

Hypothesis

Plants on the ground grow better than on the roof because:

1. The roof has higher **temperatures** throughout the growing season
2. The roof is **windier** than the ground
3. The roof has higher **solar radiation** compared to the ground

These give plants on green roofs a disadvantage.

Methods

We used a Davis Vantage Pro 2 weather station at both the roof top garden and ground level garden which collected weather data every fifteen minutes through Wi-Fi receivers for the 2021 growing season.

Temperature:

The average, high, low, and standard deviation were calculated, graphed and compared the daily temperatures throughout the entire growing season. The standard deviation was then singly analyzed with a paired t-test at the beginning, middle and end of the growing season along with three big spikes in the graph and two days where the graph intersect.

Wind:

The average, high and standard deviation per day of both the average wind speed and high wind speed were analyzed and graphed. The average amount of days with windspeeds over 2mph were recorded.

Solar Radiation:

The daily average solar radiation, and high radiation were analyzed and graphed.

We Want Green Roofs!
But why aren't they working?



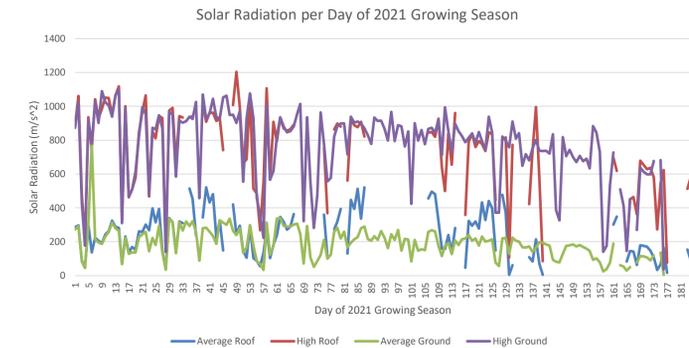
Introduction

Green roofs have the potential to reduce carbon emissions by absorbing excess atmospheric carbon dioxide and nitrogen as well as increase plant and microbial diversity, (Van der Heijden, 2008).

Previous studies always assumed the roof is a more extreme environment.

Our aim is to research the different conditions of the ground and roof to find how to grow better on green roofs.

Solar Radiation Results



Conclusions

Temperature:

Graphing the temperatures shows very similar data for both the roof and the ground. However, the change in temperature throughout the day (standard deviation), when graphed looked very different. The only differences in temperature that were statistically significant were during extreme weather spikes which was infrequent.

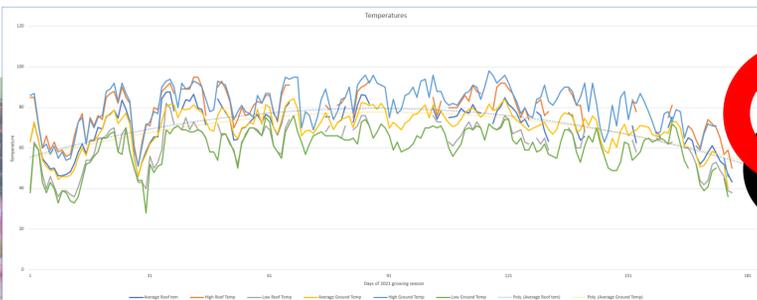
Wind Speed:

Analyzing the graph of wind speed showed very few differences. The number of days over 2mph on the roof was statically larger than the number of days on the ground. This shows a disadvantage for plants growing on the roof (2mph taken from Kitaya et al., 2003).

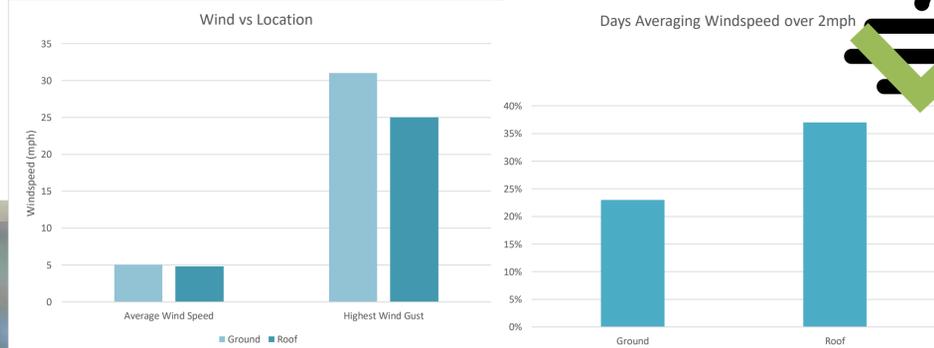
Solar Radiation:

Analyzing the graph of solar radiation and performing chi square analysis showed inconclusive results.

Temperature Results



Wind Results



Discussion

Analyzing more complete data

Looking at differences between ground and roof such as:

- Animal/fungal interactions
- Humidity
- Different types of plants
- Plant root depth and soil depth differences

References

Kitaya, Y., et al. "Effects of Air Velocity on Photosynthesis of Plant Canopies under Elevated CO₂ Levels in a Plant Culture System." *Advances in Space Research*, vol. 34, no. 7, 2004, pp. 1466–1469., <https://doi.org/10.1016/j.asr.2003.08.031>.

Van der Heijden, Marcel G., et al. "The Unseen Majority: Soil Microbes as Drivers of Plant Diversity and Productivity in Terrestrial Ecosystems." *Ecology Letters*, vol. 11, no. 3, 2008, pp. 296–310., <https://doi.org/10.1111/j.1461-0248.2007.01139.x>.