

Cacti and other iconic desert plants threatened by solar development

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A mojave yucca flowers in a solar field with heliostats. Credit: Steve Grodsky, UC Davis

With their tough skins, pointy armor and legendary stamina, cacti are made to defend themselves from whatever nature throws at them.

But large solar energy facilities are one threat that cacti weren't built to withstand, according to a study by the University of California, Davis.

The study, published July 20 in the journal *Nature Sustainability*, chronicles the impacts of ground-mounted solar energy development in the Mojave Desert on native plants and their cultural significance to indigenous tribes in the region.

"We're talking about iconic and threatened plants—cacti, especially, and Mojave yucca," said co-leading author Steve Grodsky, an assistant research ecologist at UC Davis. "These are the plants most people envision when they think about the desert, and they're also the most negatively affected by solar energy development."

Location, Location, Location

Solar energy is a key strategy for reducing greenhouse gas emissions and the threats of climate change. But like any development, where it's sited affects its overall environmental sustainability.

UC Davis Assistant Professor Rebecca R. Hernandez and Grodsky are exploring where [renewable energy](#) can best coexist with wildlife, biodiversity and the environment to achieve overall sustainability. Their work is part of their Wild Energy Initiative, a research initiative of the UC Davis John Muir Institute of the Environment, and of the Energy and Efficiency Institute.

"This is really our moment to double down," said co-leading author Hernandez. "We need to not only build out renewable energy, we also need to develop it in the places that produce positive impacts. This isn't just about saving the cacti. It's about our need to achieve both climate change goals and sustainable development goals, which include protecting terrestrial ecosystems, at the same time."



A beavertail cactus blooms amid the backdrop of a solar facility in the Mojave desert. Credit: Steve Grodsky, UC Davis

Native Plants And Native Peoples

For the study, the scientists measured the impact of solar development decisions on desert plants at Ivanpah Solar Electric Generating System, one of the world's largest concentrating solar power plants. They found negative impacts on the desert scrub plant community, including plants of cultural significance to 18 indigenous tribes.

Among them are the Mojave yucca, a Joshua tree relative. Its leaves and fiber historically were used for making shoes, baskets, and building

structures. Its roots can be used for soap, hence its common name "soap yucca." Other plants have provided medicine, tools and food, such as the fruits and pads of the beavertail [prickly pear cactus](#).

Management Options And Impacts

There are a variety of ways to prepare land for solar installations, and some of these methods are more harmful to the desert plant community than others:



The Ivanpah Solar Electric Generating System in the Mojave Desert. Credit: Joe Proudman/UC Davis

- Bulldozing, or "blading," scrapes layers of earth away from the site. It's the most damaging to cacti, Mojave yucca and other native plants. It also primes the site for invasive grasses like Schismus, which present a fire risk to deserts maladapted to wildfire.
- Mowing also destroys cacti and Mojave yucca, but creosote and perennial shrubs can recover from it.
- "Halos" are roped off areas known to hold sensitive species that create islands of undeveloped areas within the facility. They can be effective for conserving [native plants](#), including cacti and Mojave yucca.

"From a management perspective, there are things we can do to help conserve native desert [plants](#) at solar facilities," Grodsky said. "But it's best to develop solar energy in marginalized lands like urban areas, places where ecosystems are heavily altered, rather than undeveloped desert."

[Previous research](#) by Hernandez, Grodsky and colleagues examined dozens of alternatives to installing solar on undisturbed lands. These include siting solar on contaminated sites (like Superfund sites), landfills and salt-affected lands. Other options include "agrivoltaics," which co-locate agriculture and solar [energy](#), and—perhaps most promising—on the [rooftops of large commercial buildings](#), such as warehouses.

More information: Reduced ecosystem services of desert plants from ground-mounted solar energy development, *Nature Sustainability* (2020). [DOI: 10.1038/s41893-020-0574-x](https://doi.org/10.1038/s41893-020-0574-x)

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