

An Update on Recharge Net Metering, with Distributed Stormwater Collection linked to Managed Aquifer Recharge (DSC-MAR)

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Community Water Dialog of the Pajaro Valley
Watsonville Civic Center
4 November 2019

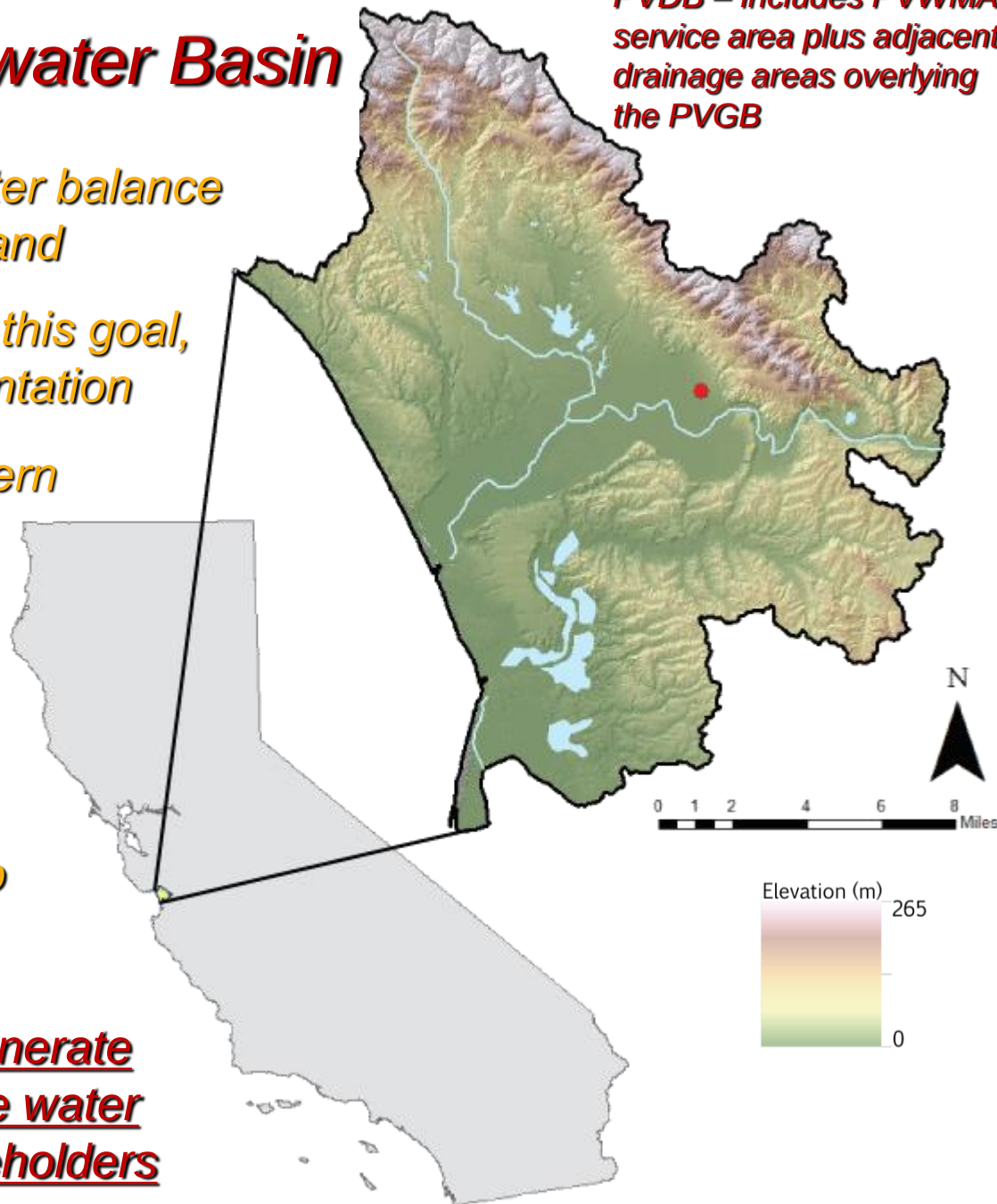


Pajaro Valley Groundwater Basin

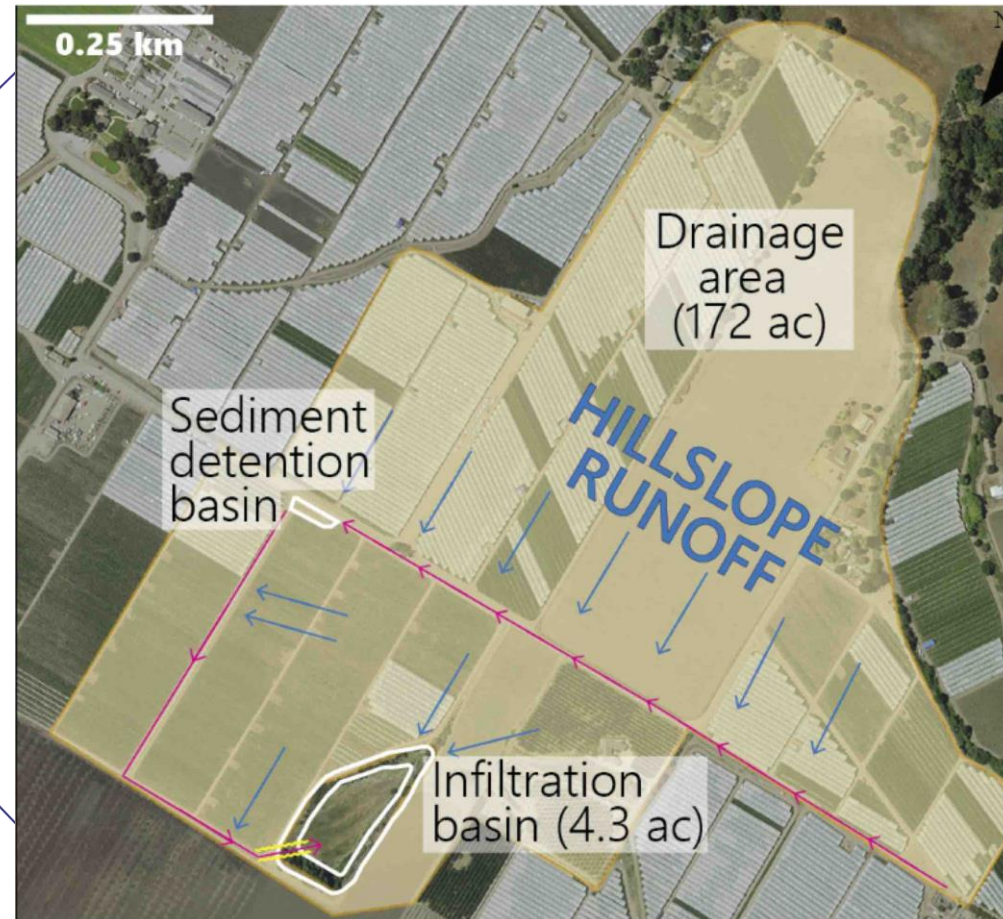
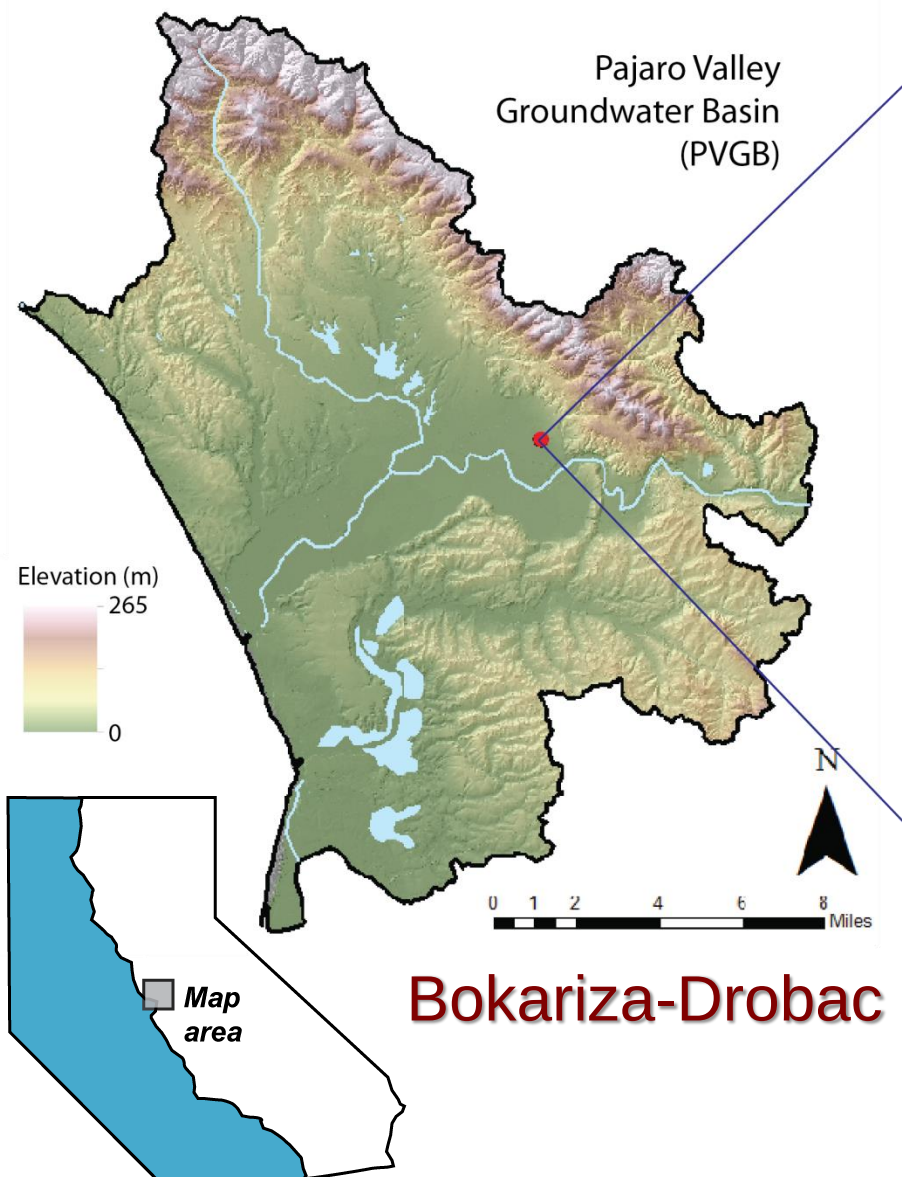
- *PVWMA seeks to change water balance by ~12k af/yr: +supply, –demand*
- *PVWMA has BMP to achieve this goal, but will take time for implementation*
- *Water quality remains a concern throughout the basin*
- *Even if BMP is successful, PVGB still must deal with the legacy of overdraft*
- *Climate change and shifting land use will make it harder to balance basin*

Would be beneficial to generate additional supply, improve water quality, and engage stakeholders

PVDB – includes PVWMA service area plus adjacent drainage areas overlying the PVGB



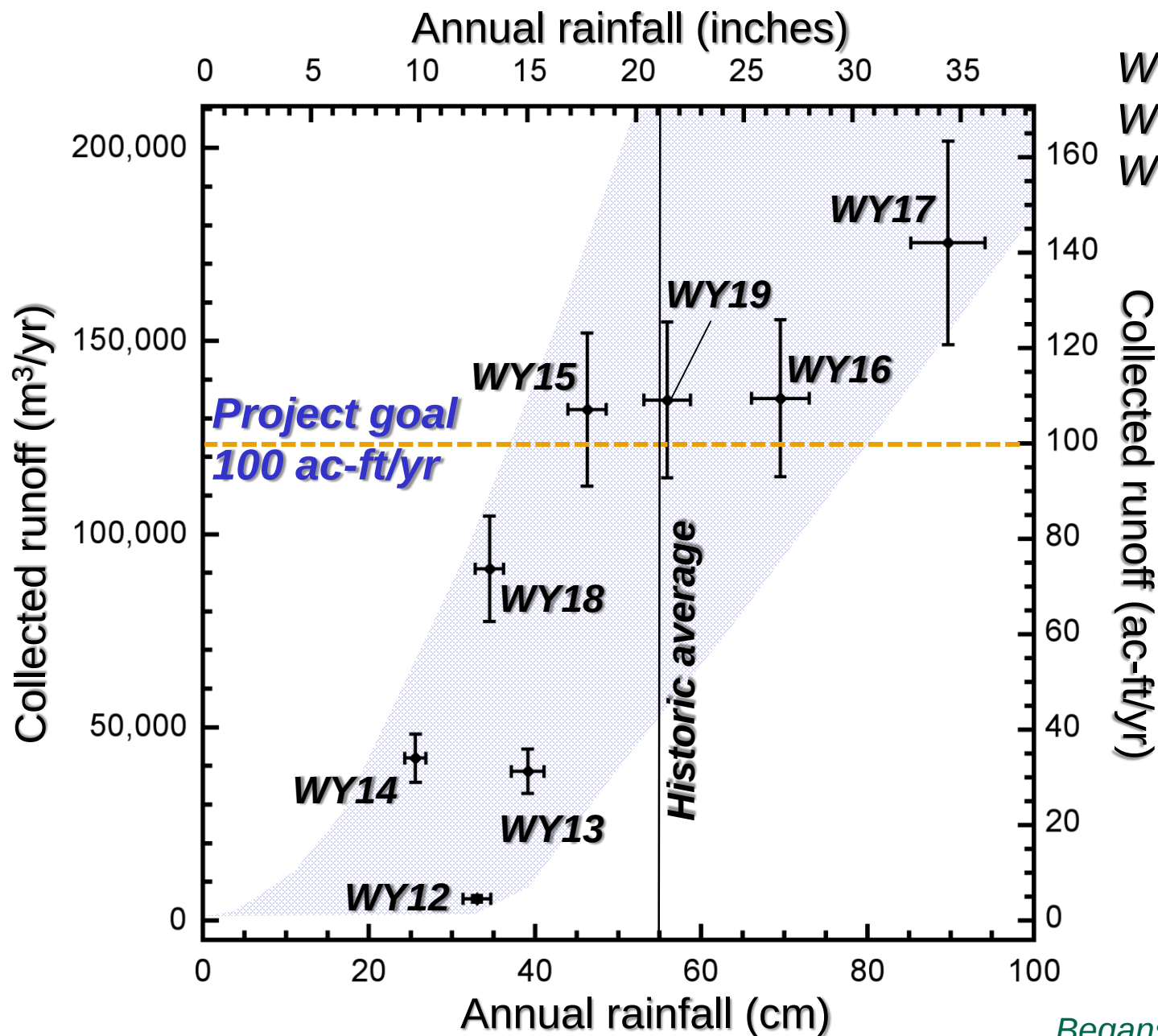
Distributed Stormwater Collection – Managed Aquifer Recharge (DSC-MAR)



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

modified from Beganskas and Fisher (2017)

Bokariza-Drobac Ranch: Performance WY12-19



WY12-15 = drought

WY16 = El Niño

WY17-19 = ...?

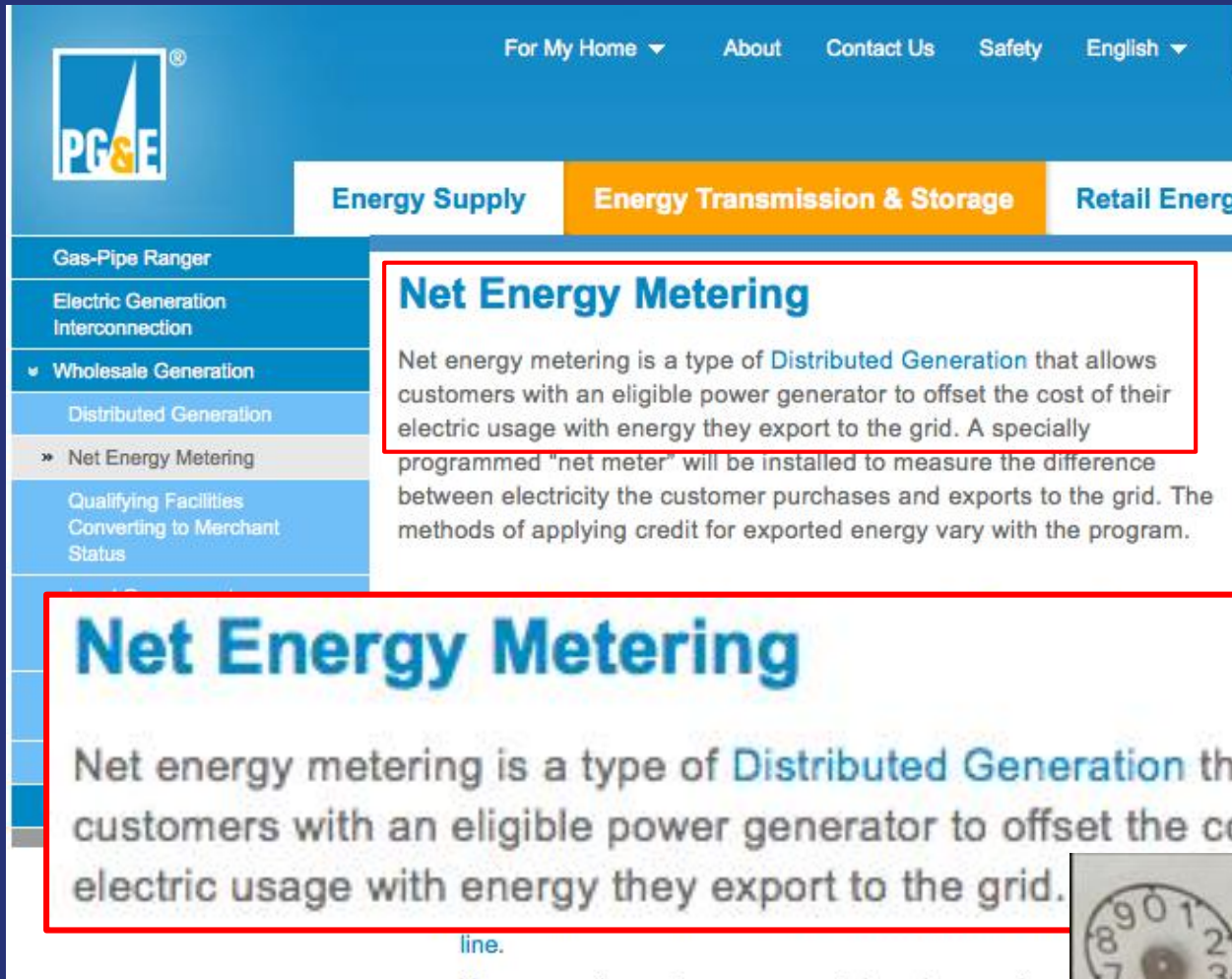
Reduce Barriers that Limit Participation

- *Land taken from production, reduced access, crop impacts, liability*
- *Maintenance of infiltration systems (basins, dry wells, Flood-MAR fields)*



***How can incentives
be most effective?***

There is a Workable Example: Net Energy Metering



The screenshot shows the PG&E website with the 'Energy Transmission & Storage' tab selected. The 'Net Energy Metering' page is highlighted, featuring a red border around the title and introductory text. The text describes net energy metering as a type of Distributed Generation that allows customers to offset their electric usage with energy they export to the grid. A sidebar on the left lists various energy services, including Gas-Pipe Ranger, Electric Generation Interconnection, Wholesale Generation, Distributed Generation, Net Energy Metering, and Qualifying Facilities Converting to Merchant Status.

Net Energy Metering

Net energy metering is a type of **Distributed Generation** that allows customers with an eligible power generator to offset the cost of their electric usage with energy they export to the grid. A specially programmed "net meter" will be installed to measure the difference between electricity the customer purchases and exports to the grid. The methods of applying credit for exported energy vary with the program.

Net Energy Metering

Net energy metering is a type of **Distributed Generation** that allows customers with an eligible power generator to offset the cost of their electric usage with energy they export to the grid.

- *generate energy locally*
- *account for net usage*
- *excess power goes on the grid for sale (and eventual use)*

- *Requires*
 - *reliable measurement and accounting*
 - *formula to calculate benefit/rebate*
 - *stakeholder and agency trust*



Example: Recharge Benefit Calculations

Irrigated area: 75 irrigated acres

Applied water: 2.5 ft



Annual precipitation: 1.5 ft (18 inches)

Runoff/precipitation = 0.4 (appropriate for intense events)

Options:



Drainage: 200

400

600 acres

Infiltration: 2

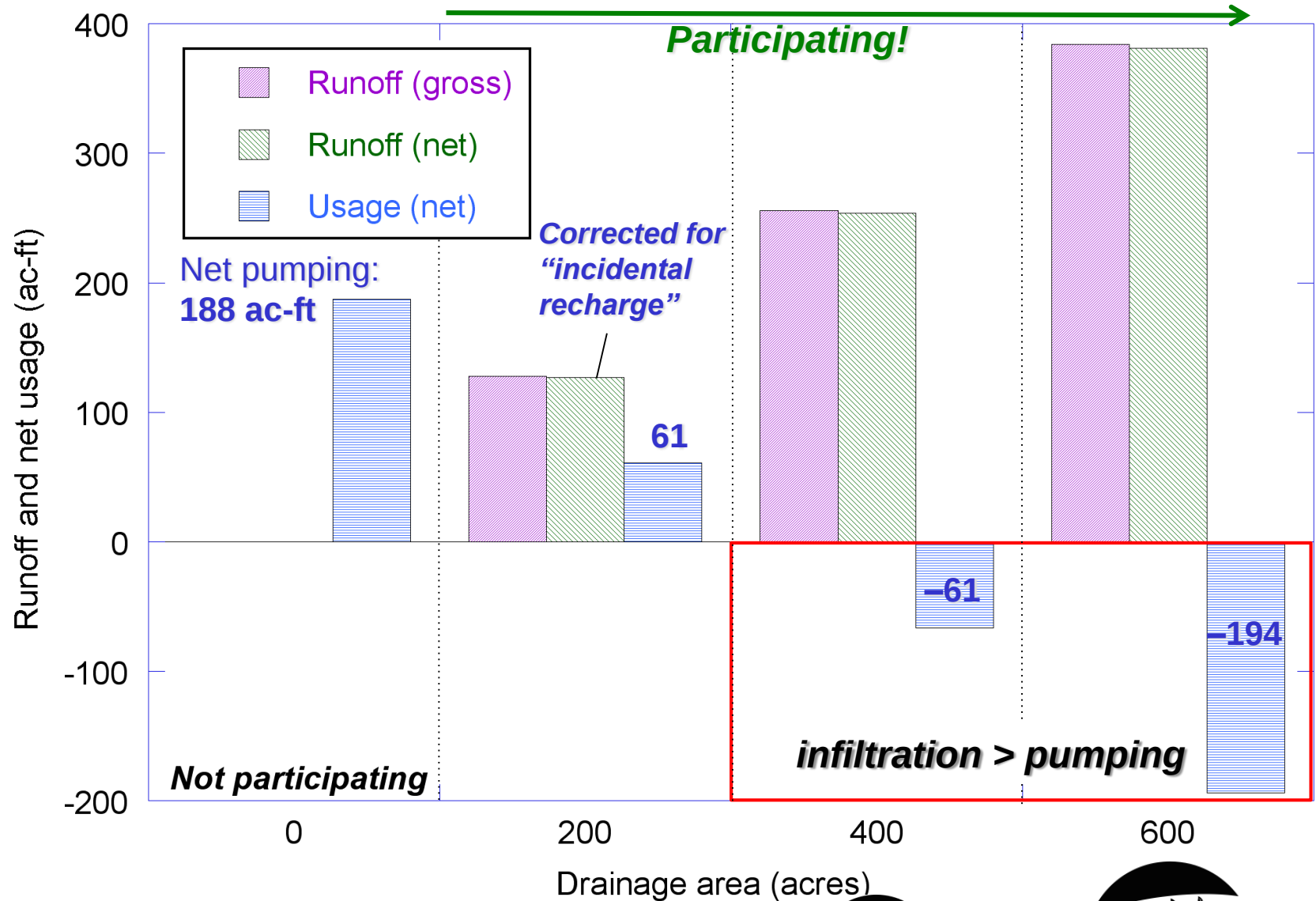
4

6 acres

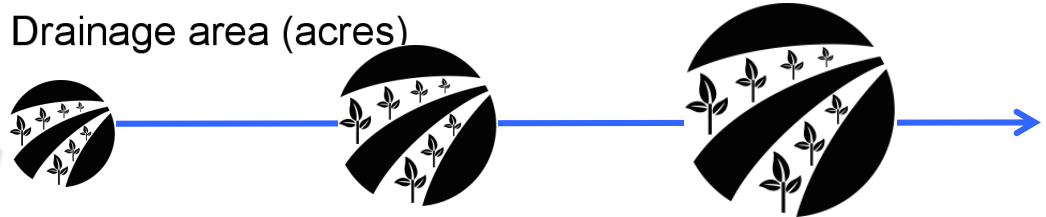
Augmentation fee = \$246/ac-ft
(**outside** of Delivered Water Zone, FY19-20)

Recharge Net Metering rebate: 50% of net infiltration

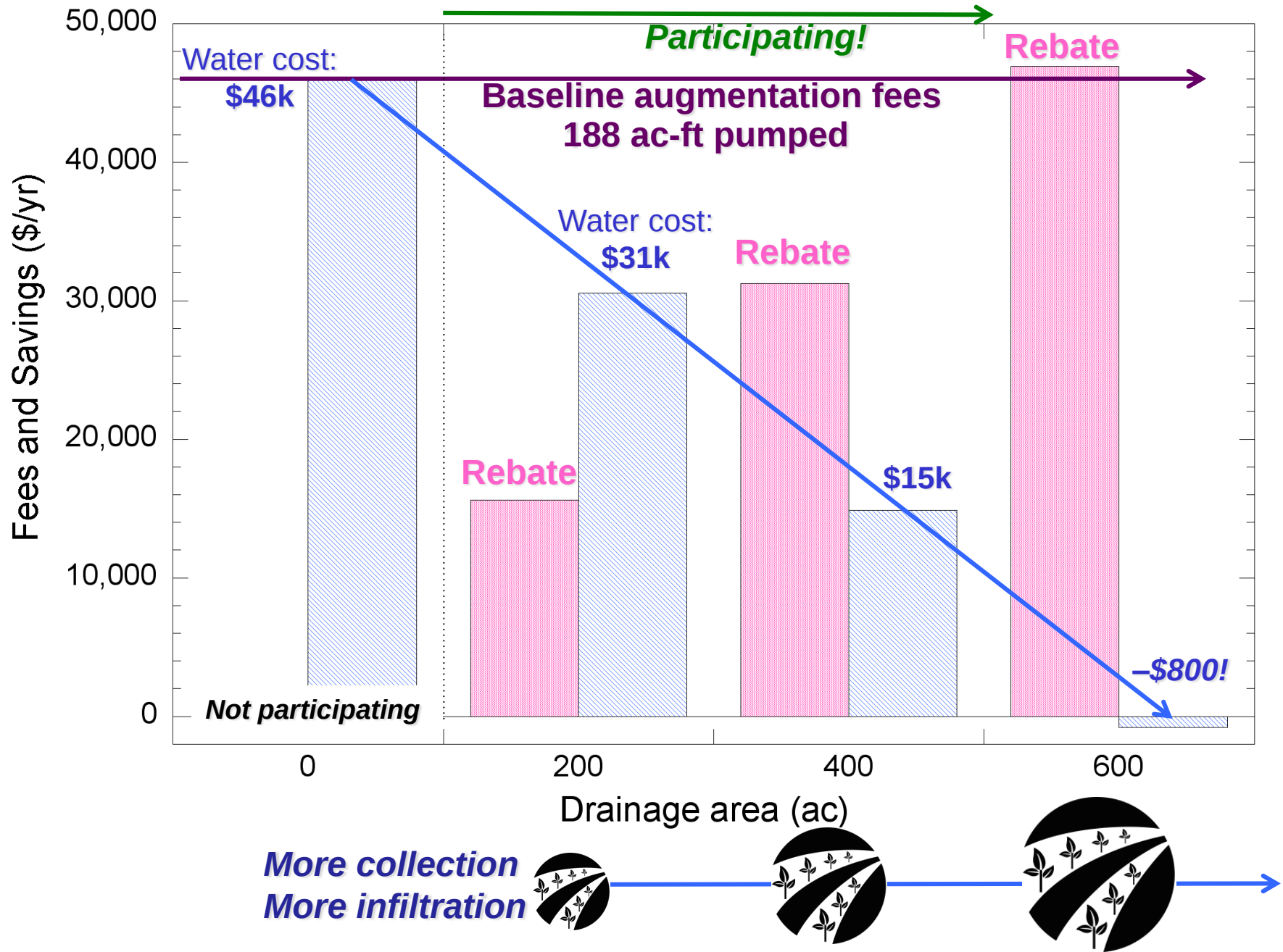
Example: Recharge Benefit Calculations



More collection
More infiltration



Example: Recharge Benefit Calculations



Recharge Net Metering (ReNeM) in the PVGB (five-year pilot program, 10/2016-9/2021)

- ***“Began” in Fall 2016***
- ***Goal: ~1000 ac-ft/yr (≤ 10 field projects)***
- ***Third-party certifier (TPC=RCD+UCSC) identifies sites, raises capital, develops engineering, plans/builds for measurement***
- ***TPC works with landowners/tenants to validate, certifies performance, reports to agency***
- ***Agency applies formula to calculate rebate (= credit)***

Program status

- ***One site operating, one more will begin operation in Winter 2019-20)***
- ***Two other projects constructed, but not part of program***
- ***More sites in the queue for investigation***

Regional infiltration projects*

- Bokariza Ranch – infiltration basin, *modified from existing*
 - *Infiltration measured since WY12*
 - *Operated/instrumented through WY20*
- Kelly-Thompson Ranch – infiltration basin, *new*
 - *Funded, permitted, constructed!*
 - *Operating Winter WY20*
- Storrs Winery⁺ – infiltration basin, *new*
 - *Installed Spring/Summer 2017*
 - *Operated/instrumented WY18-19*
- Watsonville Airport⁺ – drywell, *new*
 - *Installed Fall/Winter 2017/18*
 - *Instrument/operated WY19*

**External funding secured, in operation or active preparation*

⁺Not operating as part of ReNeM program

ReNeM Pilot Funding: Three Kinds of Support

- **Capital costs**
site ID, design,
engineering, installation
- **Validation**
measurements, sampling,
certification
- **Rebates (Incentives)**
offset for operation and
maintenance costs

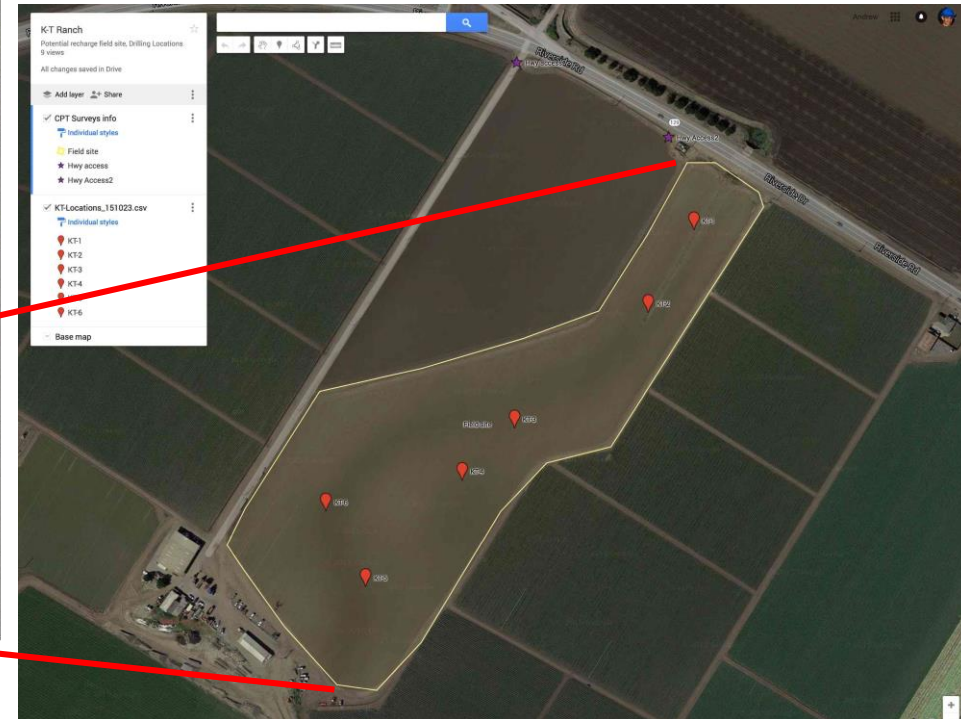
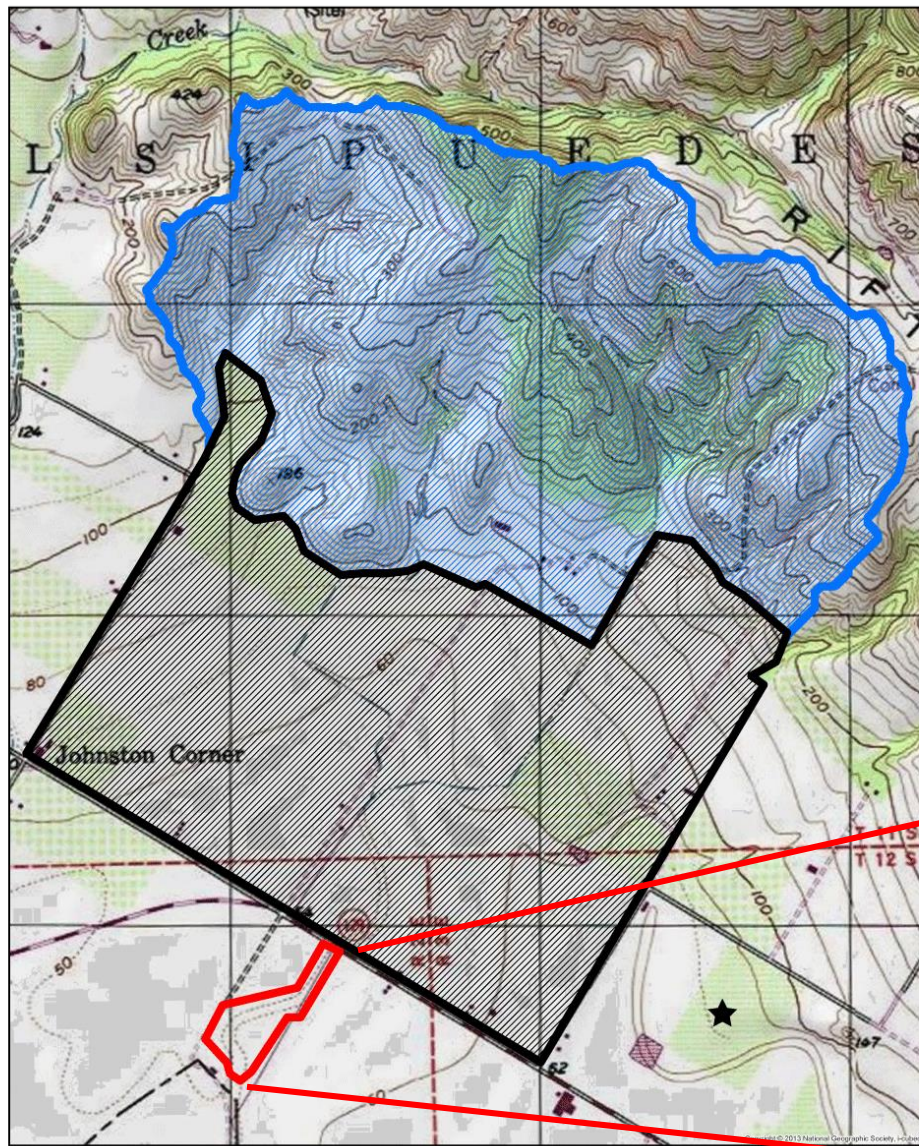
In the PVGB:

Costs are competitive, program can be revenue positive



Kelly-Thompson Ranch

- Working ranch and rangeland
- >1300 acres draining into ~15 acres
- interest in improvement to water supply and water quality



Locations and areas (approximate)



Developed (620 acres)



Potential infiltration area



Undeveloped/less developed (700 acres)

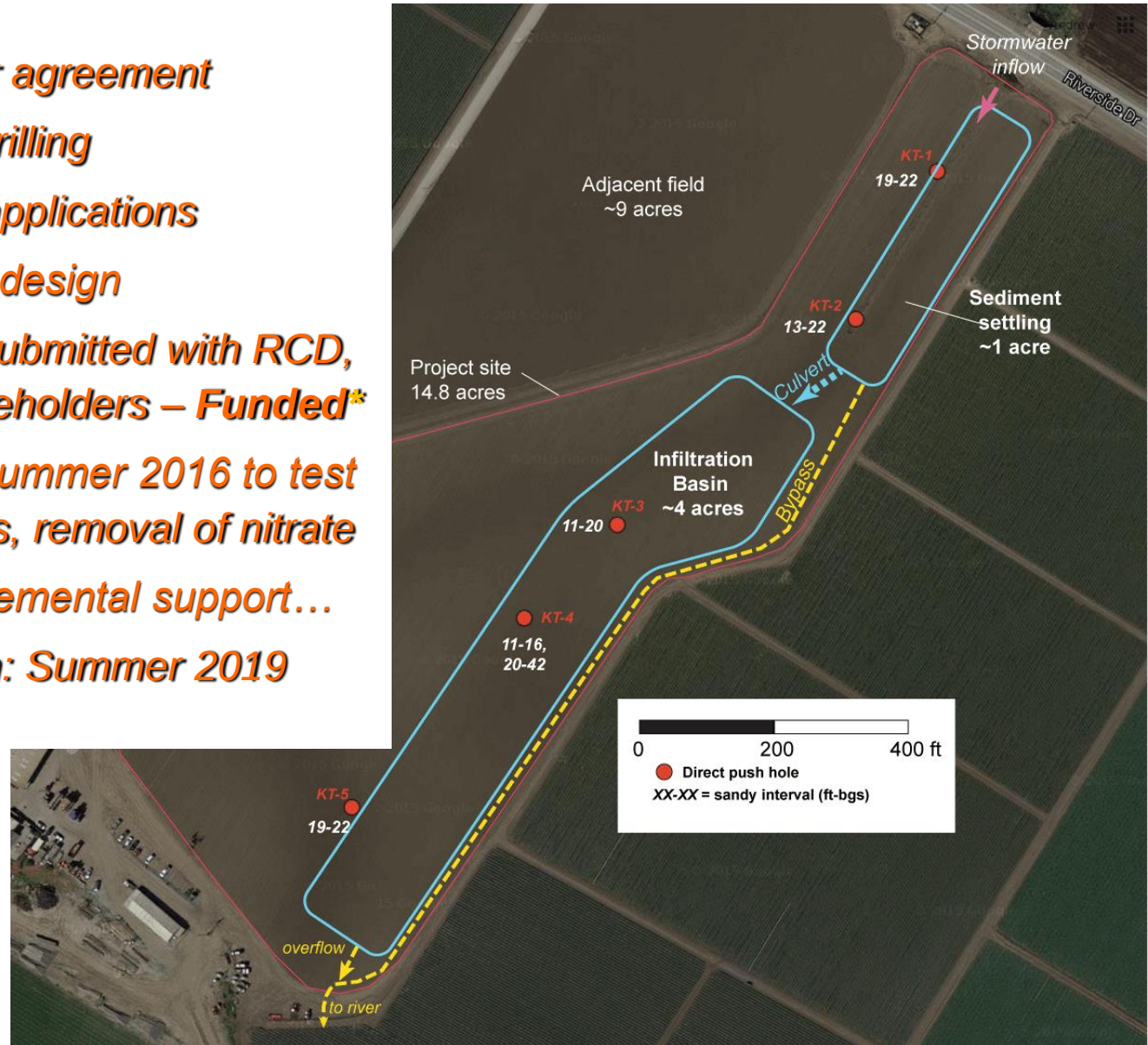


Nearby infiltration project

Soil survey (drilling)

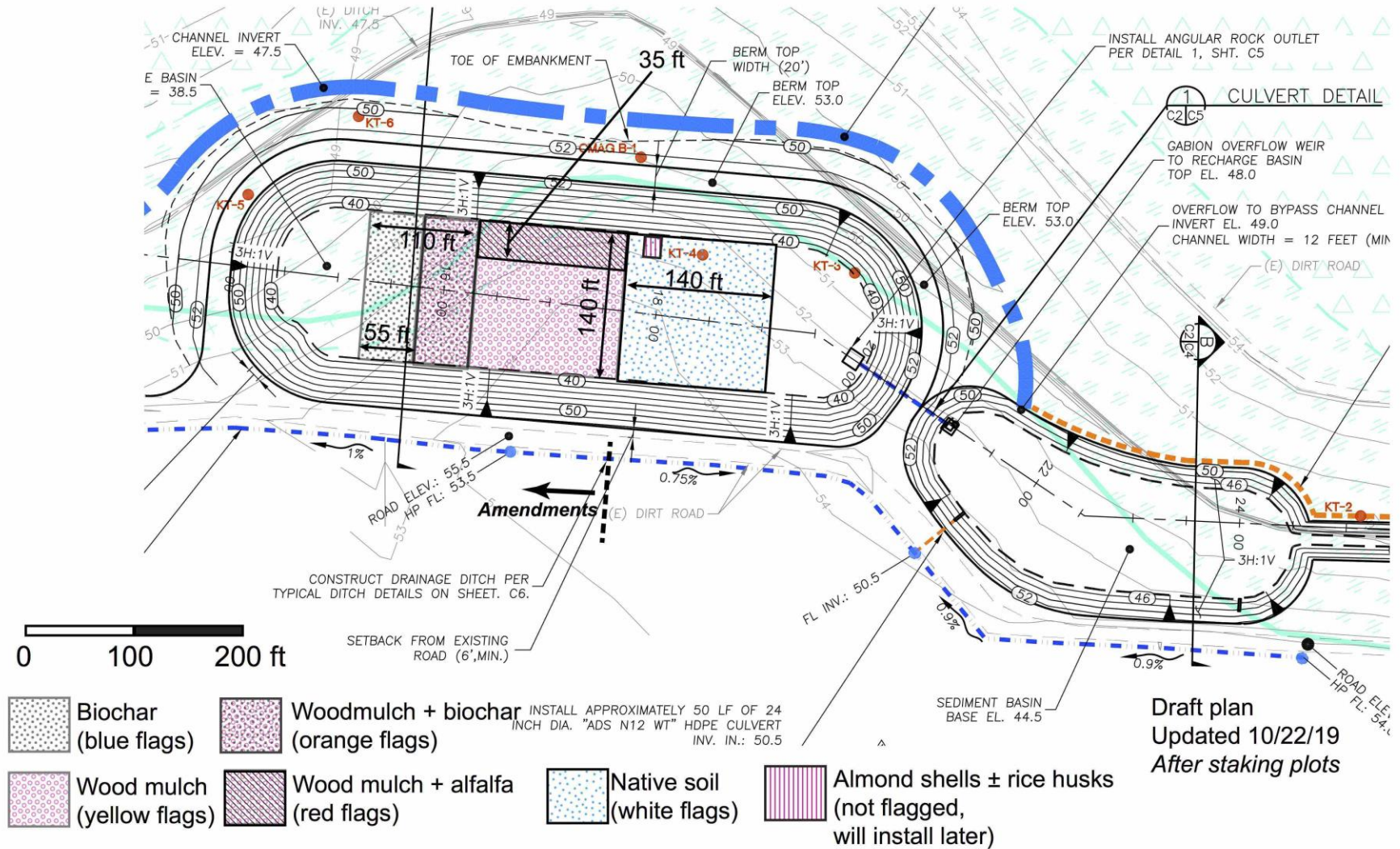
KT Project Concept and Timeline

- ✓ Secured land-owner agreement
- ✓ Surveyed site, DP drilling
 - needed for grant applications
- ✓ Prelim. engineering design
- ✓ Grant applications submitted with RCD, PVWMA, local stakeholders – **Funded***
- ✓ Field experiments Summer 2016 to test infiltration properties, removal of nitrate
- ✓ Permits, bids, supplemental support...
- ✓ System construction: Summer 2019



**ReNeM helped to make this happen!*

KT Project Engineering



- **Test carbon-rich soil amendments**

KT Ranch – Soil Amendments



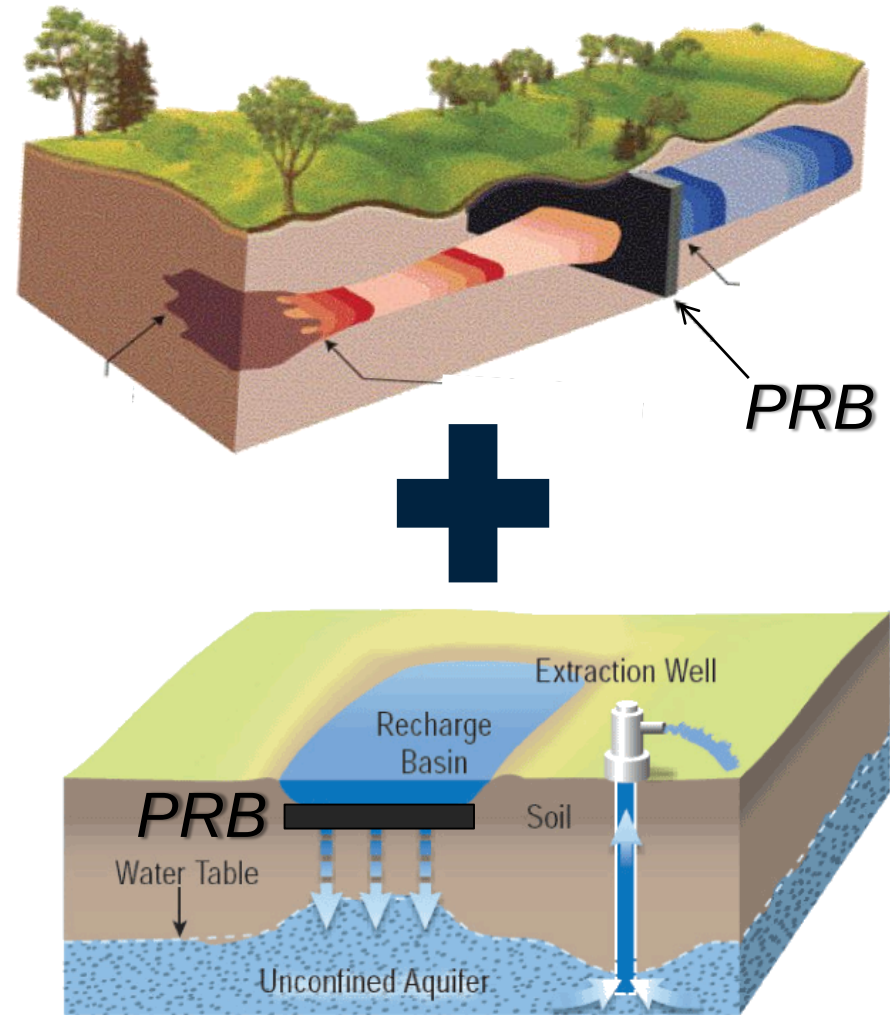
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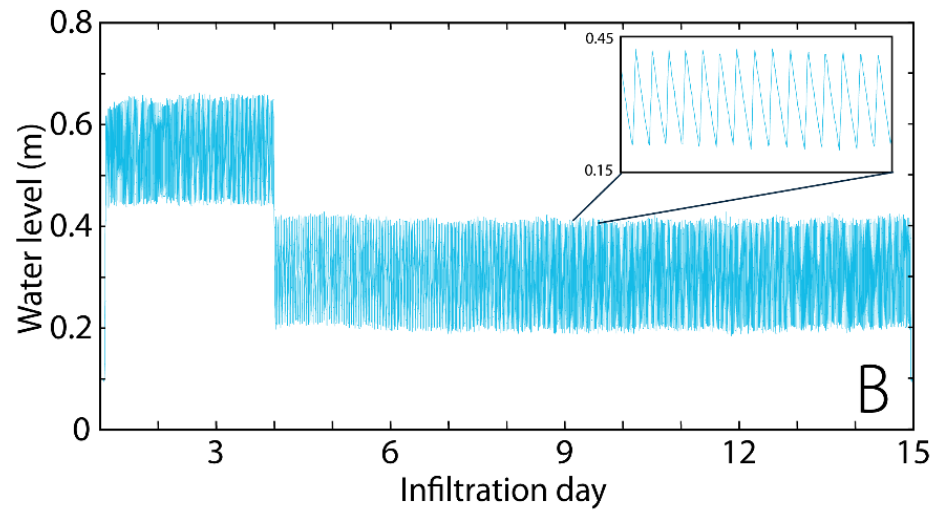
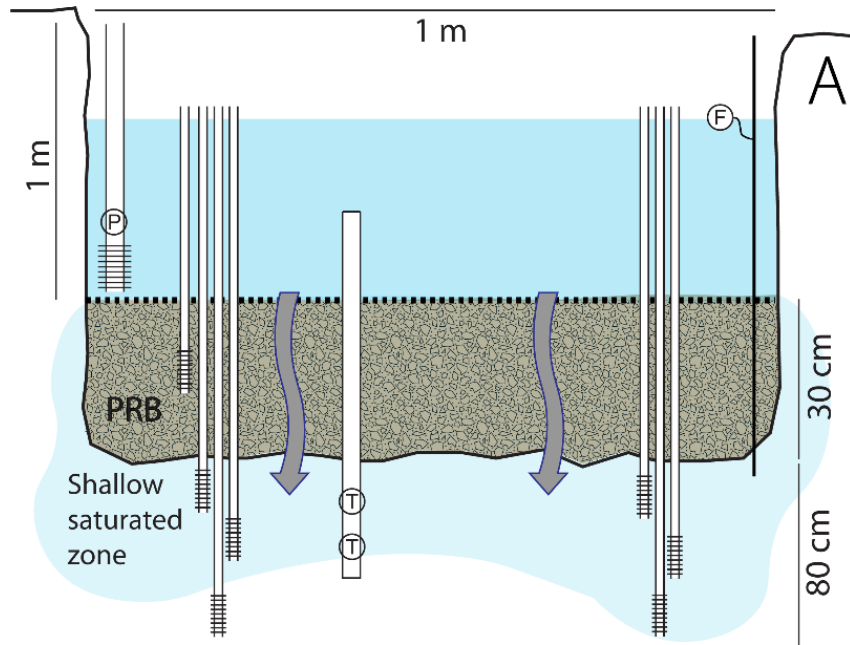
How to Improve Water Quality during DSC-MAR?

Field and laboratory studies:

- What are relations between infiltration rate, microbial activity, and nitrogen cycling?*
- How can the use of a permeable reactive barrier (PRB) impact these relations?*
- How can development and use of a low-cost PRB improve water quality during MAR?*

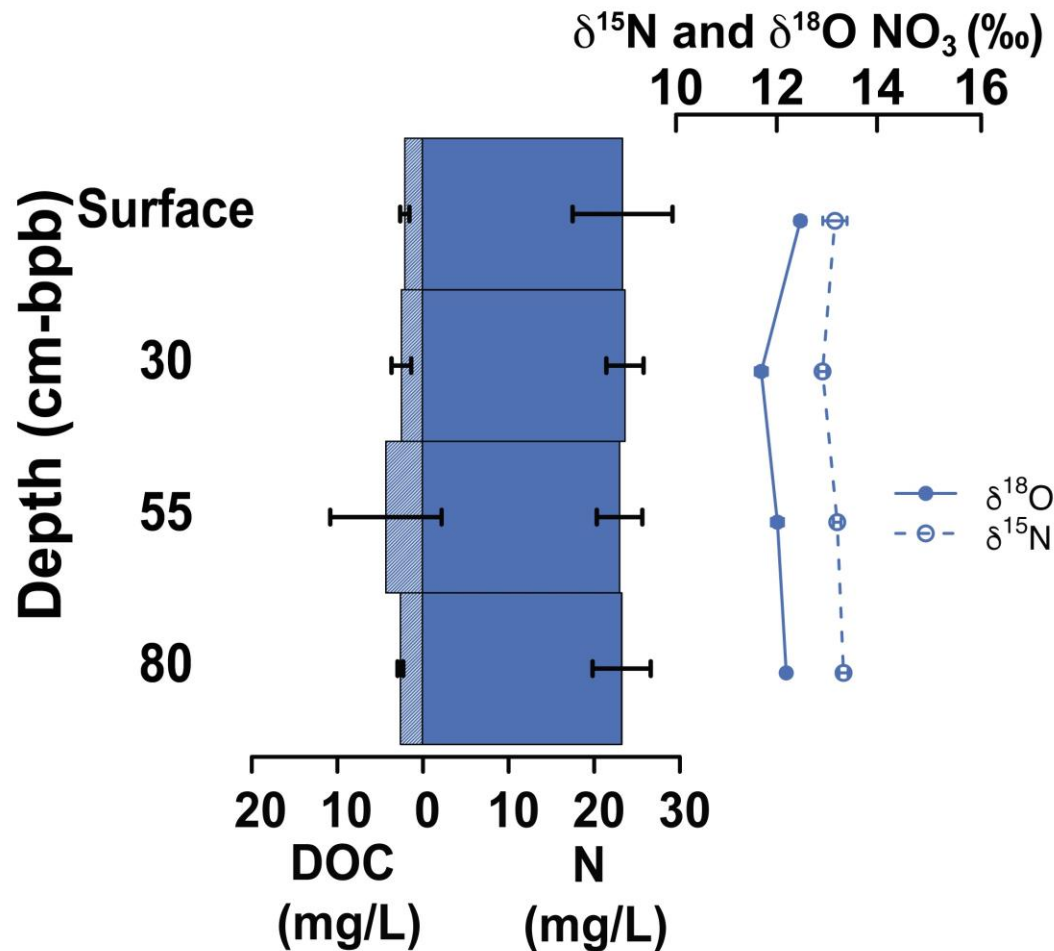


Experimental configuration



Tests at Kelly-Thompson Ranch

A *NS-Perc*

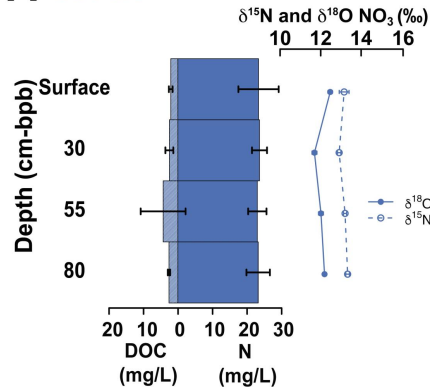


Native soil (NS):

- little change in carbon or nitrate with depth
- Nitrate isotopes consistent

Tests at Kelly-Thompson Ranch

A NS-Perc



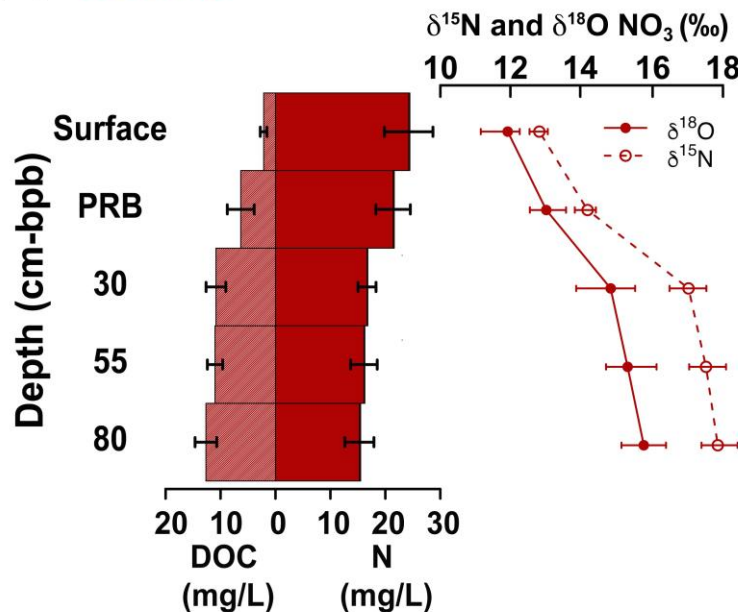
Wood chips (WC):

- Carbon increases, nitrate decreases with depth in soil
- Nitrate isotopic shift

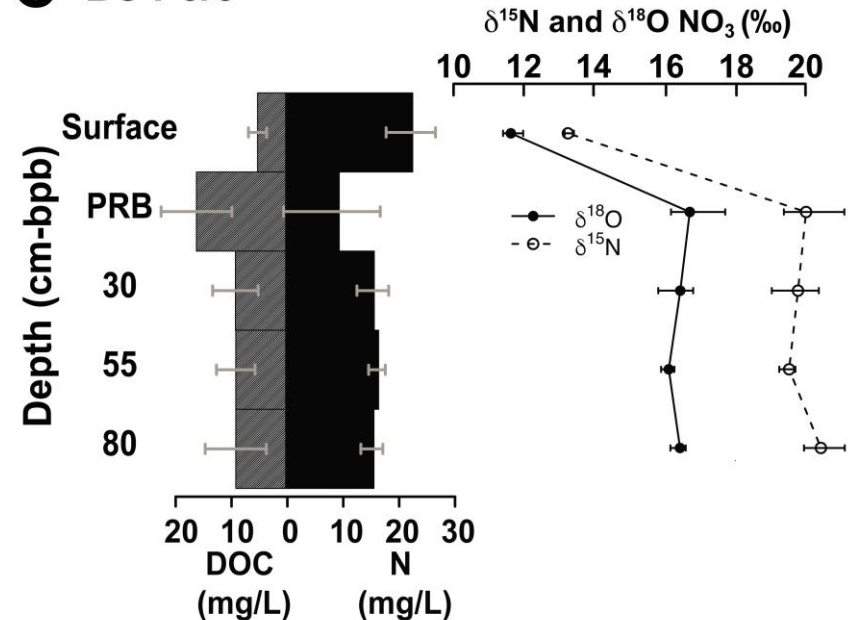
Biochar (BC):

- Similar pattern, but more in the PRB than underlying soil

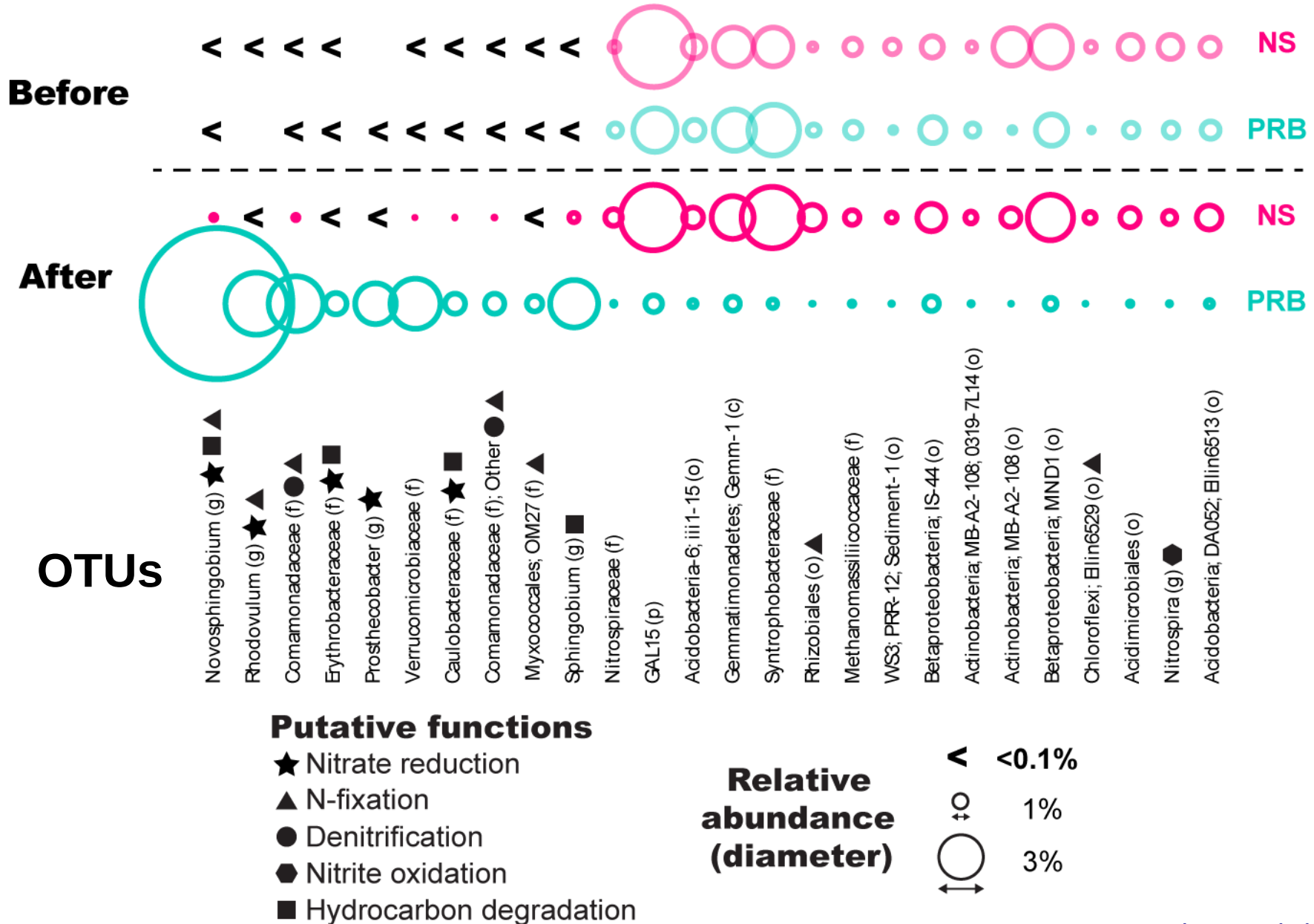
B WC-Perc



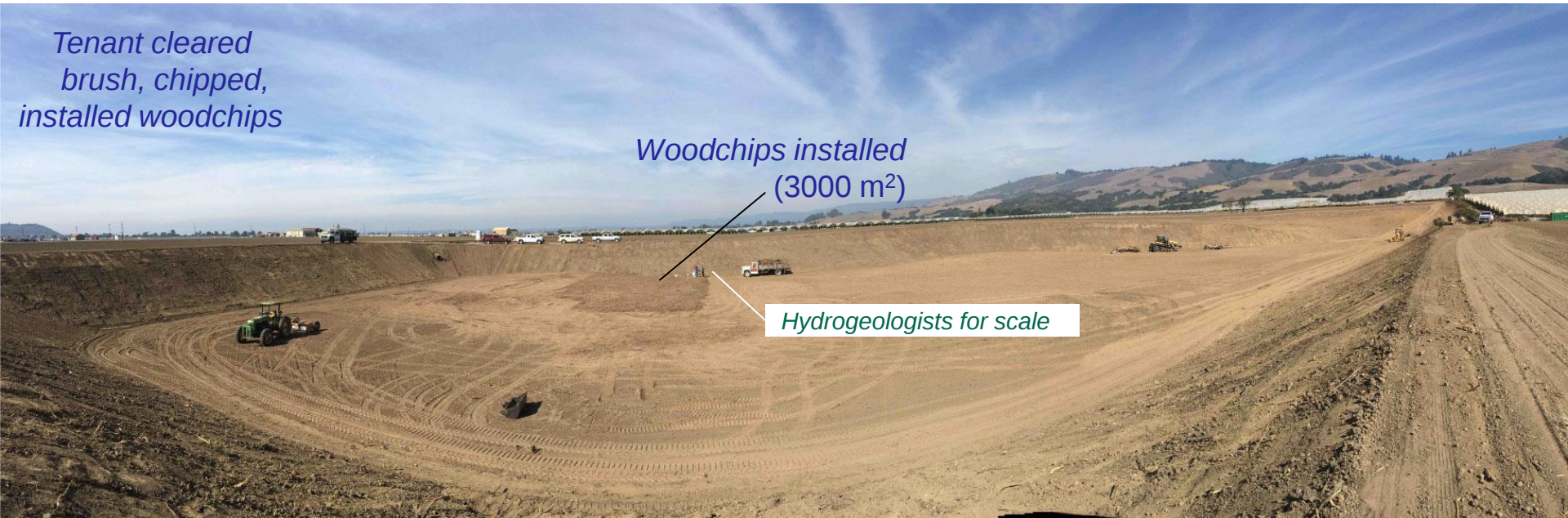
C BC-Perc



Shifts in microbial ecology with infiltration+PRB



Bokariza-Drobac: WY 19



Stormwater sampling, Winter 2018-19



A. Serrano, PhD student

Challenges and Bottlenecks

- ***Agreement on terms, requirements, liability, obligations.***



- ***Between UCSC, RCD, and participants (Phases 1/2, access)***
- ***Between water agency, participants (Phase 3, rebates)***
- ***One full package is complete***

Challenges and Bottlenecks

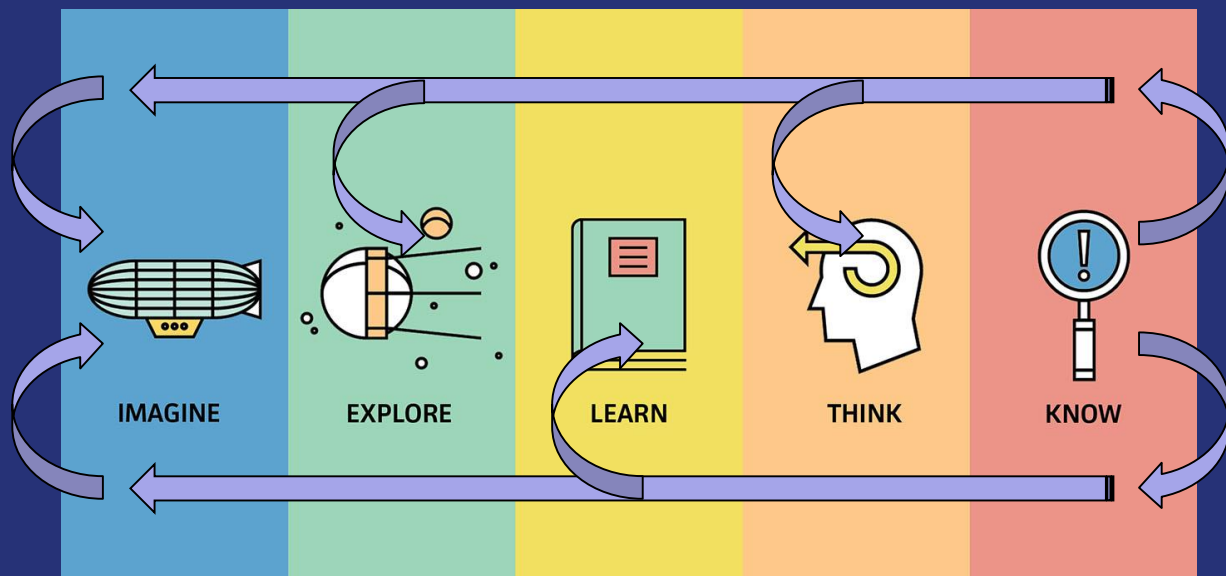
- Agreement on terms, requirements, liability, obligations.
- *Permits, "reasonable and beneficial," public benefit?*



Miller, K., N. G. Nylén, H. Doremus, D. Owen, and A. T. Fisher (2018), Issue brief: Groundwater recharge and beneficial use, Center for Law, Energy & the Environment, University of California at Berkeley, Berkeley, CA, 10.15779/J22D1H.

Challenges and Bottlenecks

- *Agreement on terms, requirements, liability, obligations.*
- *Permits, "reasonable and beneficial," public benefit?*
- *Establish and apply templates, best practices*



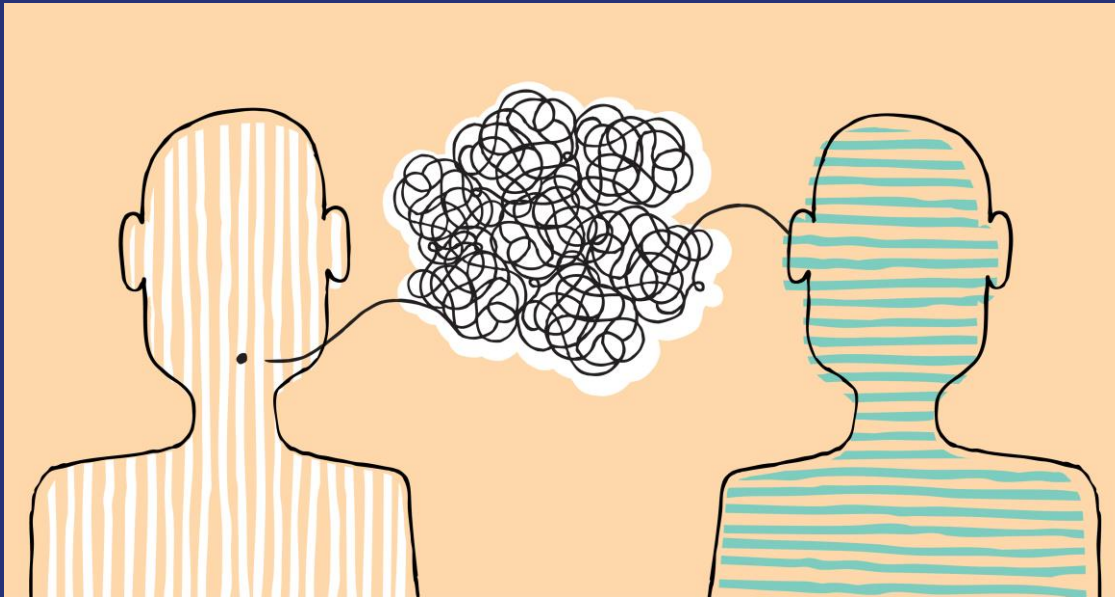
Develop tools/methods →



Each site is different, requires careful design and operation

Challenges and Bottlenecks

- *Agreement on terms, requirements, liability, obligations.*
- *Permits, "reasonable and beneficial," public benefit?*
- *Establish and apply templates, best practices*
- *Misunderstandings*



- *Recharge $\neq$ storage*
- *Infiltration vs. recharge*
- *FloodMAR*
- *Stormwater*
- *Biggest risk is not from "not recharging"*

ReNeM: Ongoing Work, Next Steps

- Encourage stakeholders to complete program paperwork
- Manage operating projects – maximize supply and quality benefits, maintain systems
- Collect water quality data from surrounding wells (in discussion with PVWMA staff, link to regional monitoring)
- Write annual reports for each project (once formally approved)
- Find new sites and partners
- Raise project funds: design, build, validate (repeat)
- Train personnel, make progress, address challenges.
- Avoid getting discouraged: ***giving up is not an option...***

ReNeM: A Team Effort



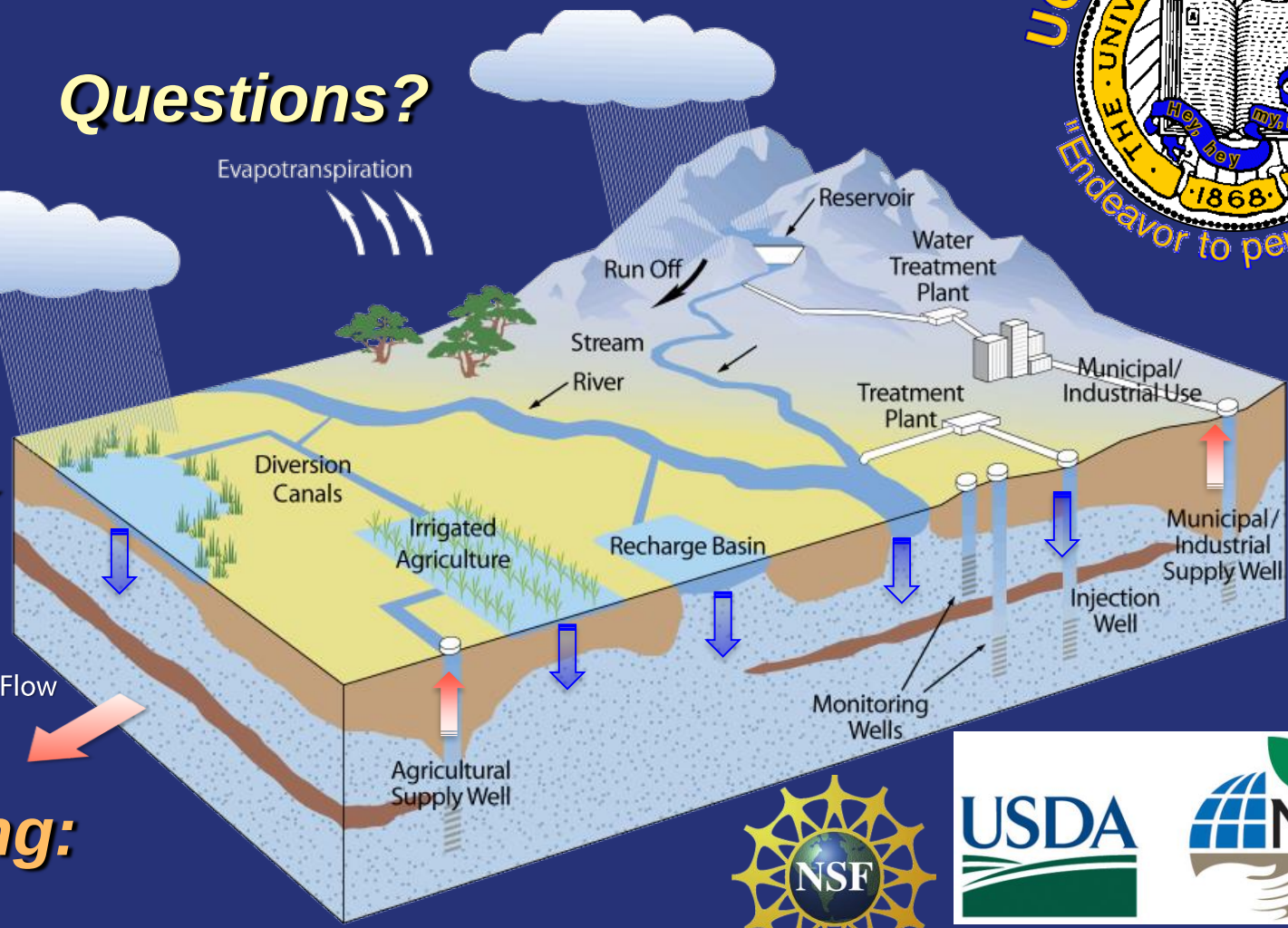
*Many partners, helpers,
students, agencies,
stakeholders, tenants,
collaborators...*



Questions?

Thank you!

Funding:



State of California
Coastal Conservancy

