

# Temperature Variation in the Rock Creek Neighborhood

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**Abstract:** Temperature variation in micro-climates has long been a topic of discussion. Despite its small scope, larger conclusions can be drawn from its prevention and effects in the neighborhood scale. Using handheld temperature probes, readings were taken at various points in the Rock Creek area and spatially located on satellite images of the area. In order to eliminate error, our recording methods were standardized and taken on a clear morning without solar radiation to ensure consistent and repeatable temperature readings. Overall, there was a 2 to 3°C difference between areas of high suburban growth and our standard of a grassy field. However, due to the lack of efficient recording devices and a cumbersome method of recording data, that is all we can conclude at this time.

## 1 Introduction:

Temperature variation due to environment has long been studied in the scientific field, with its effects often unseen by the average citizen. Disguised with words like “climate control” and “global warming”, many have assumed that it does not affect them, at least on a local level. Not surprisingly to scientists, however, this relationship between urban growth and receding vegetation such as trees and plants does have a distinct and noticeable effect on the environment, even on a neighborhood-to-neighborhood basis.

Many large-scale projects documenting the Urban Heat Island (UHI) effect have already been performed. In London, a difference of up to 7°K between the city and the rural surroundings has been recorded (Watkins et. al., 2002) using 68 different temperature recording stations in a radial grid. A study done by students at Portland State (George and Becker, 2003) found many different variables affecting perceived UHI effects and documents some of the methods used to limit these sources of error.

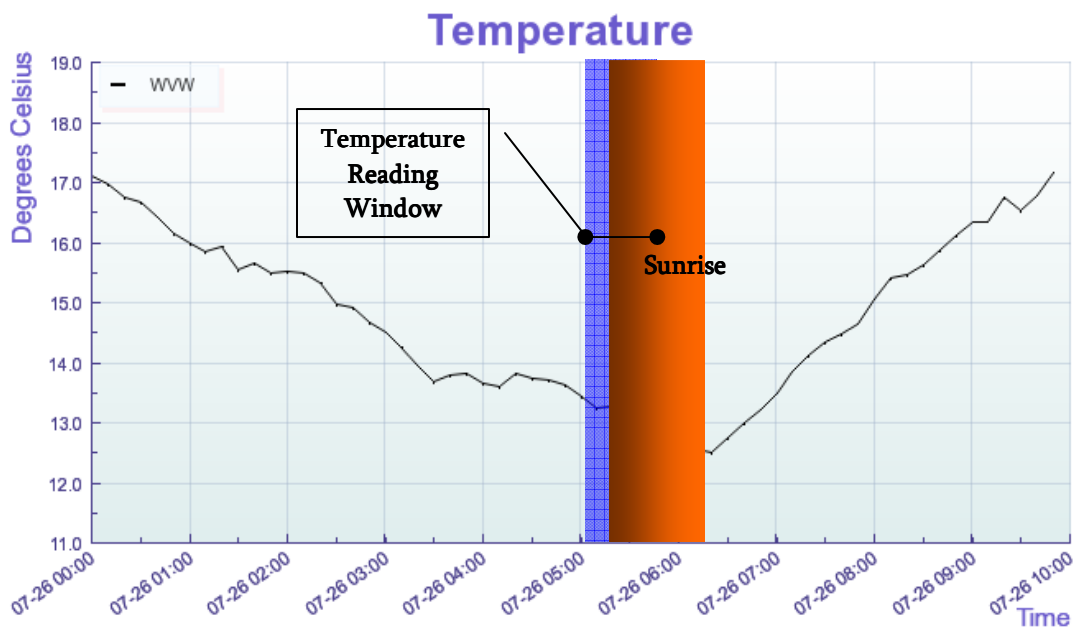
In this project, our group collected temperature readings of a moderately-sized neighborhood at the edge of the Portland metropolitan area. The Rock Creek area, besides being close in proximity to our home neighborhood, had a large swath of vegetation bordered by neighborhoods. Surprisingly, temperature variations of up to 2 or 3°C proved micro-climate information for even a small neighborhood.

## 2 Methods:

## 2.1. Accuracy

For the experiment, temperatures were measured around various locations in Rock Creek using Hanna Checktemp 1 thermometers ( $\pm 0.3$  °C) in three averaged readings 10 seconds apart. In order to eliminate as many temperature inaccuracies as possible, we standardized our recording methods.

- Surface Radiation (probe held at waist-height)
- Cloud Artifact (clear sky)
- Solar Radiation (before sunrise)
- Surface Albedo (measured over sidewalk with .5 albedo)
- Overall Temperature Change (measured during minima of temperature curve)



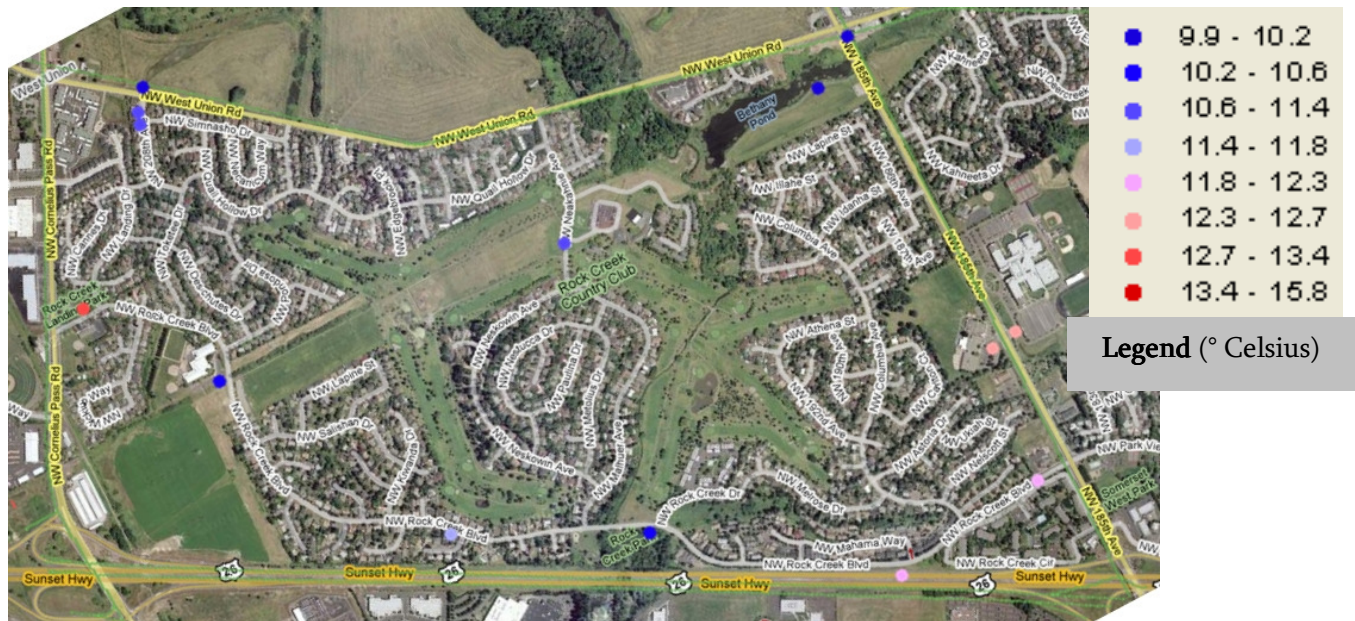
**Figure 1.** Chart of Westview H.S. temperature chart for the morning of the readings. Temperature Reading Window is between 5:00 AM and sunrise, 5:47 AM.

Other variables such as wind speed, population density, land use, and proximity to other objects were noted and accounted for in the final calculations.

## 2.2 Sensor Locations

We took great care in placing our sensors and strove to find distinct areas of separation between areas of habitation and nature. Between the 14 different data points available during our testing period, about half of the readings were in

residential areas while the other half were taken over sidewalks next to places of high vegetation. These locations are shown Figure 2.



**Figure 2.** Map of temperature readings in Rock Creek

### 3 Results:

Based on our experiment, we found that there were, in fact, significant temperature variations based on land usage. As shown in Figure 1, the difference between, say, a parking lot nestled among plots of neighborhoods reached a 2°C difference with a reading on the edge of a rural farm. The readings were uncorrupted by wind and cloud cover, and so are highly valuable for future research. However, because of the lack of readings available, no further conclusions can be made.

### 4 Discussion:

Only in areas with high density of concrete and asphalt did the temperature rise significantly (parking lots and high residential areas). However, there were limitations to the experiment because of the lack of substantial data. Because we were using handheld temperature probes, it took at least two minutes to arrive at our location, equalize the temperature, and then take the readings. A more optimized system would consist of either a car-mounted system that could take many readings and travel quickly or a large number of temperature-enabled data loggers mounted at

different points within the environment. With this information, a more detailed map of the temperature variation effect could be produced. Also, with data loggers, a graphical representation of temperature over time would be possible, as is shown for the Houston, Texas area on the FUSE website (<http://www.fuse.pdx.edu/news.htm>).

## **References:**

- 1 George, L. A., and Becker, W.G., Investigating the Urban Heat Island Effect With A Collaborative Inquiry Project, *J. Geo. Sci. Edu.*, 51, 237-43, 2003.
- 2 Watkins, R., Palmer, J., Kolokotroni, M., Littlefair, P., The London Heat Island: results from summertime monitoring, *Build. Serv. Eng. Res. Technol.*, 23, 97-106, 2002.