Enhancing California Groundwater Recharge

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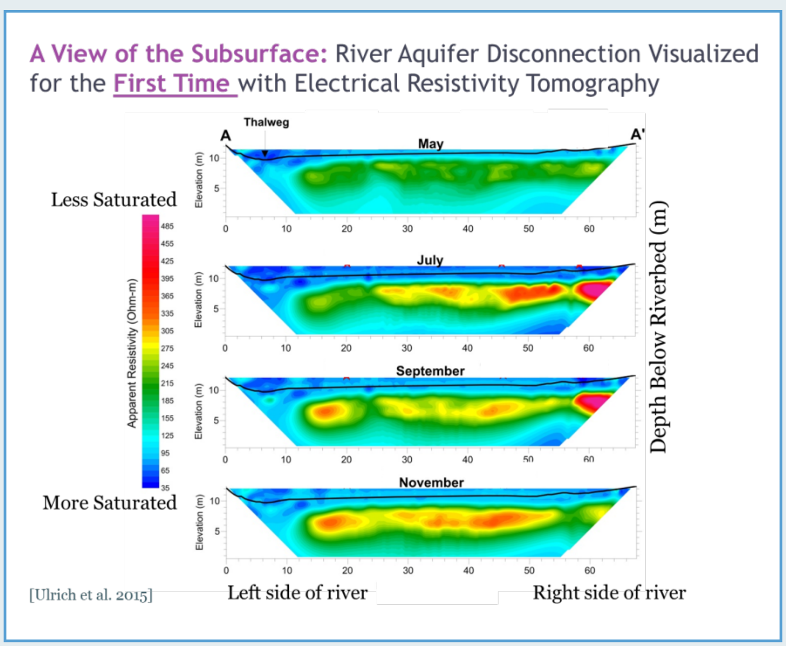
Motivation

Rivers in climatic zones characterized by dry and wet seasons, such as in California's Mediterranean climate, often experience periodic transitions between losing and gaining conditions across the river-aquifer continuum. As groundwater levels decline, losing rivers can further transition from being hydraulically connected to the groundwater through a continuously saturated zone to being disconnected from the underlying aquifer by an unsaturated zone[1–5]. Unsaturated conditions potentially increase the vulnerability to infiltration declines and reductions in groundwater recharge efficiencies in bank storage, MAR, or other induced recharge zones from microbial controlled permeability declines [6,7].

Technological Challenges

- Use of geophysics to measure and monitor subsurface connectivity
- Use of geophysics to estimate recharge rates in unmonitored settings



Geophysical data showing the transient river-aquifer connection beneath the Russian River, CA

Collector Well at the Wohler Riverbank Filtration site, Russian River, CA. Riverbank Filtration in a technique to naturally filter out water solutes and pathogens before pre-treatment.

Research

In our research, we assess infiltration, nutrient consumption, microbial growth, and subsurface groundwater storage using a variety of modeling, monitoring, and data-driven model inversion approaches. Our goal is to push forward model development to allow analysis of these fully coupled flow and reactive transport conditions. Novel inclusion of microbial functional groups within our code provides a new method for constraining sediment parameters given the range of data we incorporate: infiltration, geophysics, temperature, groundwater levels, and water chemistry. These techniques will help determine groundwater infiltration in locations where measurements are not available.

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