



Rancho Seco with native Fiddleneck. Courtesy Jessica Fox, EPRI

SMUD Rancho Seco Restorative Energy Project

Reimagining Energy for Communities, Ecosystems, and Climate

Background

SMUD's Rancho Seco site near Sacramento, CA covers 2,000 acres and is unique for its ecological attributes, land-use history, and public recreational opportunities. It is the site of a decommissioned nuclear power plant (retired 1989) with the land now repurposed for public recreation, an endangered species conservation bank, a sanctuary for rescued wildlife, and a large, ground-mounted photovoltaic solar energy facility providing clean power to Northern California. A diverse team is now leading a demonstration to reimagine the intersection of communities, ecosystems, and climate to achieve "Restorative Energy" – that supports Tribal communities, declining species, and a diverse community of SMUD's customers.

A focus of this project is to restore the California prairie biome that once proliferated across the Great Central Valley. Abundant with wildflower species, it once served as habitat for California's bio-diverse pollinator species, including the migratory monarch butterfly. Remarkably, the colorful California prairie can store up to 19 kilograms of carbon per meter square (compared to 8 kg C/m² observed in temperate forests). Unfortunately, some estimates show that 98% of this once expansive biome has been lost. The Rancho Seco Solar II project, a 160 megawatt (MW) photovoltaic (PV) solar power facility became operational in February 2021. Globally, solar development has increased by an average

- Reimagine energy supporting communities, ecosystems, and climate – *Restorative Energy*
- Create 20 acres of pollinator habitat under solar panels, measure changes in energy, soil carbon, and management costs.
- Educational native pollinator gardens for 100,000 annual visitors.
- Engage next generation of workforce in sustainability and energy science.
- Coordinate interests of local tribes, shepherds, solar owner and operator, and the protected California tiger salamander.

of 48% per year over the last decade and is expected to double again over the next five years. While this clean energy transition is important for reducing greenhouse gas emissions, ground-mounted solar can change landscapes and their underlying ecosystem functions. There are opportunities to achieve both renewable power and restoration of ecosystem services that humans depend on, including carbon sequestration and habitat for pollinators. This work aligns with the state's administration priority to advance biodiversity conservation on working land and conserving 30 percent of our lands by 2030, known as 30x30 California.



Left to Right: Emily Bacchini (SMUD), Angela Laws (Xerces), Jessica Fox (EPRI), Rebecca Hernandez (UC Davis), Yudi Li (UC Davis)



Sheep grazing around PV panels on site.

Objectives and New Learnings

This research team is conducting a four-year study (2022–2025) to restore California prairie under photovoltaic solar panels, an area also occupied by the federally protected California tiger salamander (*Ambystoma californiense*), and part of the ancestral lands of Native American Tribes. The site is directly adjacent to a working vineyard and currently utilizes sheep grazing as the primary vegetation management approach under and around the panels. Uniquely, the team will navigate the interests of the solar project owner and operator, landowner, engaged regional Tribes, state and federal wildlife agencies, shepherds, neighboring vineyard, populations of Federally protected California tiger salamander, and the security needs of the stored fuel at the retired nuclear power plant.



California tiger salamander (*Ambystoma californiense*).

Additionally, the project will establish a full mile of flowering hedgerows along the perimeter of the solar facility and create three public educational native pollinator gardens. The Rancho Seco Recreation Area receives approximately 100,000 visitors per year who bird watch, boat, swim, camp, fish, and hike. Staff training will be developed to ensure appropriate maintenance of the restored native habitat.

Approach

This project will serve as a testbed of translating scientific research while training the next generation of sustainability scientists through research and mentoring by team leaders. Students from the UC Davis Wild Energy Center will engage in projects across SMUD's Rancho Seco solar treatment areas exploring: 1) native plant mix selection and re-establishment, including across the PV facility areas and as hedgerows; 2) plant community and pollinator habitat assessment, with biodiversity and habitat suitability analyses; 3) the characterization of soil properties, including soil carbon sequestration, 4) characterizing habitat and restoration options for California tiger salamander, and 5) projects emphasizing co-development and engagement with Tribes and co-locating energy and socio-ecological benefits, including environmental justice.



SMUD Rancho Seco Site.

Measured data will include pollinator diversity and richness, native plant establishment success, and impacts to energy production because of changing albedo (light reflection) across four native vegetation assemblages under the solar panels.

Outcomes

Anticipated outcomes include the establishment of native plant species promoting pollinator habitat, soil carbon monitoring, energy production impacts, public education and workforce training, and measured scientific results for peer-reviewed publication. We will provide a nationally relevant demonstration of how to reimagine the inclusion of communities, ecosystems, and climate to achieve true *Restorative Energy*.

Project Schedule

Four years through December 2025.

Project Team

Sacramento Municipal Utility District (SMUD)
EPRI
U.C. Davis, Wild Energy Center
Xerces Society
D. E. Shaw Renewable Investments (DESRI)
NovaSource Power Services

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