

ABSTRACT

Burning wood emits airborne PM_{2.5}, which is unhealthy for humans. The researcher wanted to investigate the hyperlocal air quality around fire pits, where people tend to gather. The hypothesis was “If wood is burning in a fire pit, then it will increase airborne PM_{2.5} concentration on a hyperlocal level.” PM_{2.5} concentrations were measured upwind and downwind, at distances that encompass the area of human activity around a fire pit. The independent variables were: Wood burning nearby in a fire pit, the distances downwind from the fire pit (2-18m), and distances upwind from the fire pit (2-18m). The dependent variable was the airborne PM_{2.5} concentration (in micrograms per cubic meter). The control / baseline was no fire burning nearby. Other variables were held constant as much as possible. The researcher borrowed a professional grade Aeroqual PM (particulate matter) concentration monitor from Clean Air Engineering, which also advised on accurate measuring. The PM monitor took measurements at a height where people breathe. The data suggests that the hypothesis is supported (especially for downwind data). On average, PM_{2.5} increased from a baseline of “Good” on the EPA’s AQI (Air Quality Index) to “Unhealthy” 2-10m downwind of the fire pit during the fire. This is statistically significant; there was a 95% confidence interval of 115.7 - 215.58 micrograms per cubic meter, which is in the “Unhealthy” to “Very Unhealthy” AQI ranges. For 12-18m downwind of the fire pit, average PM_{2.5} concentrations increased from a baseline of “Good” on the AQI to “Moderate” and the upper end of “Good” during the fire. This is also statistically significant; there was a 95% confidence interval of 5.95 - 24.65 micrograms per cubic meter, which is in the “Good” to “Moderate” AQI ranges. Upwind, average readings during the fire remained near the baseline in the “Good” range, except for a few outliers, most notably the average concentration at 2m from the fire, which was “Moderate” on the AQI.