

Dr. Laura Foglia, Larry Walker Associates and UC Davis

Scott Valley Irrigation District

Recharge Project on alfalfa fields

2024 California Alfalfa & Forage Symposium



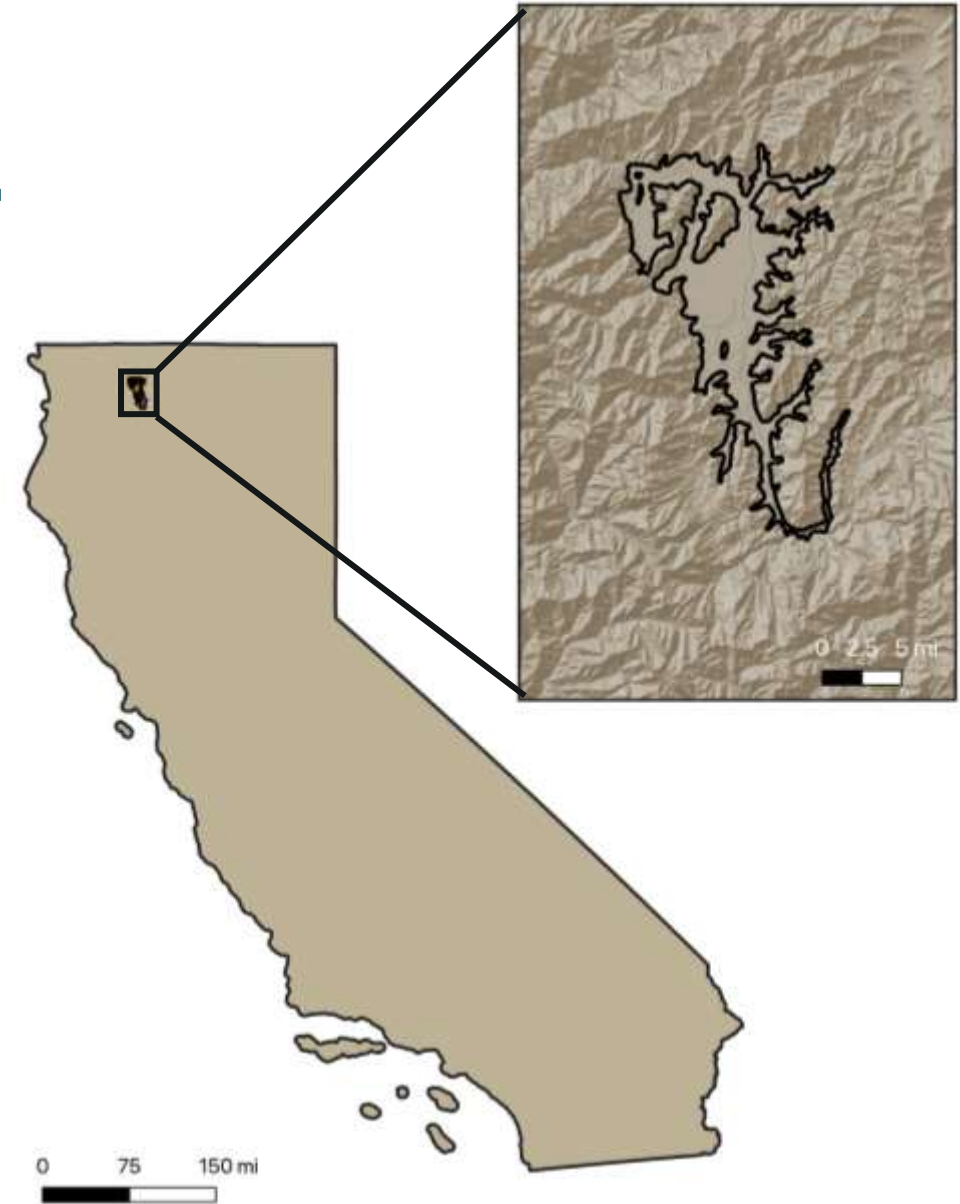
LARRY WALKER
ASSOCIATES
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Agenda

- Project Overview: why groundwater recharge in Scott Valley?
- Project History
- Monitoring and Data Collection
- 2024 Implementation Progress and Results
- Conclusions
- Next Steps

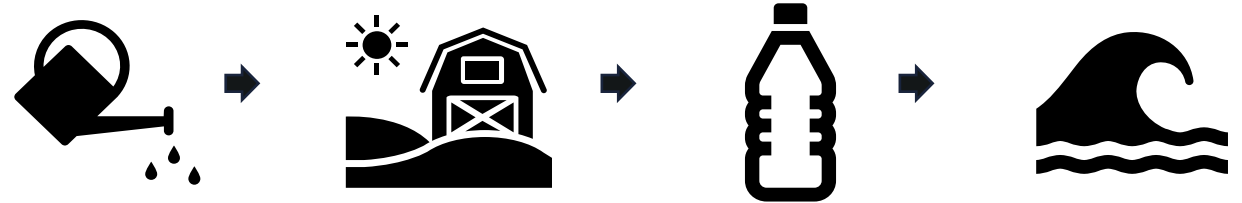
About Scott Valley

- Located in Northern California
- Medium-Priority Basin
 - GSP submitted in December 2021, approved in April 2023
- Scott River is a tributary to the Klamath River
- Important habitat for several species of anadromous fish, including coho salmon





Why recharge in Scott Valley?



During periods of high flow water is diverted from Scott River and applied to fields

This increases groundwater that is then available to return to Scott River

- Groundwater and surface water interconnection
- Importance of instream flows in Scott Valley for fish
- Existing infrastructure- Scott Valley Irrigation District ditch

From the Groundwater Sustainability Plan...

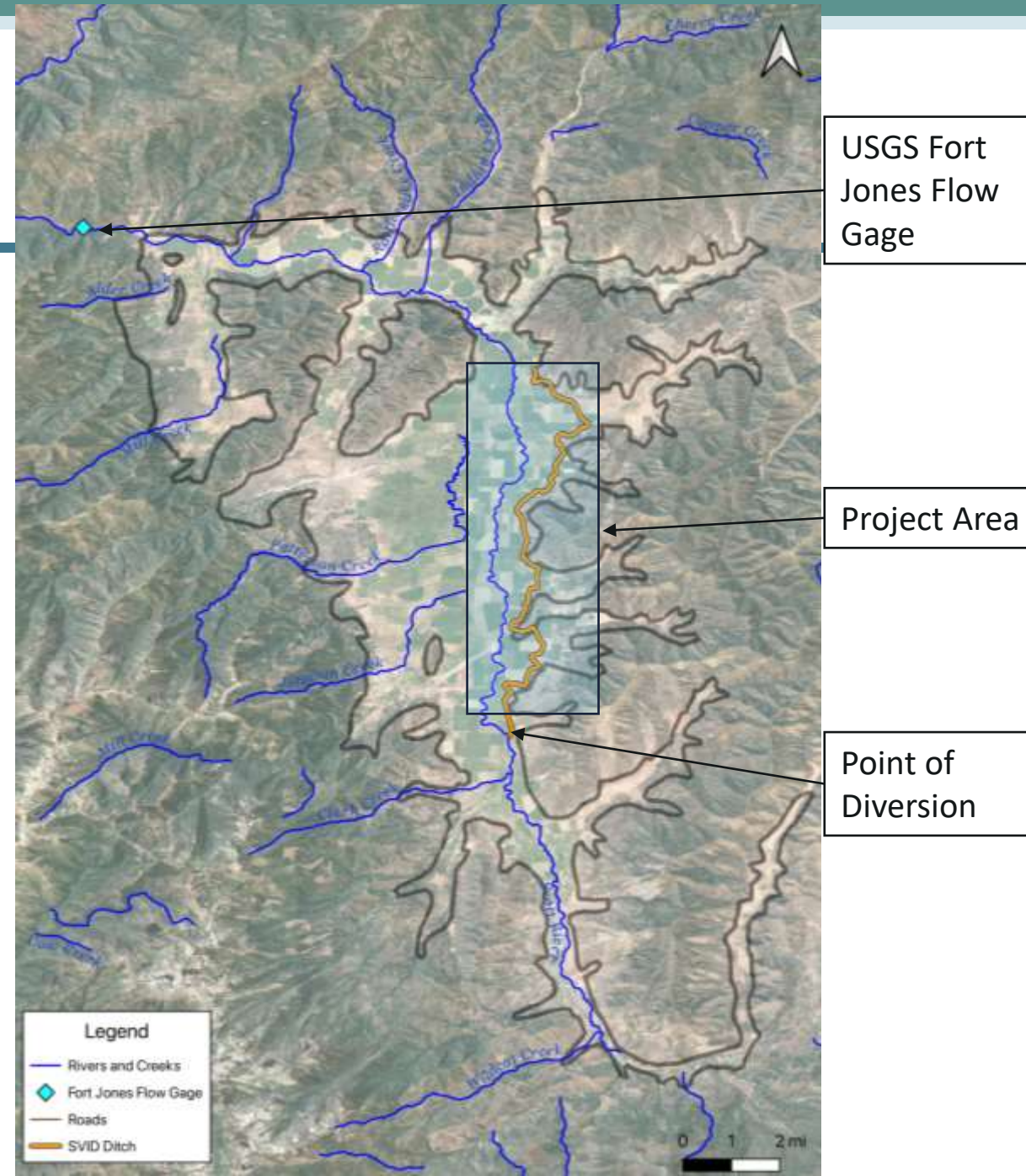
Modelling scenarios are supporting the potential of groundwater recharge as one of the possible tools for reaching sustainability

Summary Table

Scenario Type	Scenario ID	Scenario Depletion Reversal, Sep-Nov '91-'18 (TAF)	Relative Depletion Reversal, Sep-Nov '91-'18
Enhanced Recharge	MAR (Managed Aquifer Recharge) in Jan-Mar	13	10%
	ILR (In-Lieu Recharge) in the early growing season	12	9%
	MAR + ILR	25	19%
	Expanded MAR + ILR (<i>assumed max infiltration rate of 0.019 m/d</i>)	60	44%

SVID Recharge Project Overview

- Use Scott Valley Irrigation District (SVID) ditch to divert water from Scott River during periods of higher flow and apply to agricultural land for groundwater recharge
- Diversion January through March in current permits
- Long-term implementation to understand:
 - Results under different conditions/ water year types
 - Potential longer-term benefits of groundwater recharge
- **Evaluate impact to instream flows, particularly in the late summer and fall**

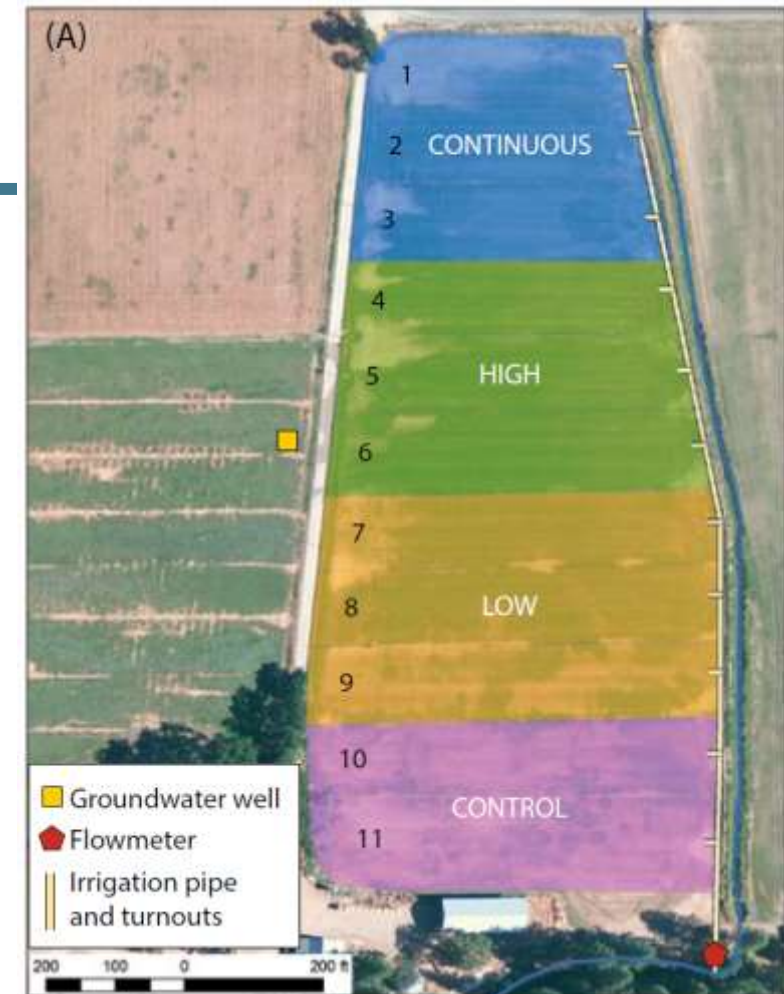


Project History and Results

- **2016 PILOT PROJECT**, about 15 acres, results summarized by UCD (Dahlke H, et al., 2018, Cal Ag) → **675 af diverted** to underground storage for fish and wildlife enhancement use. Diversion report submitted 10/10/2016.
- **2022**: permit issued 03/03/2022 → **about 28.6 af used to test recharge.** Diversion report submitted to SWRCB 07/08/2022
- **2023**: permit issued on 01/18/2023, water diverted for recharge *from March 13 through March 31*, **816 af diverted, 51.7 af applied to three fields.** Diversion report submitted to SWRCB 5/31/2023.
- **2024**: permit issued on 11/21/23, diversion for recharge started 01/15/2024 and went through 3/31/2024, **2,539 af diverted.**

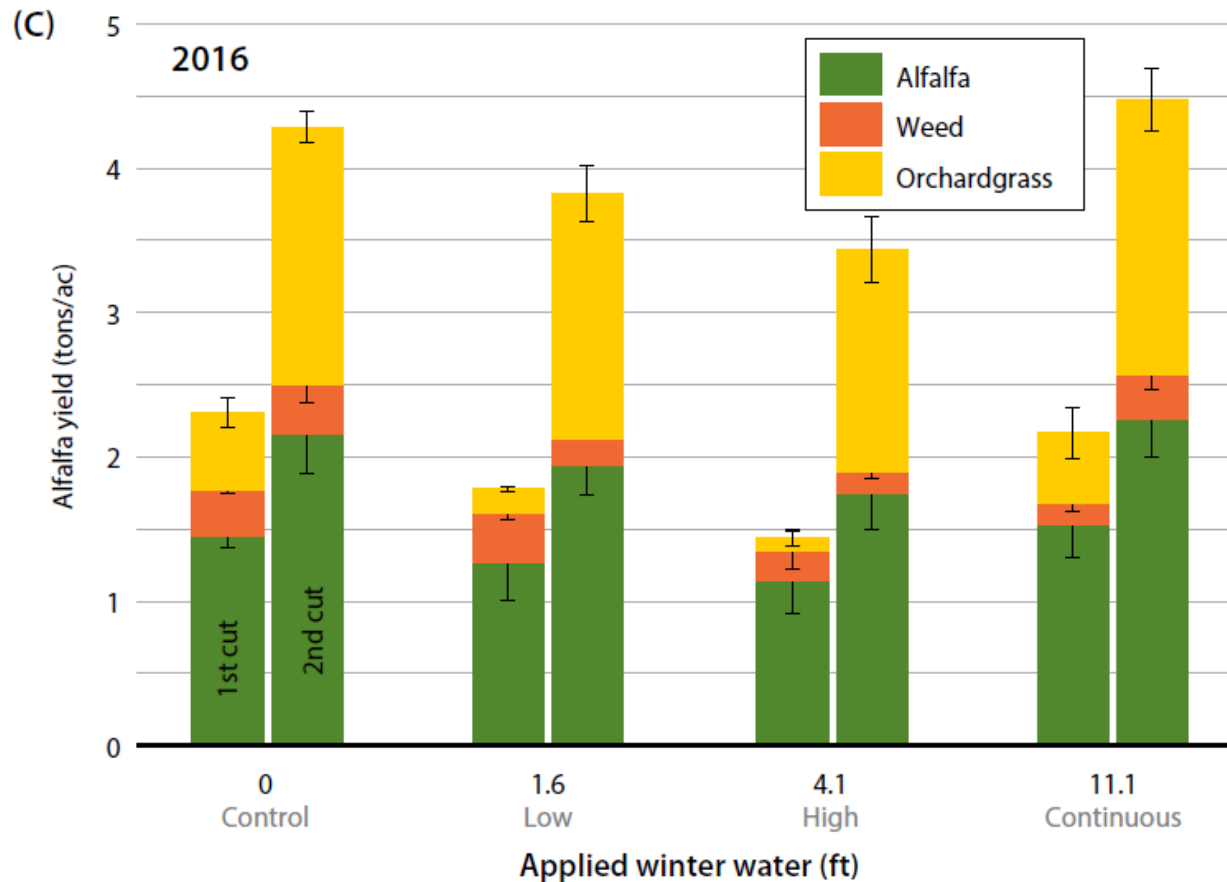
2016 ON-FARM PILOT

- Scott Valley, Siskiyou County
 - 15 acres
 - 9-yr alfalfa stand
 - Stoner gravelly sandy loam
 - Alfalfa variety: BlazerXL
 - Fall dormancy 3
- Treatments
 - **Continuous** – every day
 - **High** – 3-5 water applications per week
 - **Low** – 1-3 water applications per week
 - **Standard** - no winter water application



Dahlke H, Brown A, Orloff S, Putnam D, O'Geen T. 2018. Managed winter flooding of alfalfa recharges groundwater with minimal crop damage. Calif Agr 72(1):65-75. <https://doi.org/10.3733/ca.2018a0001>.

Groundwater Recharge effect on alfalfa



- 2016

- Continuous treatment showed slightly higher yields than control during 1st and 2nd cuttings
 - Similar to 1st cutting in 2015
- Weed and orchard grass biomass did not show correlation to total applied water

2016 conclusion

- Results: large fraction of the applied winter water percolated past the root zone toward the groundwater table.
 - Over 90% of the applied water went to deep percolation.
 - Less than 10% was either evaporated or used to fill up soil pore space to bring the soil to field capacity.
- Back in 2015-2016 → before SGMA, more interest in understanding impact to crops than potential benefit to rivers and groundwater systems
- Next step: quantify the amount of water that from deep percolation is contributing to the river in the following months

2022 and 2023: Limited water available for recharge

2022

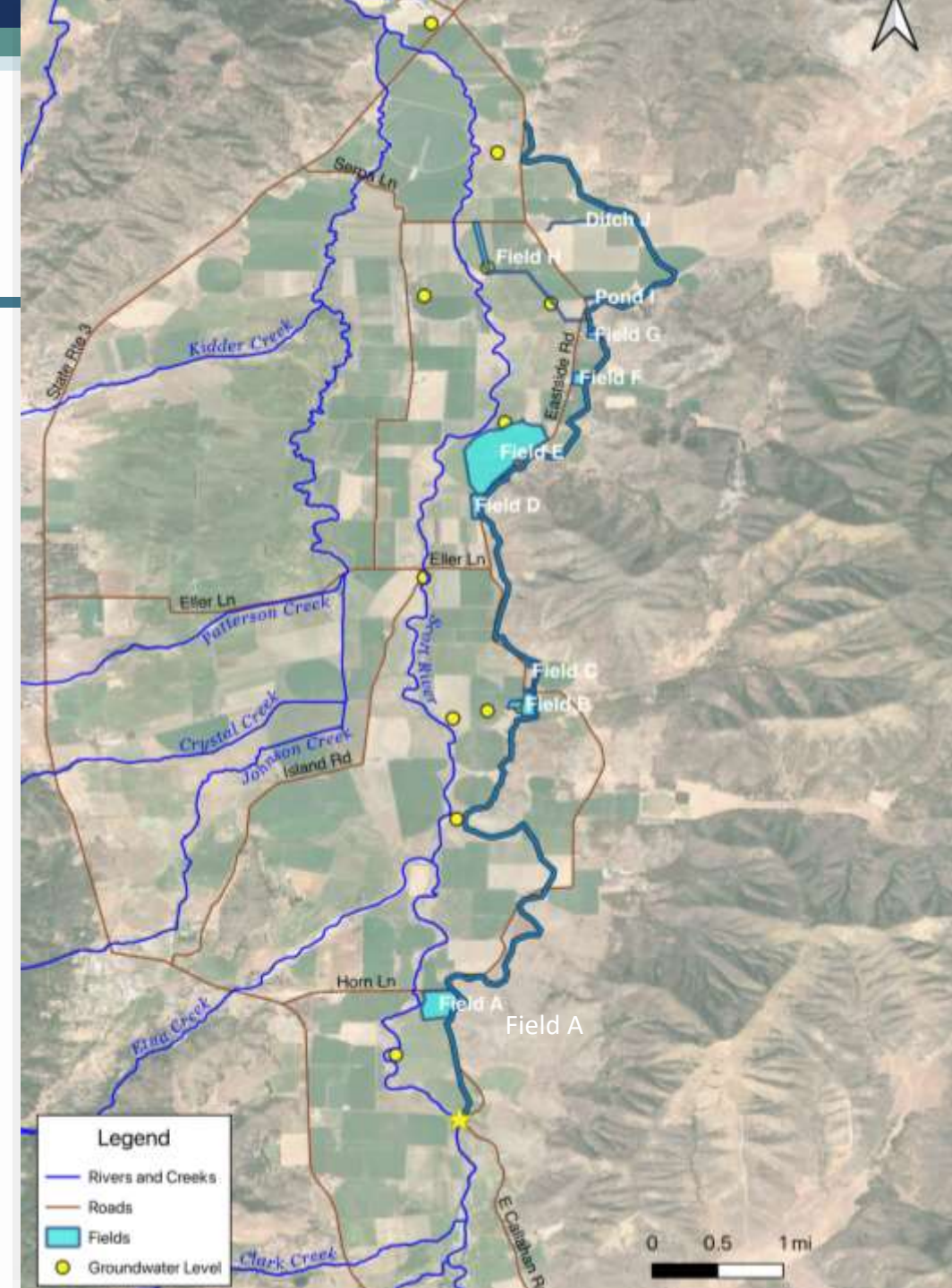
- Limited amount of recharge through stockwater permit (686.8 af in total, but only 26.8 used for recharge) applied on 15 acres to test the system and potentially the well instrumentation
- Amount was too small to notice any immediate impact on groundwater elevation

2023

- Limited window for recharge
- Recharge only conducted March 13th through March 31st
 - Ditch was dry prior to start of recharge- delay in water reaching fields
- **816 af diverted, 51.7 af applied to three fields**

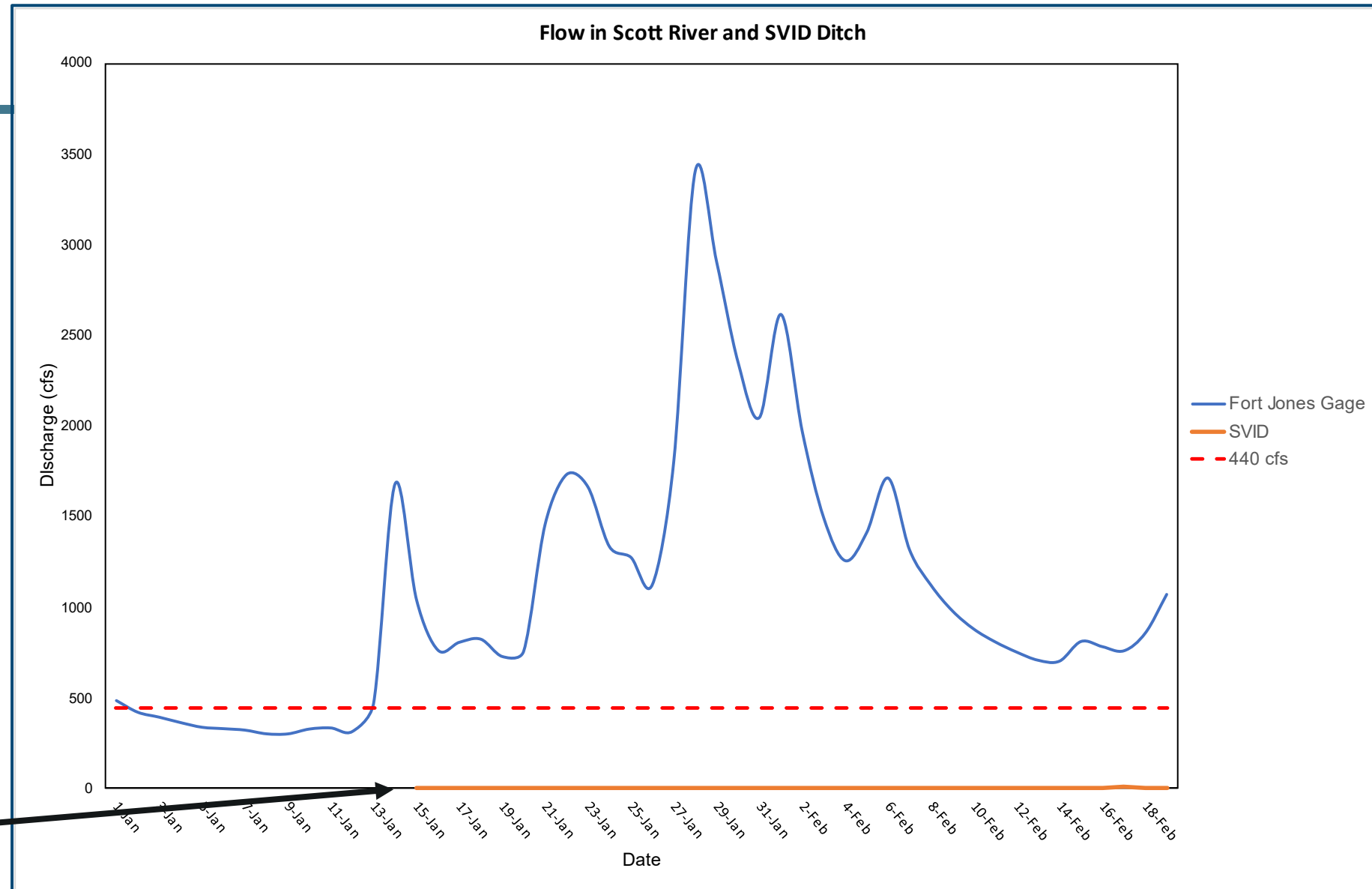
SVID Recharge 2024

- Water diverted from Young's Dam from **January 15, 2024 through March 31st 2024**
- Total of **2,539 AF** diverted from Young's Dam
- 10 different locations used in SVID service area to apply water (A through J)
- Total area ~ **260 acres**



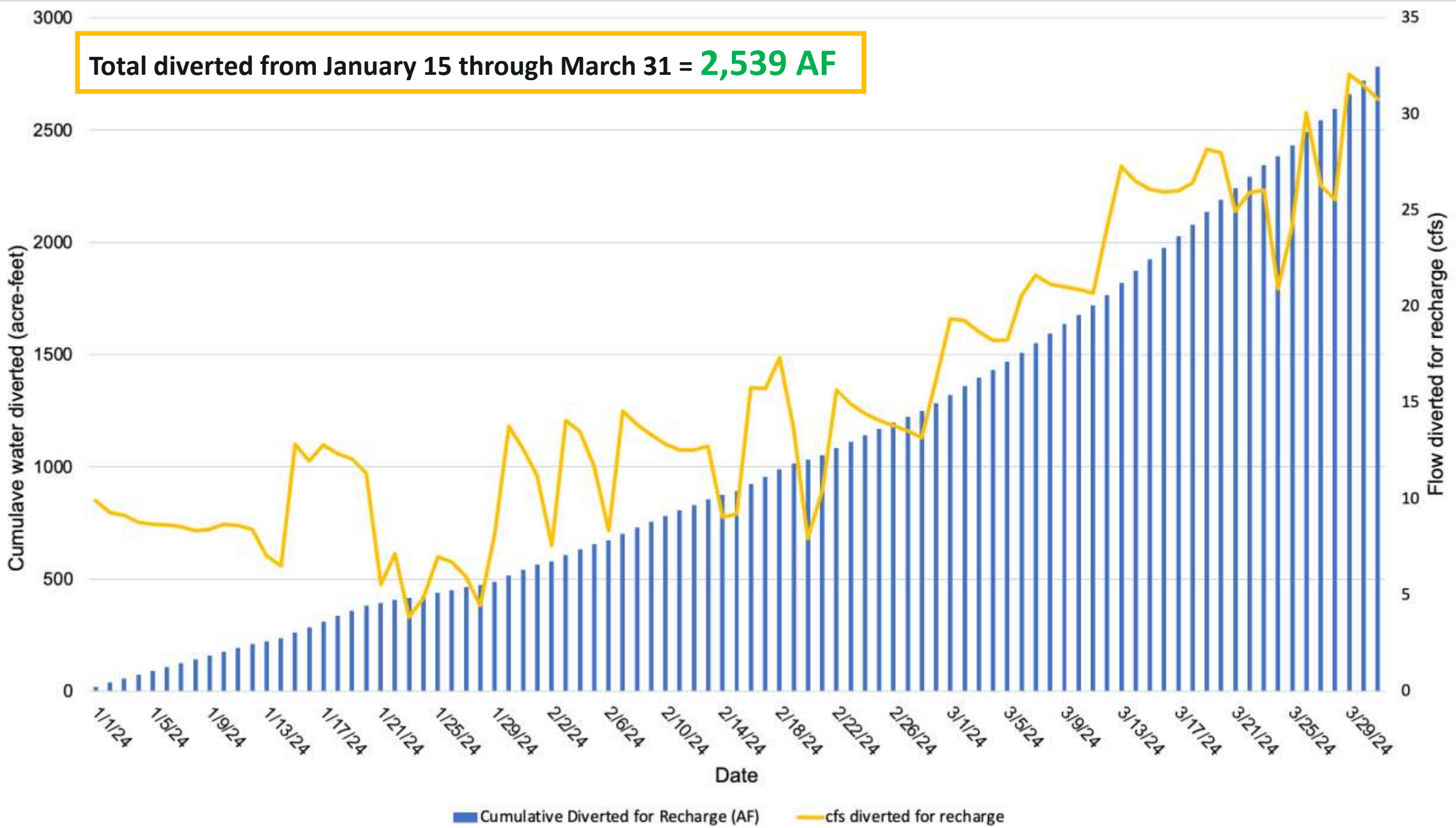
2024 Flow

Flow diverted to SVID ditch at the point of diversion (POD), Young's Dam is a fraction of flow measured at the Fort Jones USGS gage.

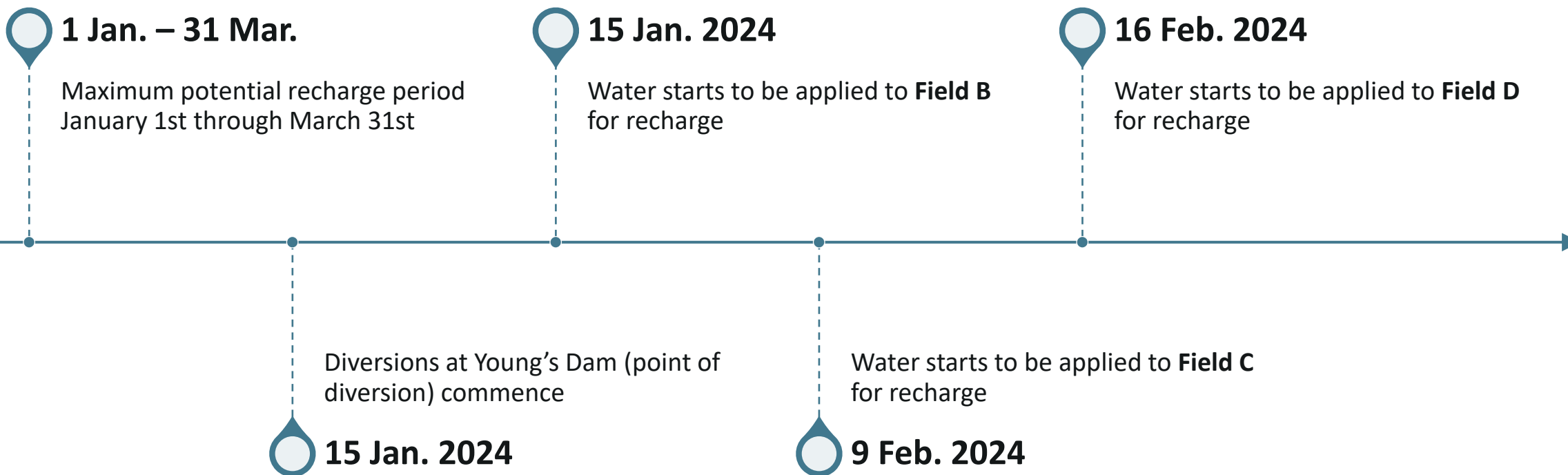


**Diversion started
January 15, 2024**

Total diverted from January 15 through March 31 = **2,539 AF**

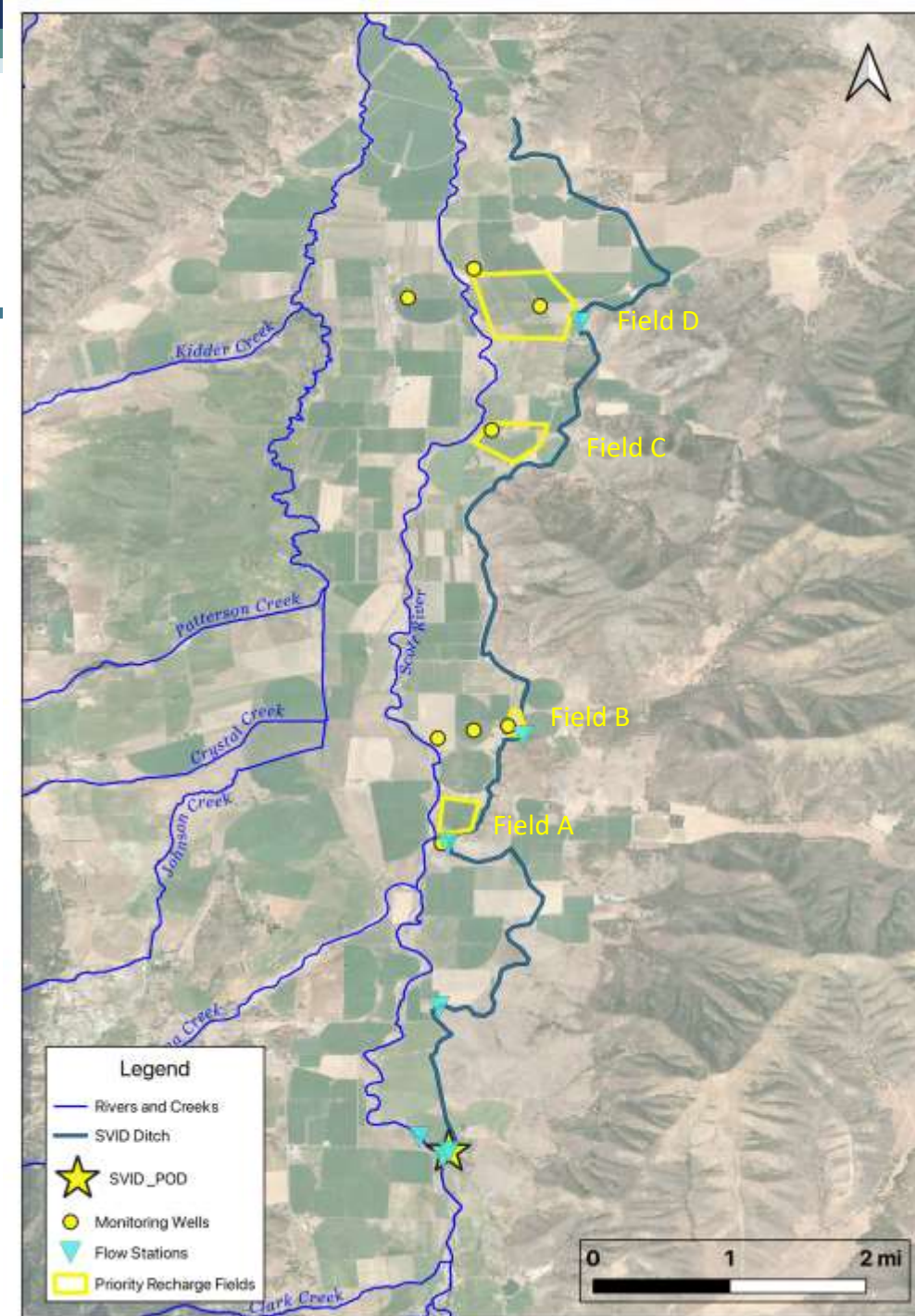


2024 Timeline

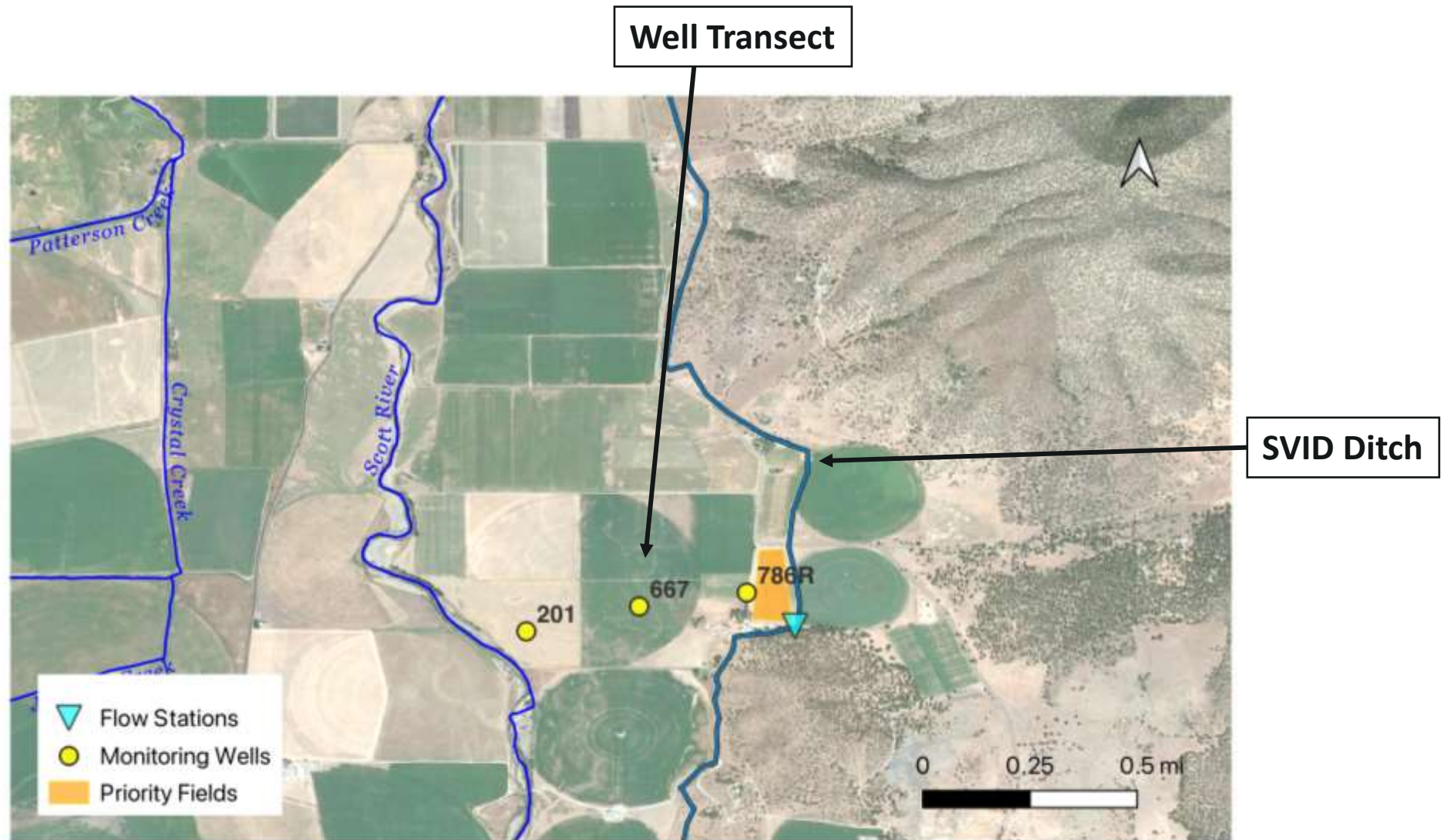


Monitoring, 2024 Update

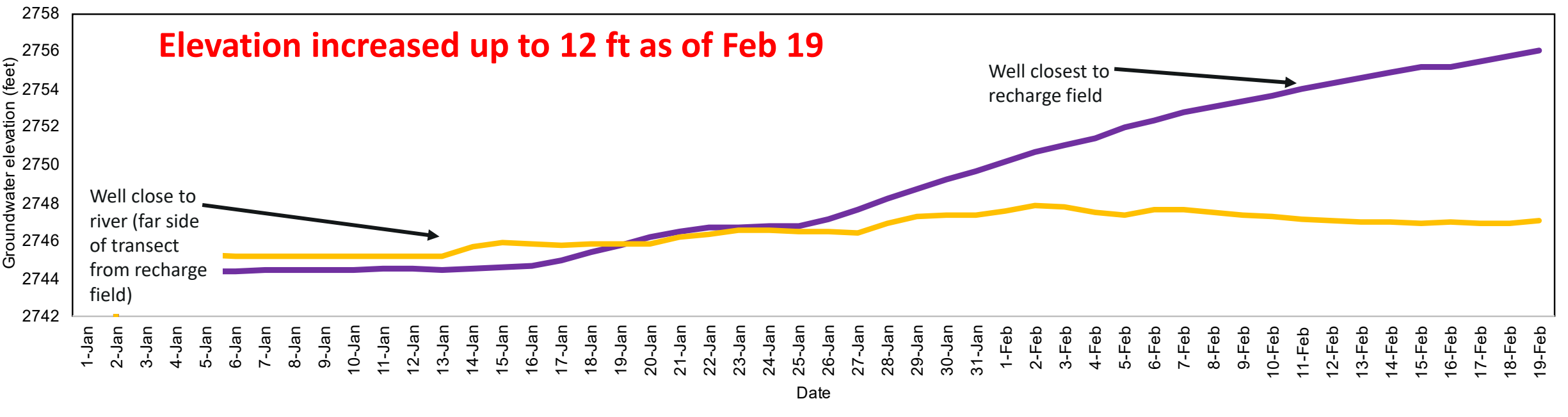
- Evaluate recharge from water applied to fields AND due to infiltration along the ditch
- 8 groundwater wells in recharge project area
- Temperature sensors
- **2** flow stations in Scott River
- **5** flow stations along the ditch
- Biological Monitoring (throughout recharge period)
- Geochemical eight sites (surface and groundwater) for: isotopes, major ions, radon
 - Use to better understand recharge dynamics, as natural tracers for the movement of water



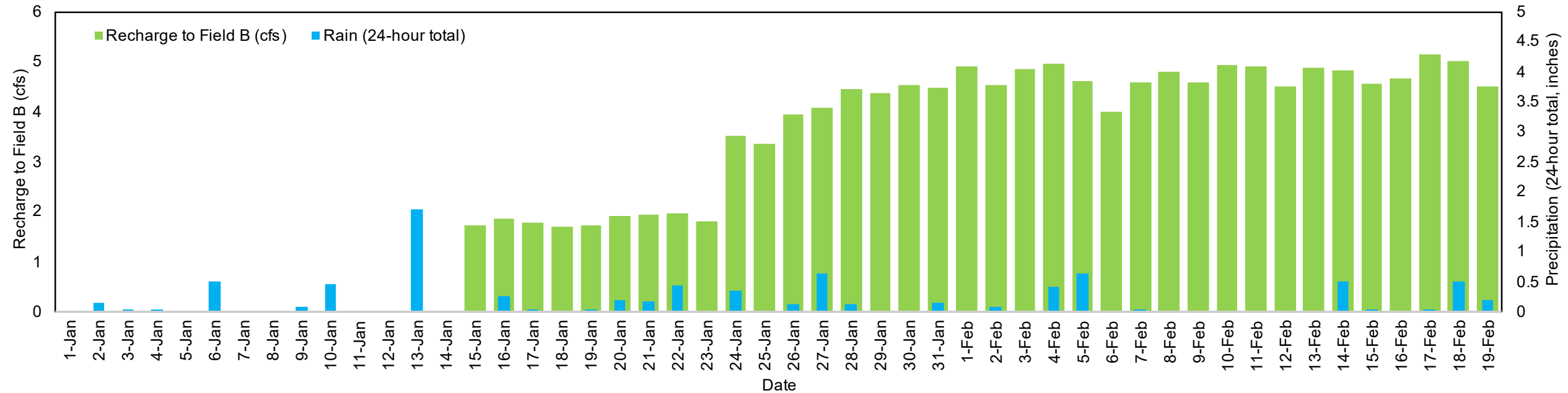
Continuous Data Snapshot at Field B



Groundwater Elevation near Field B



Precipitation and Recharge to Field B January 1 through February 19, 2024



Conclusion

- Project continually evolves and improves- 2024 had significant additions to monitoring network
- **Multiple years of implementation** are required to study benefits in:
 - Different water year types and conditions
 - Potential long-term benefits
 - Evaluating strategies for maximizing recharge benefit (e.g., key locations, application timing and frequency)





2024: Next Steps

- **Monitoring Updates**
 - Add two temperature sensors in Scott River:
 - Near recharge field
 - Near Point of Diversion
 - Add shallow piezometer transects
- **Results**
 - Diversion report and conclusions from 2024 recharge season
 - Run scenarios using the groundwater model to quantify benefits from actual implementation in 2022, 2023, and 2024
- **5-year temporary permit application**



Thank You

LWA Team

Laura Foglia, Kelsey McNeill, Audra Bardsley, Jeff Walker

Larry Walker Associates

lauraf@lwa.com