



Considering On-Farm Recharge (OFR) to support Water Resources

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Motivations and....

Motivations

- Climate Change / Drought Resilience
- Risk Management
- Regulatory

Cons

- Costs
- Risks of Outcomes
- Regulatory

Conceptual OFR Recharge Model

- Perched groundwater mounding
- Some movement to deeper aquifer if not confined
- Raised groundwater level increases stream baseflows
- Raised groundwater level can reduce irrigation demand through capillary rise

Pre - Recharge

Key

- Groundwater
- ▼ Perched Water Table
- ▼ Deep Water Table
- Lower Water Content
- Higher Water Content
- ▭ Field Boundaries
- 🌳 Field with Recharge Applied

Post - Recharge

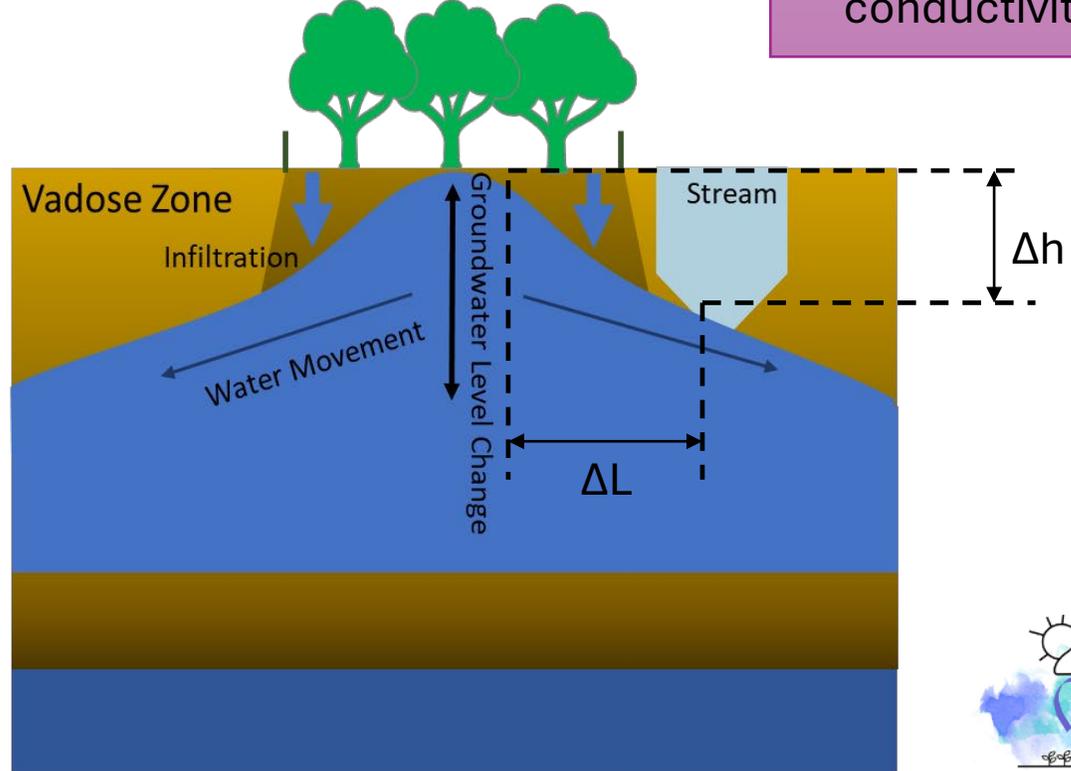
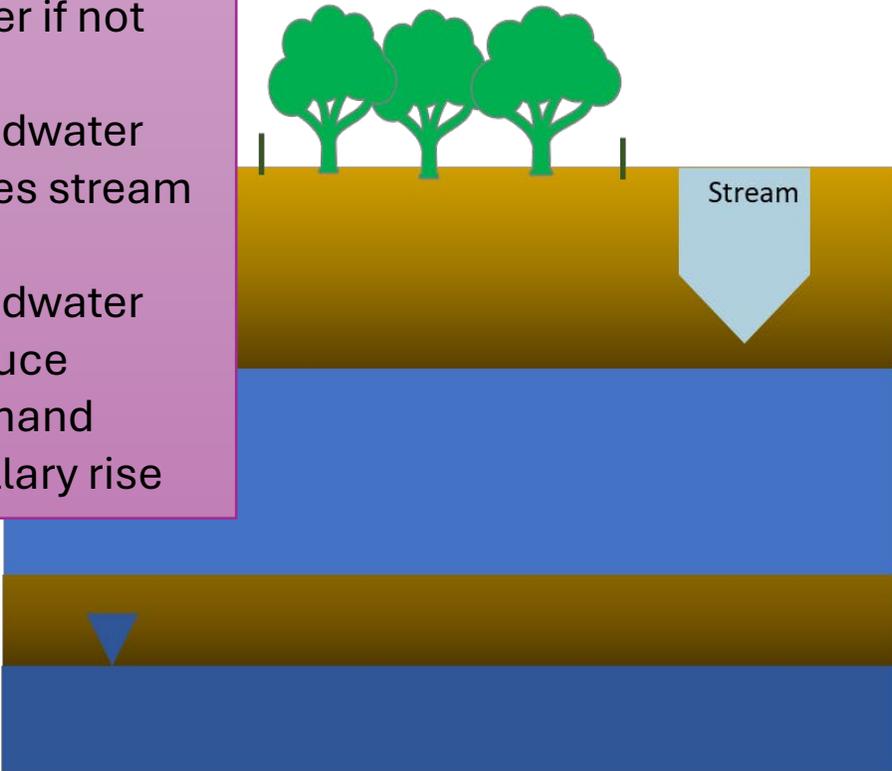


Darcy's Law

$$i = \frac{\Delta h}{\Delta L}$$

$$Q = KAi$$

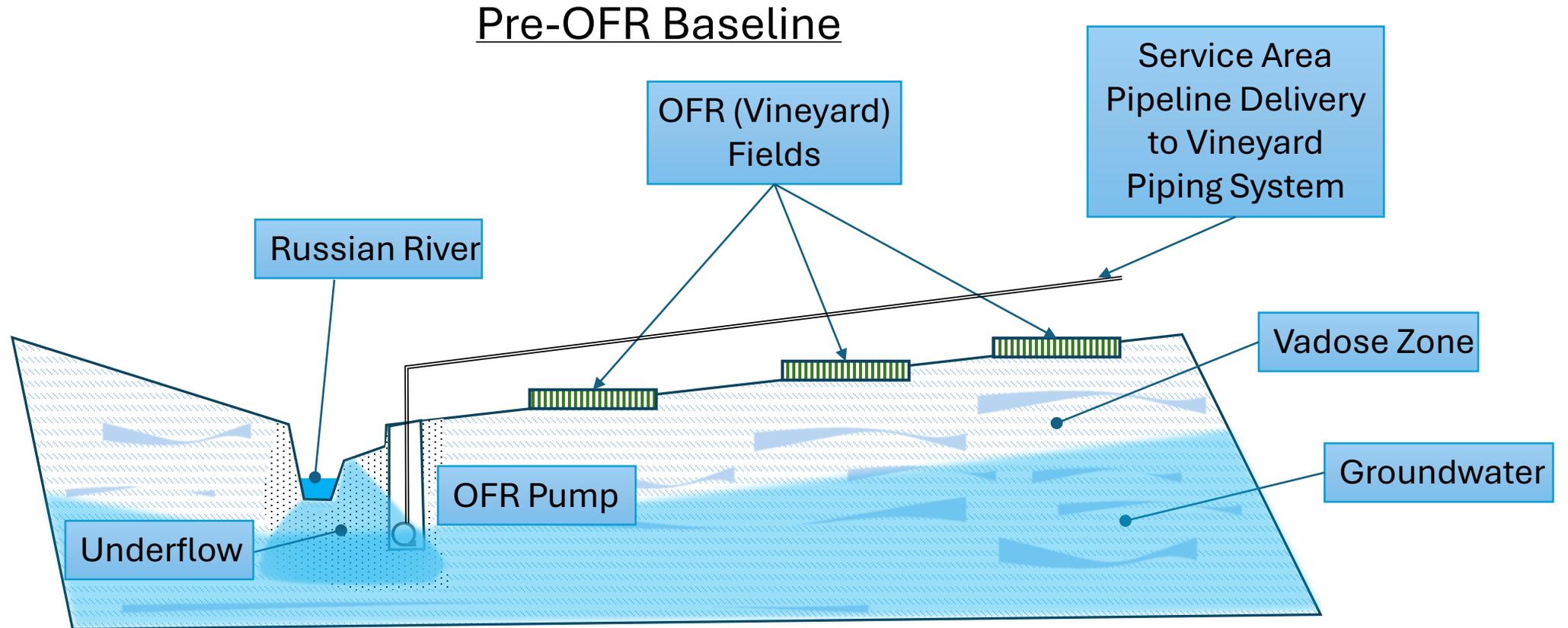
K = hydraulic conductivity



Rain present, but does not cause mounding reflected in diagram

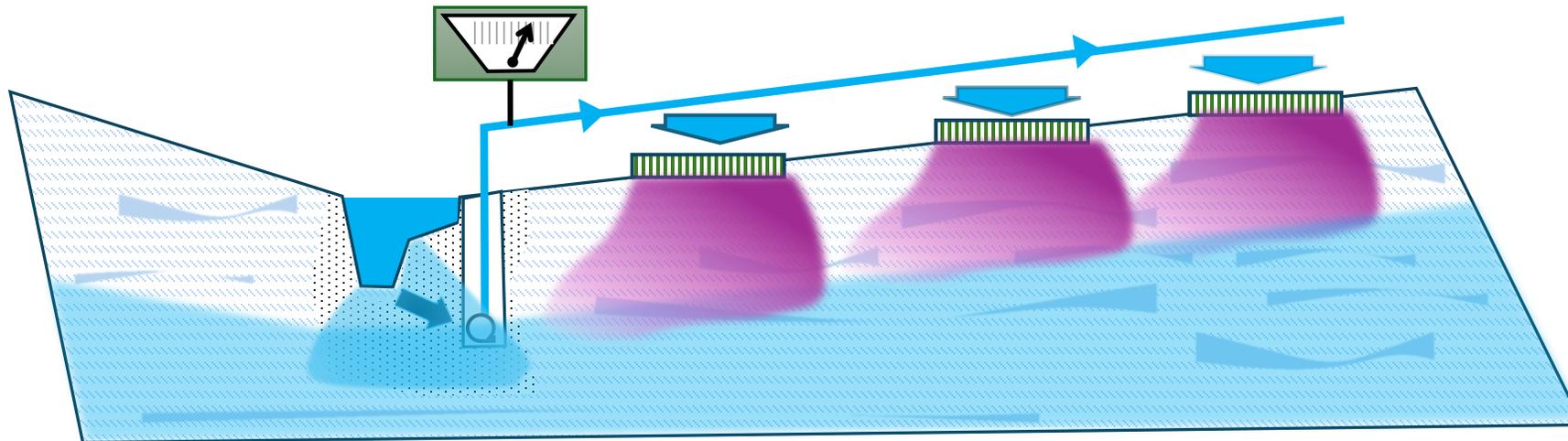


Alexander Valley FloodMAR Process



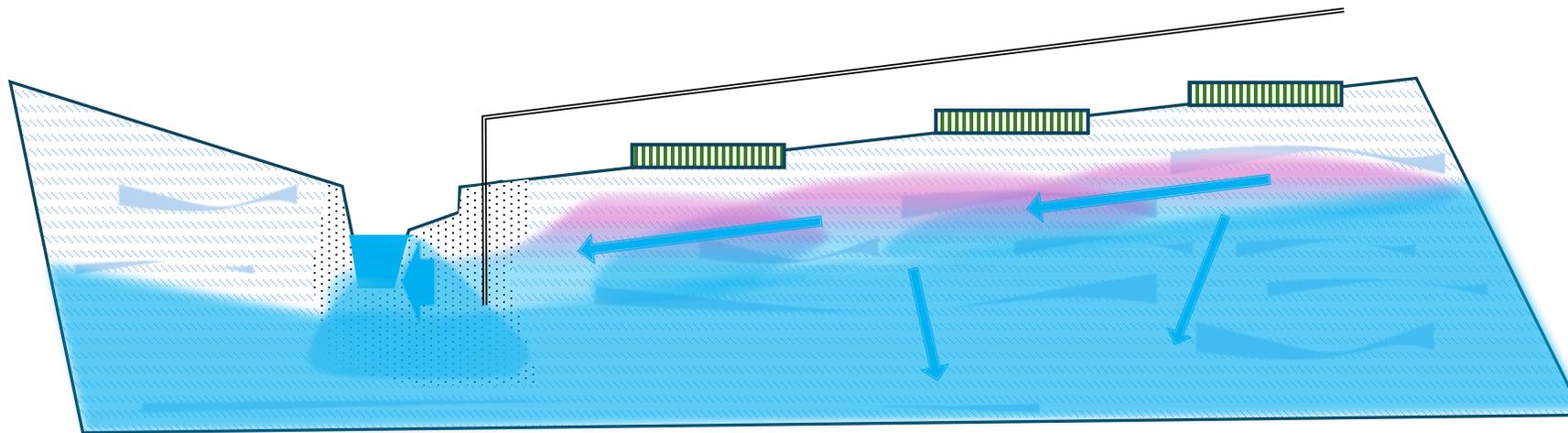
Alexander Valley FloodMAR Process

November through March

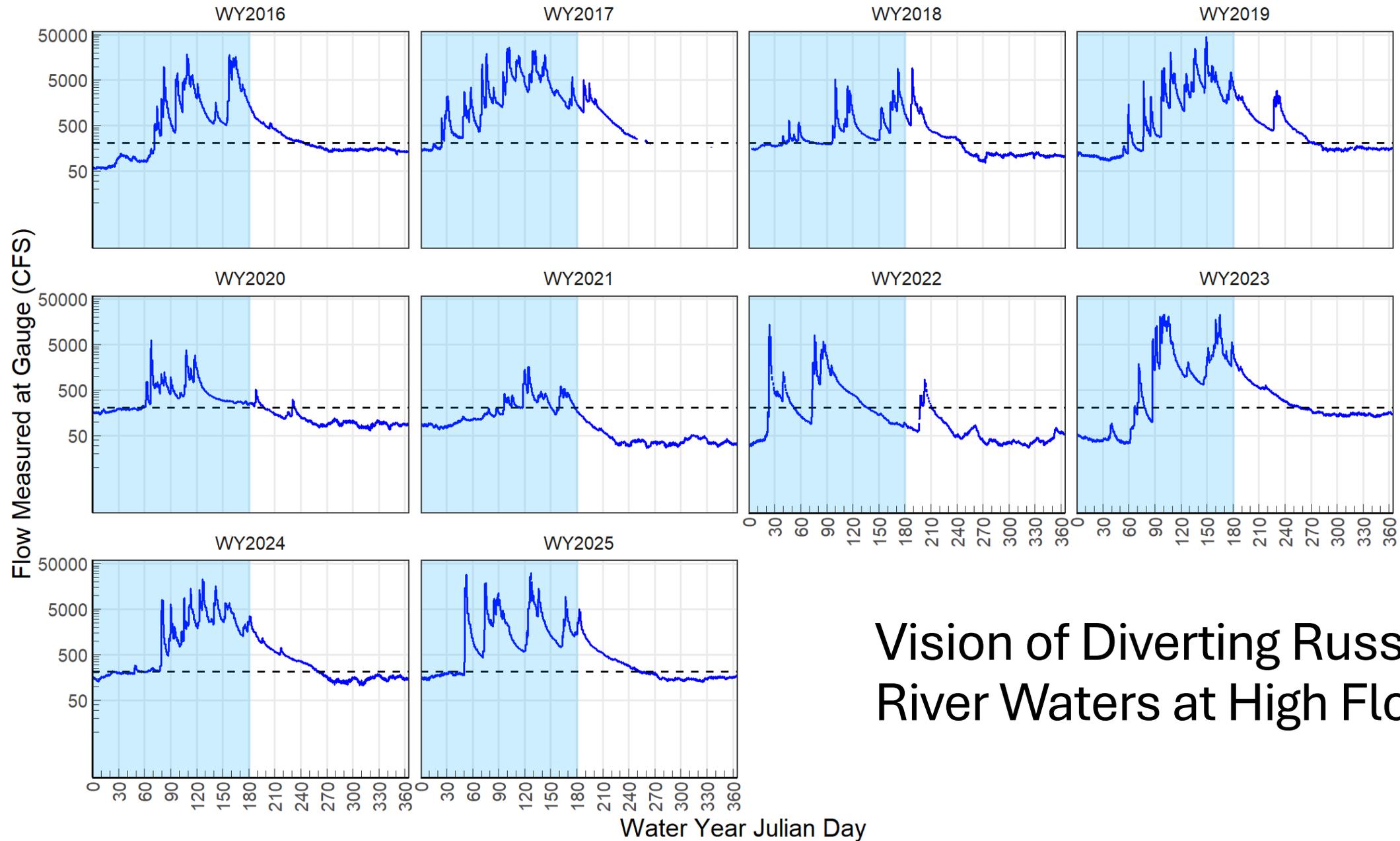


Alexander Valley FloodMAR Process

April through October

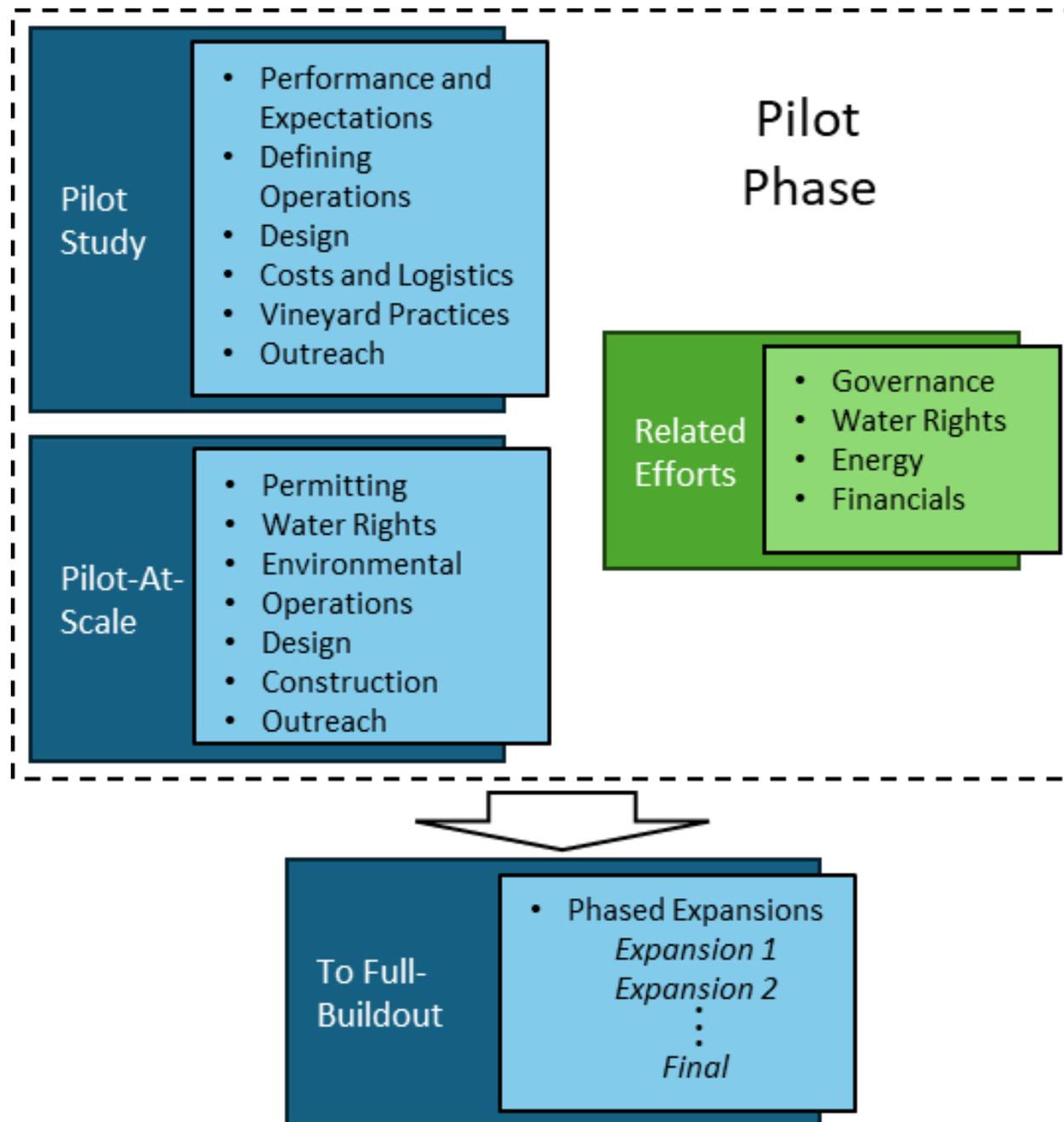


Russian River Flows Over 210 CFS Measured at Jimtown Gauge (USGS 11463682) for Water Years 2016-2025



Vision of Diverting Russian River Waters at High Flows

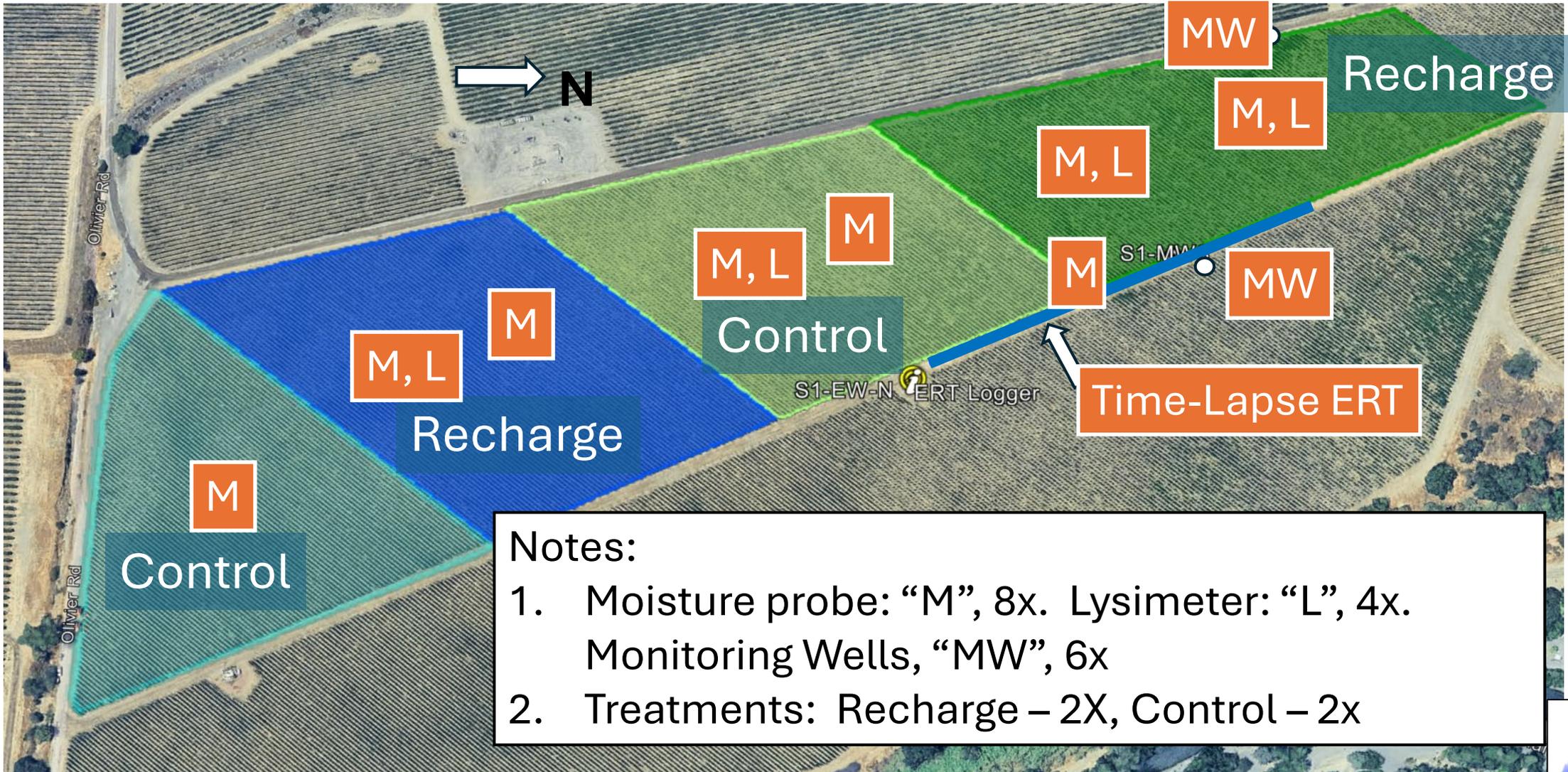
OFR Initiative Overview



Average Annual Recharge Targets



	Pilot-At-Scale	Full Buildout	Units
Field Operations			
Assumed Recharge Rate (1)	14.7	14.7	GPM/Ac
	0.1	0.1	AFD
Durations	36.0	36.0	Days
Volume per Acre	2.3	2.3	Ac-Ft/Ac
Alexander Valley Regional Operations			
Estimated OFR fields	974	2,969	Acres
Estimated OFR fields simultaneous Operations	436	1,485	Acres
Total Volume	2,278	6,944	Ac-Ft
Maximum Regional Diversion Rate	15.8	54.5	CFS
1. Rate estimated at this time.			



- Notes:
1. Moisture probe: “M”, 8x. Lysimeter: “L”, 4x. Monitoring Wells, “MW”, 6x
 2. Treatments: Recharge – 2X, Control – 2x

Frost Protection Sprinklers

Labor limited time

Not in sync with continuous high flow diversions

Higher Maintenance Likely

Frost Protection Sprinklers water rights problem and many have been removed or not maintained

Higher energy cost per volume pumped



Drip and Micro-Irrigation Sprinklers

Sensitive to filtering

24/7 operations opportunities

More Limited Maintenance Expected

In sync with 24/7 high flow diversions

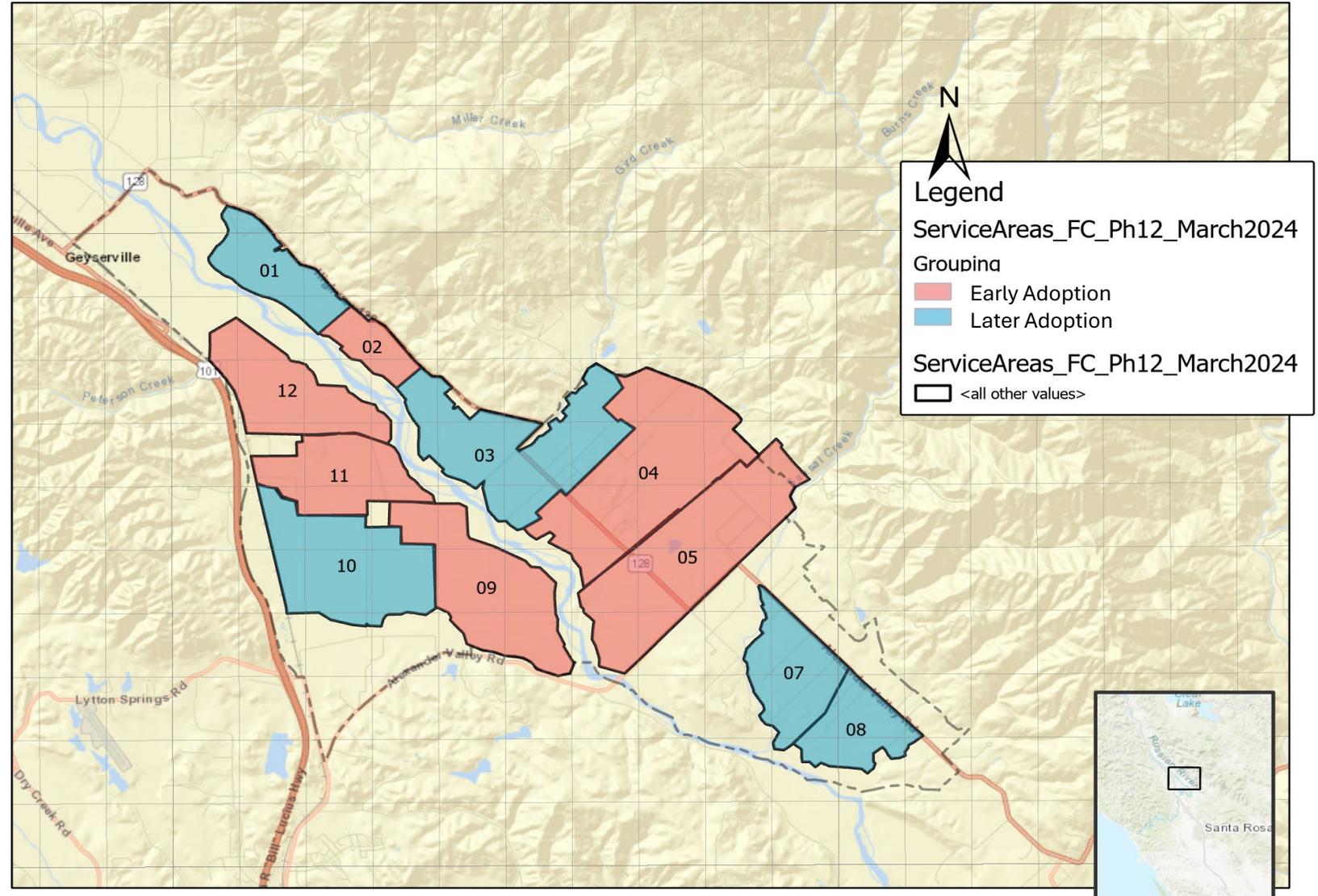
Filtration needs

Lower energy cost per volume pumped



Defining Service Areas

- Service Areas are laid out in a clockwise direction in Alexander Valley
- Designed to minimize crossing (e.g., streams, railroads, roads) and leverage landowner systems
- Each Service Area will have Russian River OFR supply pump station
- Service Areas are represented by Phase 1 and 2. Phase 3 are not in consideration at this time.



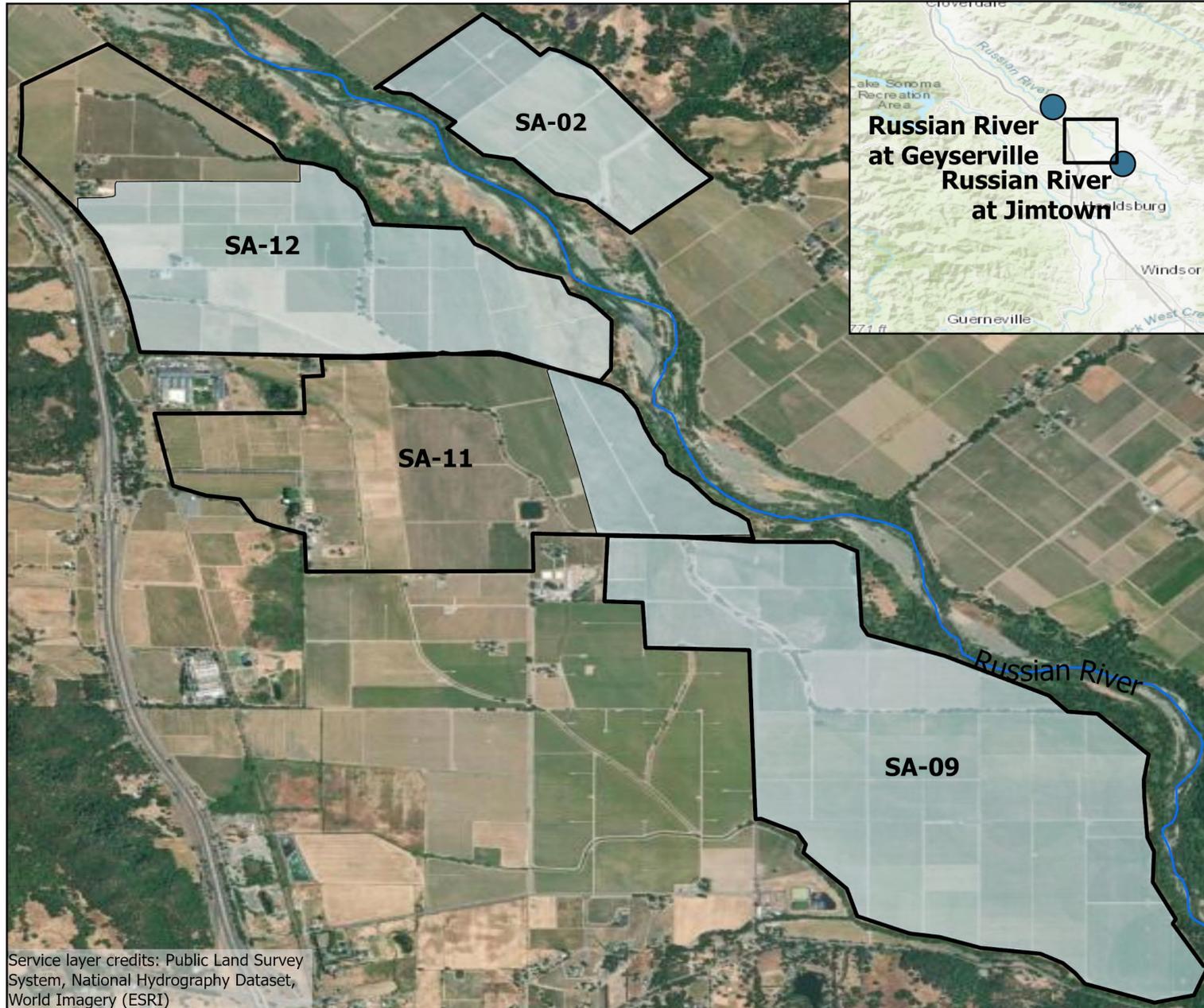
Esri, HERE, Garmin, FAO, USGS, NGA, EPA, NPS, Sonoma County, Lake County, CA, Bureau of Land Management, Esri, HERE, Garmin, INCREMENT P, NGA, USGS

0 0.42 0.85 1.7 2.55 3.4
 Miles

Map Completed by Philip Bachand.
 Bachand & Associates, March 2024
 ArcGIS Pro
 Supported through ESRI Sustainability Program



Pilot-At-Scale Coverage (~ 970 acres)



Service layer credits: Public Land Survey System, National Hydrography Dataset, World Imagery (ESRI)

Alexander Valley On-Farm-Recharge Initiative

Pilot-At-Scale Potential Recharge Application Areas: SA-02, SA-11, SA-12, SA-09

Legend

- Service Area Outlines
- Pilot-At-Scale Potential Recharge Application Areas
- USGS Gauge
- Russian River

Potential Pilot-At-Scale OFR Application Areas

- SA-02: 92 acres
- SA-09: 525 acres
- SA-11: 68 acres
- SA-12: 289 acres

Samantha Fung
Bachand & Associates
March, 2026

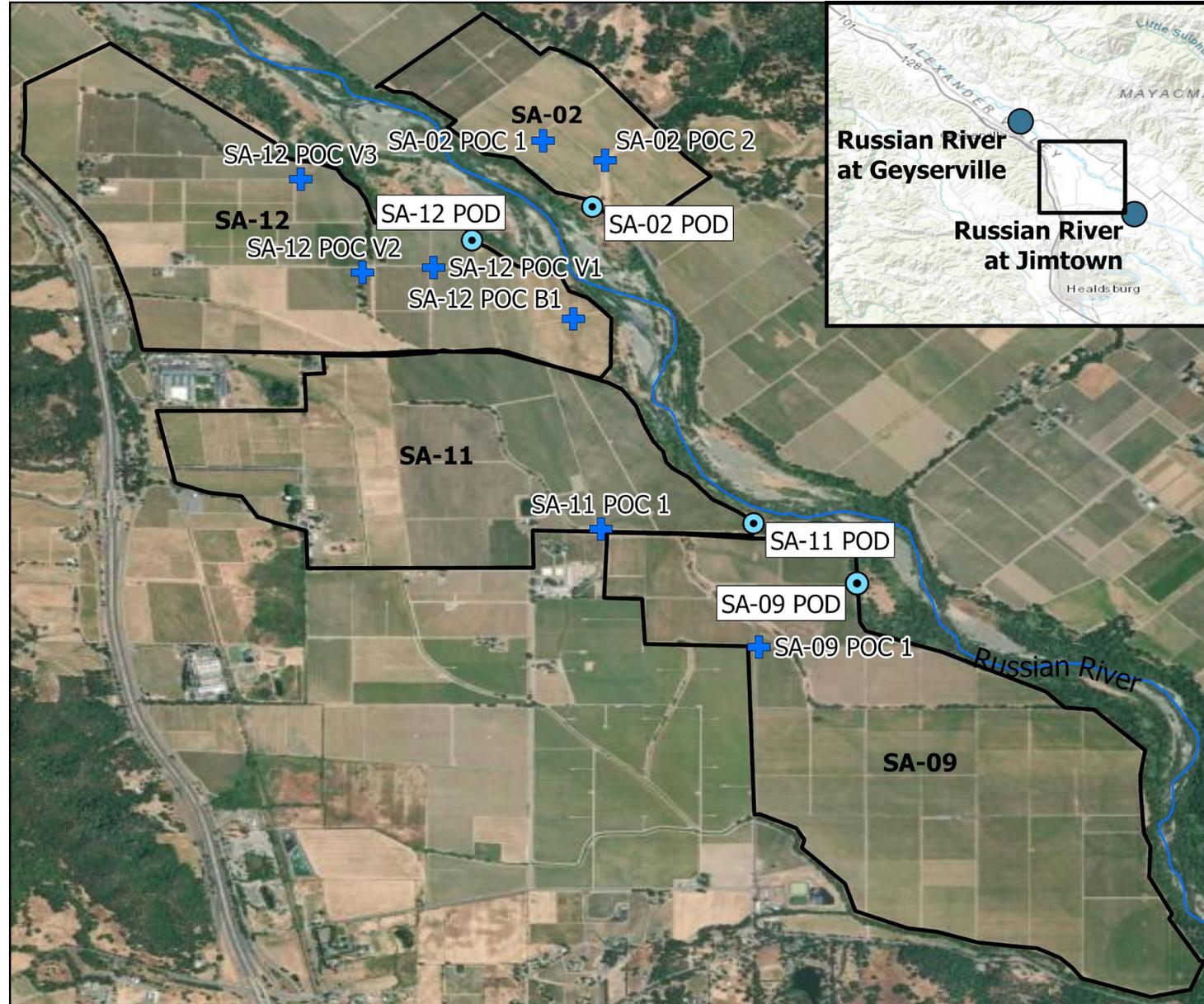


0 0.25 0.5 Miles





Pilot-At-Scale Infrastructure



Alexander Valley On-Farm-Recharge Initiative

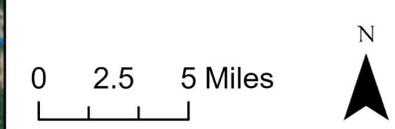
Diversion Monitoring Locations:
SA-02, SA-11, SA-12, SA-09

Legend

- Service Area Outlines
- Point of Diversion (POD)
- Point of Connection (POC) (Landowner Hookups)
- Russian River
- USGS Gauge

Service layer credits: Public Land Survey System, National Hydrography Dataset, World Imagery (ESRI)

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March, 2026





Tasks and Considerations

Tasks

- Contractual
 - Agreements
- Engineering and Env
 - Permitting –
 - Local, State, Federal
 - Approaches and Strategies
 - Water rights
 - CEQA / Environmental
 - Design and Engineering
- Construction
- Social and Legal
 - Governance
 - Financial
- Outreach

Considerations

- Vision and Expectations
- Holistic
 - Beneficial Uses (**Stakeholders**)
 - Environmental and Permitting Considerations
 - Vs. Silo
 - Water Rights (**Abundance v Scarcity**)
- Partners / Stakeholders
 - Agencies
 - Landowners
 - Tribes
 - Others....
- Energy and Water Connectivity
- Funding Constraints / Restrictions
- Governance – e.g.,
 - Mission
 - Scope and Responsibilities
 - Equity
 - Financials



Phase 1 Initiative Deliverables

“Concrete”

- Pilot at Scale
 - Infrastructure
 - Permits
 - CEQA
 - Temporary Water Rights
 - Agreements
 - Design
 - Diversion Operations Strategy
- Pilot Studies
 - Refinement of operations and design
 - Strategies
 - Proof-of-Concept
 - Expectations
 - Regulatory refinement

Policy, Planning,

- Master Plan
 - Fact Sheet
 - White Paper
- Project Completion Report
 - Challenges
- Water Availability Analysis
 - Abundance/Scarcity paradigm

Questions and Thoughts