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Surface Temperature and Diurnal Analyses of the Urban Heat/Cool Island in the Las Vegas Metropolitan Area

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This study aims to develop climate indicators for the City of Las Vegas to help assess the vulnerability and resilience of urban water systems under different climate and land cover/land use (LCLU) change scenarios. Our goal is to provide guidance for climate change planning in areas with health and air quality risk, urban ecosystem services, recreation and tourism, as well as utility management. A network analysis of surface temperature is the prelude to addressing the uncertainty and impacts of urban climate change on irrigation water demand. Increasing temperatures have been known to increase evaporation rates which can threaten sources for irrigation and other water needs. Our preliminary work with the two main airports in Las Vegas showed an average minimum temperature warming of ~1.5˚C and an average maximum temperature cooling of ~0.2˚C compared with Parameter-elevation on Independent Slopes Model (PRISM) data. Along with diurnal variations from multiple networks, these results suggest that Las Vegas is experiencing an urban heat island (UHI) during the night and an urban cool island (UCI) during the day. For further analysis, we deployed a surface station network (DRI-UHI) consisting of 20 temperature/relative humidity sensors to better understand the impact of the UHI. Locations of DRI-UHI observations were chosen specifically to characterize the overall urban climate for different LCLU characteristics (e.g. residential areas, golf courses, etc.). These observations will lead to better understanding the UHI diurnal and day-to-day variability and will serve as a benchmark for model evaluation purposes. Spatial distributions of DRI-UHI and other networks containing the time of peak maximum and minimum temperatures from August-November 2012 are evaluated to identify spatial and temporal responses to different urban and rural climate zones. Future efforts will provide urban canopy model (UCM) simulations to quantify estimates of environmental parameters, LCLU changes, and urban growth scenarios (1.5-2 times urban growth).