

Recharge Net Metering (RENEM)

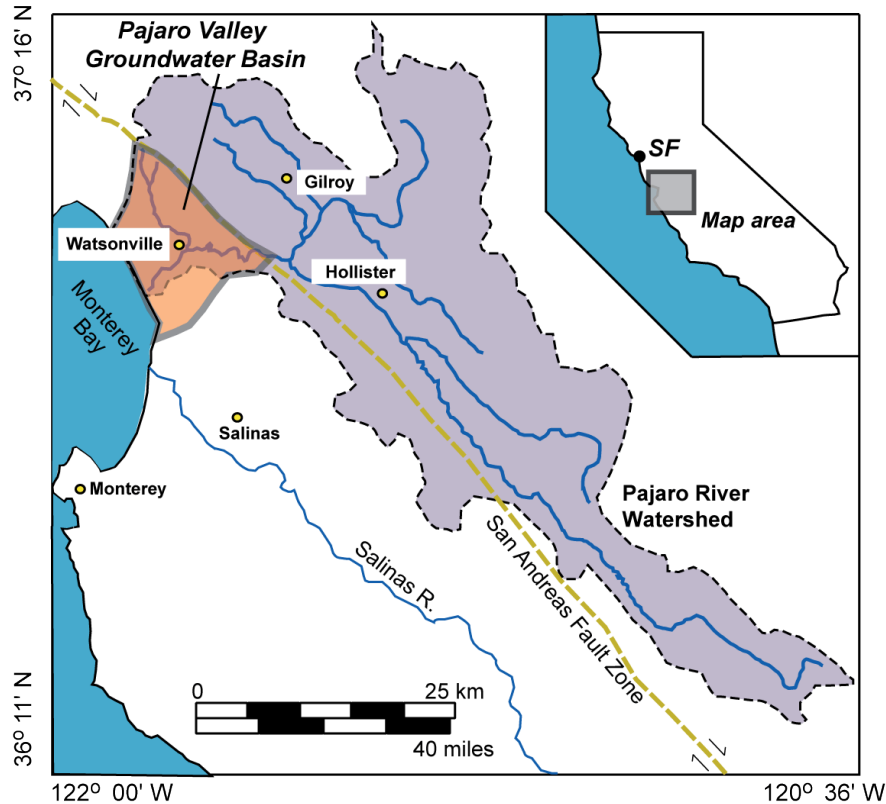
*A Cost-Effective Incentive System To Enhance
Groundwater Recharge*

Lisa Lurie | RCD Santa Cruz County
Andy Fisher | UC Santa Cruz



ReNeM | *Invented And Proven In The Pajaro Valley*

Pajaro Valley, like many other regions, faces a groundwater deficit.



- PVGB, lower PR basin, mostly Santa Cruz and northern Monterey Counties
- Primary freshwater resource is **groundwater**
- PVWMA (PV Water, 1984): special act district
- PV Water serves ~70,000 acres, ~30,000 irrigated

Major crops:

Strawberries, cane berries, table crops, organic (30%)

Pumping: ~55,000 ac-ft/yr

Overdraft: averages ~12,000 ac-ft/yr



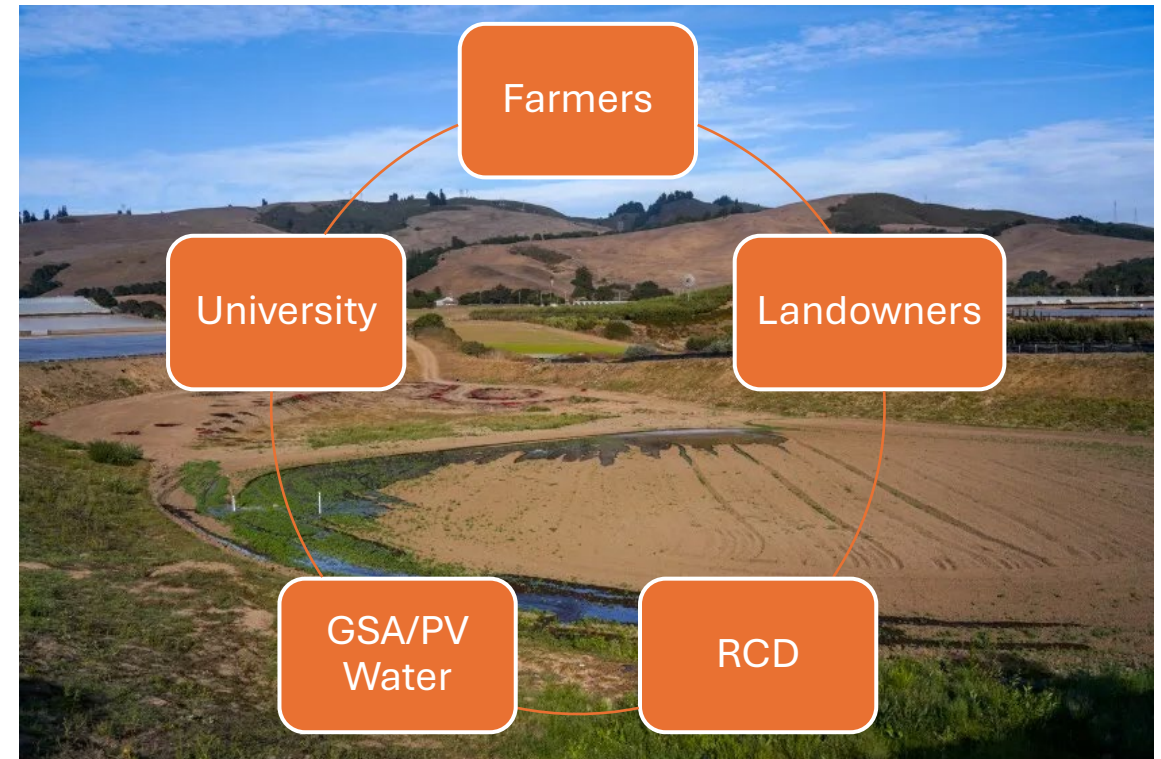
→ **\$1B farm revenue**

Groundwater sustainability plan includes conservation, improved efficiency, recharge*

ReNeM | Origins

ReNeM is the result of farmers/landowner's effort to resolve groundwater issues, reinforcing its collaborative, voluntary and community led nature.

- **Recharge** emerges from community dialogue as promising solution for increased groundwater supply.
- Project proponents pitch **ReNeM payment** as percentage of cost of water
- Landowners **volunteer access to property**, host infiltration system
- Success from **creative thought process, scientific backing**, neutral third party, **community support**, and **open-minded water agency**



Voluntary

Collaborative

Community Led

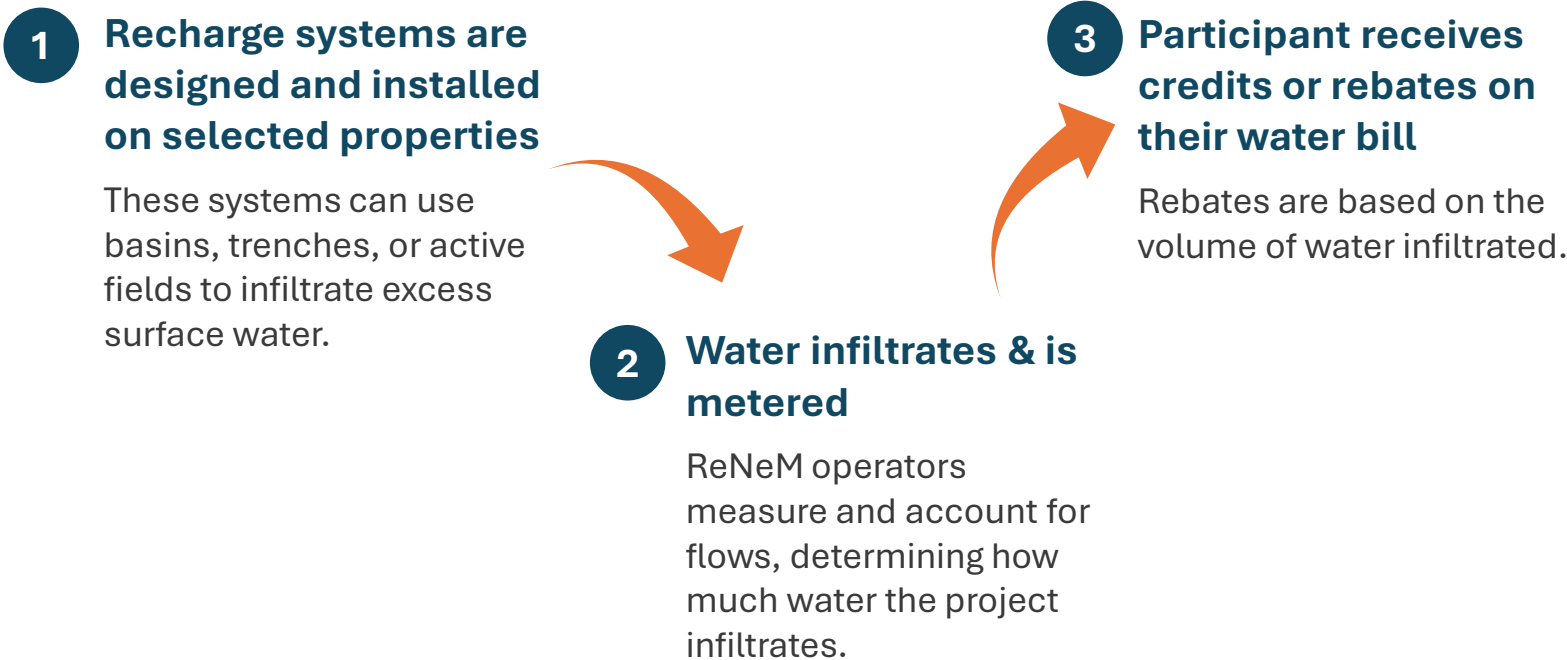
Science based

ReNeM | How It Works In the Pajaro Valley

ReNeM program participants receive payments in the form of pumping fee rebates, based on the measured volume of water their projects infiltrate each year.



Kelly Thompson Infiltration System & Instruments¹



Benefits to the basin and stakeholders

- ✓ Sustainable water supply
- ✓ Community collaboration
- ✓ Financial incentive for recharge
- ✓ Improved Water Quality
- ✓ Meet SGMA requirements
- ✓ Decreased land subsidence/salt water intrusion

ReNeM | *How It Works In the Pajaro Valley*

The RCDSCC and UCSC share leadership in several activities, from technical analysis to administrative/project management, all enabling the implementation of the project and guaranteeing its success.



Planning

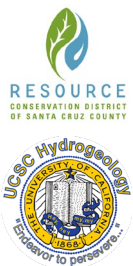


Construction & Maintenance



Monitoring & Reporting

ReNeM | How It Works In the Pajaro Valley - Planning



Planning

Site Assessment & Characterization

- Regional suitability assessment
- Testing of subsurface geology for reasonableness of basin placement*
- Drainage analysis for water source
- Willing landowner/tenant

Fundraising/ Grant writing

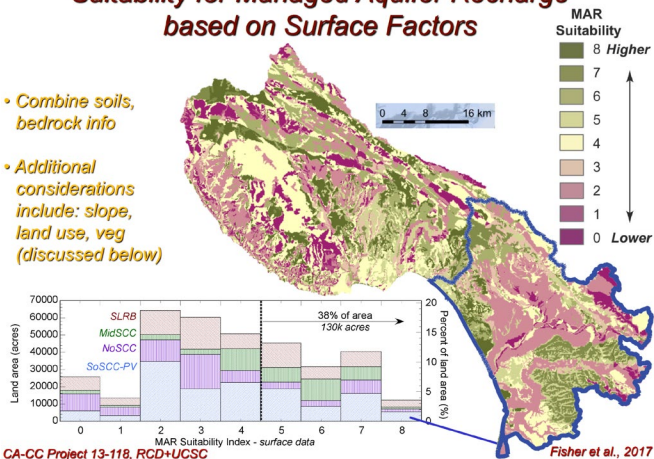
Project Design

Permitting

Agreements

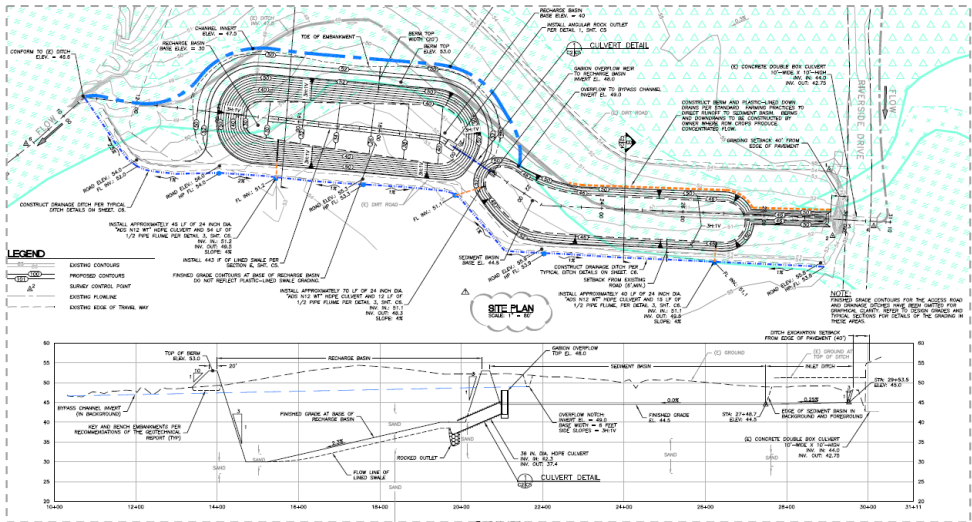
Suitability for Managed Aquifer Recharge based on Surface Factors

- Combine soils, bedrock info
- Additional considerations include: slope, land use, veg (discussed below)



CA-CC Project 13-118, RCD+UCSC

Fisher et al., 2017



*tTEM; Cone Penetration Tests (CPT)

ReNeM | *How It Works In the Pajaro Valley*

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Construction & Maintenance

ReNeM | How It Works In the Pajaro Valley

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Construction & Maintenance

Construction

- Contracting
- Oversight

Adaptive Management

Maintenance



ReNeM | *How It Works In the Pajaro Valley*

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Monitoring & Reporting

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Monitoring & Reporting

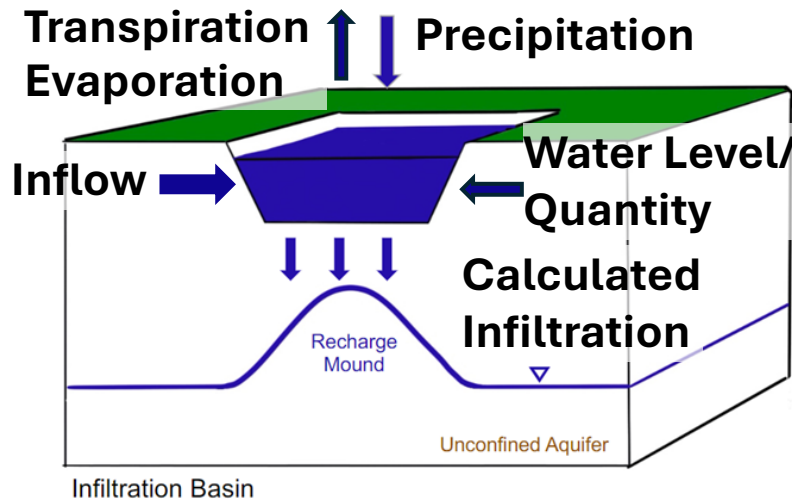
Basins equipped each season with sensors, sampling systems

Measurements include:

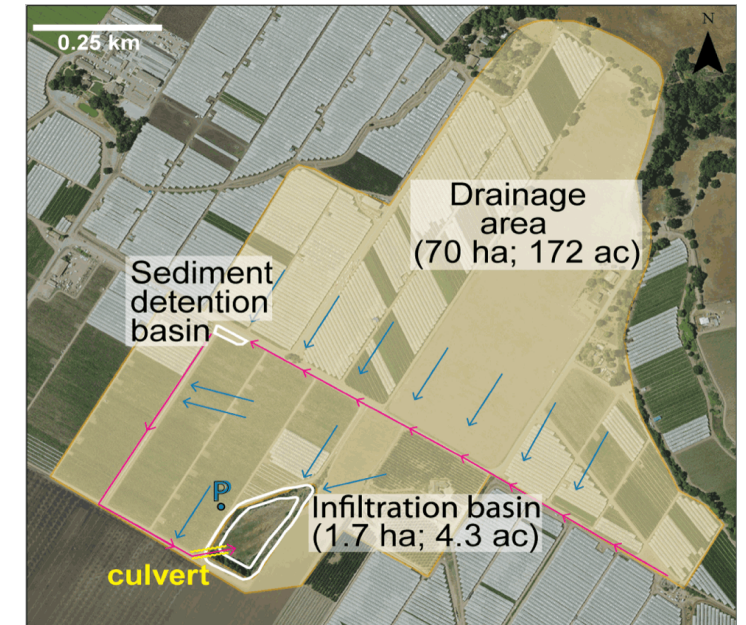
- Pressure for water level
- Evapotranspiration
- Precipitation

Calculations run and reported

Rebate \$\$\$ = 50% x net infiltration x pumping fee



- Drainage area is distinct from farmed area
- Larger drainage area generates more runoff → more potential for ReNeM (infiltration) benefit
- Flows are measured to determine benefit by the RCD–UCSC team (*third-party certifier*)
- Agency and participants *agree ahead of time* to accept TPC data and calculations



ReNeM | Initial Projects

Since WY2017, three pilot ReNeM projects have demonstrated **efficacy** and all projects to date have infiltrated **better water quality** than ambient groundwater

- PV Water removed “pilot” designation in 2021, goal = 1,000 af/yr of infiltration (~10% of PV ‘overdraft’)

ReNeM pilot projects

Infiltration basin size (ac)
ReNeM project since
Cost to design/build (US\$)
Average benefit (ac-ft/ yr)
Cumulative benefit (ac-ft)

Bokariza Ranch	Storrs Vineyard/Winery
4	0.6
WY17	WY22
100k	100k
104	5-10
728	10-20



Kelly Thompson Ranch
4
WY20
750k
160
639

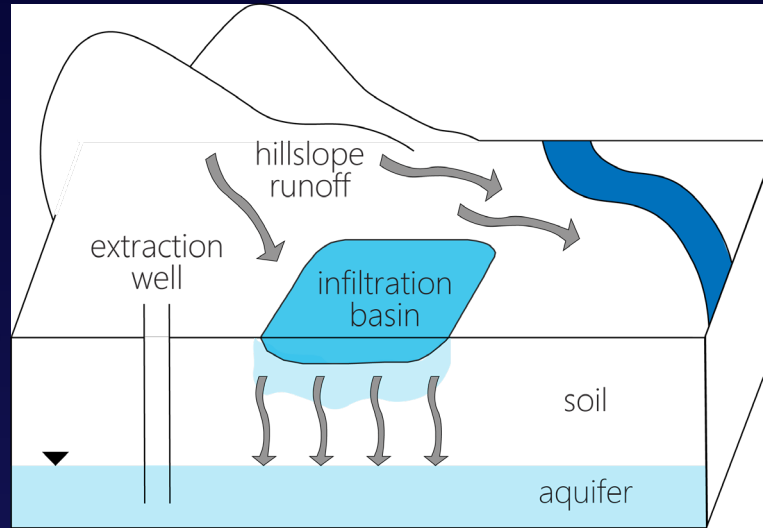


Pre-existing/modified

Built from scratch!

Stormwater as a Source for MAR

*Low-impact
development
(LID)*



*Regional
spreading
grounds*

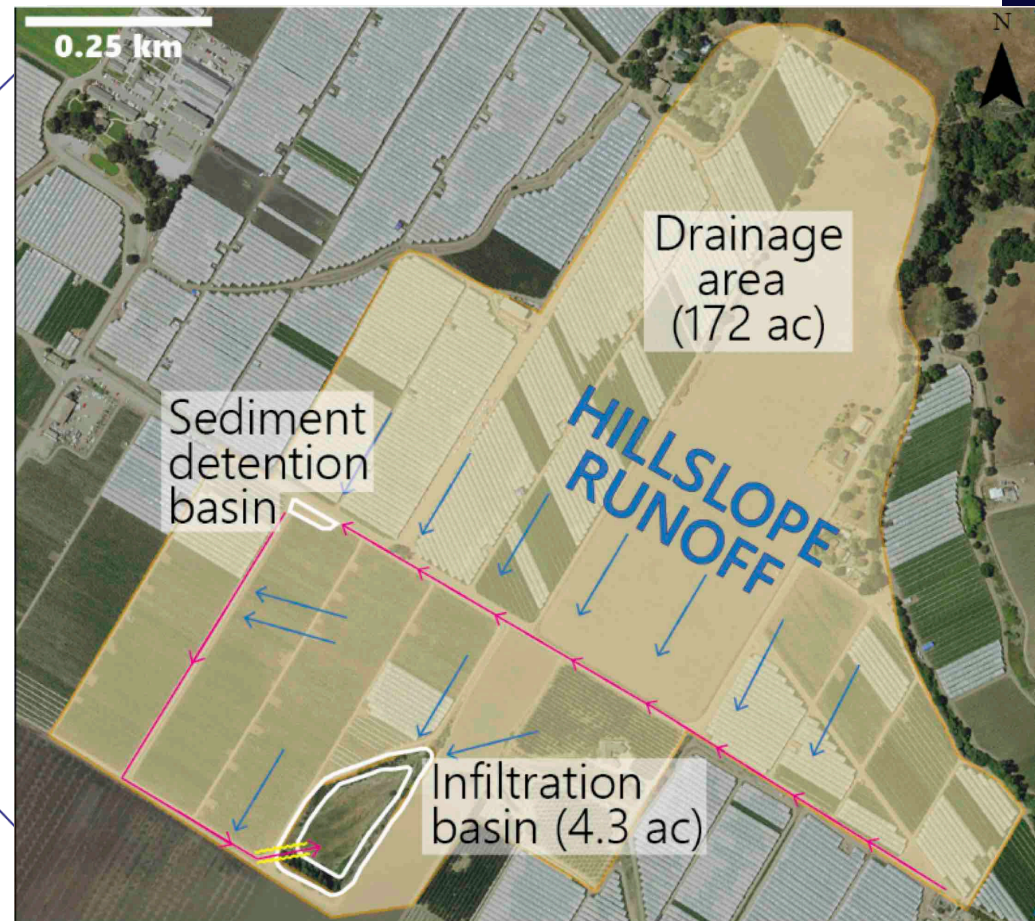
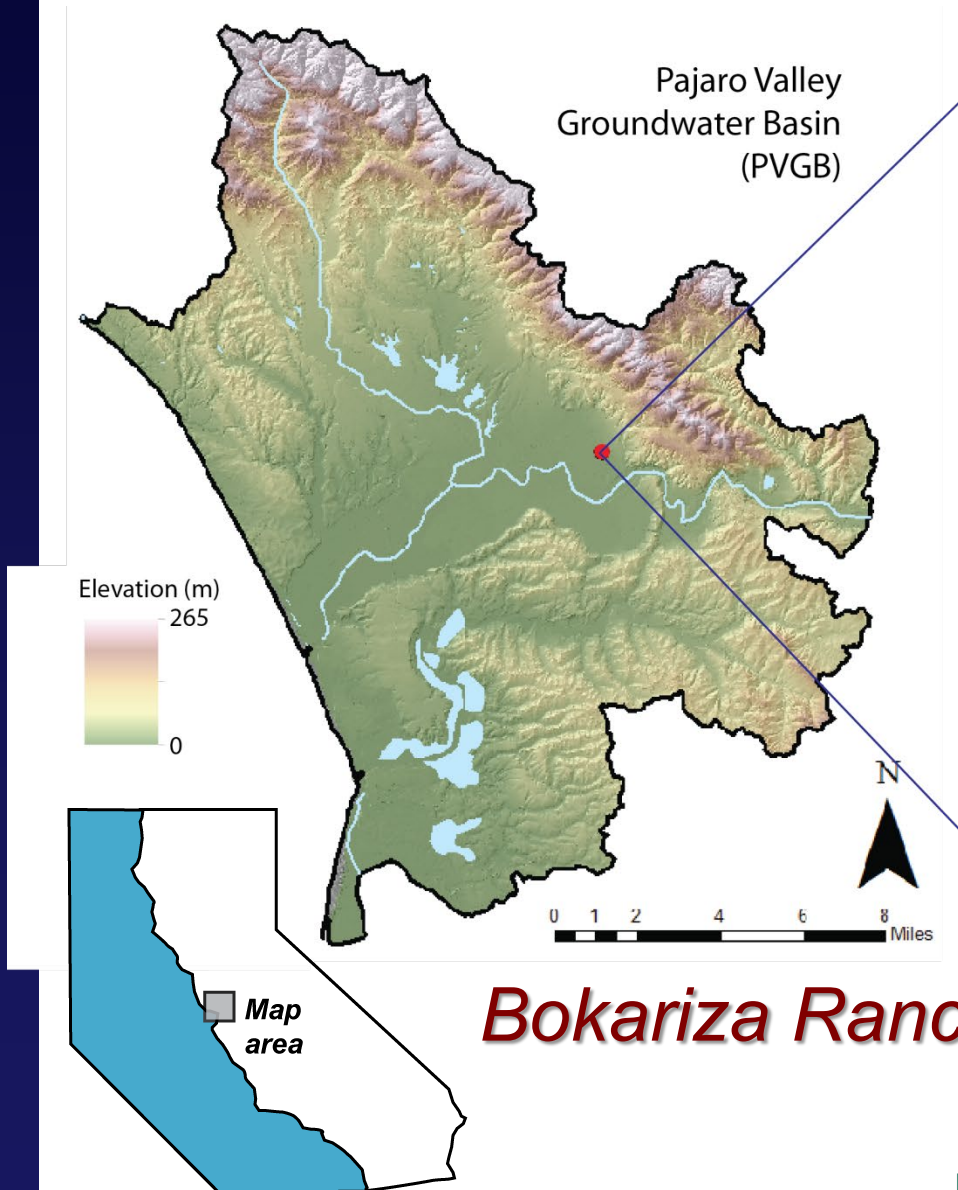
*1-10 af/yr
per site*



*10^4 - 10^5 af/yr
per program*

***100 - 1,000 af/yr
per site***

Managed Aquifer Recharge with Stormwater (Stormwater-MAR)



Bokariza Ranch, Project goal: ~100 ac-ft/yr

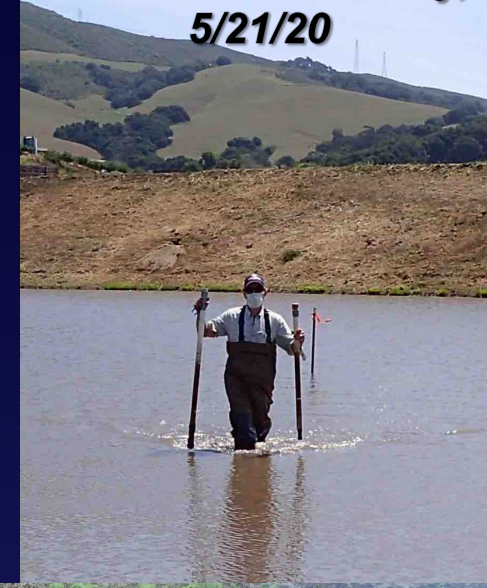
modified from *Beganskas and Fisher (2017)*

Bokariza Ranch: WY20

Arrival, looking south, 4/5/20



Instrument recovery,
5/21/20



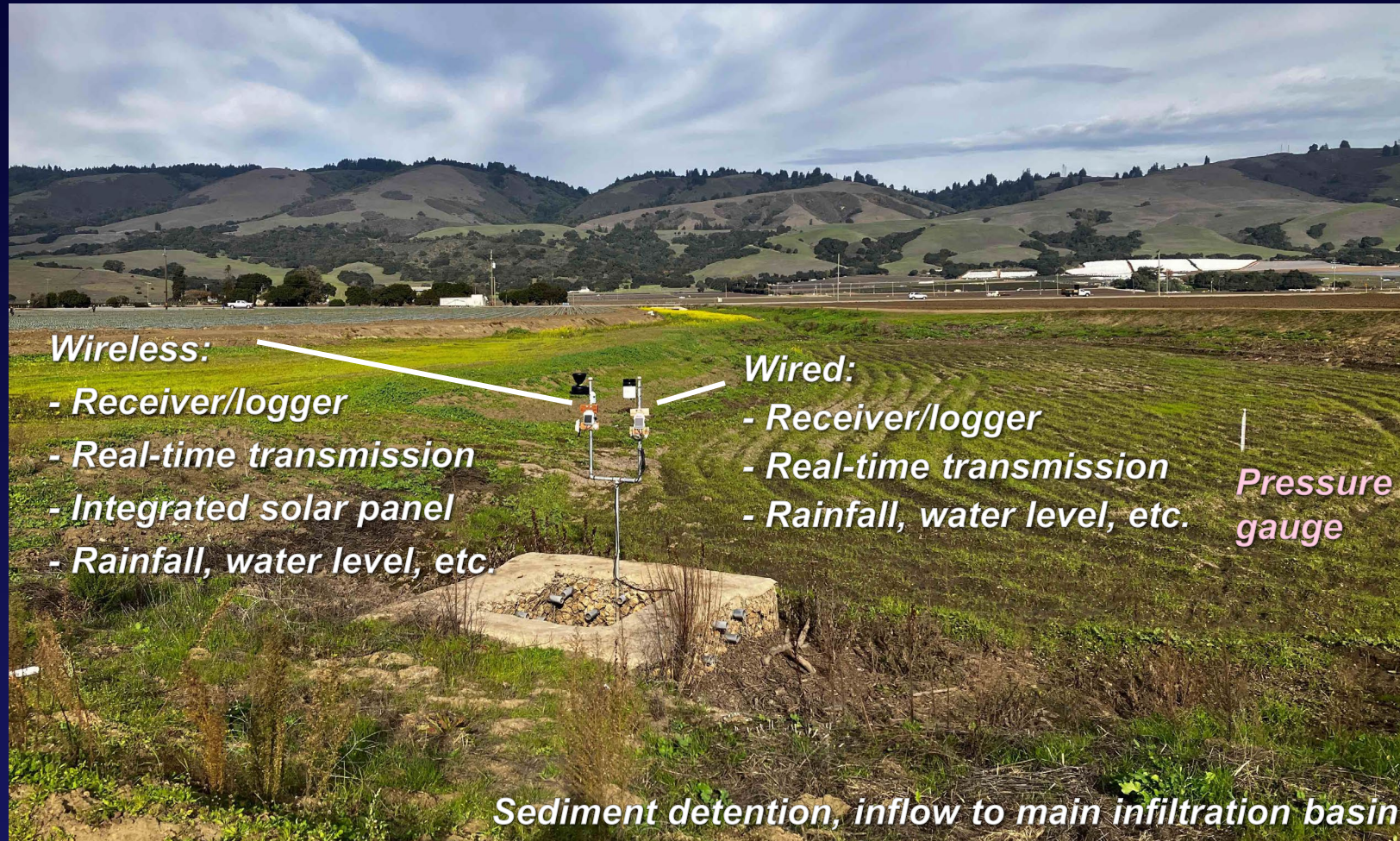
Inflow, 4/5/20



Inflow, 4/5/20

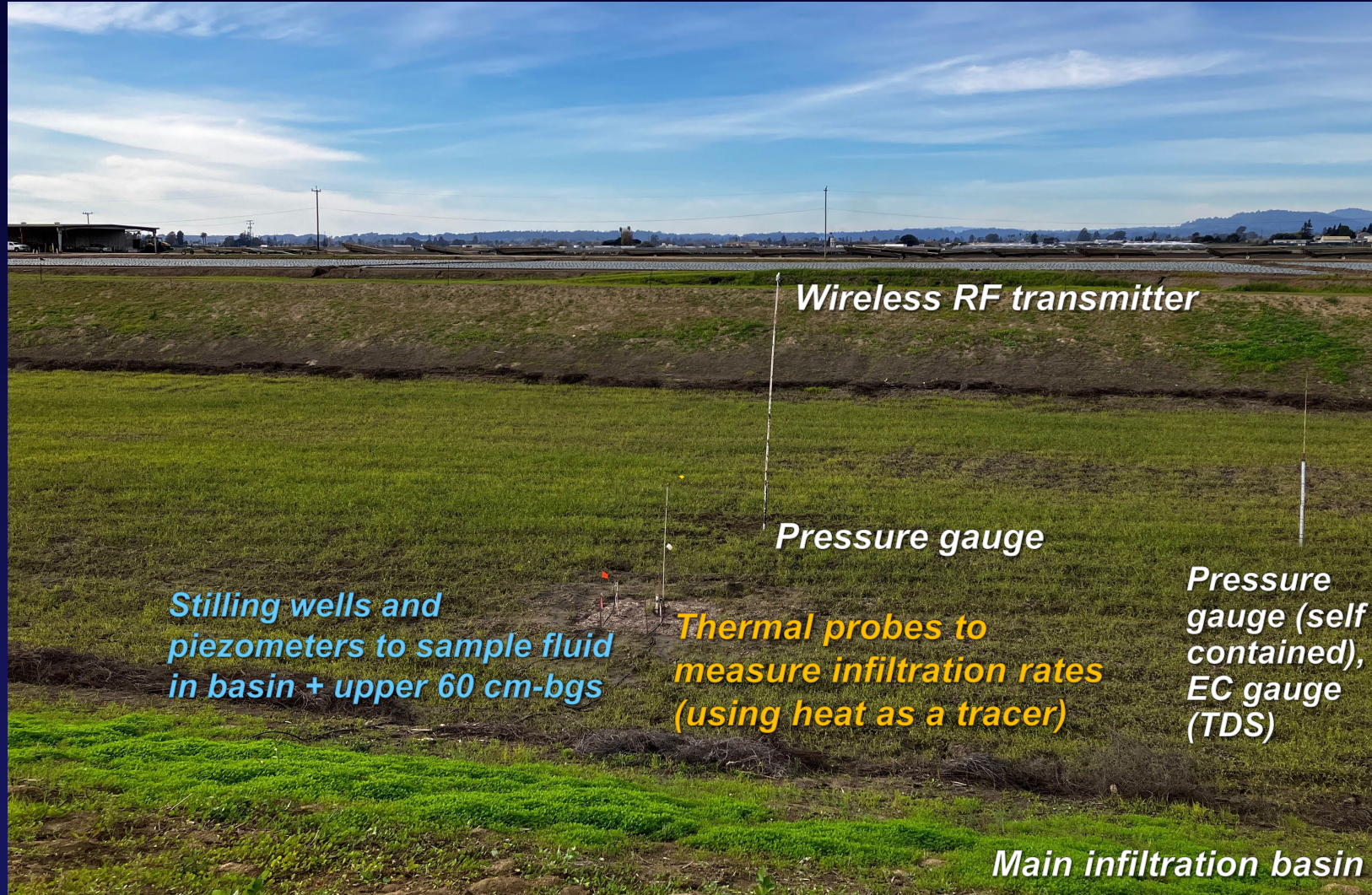
2020/04/05

Wireless sensors deployed in 2025



Deployed 12/3/25, for test of reliability, power usage, etc.
along with more conventional (wired) system

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Bokariza Ranch: Water Balance

$$I_v = Q_{\text{inflow}} + P - \text{Evap} - \Delta S$$

I_v = infiltration (volume)

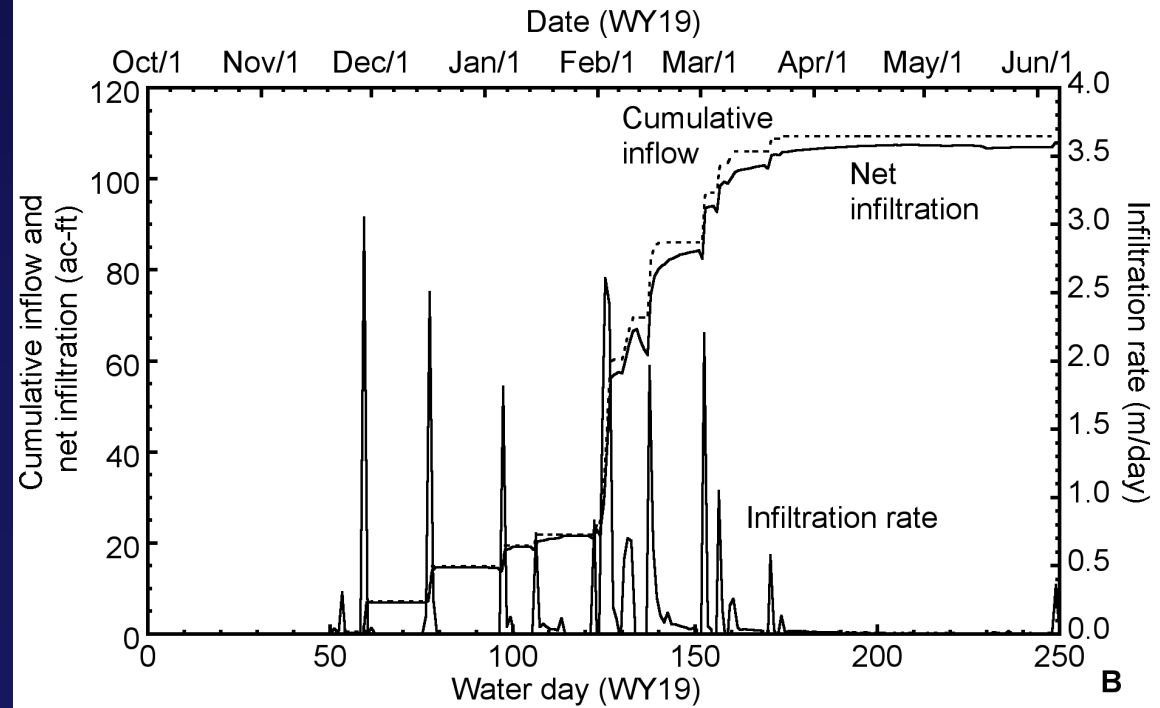
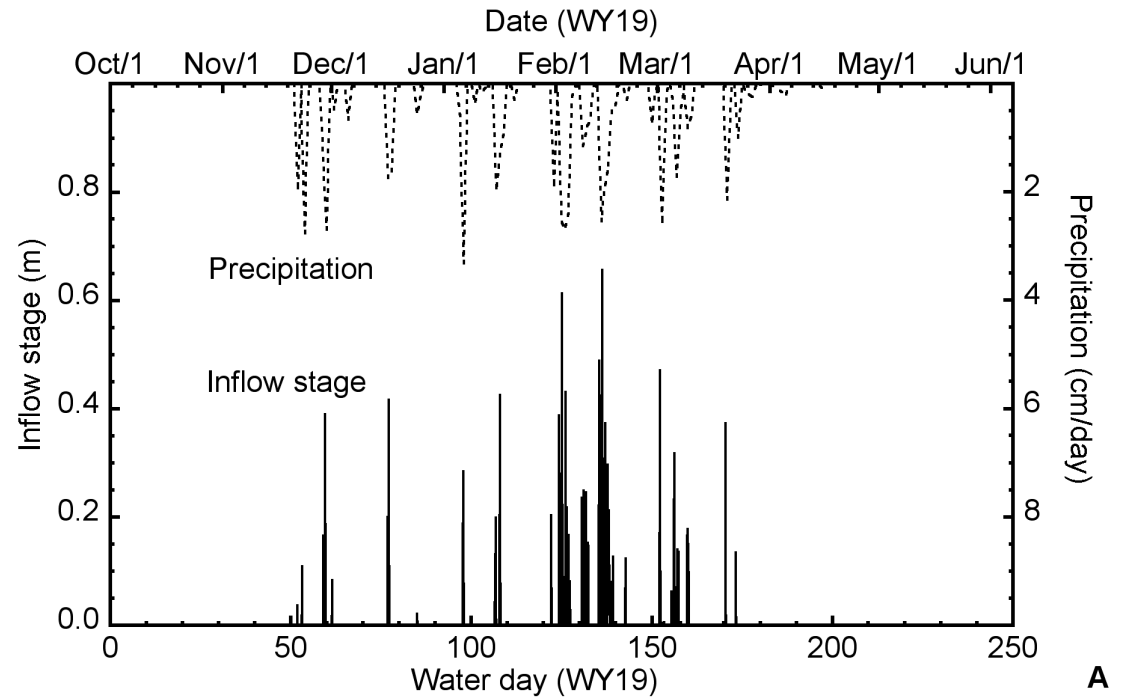
Q_{inflow} = runoff in

P = rain on basin

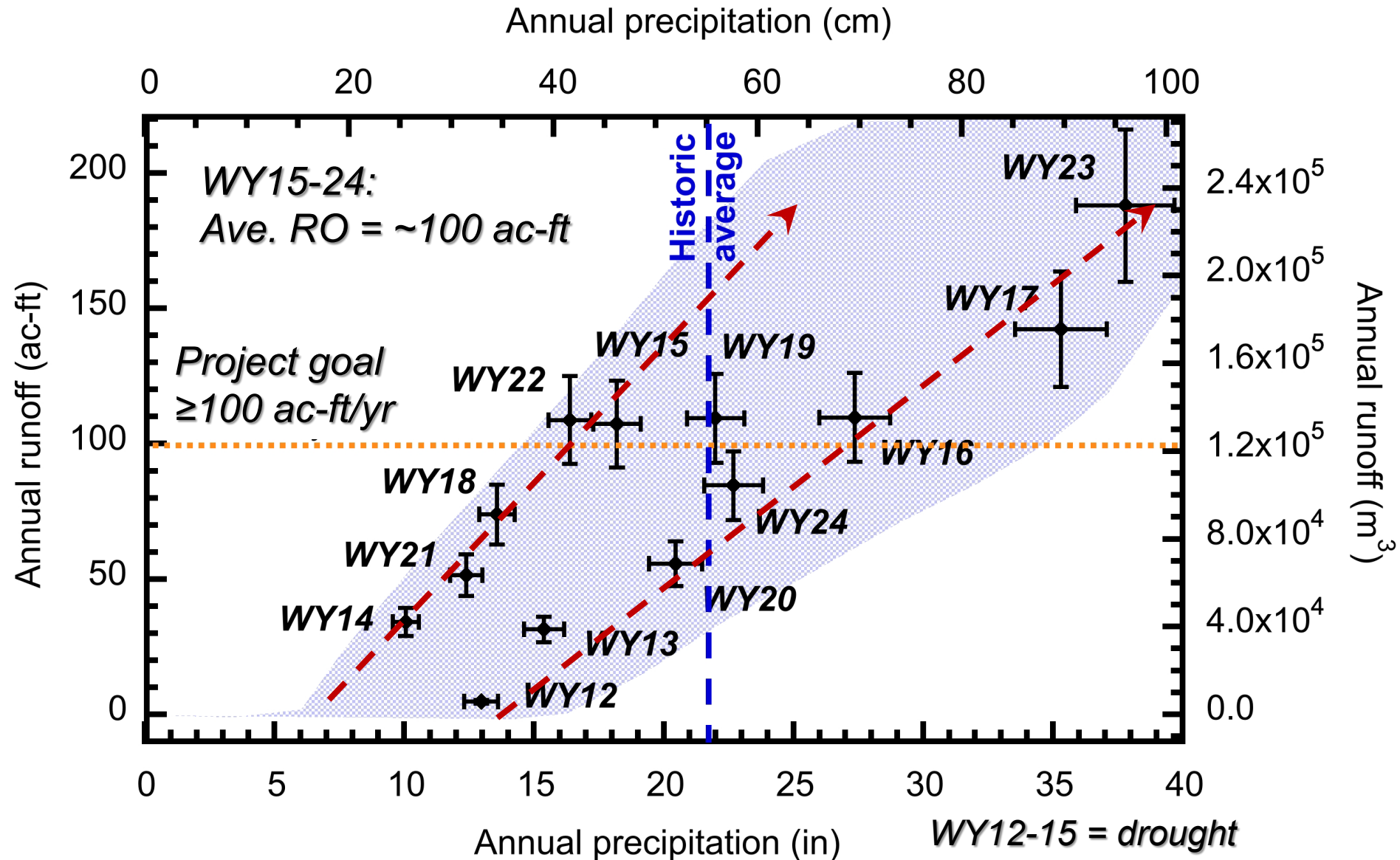
Evap = evaporation

ΔS = change in basin
storage (volume)

- Example from WY19:
Net infiltration
 ≈ 107 ac-ft



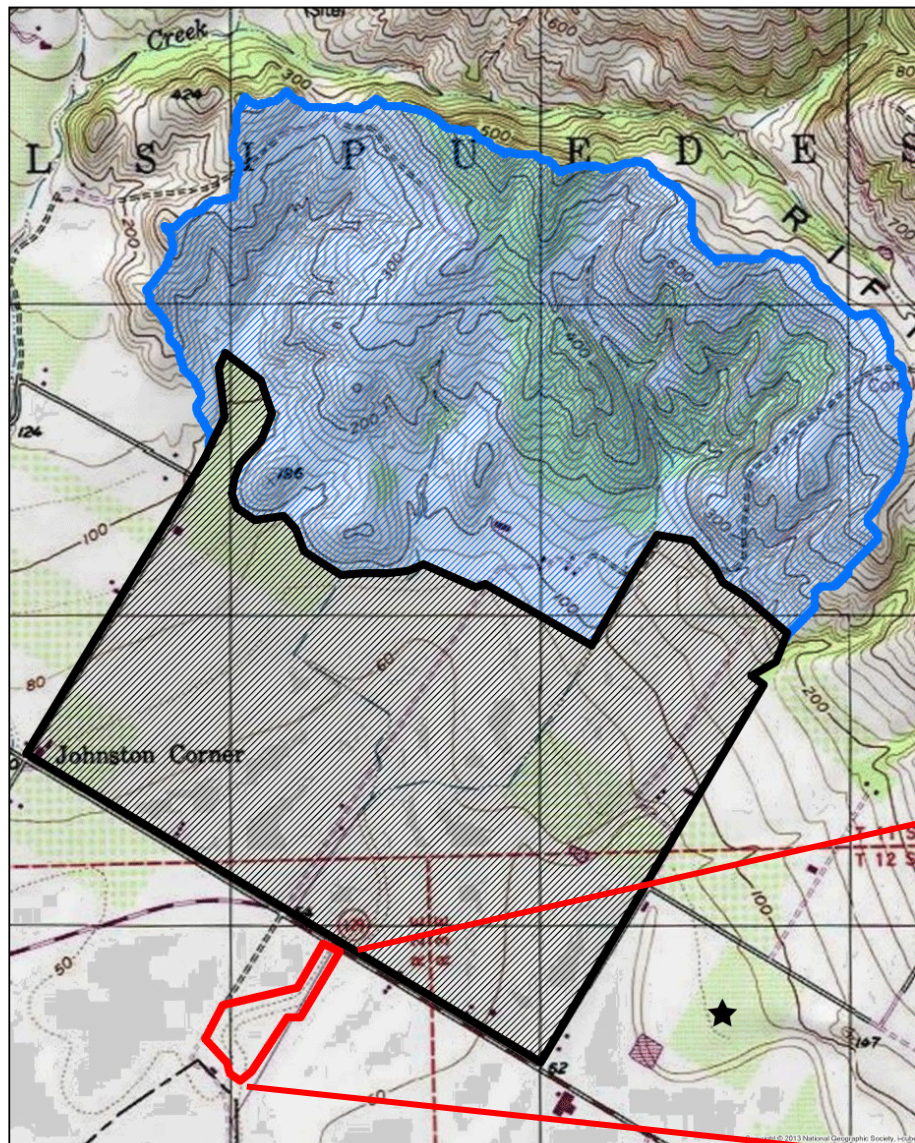
Bokariza Ranch: 13 Years of Infiltration and Recharge



Modified and updated from
Beganskas and Fisher (2017), Serrano et al. (in prep.)

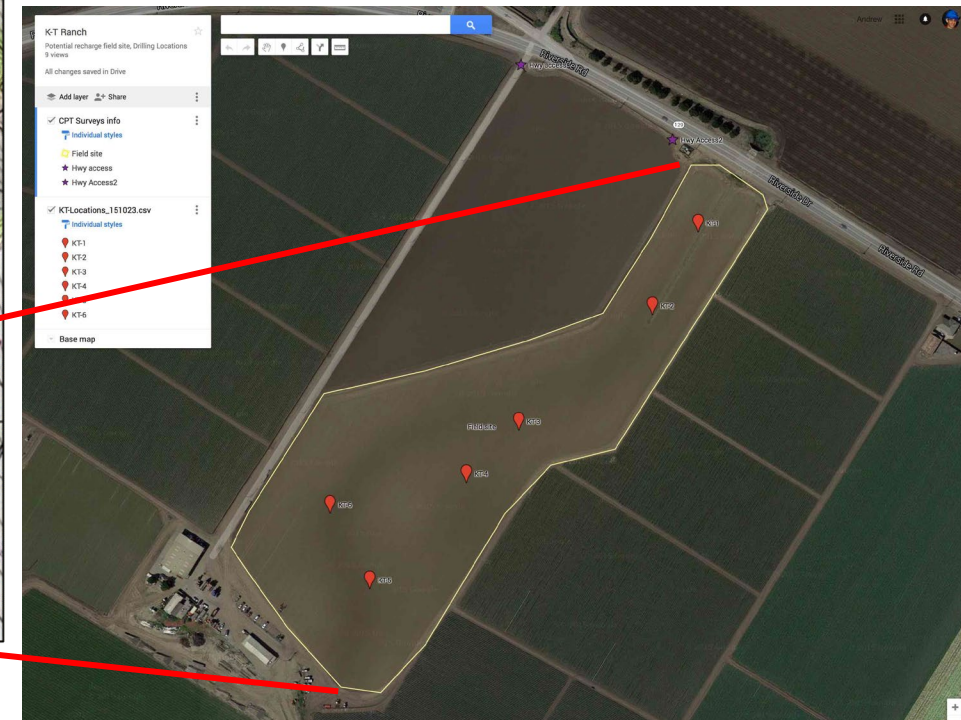
Kelly-Thompson Ranch

- Working ranch and rangeland
- >1300 acres draining into ~15 acres
- Infiltrating and improving stormwater



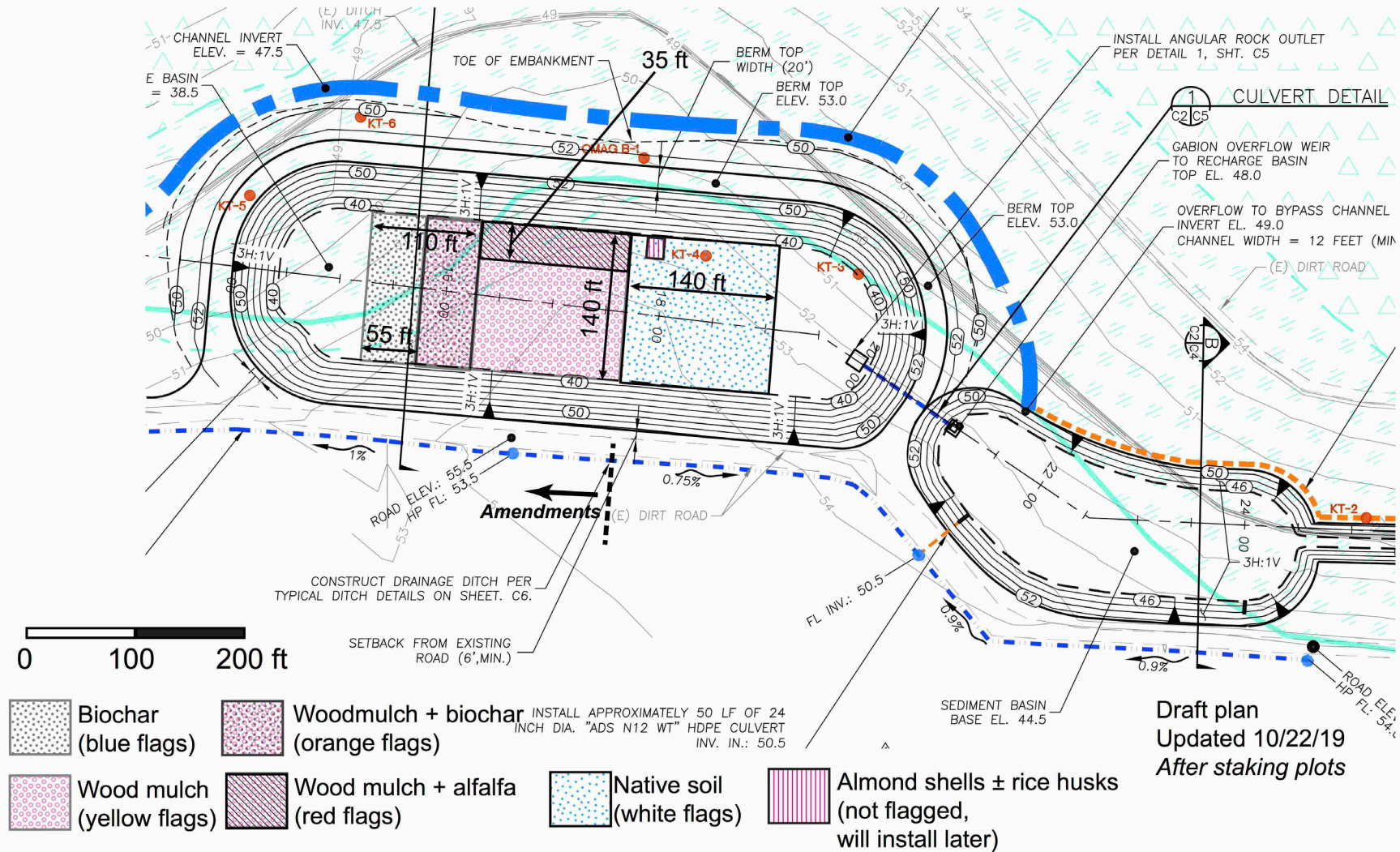
Locations and areas (approximate)

- | | |
|--|--|
|  Developed (620 acres) |  Potential infiltration area |
|  Undeveloped/less developed (700 acres) |  Nearby infiltration project |



Stormwater infiltration system location

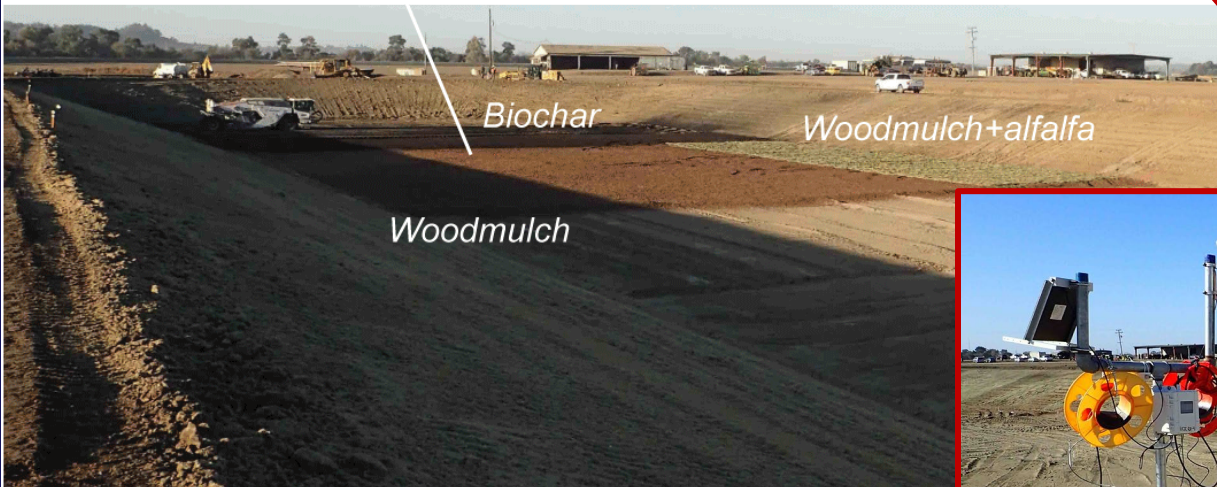
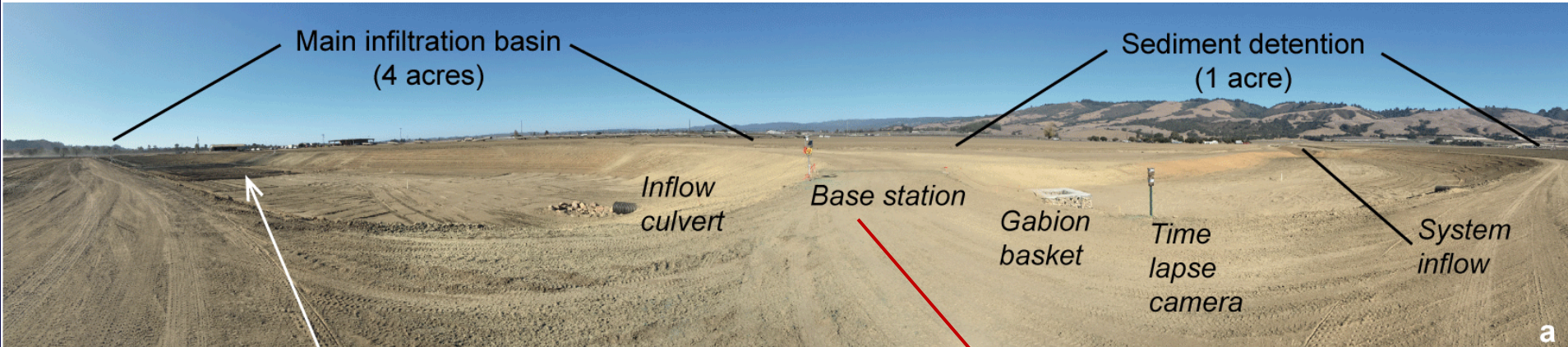
Kelly-Thompson Ranch



Carbon-rich soil amendments

Kelly-Thompson Ranch

Under construction



Adding carbon-rich soil amendments



Full-scale, field validation of improvements to water quality

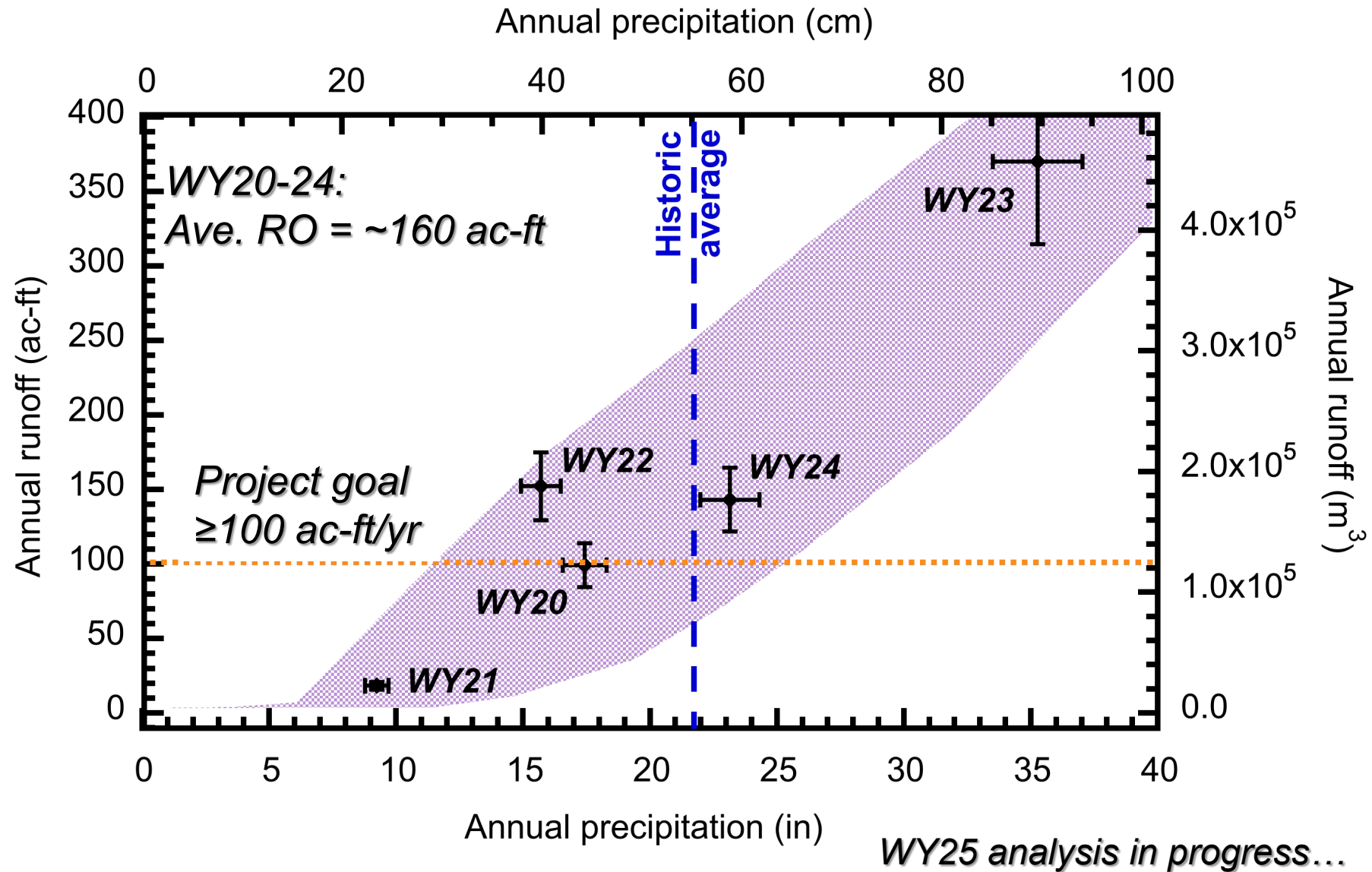


Infiltration basin in operation

- ~160 ac-ft/yr of net infiltration benefit in WY20-24
- Improvements to water quality during infiltration

Serrano et al. (2025 - in review)

Kelly Thompson Ranch: 5 Years of Infiltration and Recharge



ReNeM | Cost Effective

In the Pajaro Valley, **cost-benefit considerations** for ReNeM are **favorable** compared to alternative water sources...**ReNeM** is also **highly complementary to demand management** (in many GSPs)

nature water

Article

<https://doi.org/10.1038/s44221-023-00141-1>

Recharge net metering (ReNeM) is a novel, cost-effective management strategy to incentivize groundwater recharge

Received: 27 December 2022

Molly Bruce¹, Luke Sherman², Ellen Bruno³, Andrew T. Fisher⁴ & Michael Kiparsky¹✉

Accepted: 7 September 2023

News & views

Managed aquifer recharge

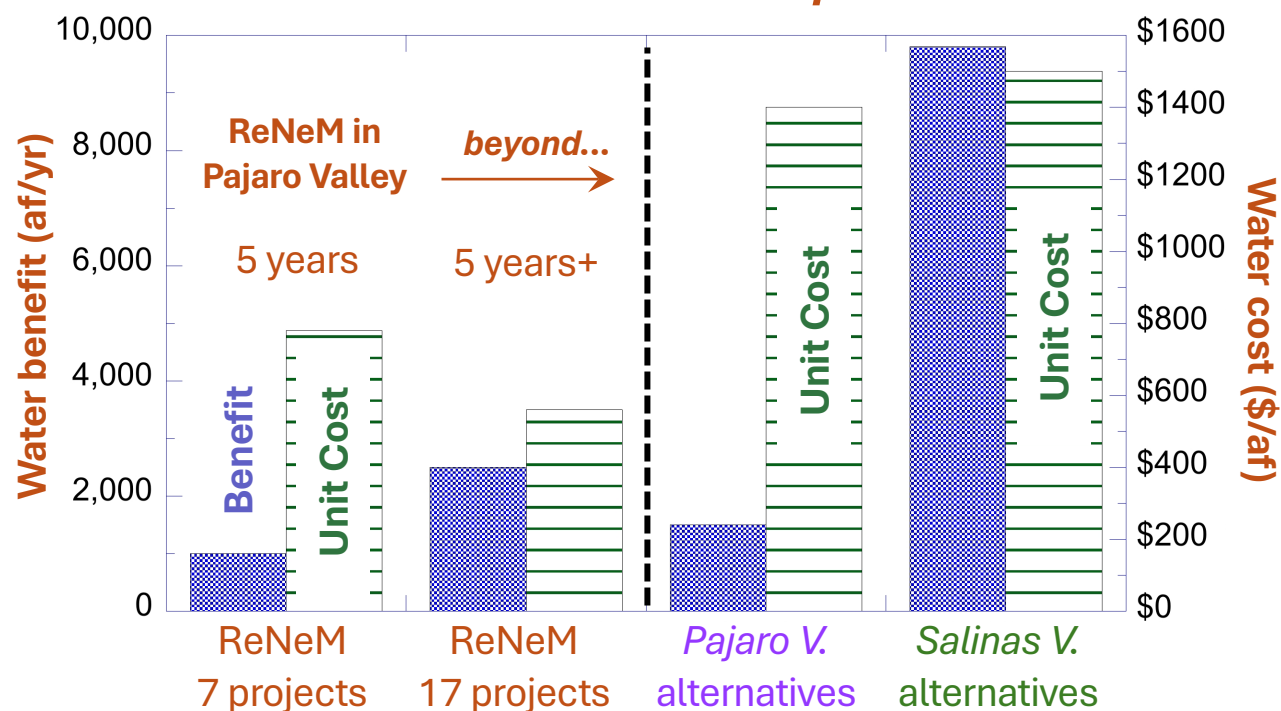
<https://doi.org/10.1038/s44221-023-00140-2>

Financial incentives can leverage existing infrastructure to replenish groundwater

Melissa M. Rohde

Paying private landowners to increase infiltration on their land is a cost-effective strategy to offset groundwater depletion.

ReNeM costs compared*



* Rounded, based only on cost of water. **Both ReNeM and alternatives may have more benefits**, e.g., improve water quality, reduce SW intrusion

ReNeM | Adaptability At Its Core

Besides its proven cost-effectiveness, the structure of ReNeM - including its partners, infiltration solutions, and incentives - is **flexible** and can be **adapted** to different context.

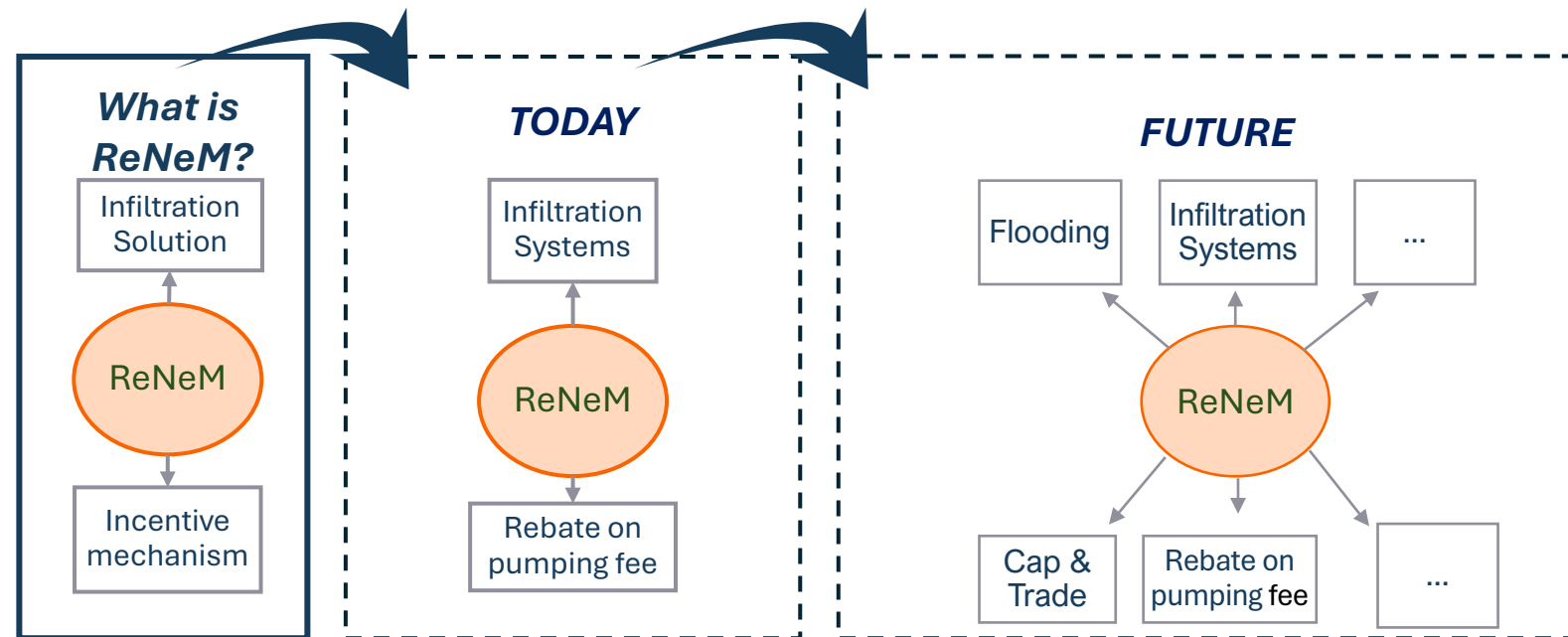
GOVERNANCE

The proposed structure serves as a framework. Roles may vary based on existing organizations, power dynamics, and project stages.



INFILTRATION SOLUTION AND INCENTIVES

ReNeM can compensate participants based on measured infiltration through the most suitable practices for each project site (e.g. infiltration basins, field flooding, levee setbacks, cover crops, etc.)



ReNeM | *Adaptability At Its Core*

Existing ReNeM



Distributed
Stormwater
Collection

Extended ReNeM



Flood MAR

Extended ReNeM



Recharge in Levee
Setbacks

Extended ReNeM



Recharge in built
environments

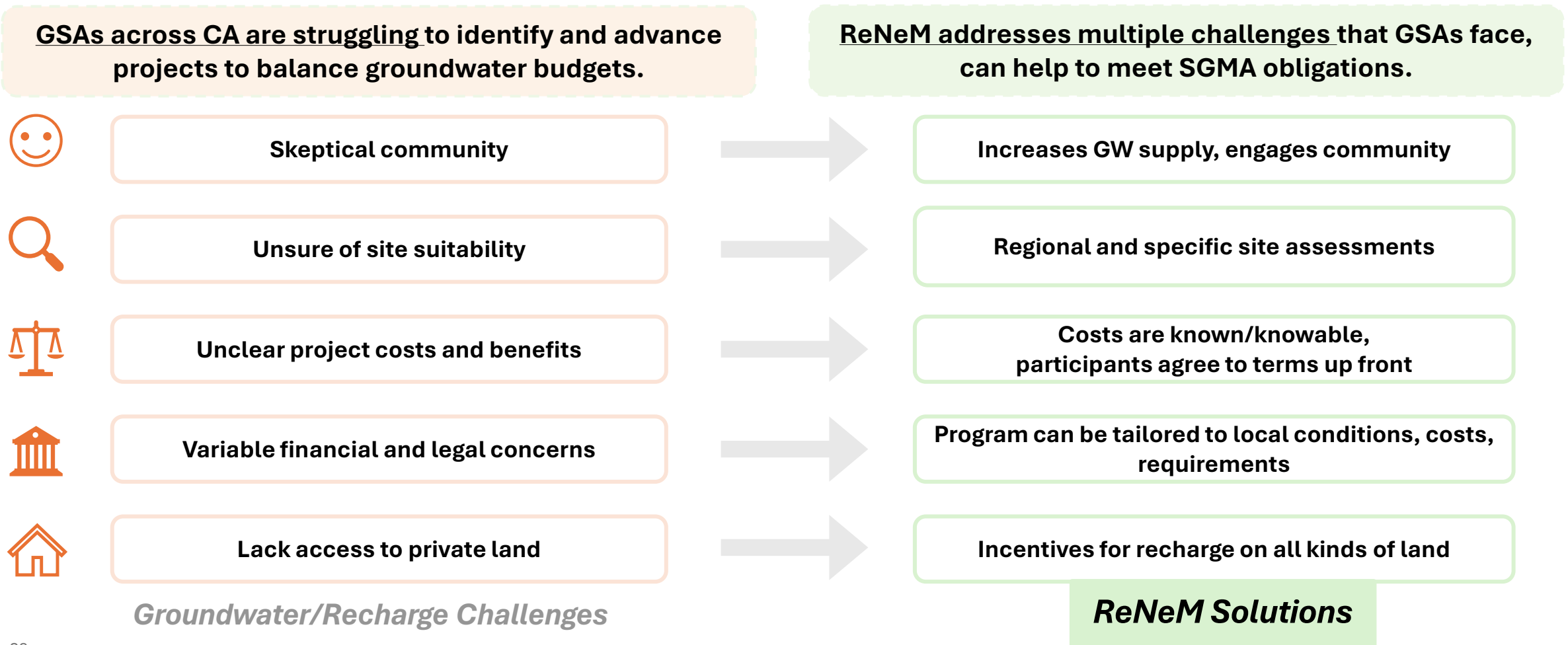
Extended ReNeM



Alternate/cover
cropping

ReNeM | *Adaptability At Its Core*

The **adaptability** of ReNeM is an important attribute of the program, specially when looking into Groundwater Sustainability Agencies' (GSAs) needs on developing projects to bring basins into balance. **Recharge is popular!**



ReNeM | *Planning For The Future*

ReNeM's successes to date highlight the opportunity for further scaling. Developing a **ReNeM Program** will enable a transition from **opportunistic to strategic expansion**.

Where We Are Now



SUCCESSFUL RENEM PROJECTS IN PAJARO VALLEY

- ✓ Cost effective
- ✓ Adaptable and Flexible to different needs
- ✓ Parties outside the PV expressed interest in deploying a ReNeM-type program in their areas

Where We Are Going



ACHIEVE SCALE WITHIN THE PAJARO VALLEY

- Establish additional recharge basins within the Pajaro Valley - deliver ~10% of groundwater shortfall.
- Test other ReNeM implementation concepts, such as FloodMAR and/or recharge within Levee Setbacks



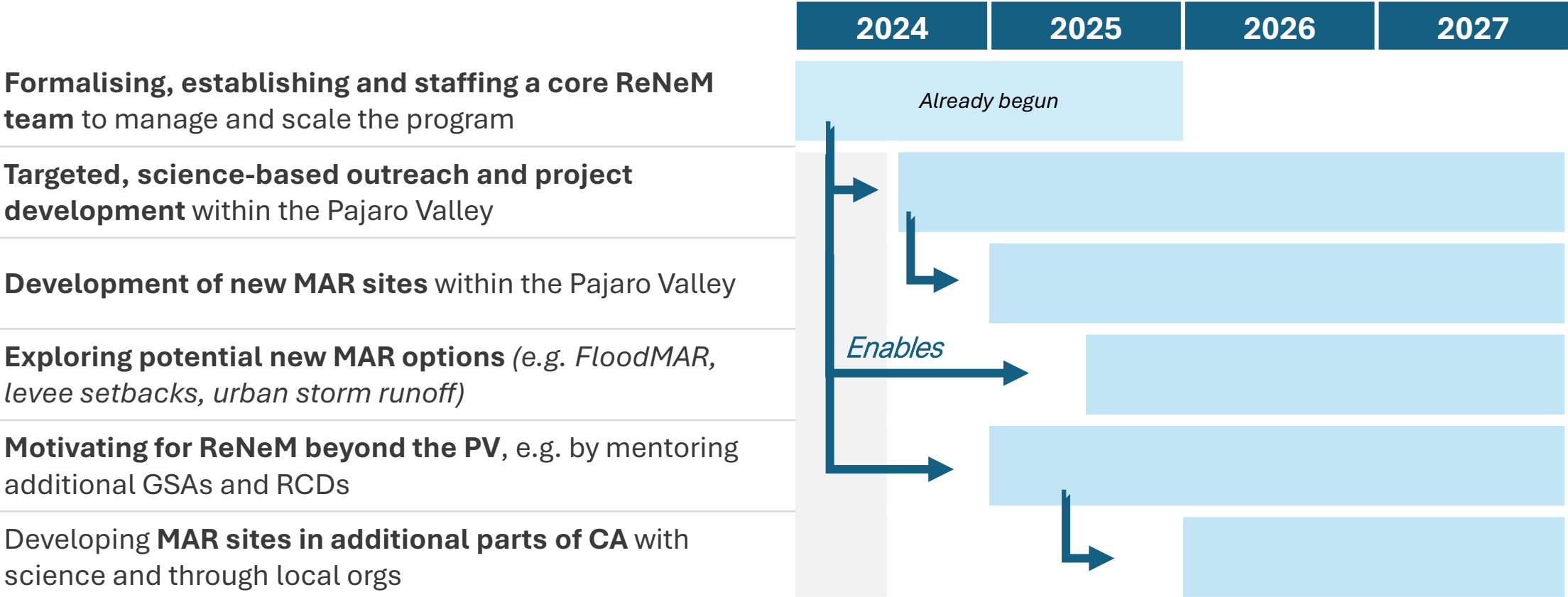
IMPLEMENTATION BEYOND THE PAJARO VALLEY

- Establish processes;
- Build staff capacity: mentor, guide and support the adoption of ReNeM across California;
- Help GSAs and communities achieve their sustainability goals.

Program Development enables projects' scalability

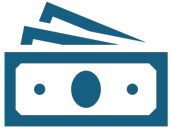
ReNeM | Roadmap

Near-term priorities are to establish and staff a core team and continue targeted project outreach. 2026 will involve further site development in the Pajaro Valley, and intentional mentoring of GSAs and RCDs outside the Valley.



ReNeM | A flexible, practical, proven incentive-based solution

ReNeM addresses needs, creates opportunities, builds partnerships, generates value.



Cost-effective and complementary (*augments other activities*)



Adaptable and scalable (*different approaches will work in other basins*)



Encourages community participation and engagement



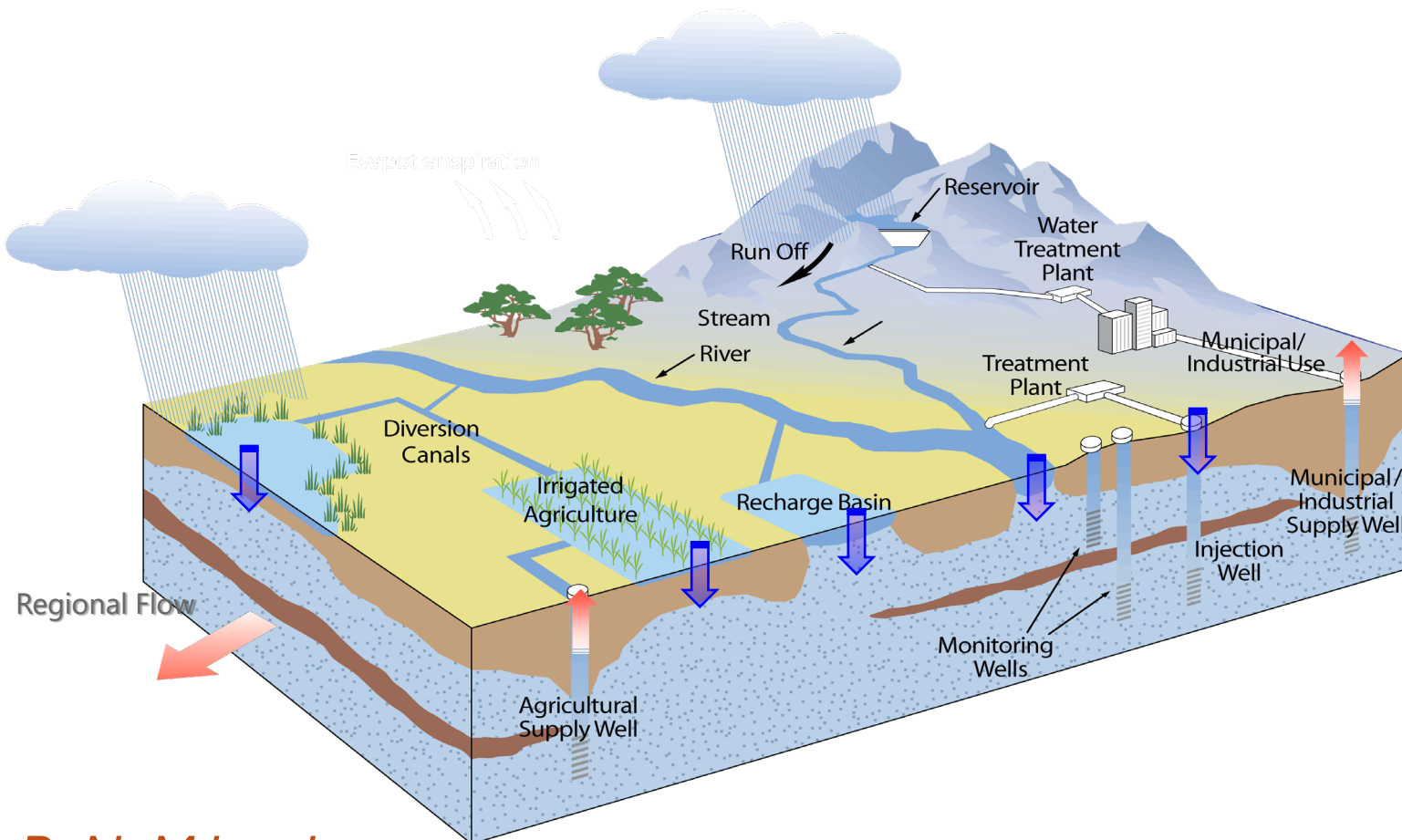
Aligns individual and organizations (*creates collaboration*)
GSAs, RCDs, Land Trusts, Open Space Authorities, cities, tenants and landowners



There is great need and considerable interest

Thank you for your time!

Thank you to many project partners...



Want To Further Engage?
Feel Free To Contact us!



Inquiries welcome!

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funded by:*

