

Identifying the Influence of Vegetation Type on Multiple Green Roof Functions with a Field Experiment in Zurich

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Abstract : Due to their potential to provide numerous ecosystem services, green roofs have been proposed as a solution to mitigate a growing list of environmental challenges, like urban flooding and urban heat island effect. Because of their cooling effect, green roofs placed below rooftop photovoltaic (PV) panels also have the potential to increase PV panel efficiency. Sedums, a type of succulent plant, are commonly used on green roofs because they are drought and heat tolerant. However, other plant species, such as grasses or plants with reflective properties, have been shown to reduce more runoff and cool the rooftop more than succulent species due to high evapotranspiration (ET) and reflectivity, respectively. The goal of this study is to evaluate whether vegetation with high ET or reflectivity can influence multiple co-benefits of the green roof. Four small scale green roofs in Zurich are used as an experiment to evaluate differences in (1) the timing and amount of runoff discharged from the roof, (2) the air temperature above the green roof, and (3) the temperature and efficiency of solar panels placed above the green roof. One grass species, *Silene vulgaris*, and one silvery species, *Stachys byzantia*, are compared to a baseline of *Sedum album* and black roof. Initial results from August to November 2019 show that the grass species has retained more cumulative runoff and led to a lower canopy temperature than the other species. Although the results are not yet statistically significant, they may suggest that plants with higher ET will have a greater effect on canopy temperature than plants with high reflectivity. Future work will confirm this hypothesis and evaluate whether it holds true for solar panel temperature and efficiency.

Keywords : co-benefit estimation, green cities, green roofs, solar panels

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