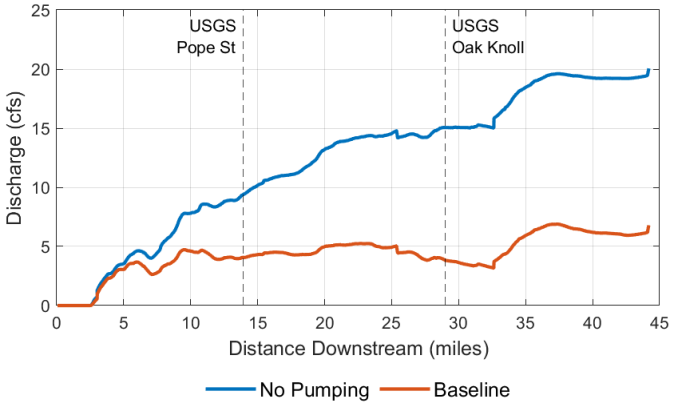


September

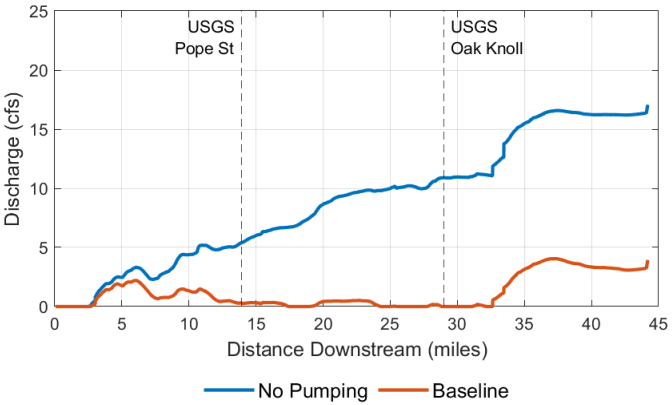


No Agricultural, Landscape or Municipal Pumping (Napa Valley)

July

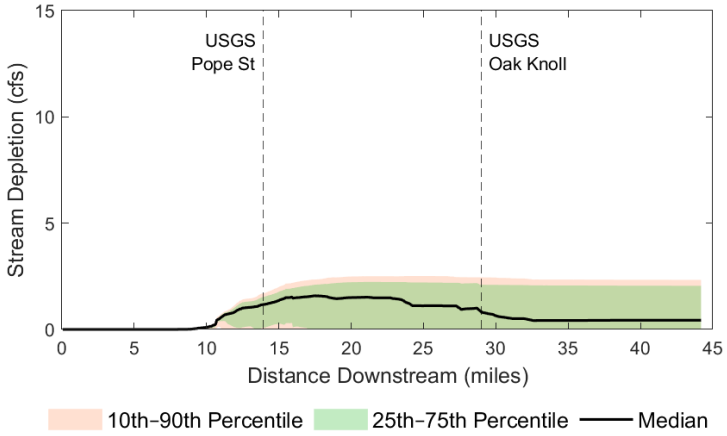


September

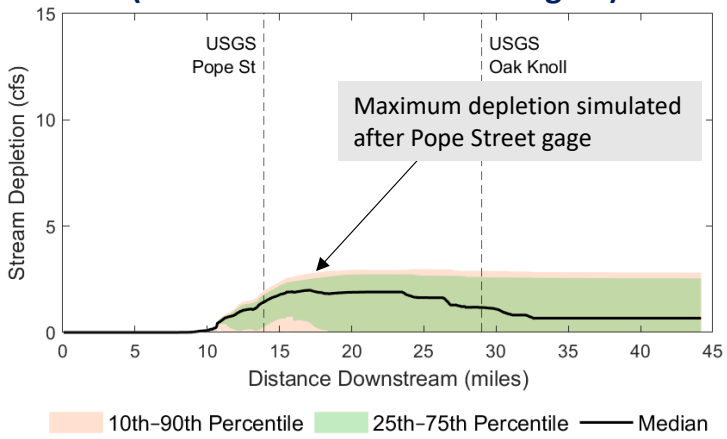


Low Flow Stream Depletion on the Napa River (2005-2024)

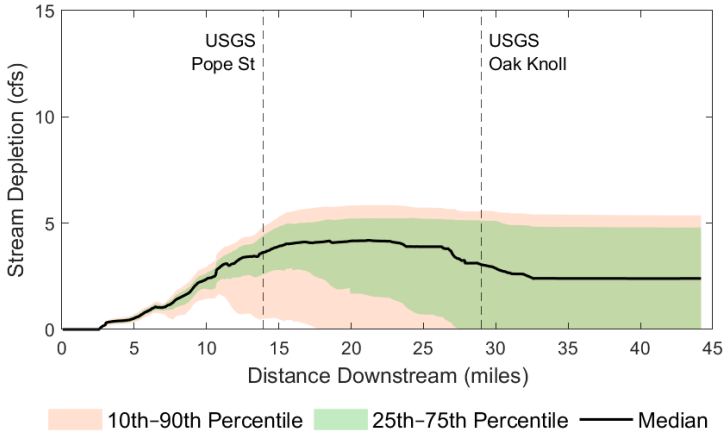
No Agricultural or Landscape Pumping (St Helena Water Balance Region)



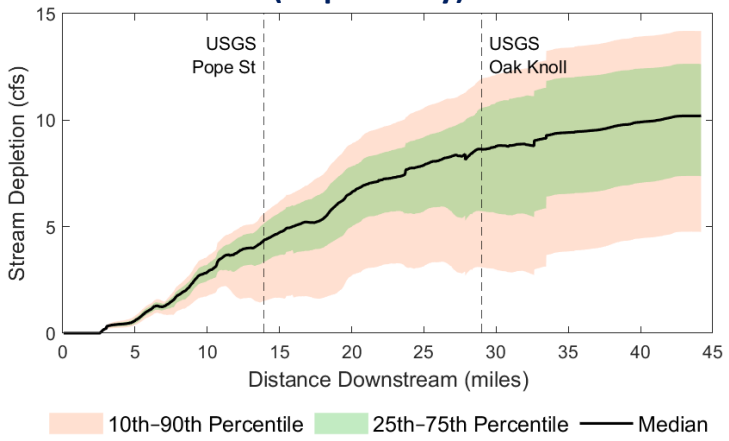
No Agricultural, Landscape or Municipal Pumping (St Helena Water Balance Region)



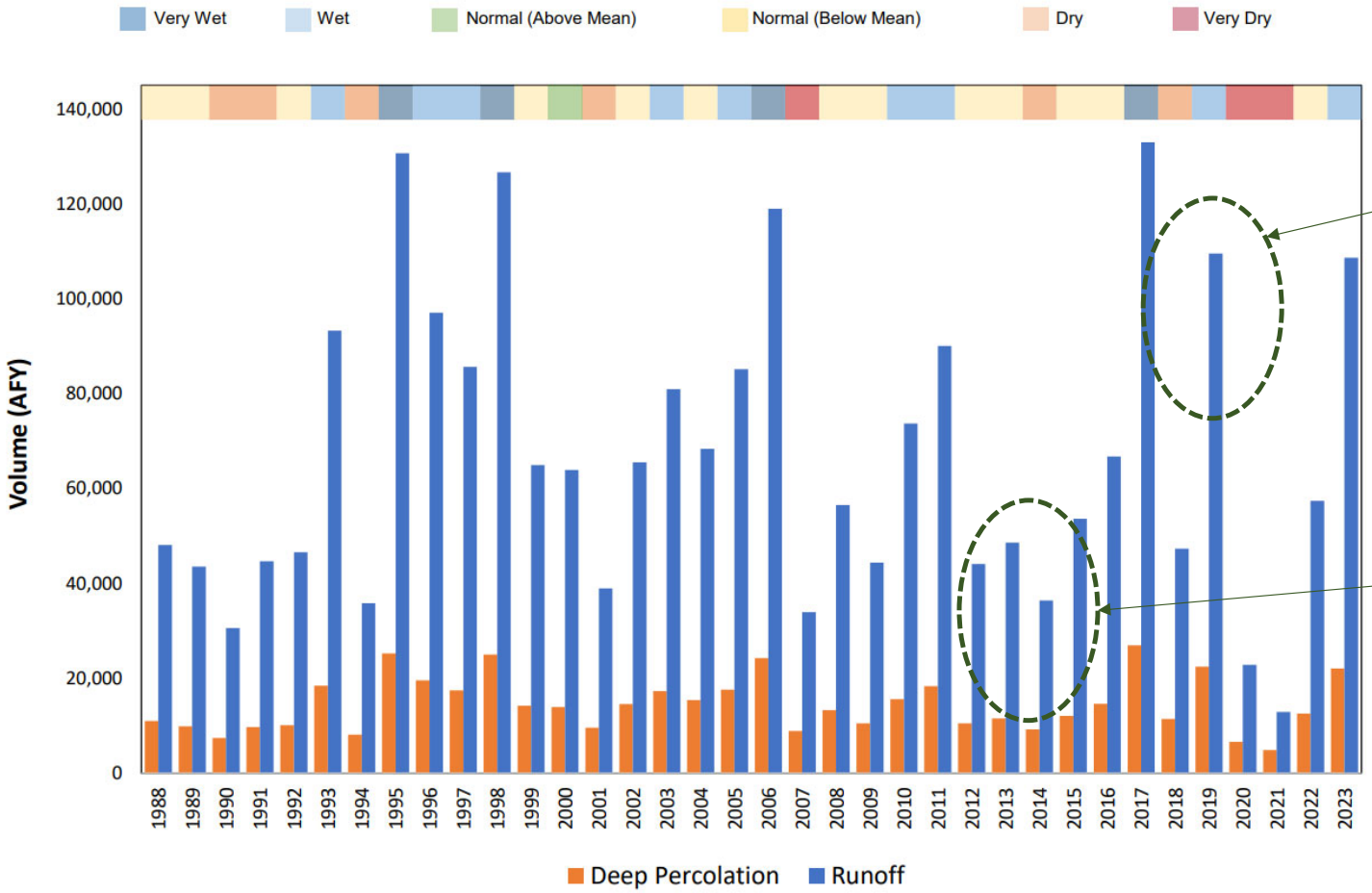
No Agricultural, Landscape or Municipal Pumping (St Helena & Calistoga Water Balance Regions)



No Agricultural, Landscape or Municipal Pumping (Napa Valley)



Other Potential Scenarios: Retaining Runoff (Recharge)



Wetter years provide opportunities to replenish groundwater and increase resilience to drought effects.

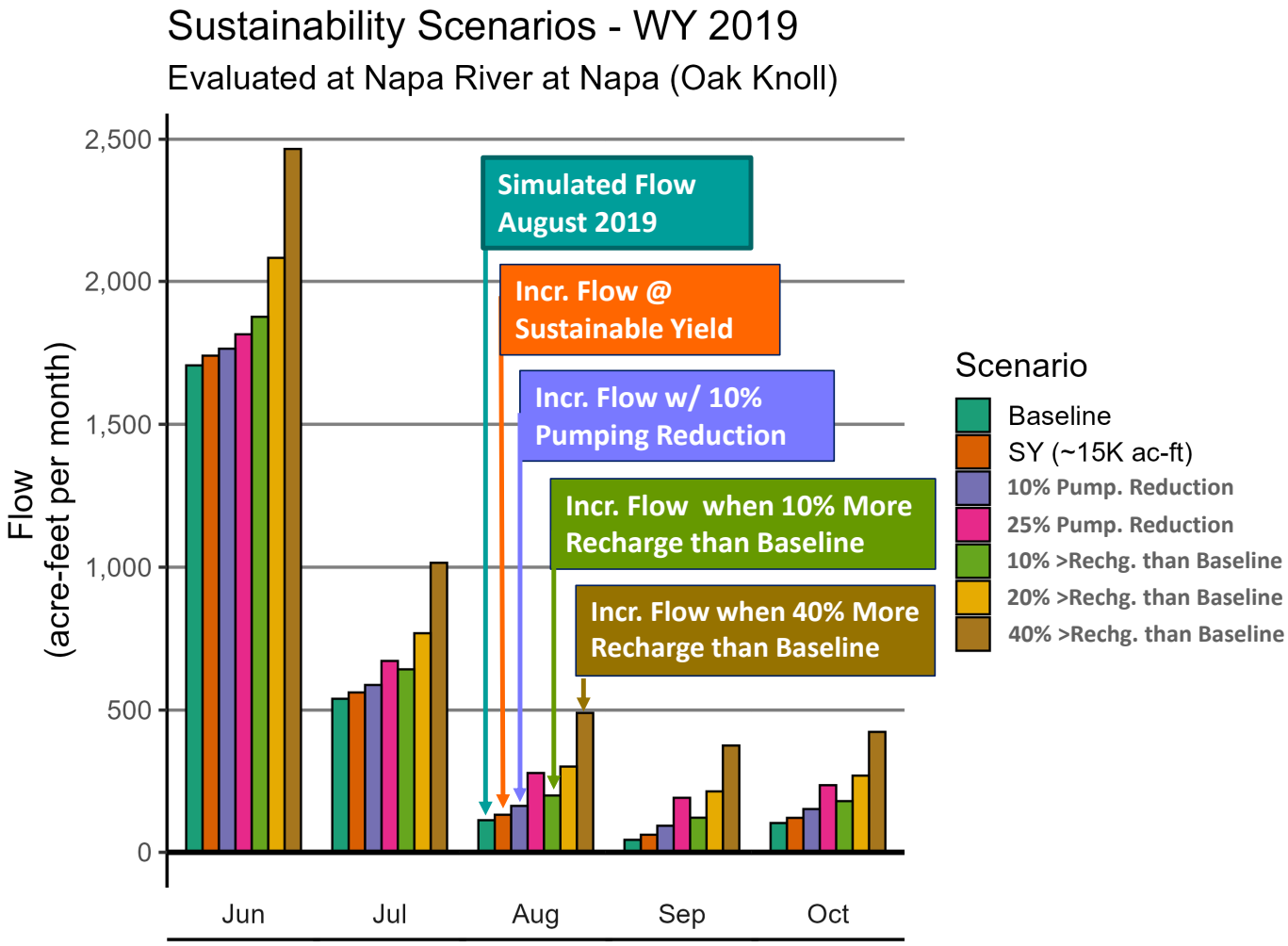
Dry years still provide key opportunities to increase recharge to mitigate drought effects.

Other Potential Scenarios: Retaining Runoff (Recharge)

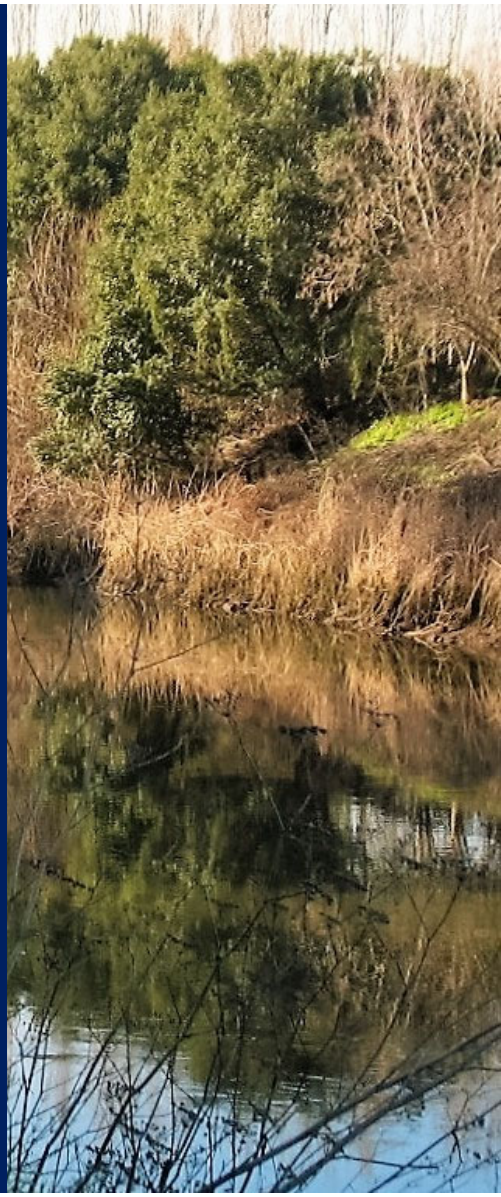
Recharge & Pumping Benefits (Napa Valley)

Actions to Achieve 10% More Recharge Compared to Baseline Result in More Streamflow than 10% Pumping Reduction

Localized recharge scenarios can be used to evaluate (and optimize) benefits to specific reaches



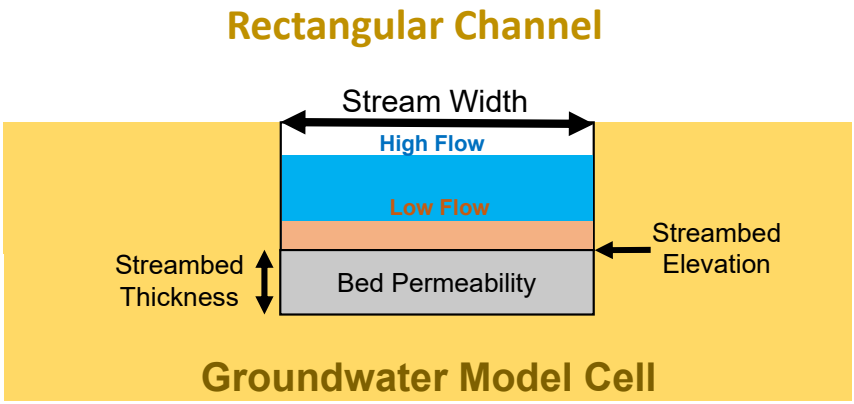
Model Updates

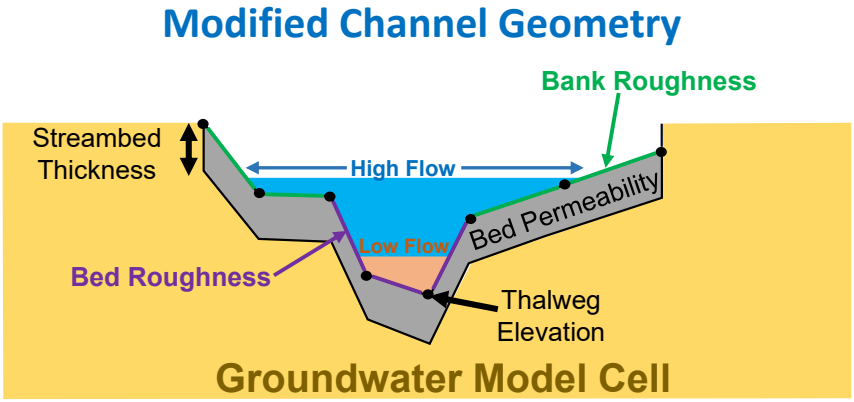


Surface Water (Channel Geometry Refinements)

Updates

- Updated channel methodology to better represent geometry
  - Lidar (2003, 2018)
  - Channel cross sections from pre- and post-restoration
- Utilized datasets to vary channel geometry over time
- Completed, but not yet included in current model
  - Model requires some re-calibration to be conducted during other model updates





Water Use (Evapotranspiration Updates)

Evapotranspiration

- Discrepancies between measured (Tule) and remotely sensed ET (OpenET)
- Issues with local CIMIS station

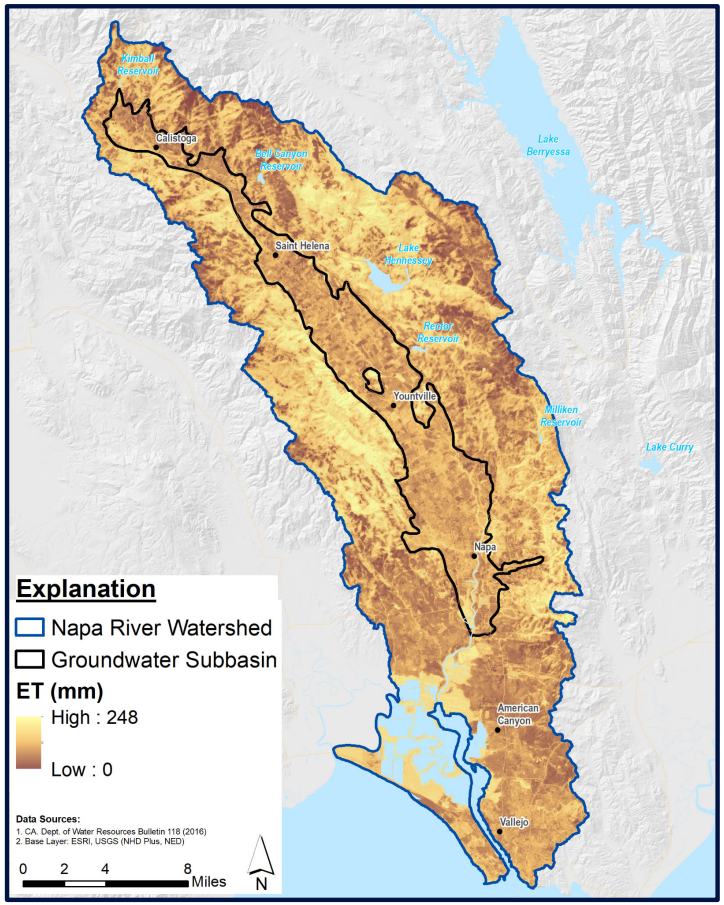
Crop Coefficients

- Assigned by crop type (e.g. white vs black grapes)
- May not account for spatial variability in ET
- May not account for temporal variability in ET

Updates

- Determine Factors that influence Kc and ET
  - Physical Processes
  - Cultural Practices
- Developing approach to appropriately adjust framework to capture variability

OpenET Evapotranspiration (July 2021)



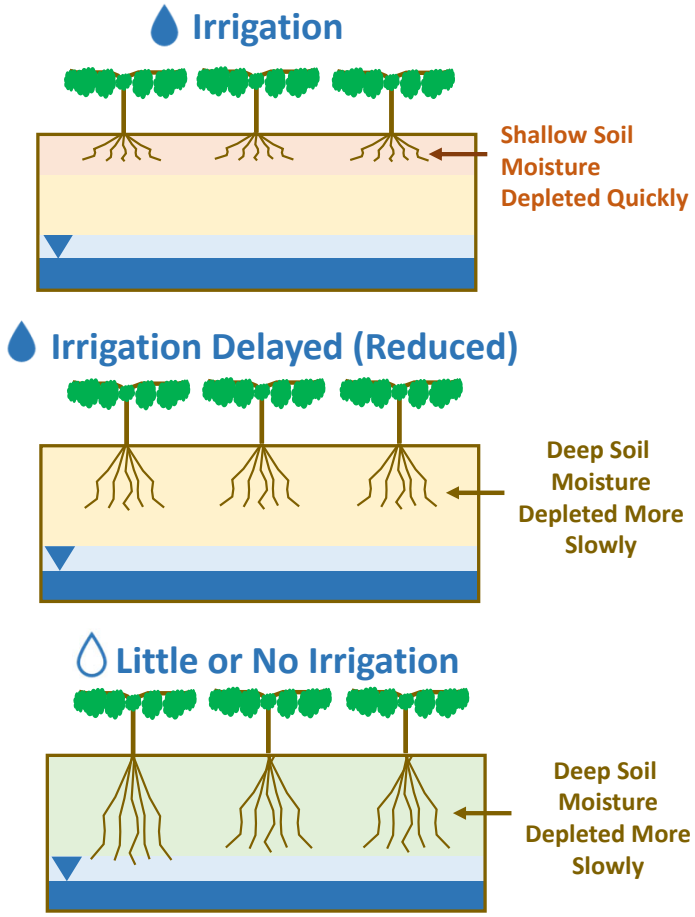
Water Use (Soil Moisture Storage)

Existing Framework

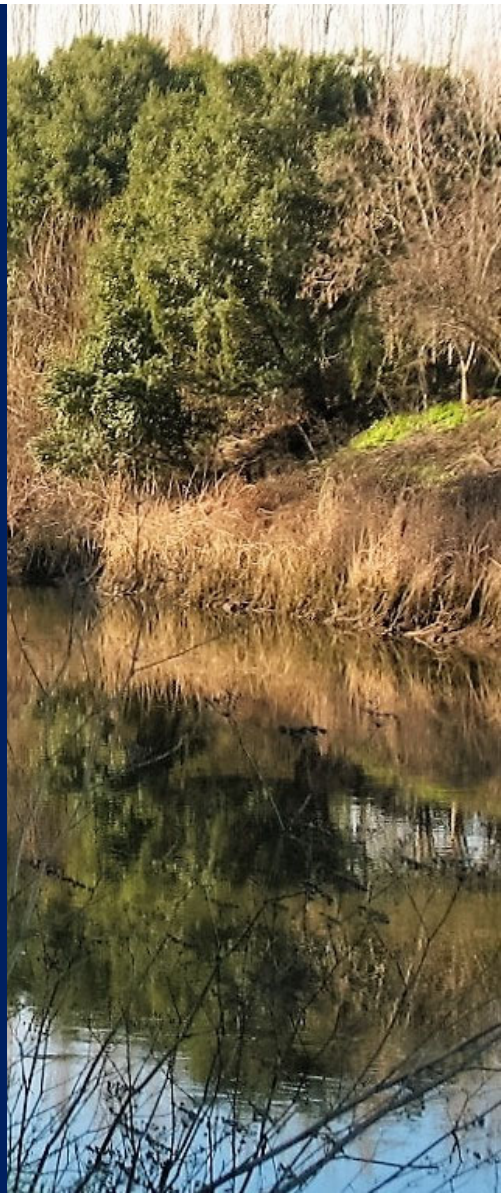
- Assumes soil moisture storage is reduced on the scale of days to weeks
- Irrigation is required when precipitation or groundwater uptake cannot satisfy crop water demand
- Irrigation begins earlier in season
- Native vegetation can be easily water stressed

Update

- Coordination with USGS platform developers
  - Updates to model platform to incorporate longer-term soil moisture storage
  - Evaluating options for evaluating runoff from precipitation
  - In progress – beta version expected later in spring 2025



Questions and Discussion



Thank You

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