

Annual Nevada EPSCoR meeting abstract.

"Untangling the Development of An Extreme Urban Heat Island Signal for the Arid, Complex Terrain City of Reno, Nevada"

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The urban heat island (UHI) is a well-studied phenomenon in many large cities and its magnitude can generally be estimated by log of population (Oke, 1973). Reno, Nevada presents an interesting case in that this method underpredicts the observed (UHI) by nearly an order of magnitude. The presence of a severe summertime (JJA) Reno UHI has been speculated by Billings (2006) and Menne et al. (2009). A further complicating factor is the lack of nearby rural stations to calculate the classic UHI indicator $\Delta T(u-r)$. Here we present a detailed analysis of driving forces in the Reno UHI using hyperspectral Landsat TM data, long-term data (1950-present) from 20 surface stations, 27 years of NWS upper air data, population data and parcel-scale GIS maps of landuse type. The local temperature change is isolated by removing the JJA regional climate signal (derived from the Western Regional Climate Center) from the Reno timeseries. We develop a standardized anomaly procedure for identifying UHI events in Reno and compare these events to nocturnal boundary layer heights to understand how the UHI causes perturbations to the boundary layer. Spectral analysis is performed on annual and seasonal scales to understand the role of larger scale phenomena in forcing UHI signals at these timescales. Finally, we attempt to develop historical relationships between temperature perturbations and landuse changes as well as landuse trends based on population changes. We then apply future population estimates to these relationships to derive future UHI perturbations which are applied to statistically downscaled IPCC climate scenarios for Reno. Climatologies of extremes will be presented under various scenarios of future climate and growth projections. These future urban climate scenarios can be used by policymakers and resource managers at local and state levels to adapt policies and strategies designed to mitigate negative effects on public health and infrastructure as well as realize potential vulnerabilities in urban infrastructure.