Hidden, local climate impacts of drought-friendly vegetation

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To address the recent drought in California, policymakers have created incentives for homeowners to replace existing lawns with drought tolerant vegetation. However, new research from George Ban-Weiss, an assistant professor in the Astani Department of Civil and Environmental Engineering at the USC Viterbi School of Engineering, has found that these efforts might have some hidden consequences on local climate.

Ban-Weiss and post-doctoral scholar Pouya Vahmani used a model of the Los Angeles basin to investigate the climate impacts of widespread adoption of drought tolerant vegetation. Their findings, put forth in the article "Climatic Consequences of Adopting Drought Tolerant Vegetation over Los Angeles as a Response to the California Drought" in the journal *Geophysical Research Letters*, indicate that in fact, if all lawns were replaced with drought tolerant vegetation, that Angelenos could expect an average daytime warming of 1.3 degrees Fahrenheit due largely to decreased evaporative cooling, as irrigation is stopped. For the hottest regions of the Los Angeles basin, such as the inland empire and San Fernando valley, the researchers predict a daytime increase in temperature of 3.4 degrees Fahrenheit. Such temperature increases could exacerbate heatwaves, increase photochemical smog production, and increase air conditioning energy use.

However, one effect of widespread planting of drought tolerant vegetation— which the researchers believe could counteract these higher daytime temperatures— is an even greater decrease in nighttime temperatures. The researchers forecast that the average nighttime

temperature decrease could be as much as 6 degrees Fahrenheit. Lower nighttime temperatures are important for preventing adverse human health consequences like heat stroke or even death during heat waves, says Ban-Weiss. People, especially vulnerable populations like the elderly, need temperatures to reduce sufficiently at night to allow their bodies to recover from high daytime temperatures and prevent heat-related illness.

"Our interest in this topic was initially piqued because we hypothesized that the reductions in irrigation associated with adopting drought-tolerant vegetation would cause temperature increases," says Ban-Weiss. "We were surprised to find the reduced temperature signal at nighttime. But this actually has a simple physical explanation, since reducing soil moisture decreases upward heat fluxes from the sub-surface to the surface at night, subsequently reducing surface temperatures."

"Our research highlights how water and climate are intimately coupled," says Ban-Weiss. "You can't change one without effecting the other."

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