Napa Valley Subbasin
Groundwater Pumping Reduction Workplan Update and Recharge Feasibility Study

Napa County GSA TAG Meeting

March 12, 2026

LSCE ERA Economics
Environment • Resources • Agriculture

Overview

1. GPR Workplan Implementation
2. Recharge Feasibility Study
3. Next Steps

GPR Workplan Implementation

Guiding Framework

- Focus on voluntary actions that achieve groundwater benefits for the Subbasin
- Assess the costs and benefits of alternative actions and focus on those that are most cost-effective
- Leverage existing programs and opportunities to generate value from a suite of voluntary actions
- Include adaptive management to adjust the program as data and sustainability indicators evolve
- Mandatory measures if voluntary programs do not achieve measurable reductions in groundwater pumping (e.g., mandatory metering/reporting)

Groundwater Pumping Reduction **10%**

Groundwater Replenishment/ Other GSP Projects

Program Components & Voluntary Actions

(Individual Choice to Participate in Some or All)

GSA & Stakeholders	MA1: Water Conservation MA2: GW Pumping Reduction	P1: Aquifer Recharge	P2: Expand Recycled Water Use
Education & Outreach	Urban & Rural Conservation	Soil Health/ Cover Crops	Landscape Irrigation
Local Certification Partnerships	Best Management Practices (e.g., irrigation efficiency)	Best Management Practices (e.g., increase infiltration)	Best Management Practices (e.g., onsite treatment & resuse)
Conservation Incentives	Apply Technologies	Retain On-farm Stormwater	Vineyard Irrigation
Water Use Data; Benchmarking	Water Use Tracking	Capture/Reuse Tile Drain Stormwater	Dry Farm Supplemental Water Source
Agriculture Innovations & Influencers	Conservation Initiatives	Stormwater Storage/ In Lieu Use	Recycled Water Storage/ In Lieu Use
Conservation Nudging	Extended Time to Vineyard Replanting	Winter Recharge	Fallow Acreage Recharge

Sustainability Goal Achieved through Collective Community Actions?

YES — **Local Control**
Continue Voluntary Efforts

NO — **State Control**
Mandatory Measures

GSP PROJECT #1: MANAGED AQUIFER RECHARGE

Recharge Investigation

Study Overview

- Increase groundwater recharge
  - Target SGMA benefits (e.g., ISW and GDE)
  - Application of BMPs (e.g., stormwater retention)
  - Link to other GPR programs (extending replant, certification, other water conservation practices)
- Assessment of recharge opportunities
  - Technical (water supply, land use, infrastructure needs)
  - Economic (costs, benefits, return on investment, comparison to other PMAs)
  - Financial (funding mechanism)

Working Draft TOC

1. Overview
2. Recharge Opportunities
   - Recharge Scenarios (Four Scenarios)
3. Technical and Legal
   - Water Rights for Recharge
   - Existing Water Right Utilization in Subbasin
   - Obtaining New Water Right
   - On-Farm Infrastructure and Management Considerations
   - GSP and Effects on ISW/GDE and Other SMC
   - Environmental
4. Economic Feasibility
   - Capital and O&MR Costs
   - Economic Benefits and Benefit-Cost Assessment
5. Financial Feasibility
   - Cost Recovery and Funding Strategy
   - Recharge Crediting Concept
6. Summary
7. References

Recharge Scenarios

	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Name	Extended Replant Recharge	Direct On-Farm Recharge	Pumping Reduction Recharge	Multibenefit Recharge
Description	Increase recharge on idle vineyard	On-farm recharge that may include Ag-MAR or basins	Use existing pond or reservoir for storage to reduce pumping	Recharge on lands near significant streams
Duration	< 5 years	Longer	Annual	Longer/permanent
Capital	Limited to standard replanting work, light earthwork/berms	Flood-MAR or recharge basins	Limited	Earthwork and infrastructure
Water Right Pathway	Temporary underground storage	Temporary underground storage	Existing rights	Temporary underground storage
Administration	GSA or individuals	GSA	Individuals	GSA

Recharge Feasibility Study

Preliminary Activities: Feasibility Study

- Analysis underway across multiple components, including economic, technical, and financial
- Ongoing grower and partner discussions for existing activities, feasibility, infrastructure, costs, experience and knowledge
- Developing necessary datasets and refining modeling and analyses

Replant Scenario (Methods)

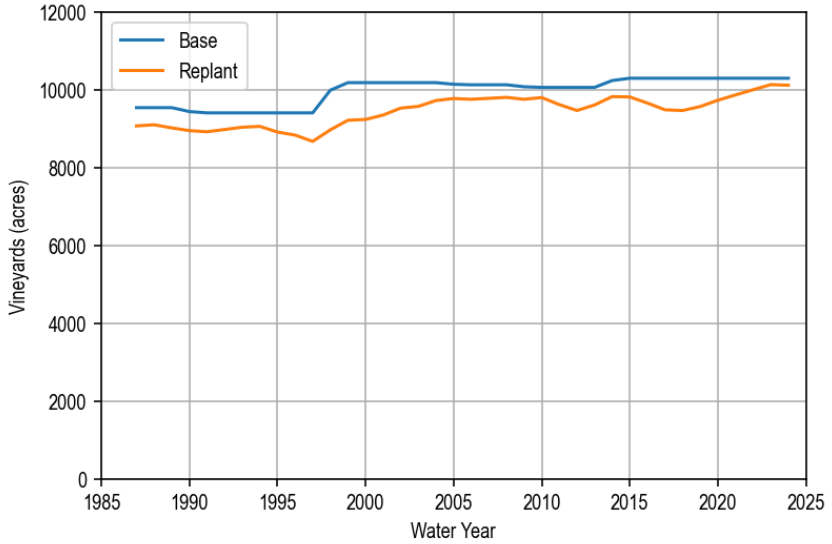
Approach

- Increase period vineyards are idle before replanting by 2 years as a demand reduction strategy

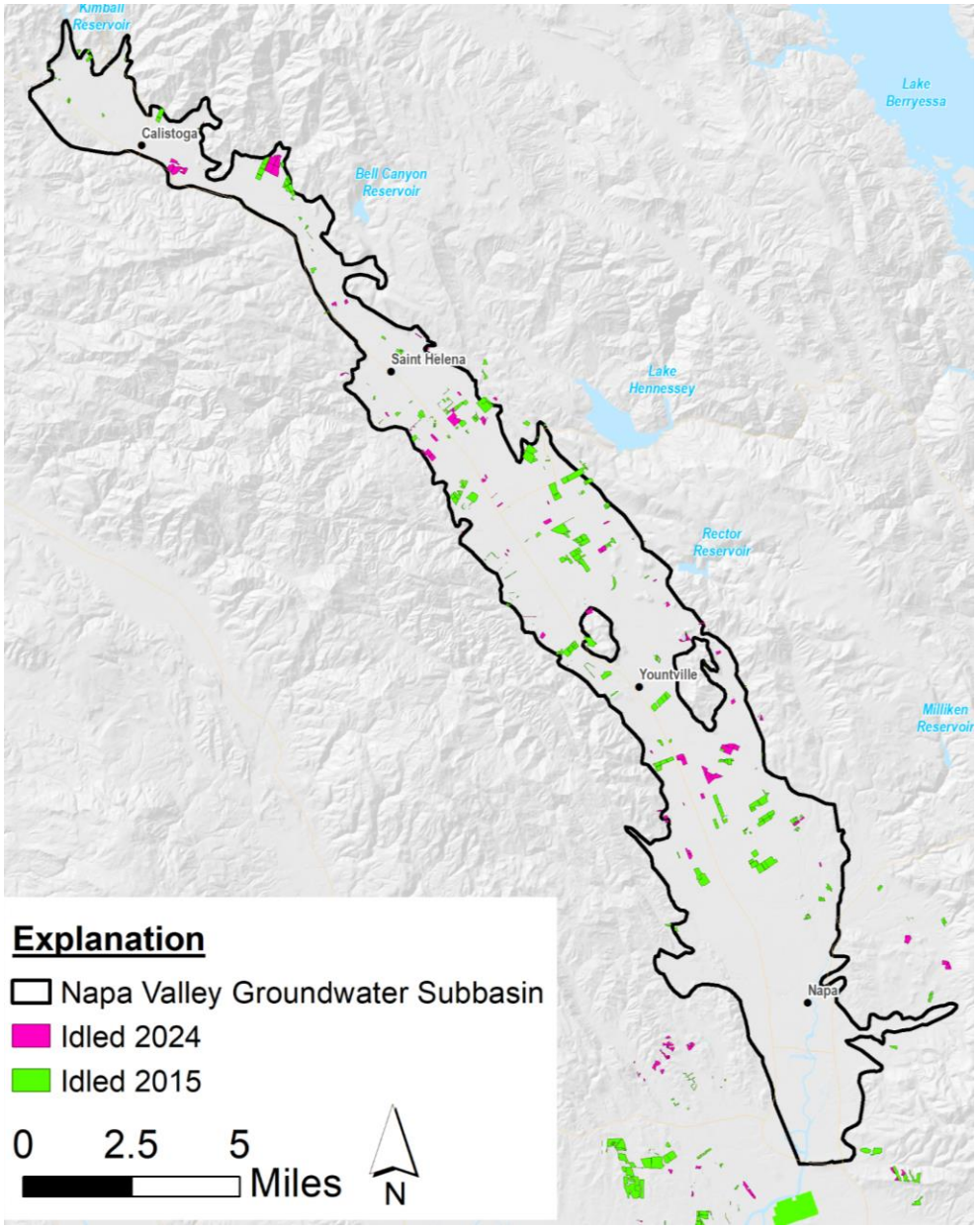
Determining Vineyard Age

- Current vineyard age determined using the Napa County Assessors information (2024)
- Assumed a 30-year replant cycle to determine vineyard age

Total Vineyard Acreage in Subbasin 1987 though 2024



Idled Fields in Model Year 2015 & 2024

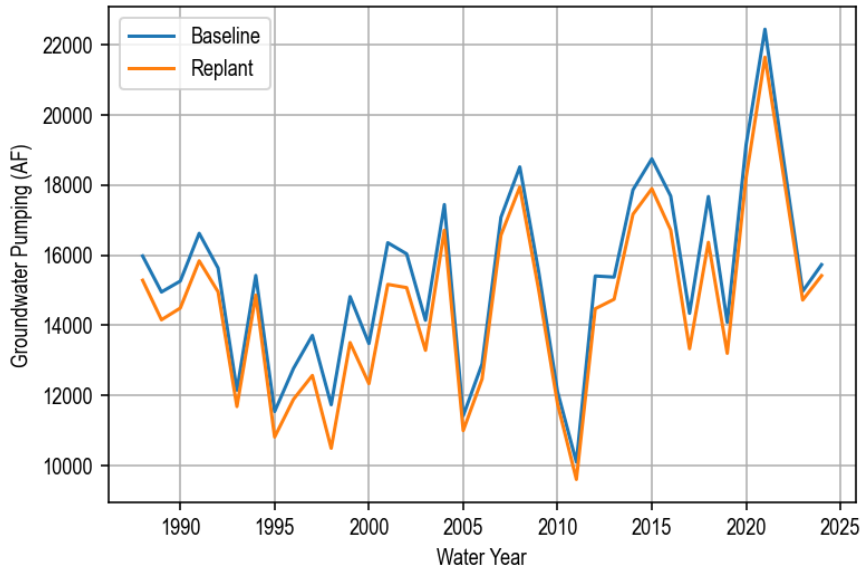


Replant Scenario (Pumping Reduction)

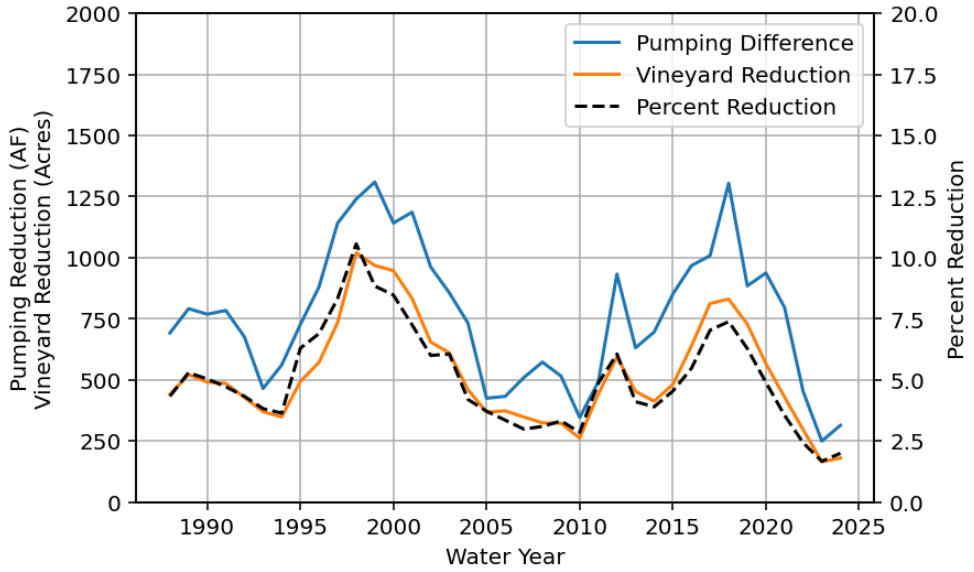
Results

- Amount of vineyards idled in the scenario varies from 200 to 1,000 acres by year
- The resulting pumping reduction ranges from 250 to 1,250 acre feet
- Percent reduction ranges from 2.5 to 10%

Total Subbasin Pumping (1988-2024)



Total Subbasin Pumping Reduction (1988-2024)



Replant Scenario (Streamflow)

Results (Oak Knoll Gage)

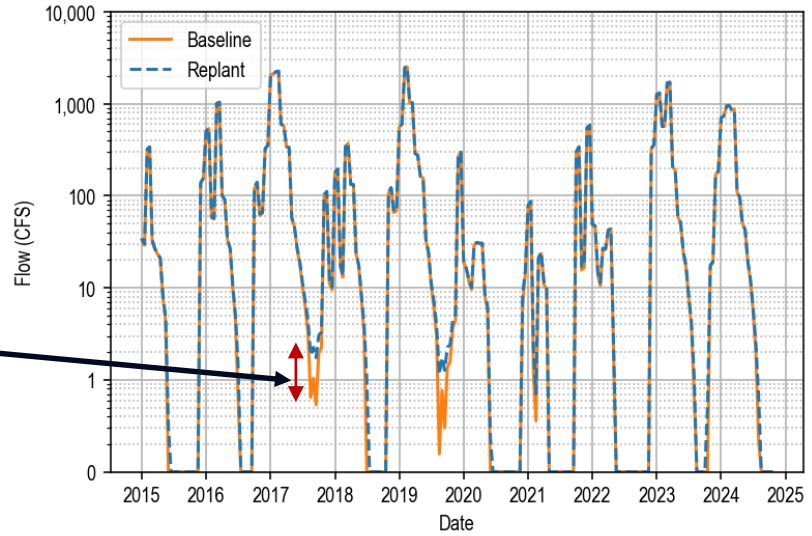
- Oak Knoll gage near the southern Subbasin boundary is where most of the pumping reduction will be accrued.
- Low flows increase by about 1 cfs
- Period where the stream is not dry increases by about 2%

Streamflow benefits are roughly commensurate with pumping reduction

- Pumping reduction is about 2.2 acre-feet per day on average or 1.1 cfs

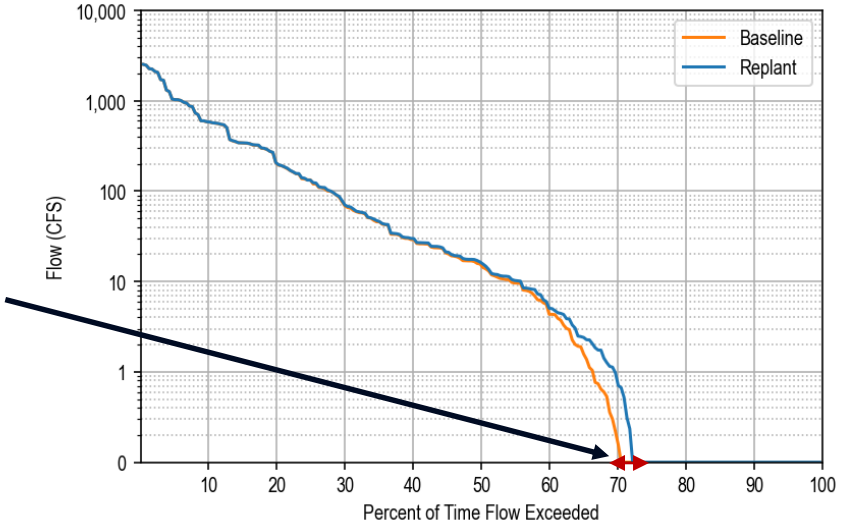
Simulated Streamflow at Oak Knoll (2015 – 2024)

1 cfs increase in low flows when they occur



Simulated Flow Duration Curve at Oak Knoll (2015 – 2024)

~2% increase in amount of time there is flow



Discussion

- Are there any specific questions and feedback on the Replant Scenario update presented?

Recharge Scenarios (Objectives & Background)

Objectives

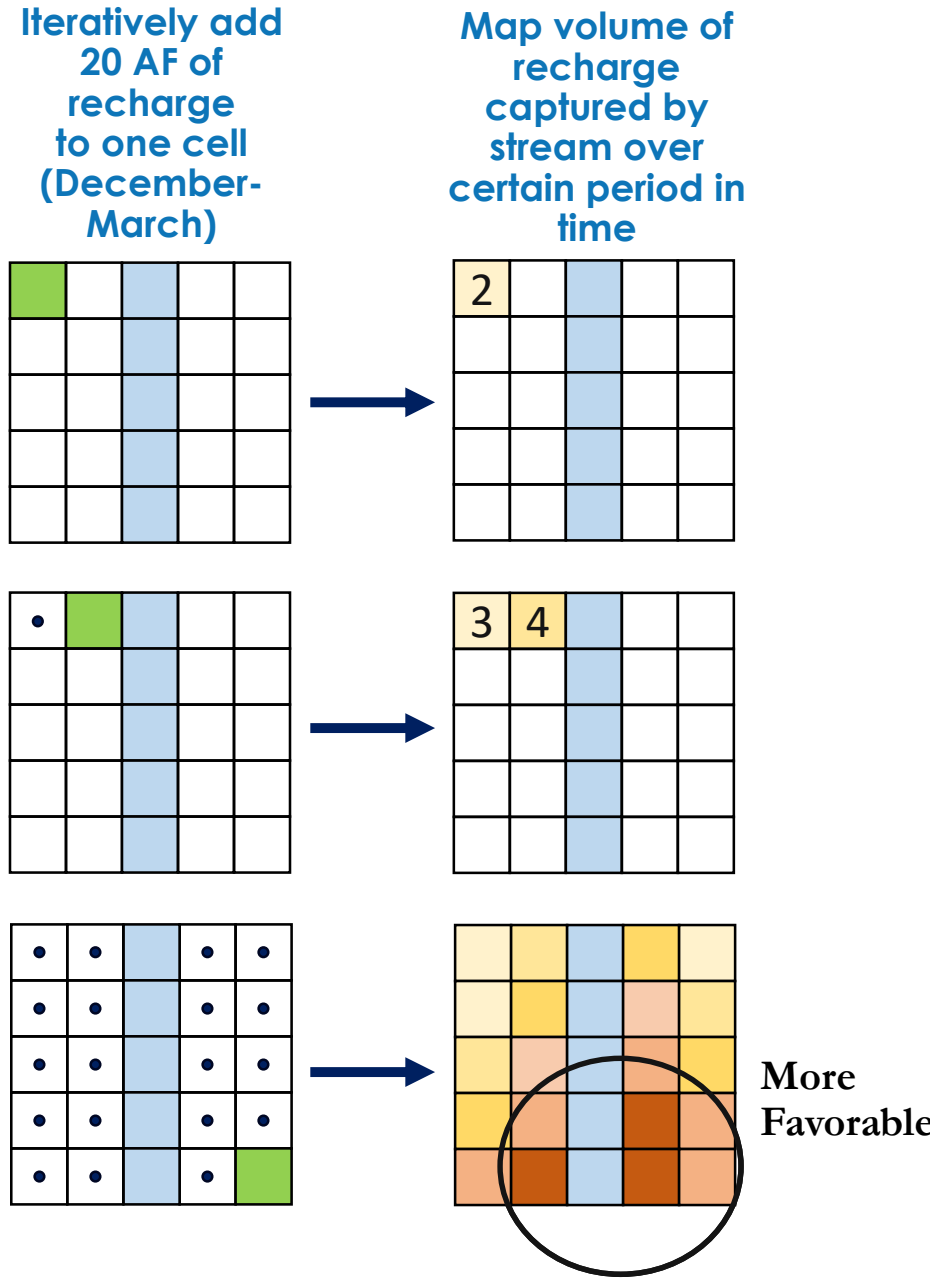
- Leverage model to evaluate recharge favorability with respect to low flows

Methods (Capture Fraction Method)

- Numerical method to evaluate spatial and temporal relationships between pumping and recharge and streamflow and riparian ET (Leake et al., 2008 & 2010)
- Method involves adding pumping or recharge to one cell in the model domain and evaluating the response in streams
- By iterating through all cells in a subregion, you can map the response with respect to location.

Assumptions

- Used Water Year 2017
- Applied 20 AF of water distributed from December through March (5 AF per month)
- Consistent with Streamlined Recharge Permit time frame

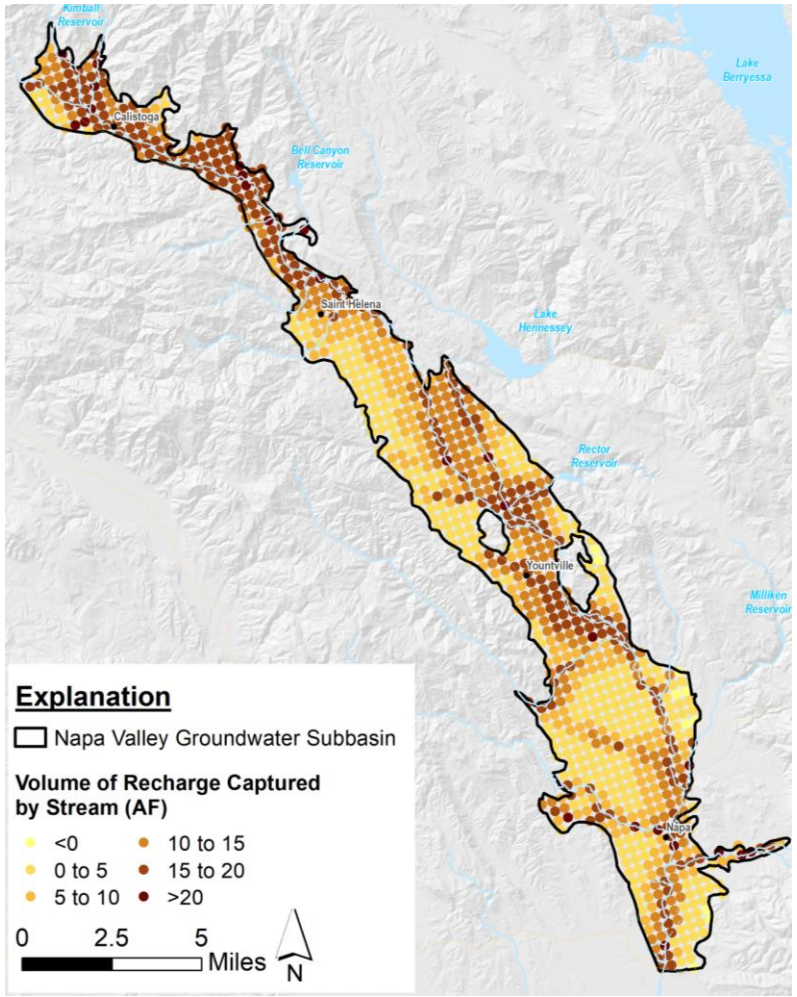


Recharge Scenarios (Results)

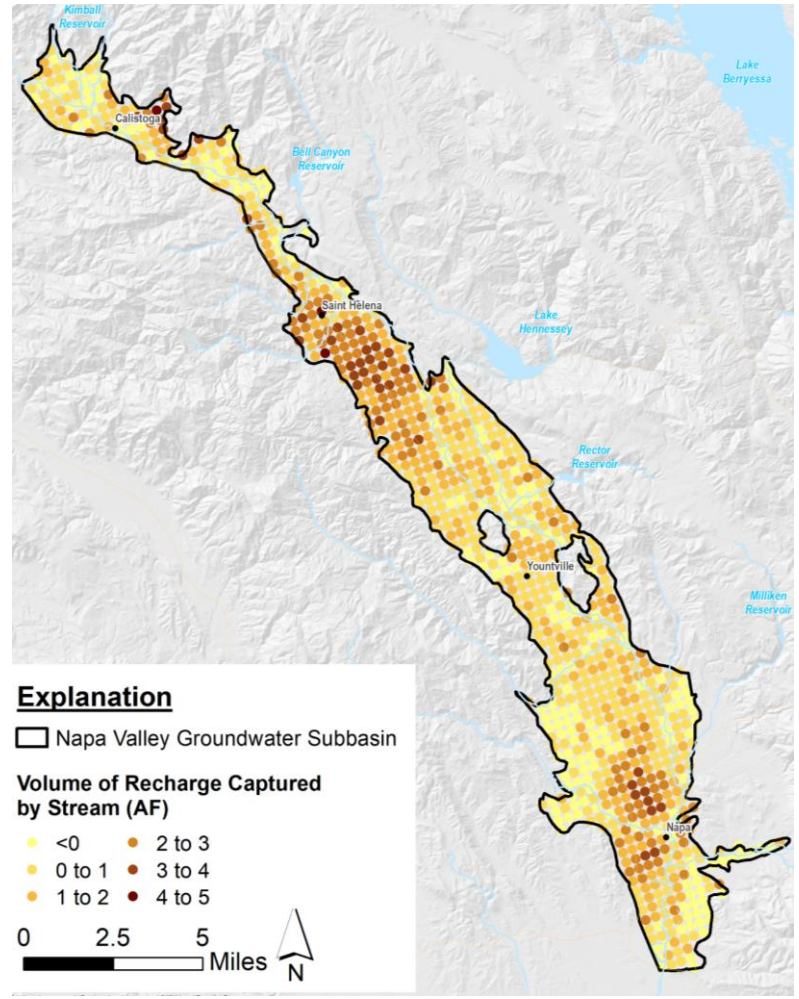
Results

- Recharge near streams tends to get captured sooner when flows are still high.
- Recharge captured by streams during low flows is generally smaller (less than 5 AF).
- Other sources of capture (root groundwater uptake, drains)
- Some water may also stay in groundwater storage and doesn't make it to the stream during the year evaluated.
- Likely need to evaluate multiple years following recharge to evaluate full benefits
- Small volume of water challenging to evaluate using a regional model (noisy)

High Flows (December-May)



Low Flows (June-October)



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Discussion

- Are there any specific questions and feedback on the preliminary analysis of Recharge opportunities?

Next Steps

- Continue Recharge Feasibility Investigation
  - Replant
    - Augment scenarios to include recharge on idled parcels
  - Recharge
    - Experiment with methods to minimize noise, improve confidence and evaluate additional metrics (groundwater storage and GDEs)
    - Investigate site specific hydrogeology and feasibility (e.g., water availability, conveyance)
- Pumping Reduction and Recharge Opportunities
  - Continue investigating water availability (underutilized water rights)
  - Outreach to growers to evaluate feasibility and pursue partnerships

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