Exploring the Cooling Effect of Urban Forests at Parking Lots in Summer

Abstract

The newly released Fifth National Climate Assessment (NCA5) concludes that climate change impacts (e.g., heatwaves) are of serious concern in disadvantaged communities, especially in cities. As a Nature-based Solution (NbS), urban forests have great potential to cool cities and help with climate change adaptation. However, little is known about the cooling effects of urban forests at parking lots. To fill the research gap, we conducted this study to explore the cooling effect of urban trees at parking lots in Nashville, TN. We measured 2m-air temperature (AT) and relative humidity (RH) every two hours using HOBO MX2301A data loggers in August, 2024. Specifically, we ask:1) Whether the parking lots with trees are cooler than the parking lots without trees, if so, how much cooler? 2) Within the parking lots with trees, whether the air temperature increase with the increasing distance from the trees, if so, how much it will increase? And 3) How does the relative humidity change with the distances from trees? We found that: 1) For the average daily AT, the parking lots with trees is about 0.09°C cooler than the parking lots without trees; within the parking lots with trees, the area near trees (*the average distance between sensors and tree trunks is 7.7 meters*) is about 0.15°C cooler than the area under trees, and about 0.06°C cooler than the open space; and 2) For the average daily RH, the parking lots with trees is about 0.24% higher than the parking lots without trees; within the parking lots with trees, the areas near trees is about 0.58% higher than the areas under trees, and about 0.3% higher than the open space. However, there were no significant statistic differences in AT and RH between parking lots with trees and without trees. The findings can help guide diverse stakeholders for their future urban greening efforts to achieve maximum cooling effects with limited spaces in cities.