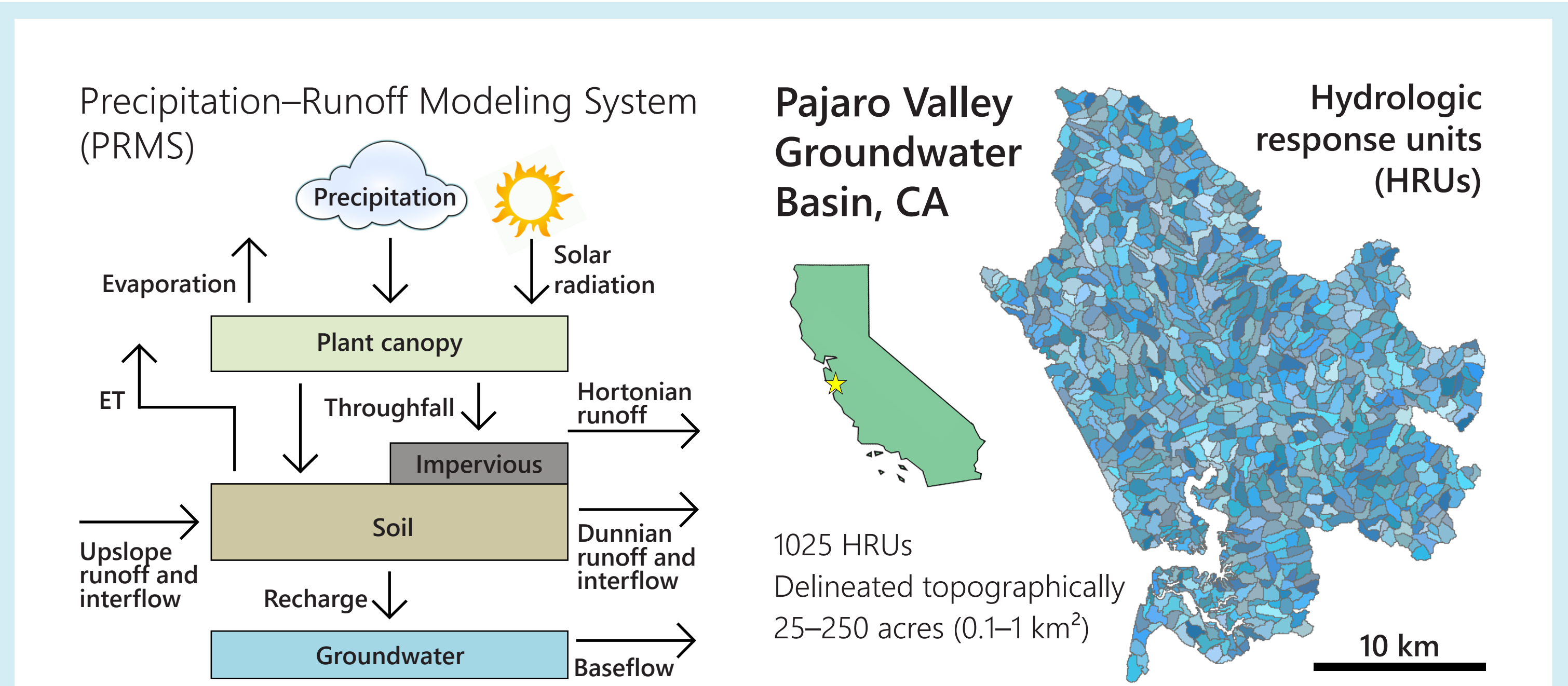
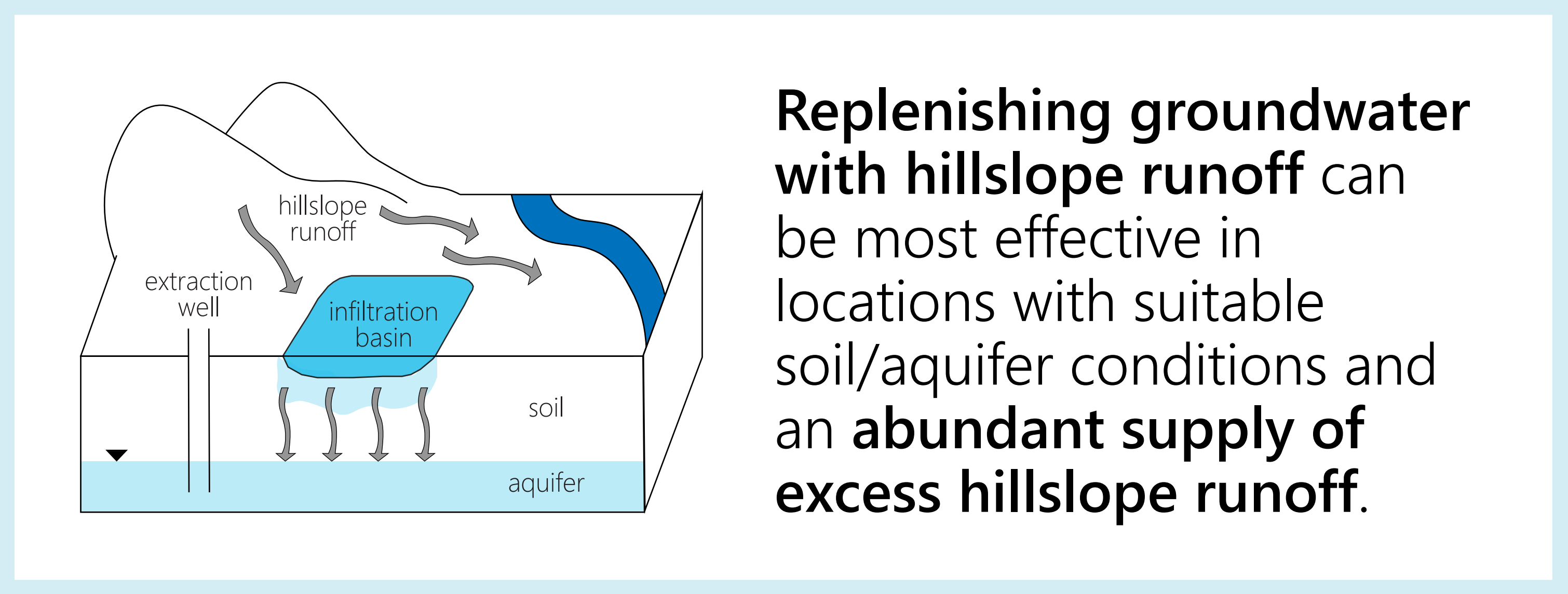
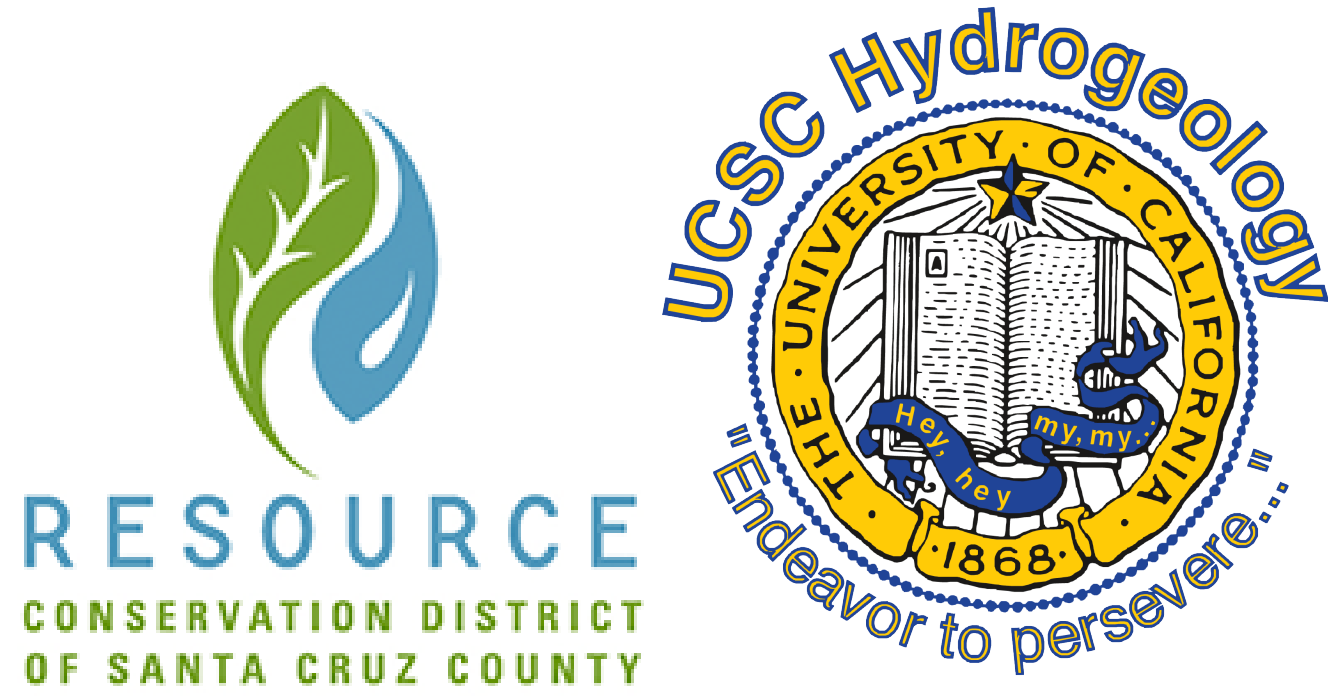


Applying a regional hydrology model to evaluate locations for groundwater replenishment with hillslope runoff under different climate and land use scenarios

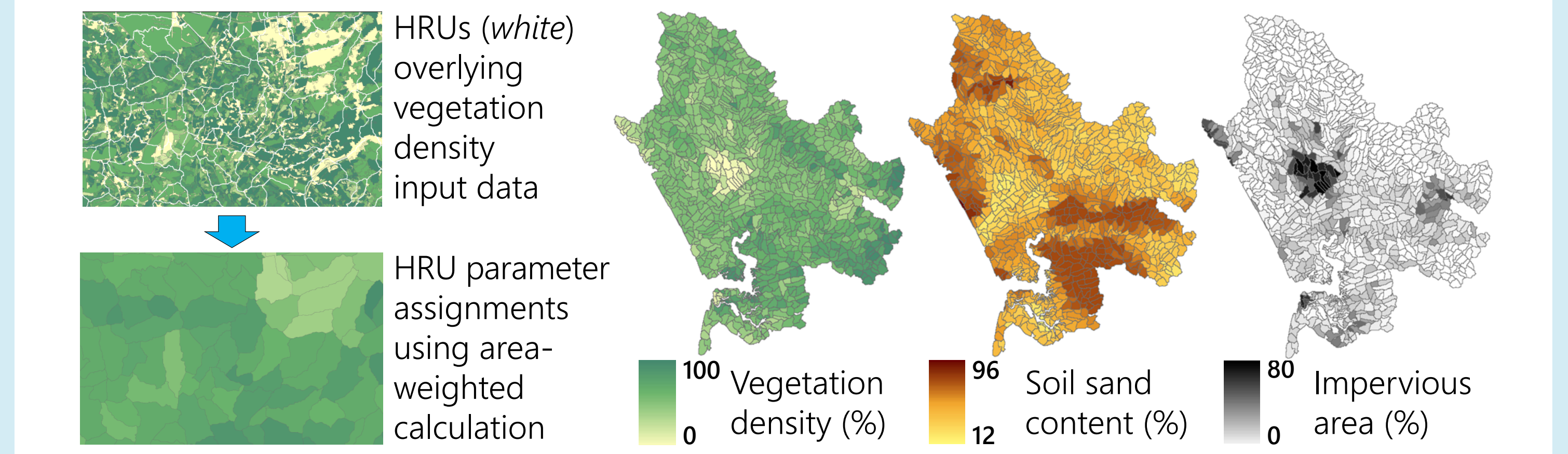
Sarah Beganskas (sbeganskas@ucsc.edu)¹, Kyle Young², Andrew T. Fisher¹, Sacha Lozano³, Ryan Harmon⁴, Elke Teo¹

¹University of California, Santa Cruz, CA
²Coast Guard Academy, New London, CT
³Resource Conservation District of Santa Cruz County
⁴Colorado School of Mines, Golden, CO

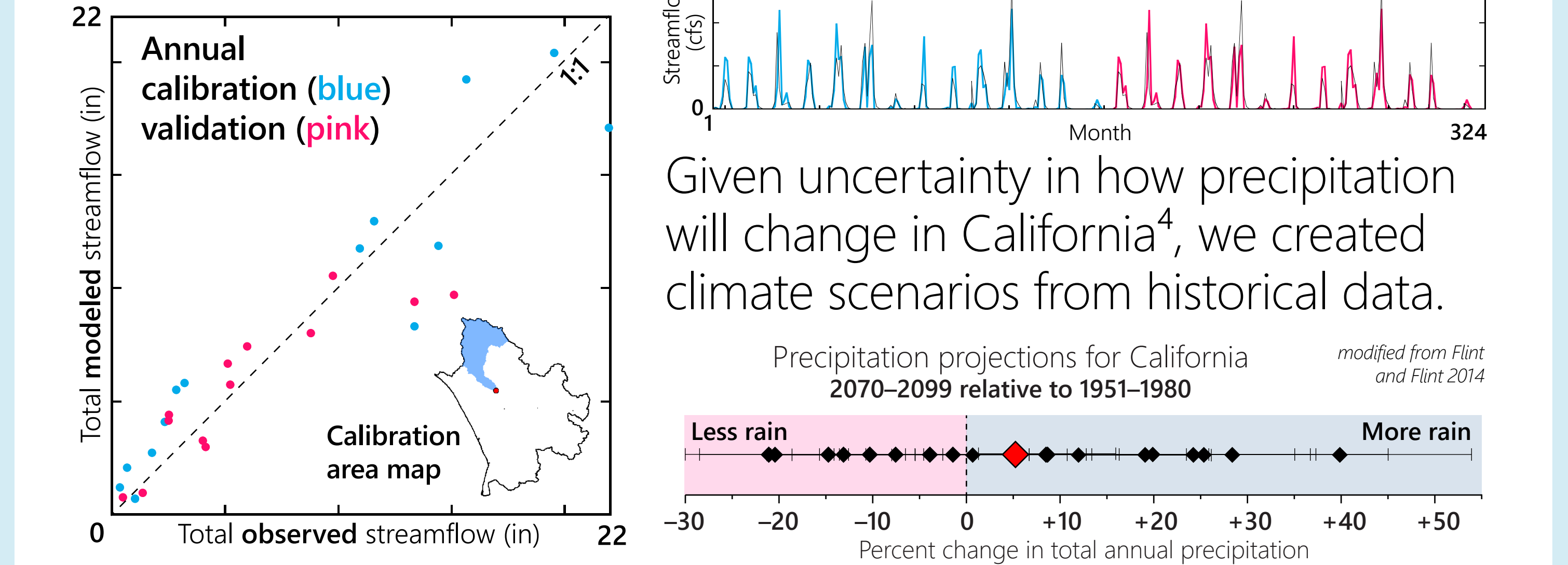
H53E-1504



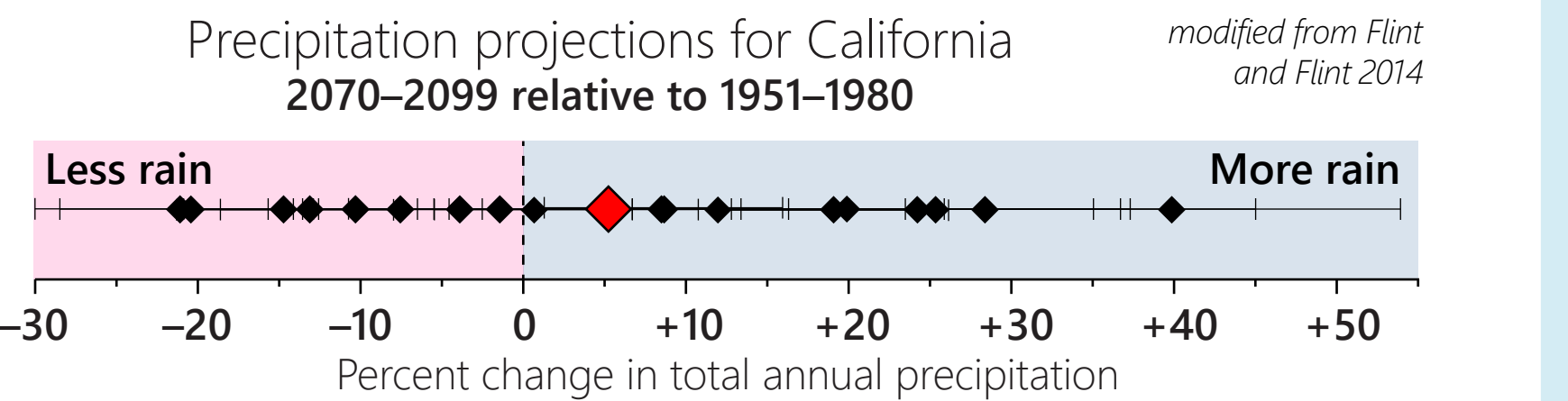
We developed tools to apply PRMS¹ to evaluate hillslope runoff generation at sub-watershed scale.



We used high-resolution vegetation² and soil³ input data to characterize each HRU (above), and calibrated/validated using daily streamflow data (below).

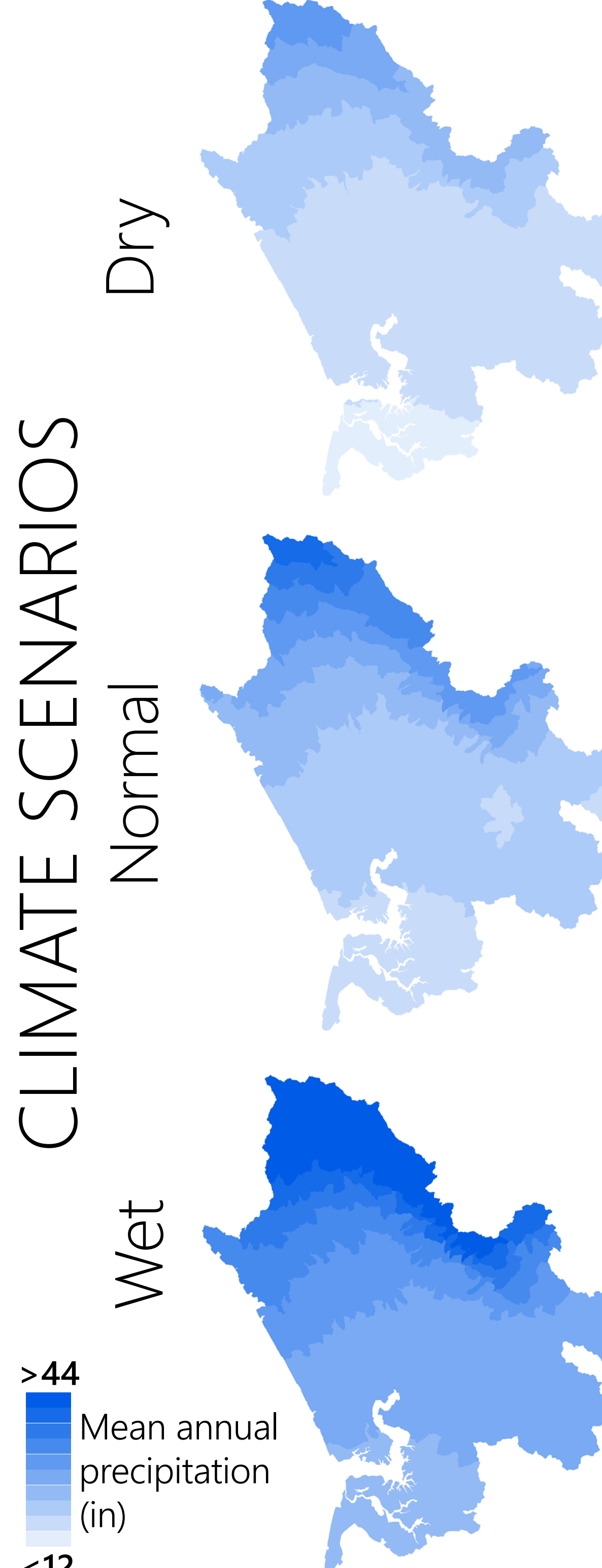
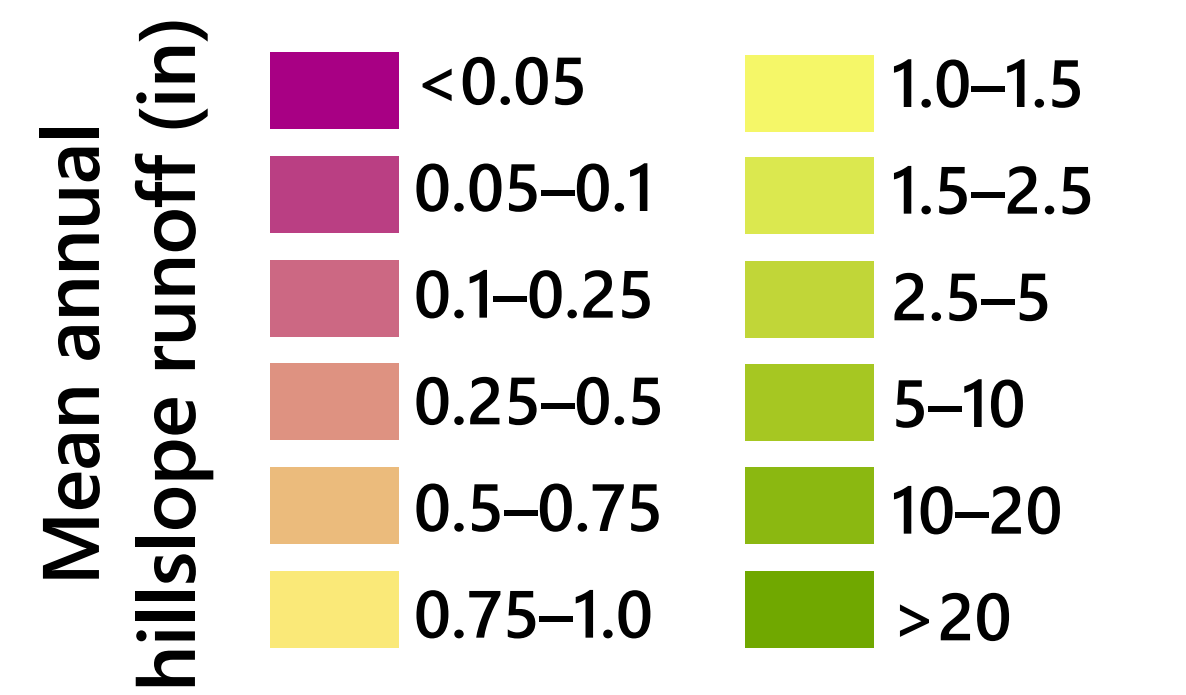


Given uncertainty in how precipitation will change in California⁴, we created climate scenarios from historical data.



We also developed tools to **analyze and visualize model output**.

We define **hillslope runoff** as the sum of Hortonian runoff, Dunnian runoff, and interflow, including inputs from upslope HRUs.



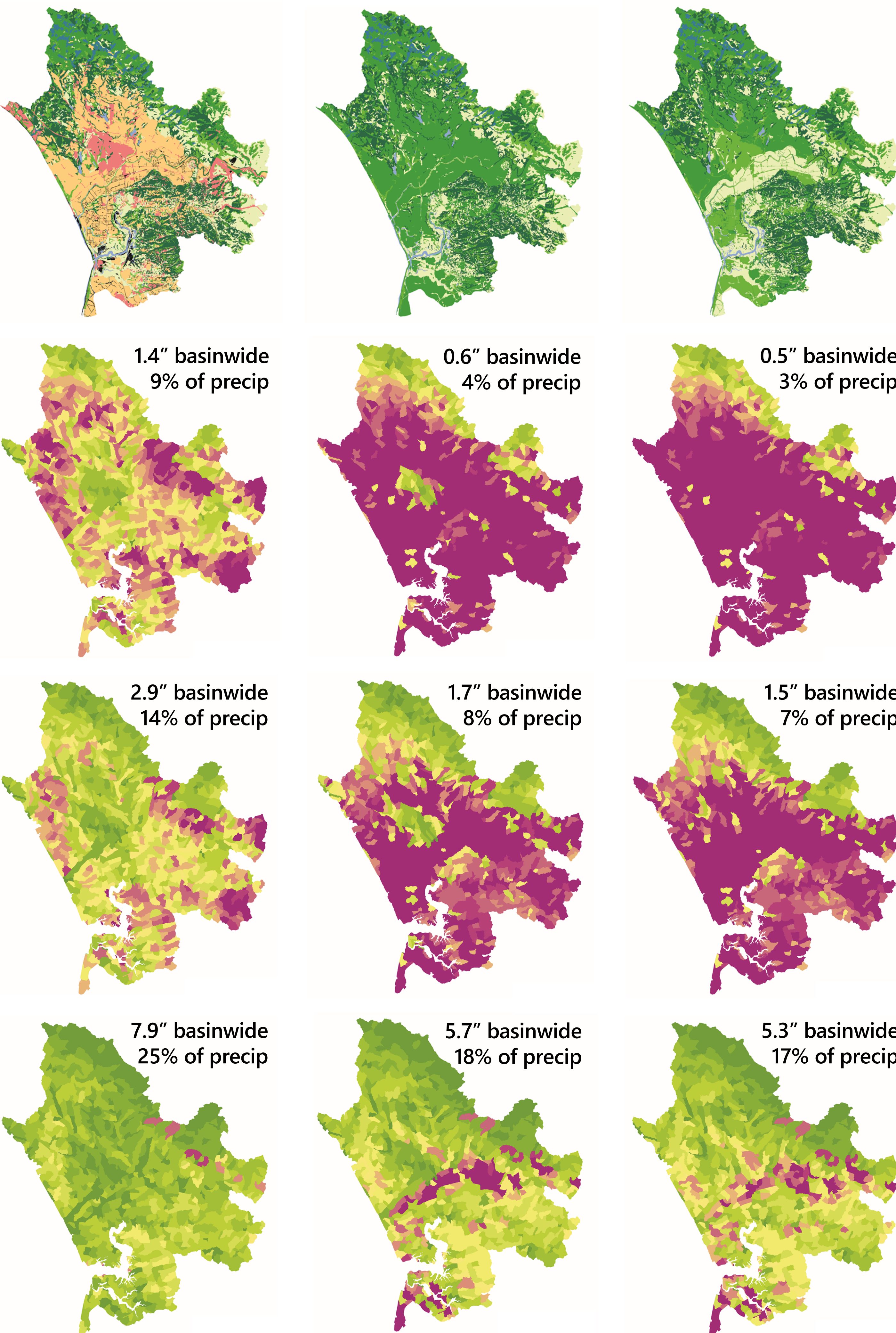
During dry scenarios, **more than twice as much runoff** is generated under contemporary land use than under pre-development conditions.

LAND USE SCENARIOS

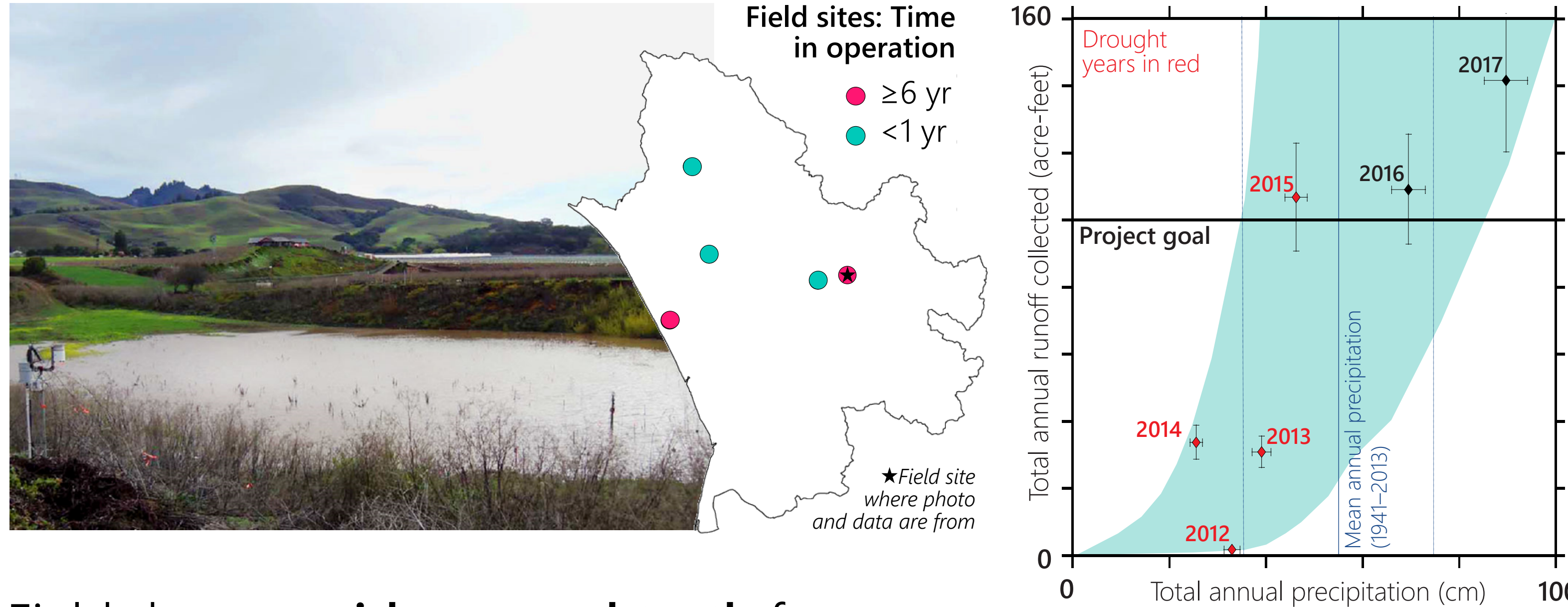
Contemporary
Agriculture, Barren, Conifer, Hardwood, Herbaceous, Mixed forest, Shrub, Urban

"Pre-development"
MIXED FOREST
Replace all developed land (urban, agricultural, and barren) with mixed forest.

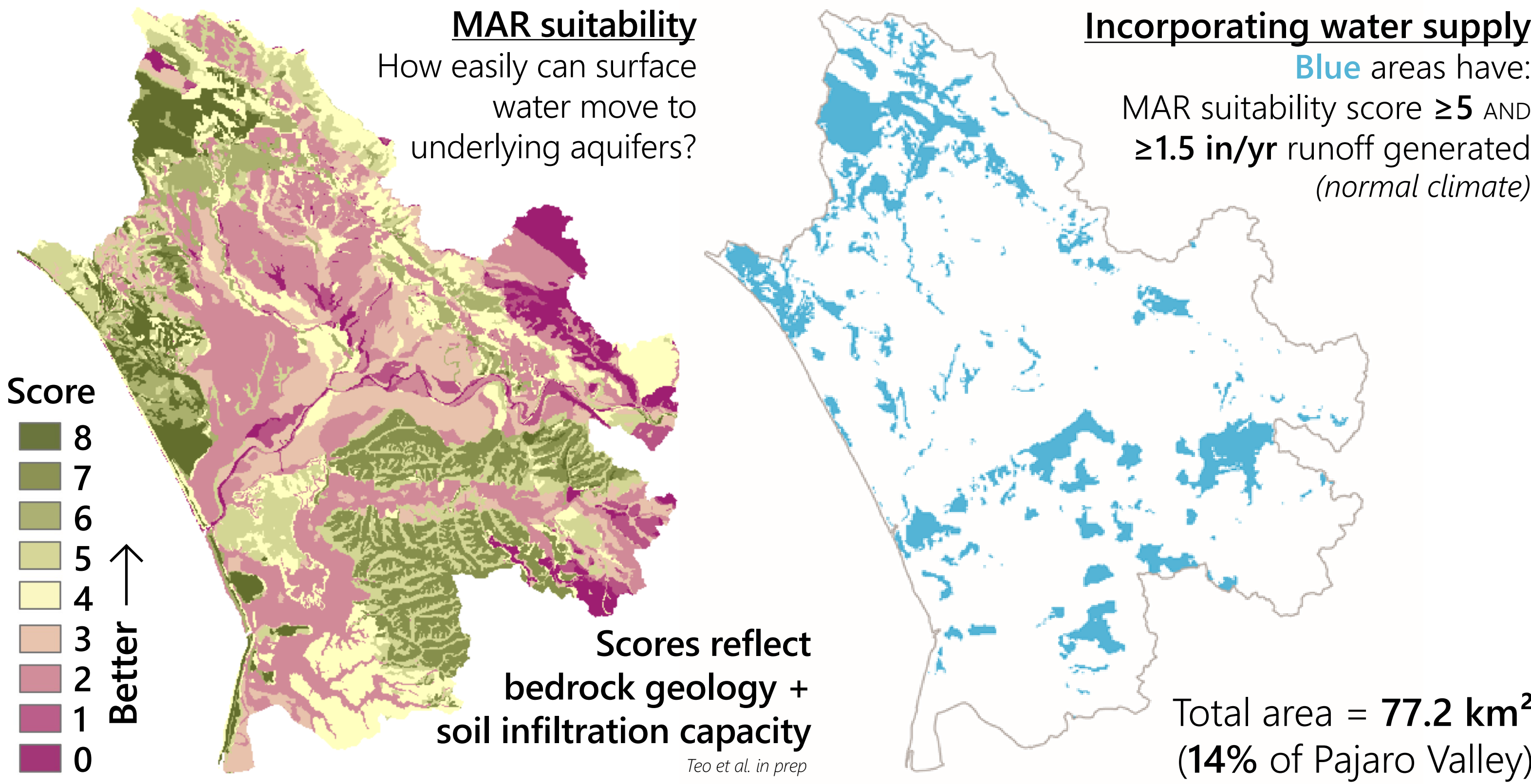
SLOPE-DEPENDENT
Replace developed land with grass (low slope), shrub (med. slope), and mixed forest (high slope).



Reducing basin overdraft by 10%⁵ would require collecting 1,000 af/yr—just 6% of runoff generated during dry times.



Field data **provide ground truth** for regional models and show that runoff collection can be an effective water management strategy, **even during a severe drought**⁶.



A large fraction (**14%**) of the Pajaro Valley appears to be well-suited for groundwater replenishment with hillslope runoff.

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⁵Pajaro Valley Water Management Agency. Basin Management Plan Update, Final: February 2014. 80 pp. (Pajaro Valley Water Management Agency, 2014).

⁶Beganskas, S. & Fisher, A. T. Coupling distributed stormwater collection and managed aquifer recharge: Field application and implications. J. Environ. Manage. 200, 366–379 (2017).

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