Researcher seeks to maximize the health of native plants in restored environments

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Mia Maltz, a Ph.D. student in ecology & evolutionary biology, takes soil samples from her restoration plots at Crystal Cove State Park. Credit: Jocelyn Lee / UC Irvine

With its desolate hills and slopes overrun by non-native grasses and black mustard, the West Loma Ridge isn't much to look at as you're speeding down the 241 toll road. But closer inspection reveals an ambitious ecological effort to restore its native grasslands and shrubs.

It's also where Mia Maltz, a doctoral candidate in ecology & evolutionary biology at UC Irvine, is trying to determine how what happens underground, at the root level, can enhance this restoration.

The 530-acre West Loma Ridge project area is one of several Orange County sites managed by the Irvine Ranch Conservancy where biologists – including those with UCI's Center for Environmental Biology – are improving the long-term health of native environments.

Here, Maltz's focus is on fungi, specifically a type called mycorrhiza ("myco" meaning fungus, and "rhiza" meaning root) that invades plant root systems. She explains that these fungi have evolved to help plants by growing into their root cells and increasing the root surface area available to absorb water and nutrients. In turn, plants give the fungi the sugars they crave.

"It's a mutually beneficial arrangement that's existed for hundreds of millions of years," Maltz says.

Her West Loma Ridge fieldwork aims to identify the best types of mycorrhizal fungi for use in restoration projects. It's influenced by a study that appears in *Restoration Ecology*, in which she and Kathleen Treseder, UCI professor of ecology & evolutionary biology and Maltz's adviser, performed a large-scale analysis of published research on the effects of various types of mycorrhizal fungi on plants utilized in restoration efforts. They explored whether local types of fungi were more beneficial for native plants than the general commercial fungal blend often used by restoration biologists.

"We found that mycorrhizal fungi sourced from ecosystems with similar types of plants seem to be more beneficial for supporting plants and plant-fungal associations than the general commercial mycorrhizal fungi," Maltz says.

Treseder adds that use of the former resulted in heartier, larger (by about 35 percent) and more drought-tolerant plants, the kind that can thrive in dry, degraded sites.

"This is significant because a key measure for the success of a restoration project is the percent of native plant cover, which correlates directly with plant weight," Maltz notes. "A little bit of fungi can help plants get established and then continue to proliferate and persist in the landscape – providing long-term benefits to restored ecosystems."

Matt Major, a restoration project manager for the Irvine Ranch Conservancy, says that at a degraded site such as West Loma Ridge, integrating mycorrhizal fungi taken from similar ecosystems shows promise, but he adds that the topic is debated among restoration ecologists and practitioners. "This is an evolving part of habitat restoration science, and Mia is on the leading edge," he says.

Maltz says the potential impact of the analysis finding should invite further exploration. That's why she's on West Loma Ridge inoculating the reintroduced chia, tarweed, black sage, wishbone bush and California sagebrush with native mycorrhizal fungi.

Major and Megan Lulow, a senior field ecologist at the Irvine Ranch Conservancy, helped initiate the project, and Amanda Iaali , a UCI Earth system science major, has performed a lot of the associated field and lab work.

"Land managers, such as restoration ecologists, can incorporate this [study] information into their best management strategies," Maltz says. "An initial investment in these mycorrhizal fungi can provide benefits for up to several years in the field."

Along with her work at West Loma Ridge, Maltz manages a second

project at Crystal Cove State Park, where she sees how specific restoration methods influence fungal communities. In addition, she looks into how fungi – which naturally break down organic compounds – could be used in bioremediation efforts, such as cleaning up pollution spills.

It's all part of a robust research program overseen by Treseder, who's nationally recognized in the field of ecosystem ecology. She aims to build an understanding of the role fungi can play in bolstering ecosystems affected by global change.

"Local fungi are a cheap, sustainable way to restore endangered ecosystems," Treseder says. "Mia is leading UCI's campaign to harness the potential of these hidden players, and I'm so excited about her work."

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