Note: Guidelines were changed from 5000 characters to 2-pages

Does Size Matter?

Introduction

Green spaces, defined as patches in urban environments, which includes parks, causeways, residential gardens, and forests, provide many benefits in cities as they support human well-being and provide habitats to many species. A good example is wetlands which protect people from storms by slowing down or even stopping the winds and waves (Taylor and Hochuli 2017). Other green spaces such as parks give people room to exercise and enjoy nature (Taylor and Hochuli 2017; Maimaitiyiming et al. 2014; Lai et al. 2019). As well as improving people's mental health, spending time in nature can help recover from mental fatigue and present time to self-reflect (Dallimer et al. 2012; Cox et al. 2017; Lai et al. 2019). Other benefits to green spaces is their association to improved memory, and decreasing inattentiveness (Dadvand et al. 2015), decreasing air pollution (Selmi et al. 2016), and increasing tourism. Previous research has also shown that increasing vegetation cover in cities can alleviate the urban heat island effect (Melaas et al. 2016). The urban heat island effect is a well-documented phenomenon in which city centers are significantly warmer than residential areas, as they are denser, have a greater proportion of impervious surfaces with low albedo, and lower vegetation coverage (Melaas et al. 2016; Yin et al. 2023). Large cities such as San Diego are in danger of this phenomenon. Green spaces can help regulate temperatures in cities by providing vegetation, water, and shade that can decrease these higher temperature (Melaas et al. 2016). However, fewer studies have specifically looked at the effect of park size, density, and vegetation composition in modulating their cooling effect. This is important because (1) as cities are densifying and expanding, we need a variety of green spaces (and sizes of green spaces) to cater to various human needs and increasingly limited space to establish new green spaces, and (2) because there is an unequal distribution of green spaces in cities, and we know that increasing temperatures will disproportionally impact low-income and minoritized communities. As such, improving our understanding of the role that green spaces – and their characteristics – play can inform city planning for more just and healthy cities.

Goals

To explore the idea cities need more green spaces I will use remote sensing data and use ArcGIS to compare the surface temperatures of different areas in San Diego and how they vary with the sizes of different green spaces. I hypothesize that areas with smaller but more frequent green spaces will have a greater cooling effect compared to areas with larger but fewer green spaces. Using census data I plan on seeing if there is an unequal distribution of green spaces in low-income and minoritized communities. I hypothesize that there will be less green spaces in areas of lower income compared to areas with higher incomes. To test the accuracy of the remote sensing data I am using to identify green spaces and their vegetation composition, I will conduct field work in some of the random points we will generate. This will tell us if our data is accurate and allow us to compare the amount of native plants in green spaces compared to invasive plants. As we hypothesize that native plants are able to decrease surface temperatures more compared to invasive plants.

Methods

I will use remote sensing data of San Diego city and a program we created for ArcGIS to identify buildings, concrete surfaces, green spaces from the remote sensing data. On top of that data layer we are going to generate 50 to 100 random points and create a 500 meter (m) buffer surrounding that point. Within those points we are going to calculate (a) green space area and (b) surface temperature that will allow us to determine if the size and frequency of green spaces has an impact on surface temperature (see Table 1). As well as (c) vegetation type such as native or non-native so we are able to compare if type of vegetation is going to have an impact on surface temperature. Lastly (d) census data (Table 1) so that I can compare income for the different buffers and investigate if there is a discrepancy of green space distribution based on income. We will then use R-studio to run statistical analysis such as linear regression to measure the impact of green space cover on surface temperature.

Within our randomly generated points we are going to select 5m areas within the buffers to conduct field work. The field work will be done to determine the accuracy of the remote sensing and the program we created. So, we are going to make sure the building that ArcGIS identified as a building or a greenspace is actually a building or a greenspace. During the field work we are also going to gather data on the plants we find in the green spaces to determine if the majority of the plants are native plants or non-native plants to determine if vegetation type has an
impact on surface temperature.

Data Analysis

Table 1: Datasets that I will use for this study

Data I need	Source	Why
Green spaces -need to know the sizes	Classification of aerial images	Size of green space
Surface Temperature	Landsat data	Size/ social justice
Average income	Census	Social justice
Races	Census	Social justice
Plants	Classification of aerial images and field work	Testing accuracy of remote sensing, testing differences between native and invasive

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