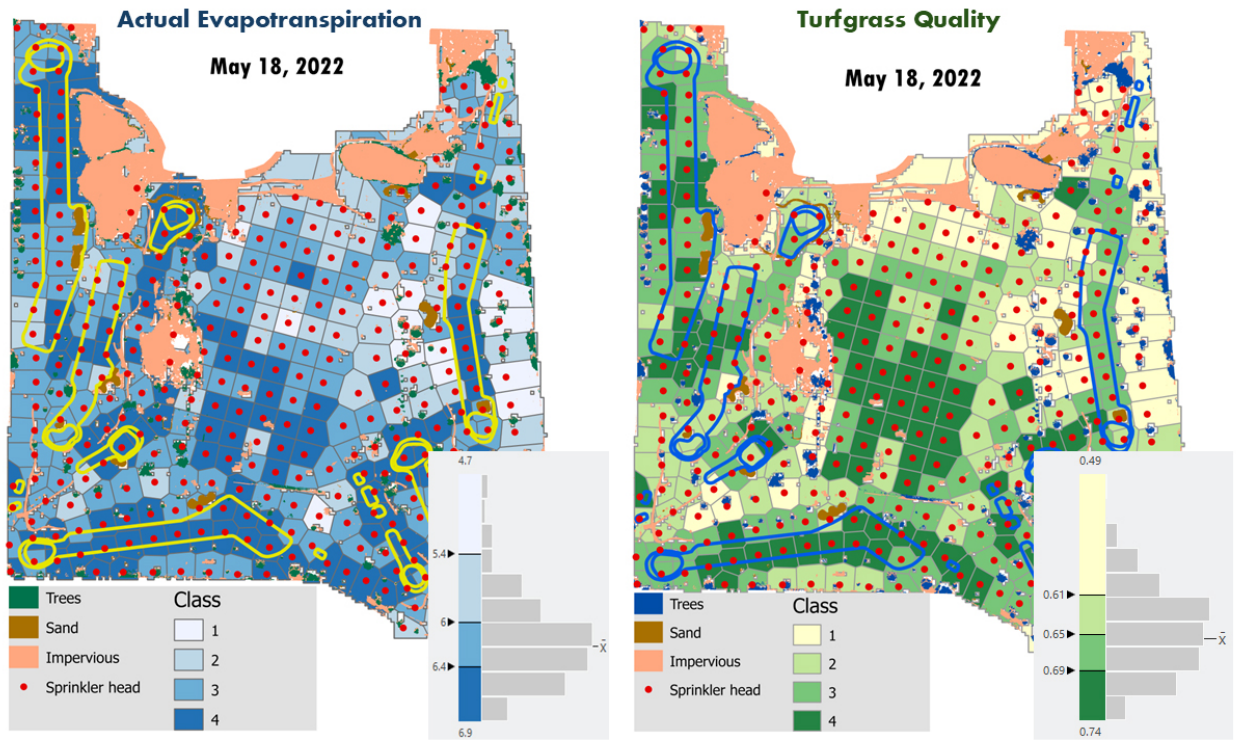
Science Societies

Site-specific irrigation and turfgrass quality using UAS imagery

April 15, 2025



Site-specific management zones of actual evapotranspiration and turfgrass quality at Eagle Lake Golf Course in Roy, UT and histograms of the four natural break classes (1-4) of estimated TQ. Blue lines identify the fairway, greens, and tee boundaries and red dots identify sprinkler heads. Image by Karem Meza.

Water scarcity and climate change are pressing concerns for golf course management, requiring site-specific irrigation strategies to maintain turfgrass quality (TQ) while conserving water. Traditional irrigation methods do not account for the spatial variability in reliable estimates of actual evapotranspiration (ET_a) and TQ. Therefore, an approach that integrates accurate spatial estimates of ET_a and TQ and their relationship is essential for enhancing the best precise irrigation practices, particularly in semi-arid regions.

In a new study published in *Crop Science*, researchers addressed this challenge by integrating aerial mapping with advanced modeling techniques to estimate ET_a and TQ at a golf course in Utah. They used multispectral and thermal imagery from unmanned aircraft systems (UAS) in conjunction with the Two-Source Energy Balance model and machine-learning models to estimate high-resolution spatial ET_a and TQ, respectively. They validated ET_a estimates against gold-standard eddy covariance data commonly used in scientific research and compared random forest TQ model estimates to ground-based and visual TQ assessments.



Left: An eddy covariance flux tower. Right: Researchers planning a drone flight at Eagle Lake Golf Course in Roy, UT. Photos by Karem Meza.

The findings demonstrate that incorporating spatial TQ and ET_a data into site-specific irrigation zones enables more informed water management decisions. This approach

may reduce water use, lower costs, and improve irrigation efficiency in golf courses in semi-arid regions. The study underscores the value of UAS-based remote sensing for optimizing turfgrass management in water-limited environments.

Dig deeper

Meza, K., Torres-Rua, A. F., Hipps, L., Kopp, K., Straw, C. M., Kustas, W. P., Christiansen, L., Coopmans, C., & Gowing, I. (2025). Relating spatial turfgrass quality to actual evapotranspiration for precision golf course irrigation. *Crop Science*, *65*, e21446. https://doi.org/10.1002/csc2.21446

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