

Thesis Defense for Kendra Busse

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“Effect of Residential Landscape Design on Undercanopy Microclimate”

Understanding environmental factors that influence microclimate at the neighborhood scale is necessary to improve performance of mesoscale urban meteorological models and strategies of urban heat island mitigation. The purpose of this study was to examine the influence of landscape design on microclimates at the neighborhood scale. Four clusters of six residential homes surrounding a public common area were landscaped in 2004 with either one of four archetypical landscape design types (mesic, oasis, xeric, and desert). The mesic, oasis, and xeric treatment areas were normally irrigated with systems with scheduled watering frequencies and durations based on daily evapotranspiration potential demand. The desert treatment was not irrigated. A mobile micrometeorological station was constructed to measure temperatures at heights of 0 m, 0.25 m, 0.5 m, 1.0 m, 2.0 m, and 5.0 m, percent relative humidity, and saturation vapor pressure at 2.0 m. Morning, afternoon, and evening micrometeorological data were recorded during pre-monsoon, monsoon and winter conditions of 2007-08. Overall, temperatures in the mesic and oasis treatment areas were cooler than in the xeric and desert treatment areas to approximately 2 m above the surface during pre-monsoon conditions and 1 m above the surface during monsoon conditions. Percent relative humidity and saturation vapor pressure were generally not affected by design treatment. These findings clearly demonstrate the important role of landscape surface cover type to mitigate urban heating by modifying the surface energy balance, especially during the years after landscape installation but before tree canopies are established to provide maximum shade potential.