Islands in the Sun: UCF Urban Heat Island

Maria Crosby, Alexandra Schilling, Christen Callahan, Peter Denis, Keith Berry

Study Objective

To determine if the University of Central Florida main campus is warmer due to urban heat island affects.
Focus was placed on the horizontal spread of thermal effects from the urban center to surrounding natural lands.

Background Information

When differences in temperatures from urban to natural lands occur, it said to be an urban heat island (UHI) (2014). The temperature difference for an UHI is considered to be 1.8ºF to 5.4ºF(Akbari et al).

Determining an UHI is mostly done utilizing thermal sensing and the Normalized Difference Vegetation Index.

UHI's results due to differential surface cooling which governed rates of radiative exchange and of heat storage(Mills, 2013).

The cooling rate differences will create a temperature contrast between urban and natural areas, with the most significant change in temperature occurring along a boundary of where UHI effects no longer influence natural land cooling rates.

Previous studies have focused on determining if an area is an UHI, based on vertical extent.

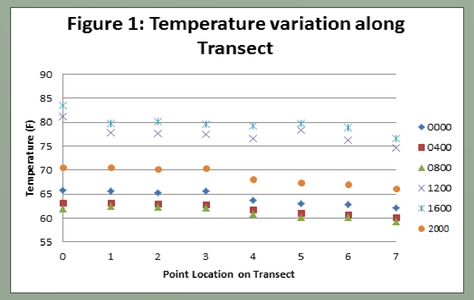
Methods

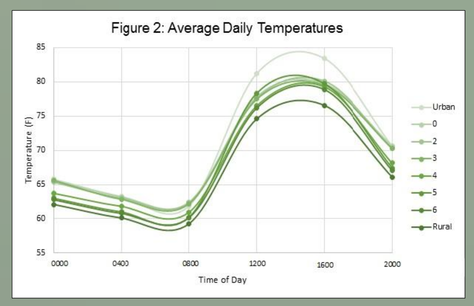
- Four 400 meter transects were placed around the UCF campus; all extended 200 meters into natural lands and 200 meters into urban lands.
- Each transects was assigned six Hobo Pro V2 data loggers which recorded the temperature every four hours for 28 days.
- Loggers were spaced a distance of 80 meters apart and secured at six feet in height.
- An urban control and natural lands control were also utilized. The urban control was placed in the center of campus, and the natural lands control was placed in the Arboretum.
- After the temperatures were collected, three analyses were preformed using regressions and ANOVA tests in order to determine the outcome.

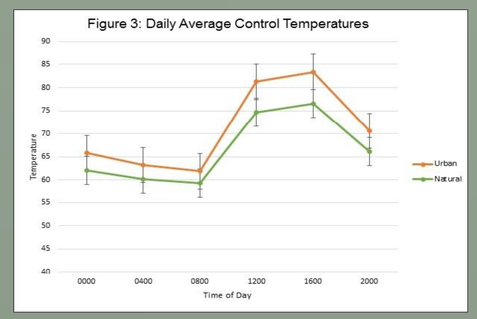
Hypotheses

I. The average daily temperatures will decrease with distance from urbanized land.
II. It is expected that urban areas will retain heat longer than natural areas, because natural areas have greater ability to process heat.
III. The UCF main campus is an urban heat island.

Results







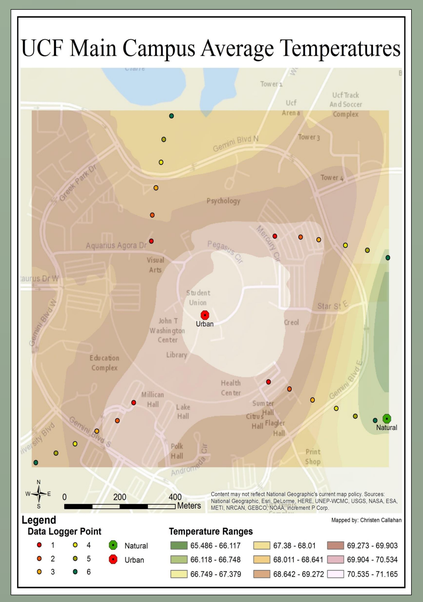


Figure 4:Thermal map

Discussion

Figure 1 shows that most data loggers located immediately on either side of the road dividing urban and natural areas are in different thermal zones. This suggests that the influence of urban heat islands can extend a substantial (over 100m) distance into natural areas.

The influence begins decreasing almost immediately at the end of the asphalt or pavement. The most pronounced difference in the cooling periods of each day, was between the hours of about 1400 to 0800 (as seen in Figure 2).

Figure 3 shows that the urban lands remain hotter longer then the natural lands. Transects of data loggers that span the urban-to-natural transition on campus revealed a temperature gradient consistent with an urban heat island.

Figure 4 shows that the average monthly temperatures at UCF remain warmer than surrounding natural lands.

References

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