

Streetlight Illumination and Crime in Greenville Neighborhoods

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Abstract

Various studies have declared the use of streetlights to be an ineffective method of combating criminal activity. However, we found most of these studies to have a broad focus; we, on the other hand, were interested in the less-studied minutiae of how bright and operational streetlights influenced the location of criminal activity. The intent of this project is to evaluate the streetlights in two neighborhoods in the Greenville area, Poe Mill and New Washington Heights, by comparing their illumination radii and determining their correlation with recent crime statistics. Between both sites, we catalogued over 100 streetlights; many of these were non-operational. It should be noted that the intent of this project is not to determine the ability of neighborhood lighting to remove crime from a neighborhood altogether, but to instead search for a noticeable relationship between illumination and reported crimes.

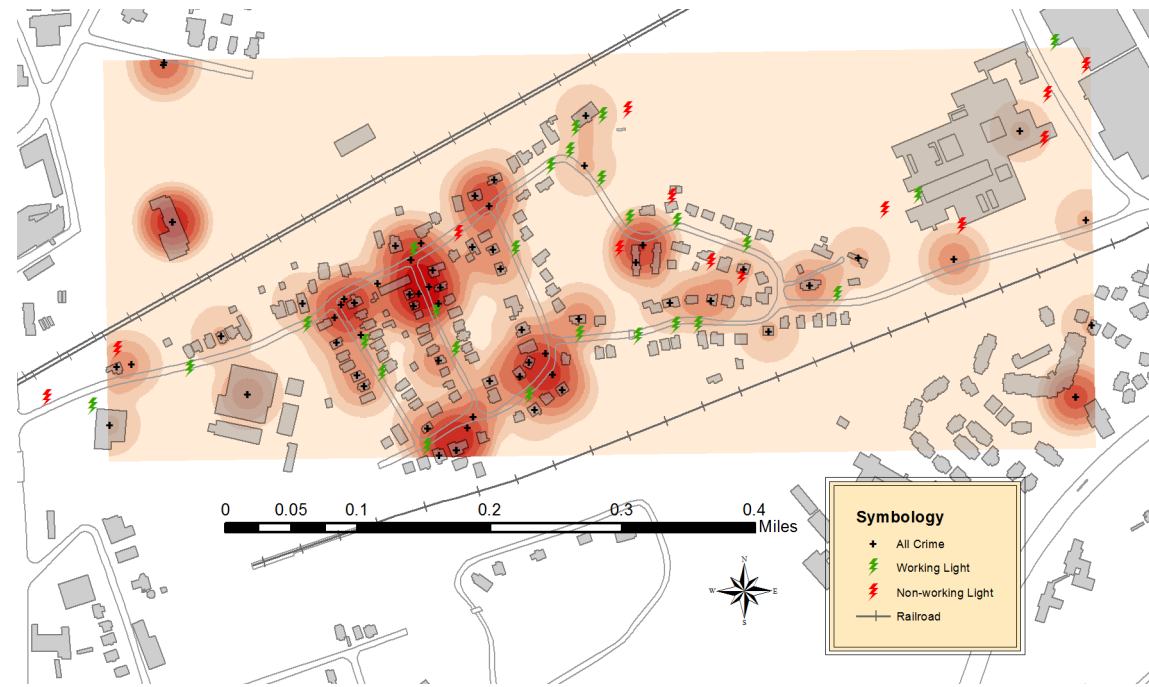
Lit Review

"When, where, if, and but': qualifying GIS and the effect of streetlighting on crime and fear", a journal written by Pain R., MacFarlane R., Turner K., and Gill S. explains the relationship between street lights in neighborhoods, GIS mapping, the opinions of residents, and the monitoring of crime in those neighborhoods in England and Wales. The authors assert that there is no statistical evidence to back the popular belief that adding street lights strategically throughout neighborhoods will better the community. The point they make is that the residents of the community have varying opinions and that the current evidence of adding street lights to reduce crime is very marginal, making the process of adding the street lights controversial in some cases, however, there is great potential in monitoring these statistics by using GIS mapping. In addition, authors Stephen Atkins, Sohail Husain and Angele Storey in the journal, "The Influence of Street Lighting on Crime and Fear of Crime", also assert that there is no change in crime rate with the addition of brighter street lights, but the addition of those lights however, was welcomed by each neighborhood because it increased pride throughout the community and encouraged the residents to report a crime if they witnessed it. The authors monitored 3,500 street lights over the course of a year and analyzed the crimes reported by police in those areas compared to other years. Their purpose was to indicate the reassurance that adding street lights in a neighborhood brings, even though the actual change in crime rate did not differ. New Washington Heights and Poe Mill are being improved by the Poinsett District Revitalization Coalition, and their goal is to better the community by trying to create a safer environment and a more prideful community. In terms of our studies, we did not necessarily see a correlation between lighting in the neighborhood and the reduction of crime, but from speaking with the members of the Poinsett District community, they seemed to believe that adding and improving the street lights in the community would improve the current safety.

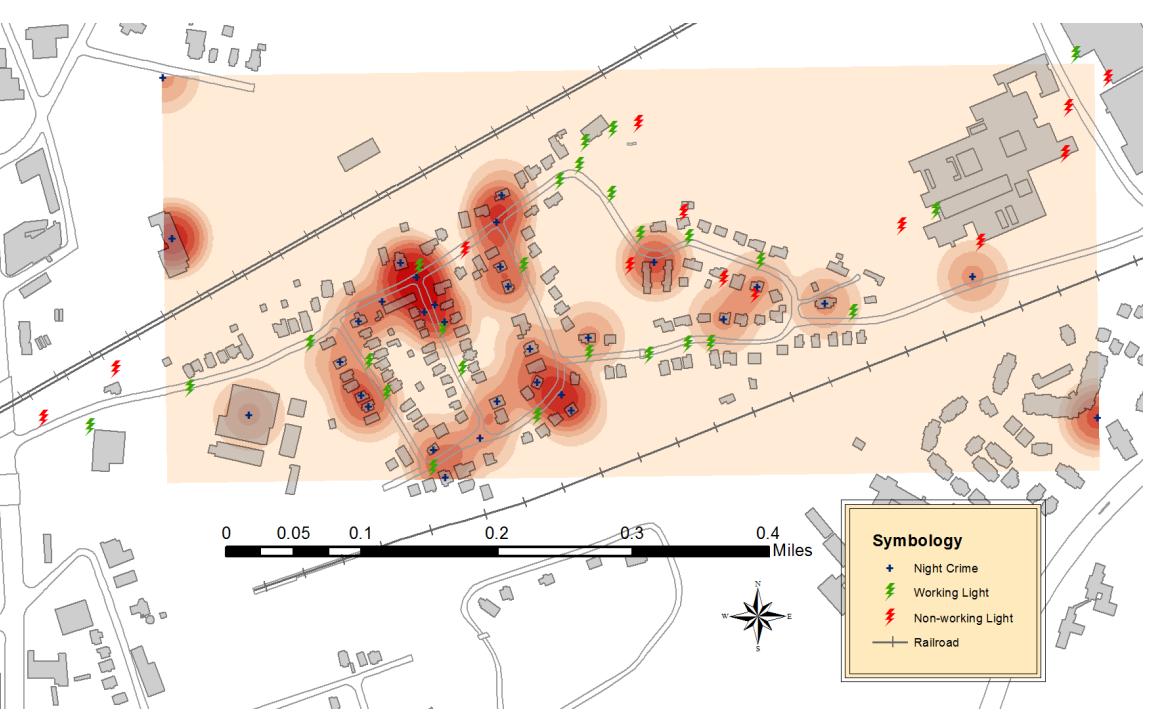
Methodology

In cataloguing each streetlight, we took note of three characteristics: the location of the streetlight (later confirmed and pinpointed via Google Earth), whether or not it is operational, and what type it is. We found all of our streetlights to be of two uniform models: older incandescent lights and newer LED lights. Both models were of equal height, approximately 8.25 meters above the ground. We then proceeded to measure the light level below each streetlight model using an Extech ProbeMeter. Using this data and the output in lumens of each streetlight model, we were able to model illumination beneath any streetlight using the equation $E_h = (\Phi \times N \times \cos 3\Phi) / H^2$, where E_h is ground illumination in lux, Φ is the intensity of the light in a given direction relative to Φ measured in $cd/1000$, N is the luminous flux of the streetlight measured in lumens, and Φ is the angle in degrees from the point of measurement to the light source relative to the ground. After obtaining our crime data courtesy of the Greenville County Police, we then separated out our crimes of interest, which each occurred at night and within the past 5 years. We then overlaid our crimes onto the streetlight illumination model, allowing us to determine correlations using IDW and other interpolation and statistics techniques.

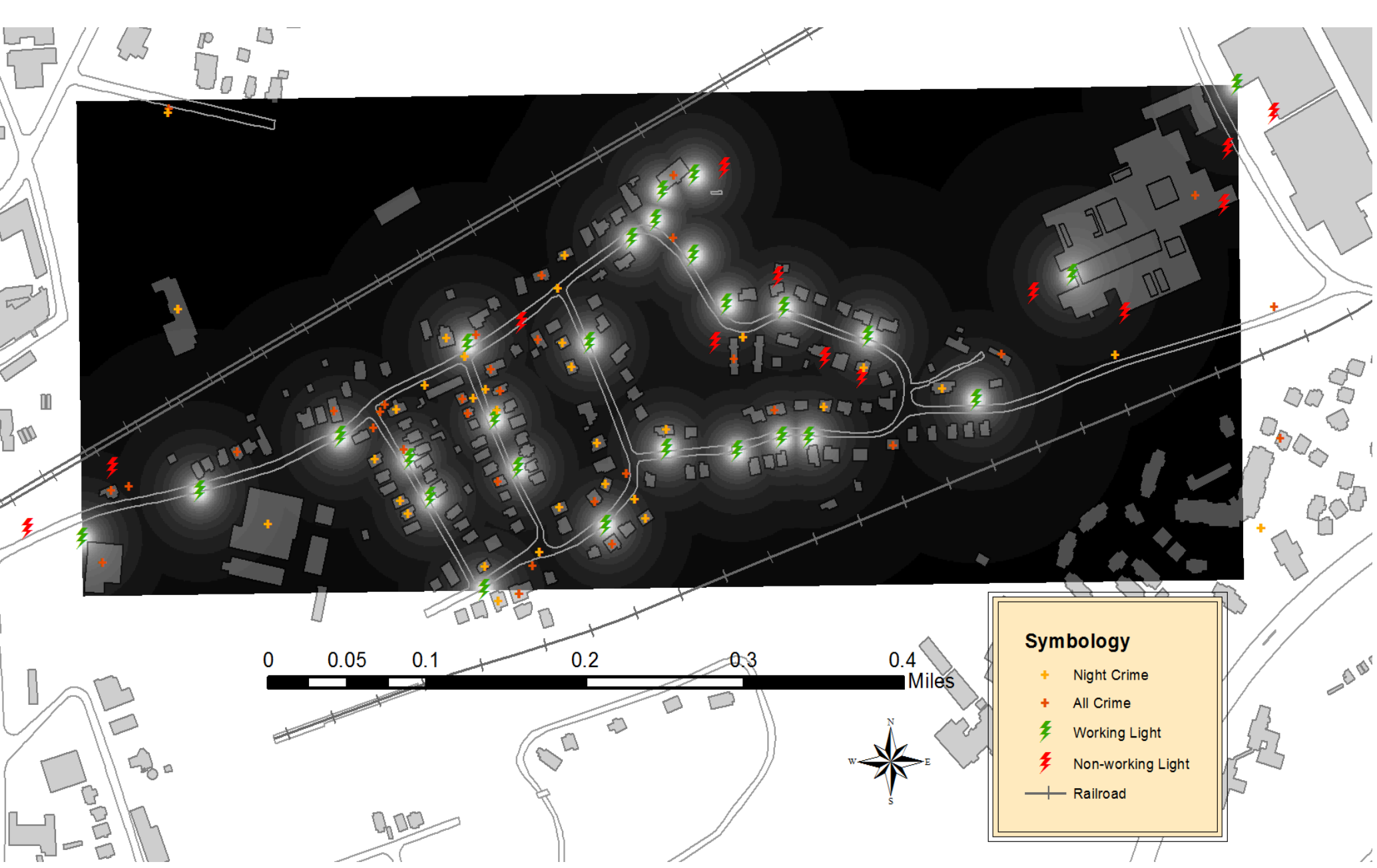
New Washington Heights
24 Hr Crime Kernel Density



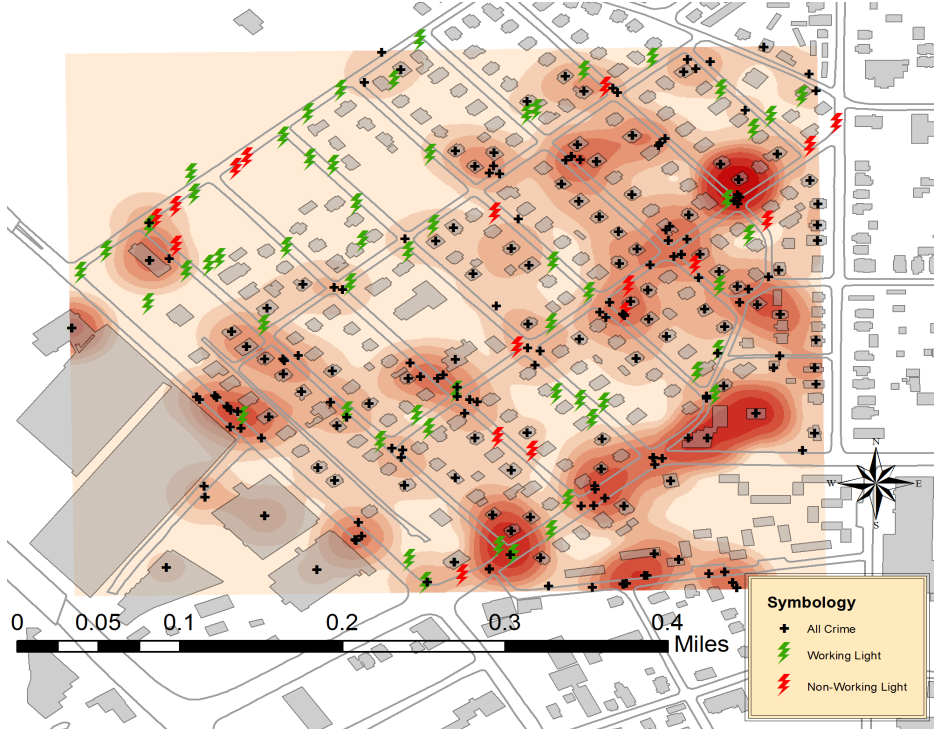
New Washington Heights
Nighttime Crime Kernel Density



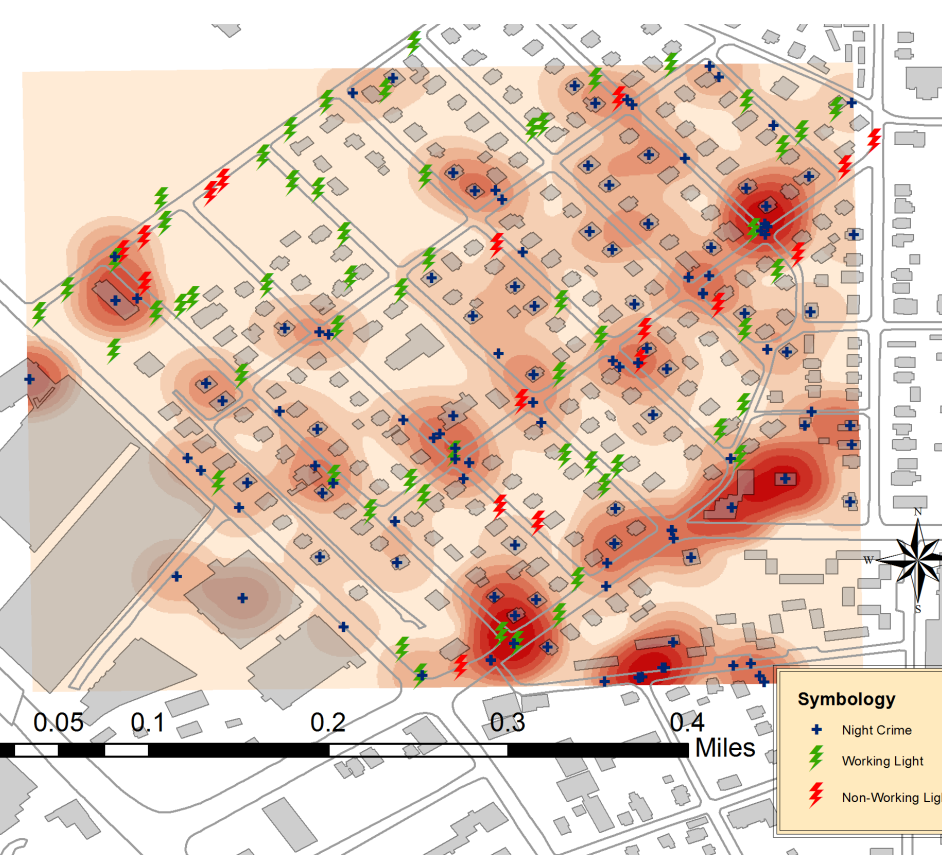
New Washington Heights
Isolux Map



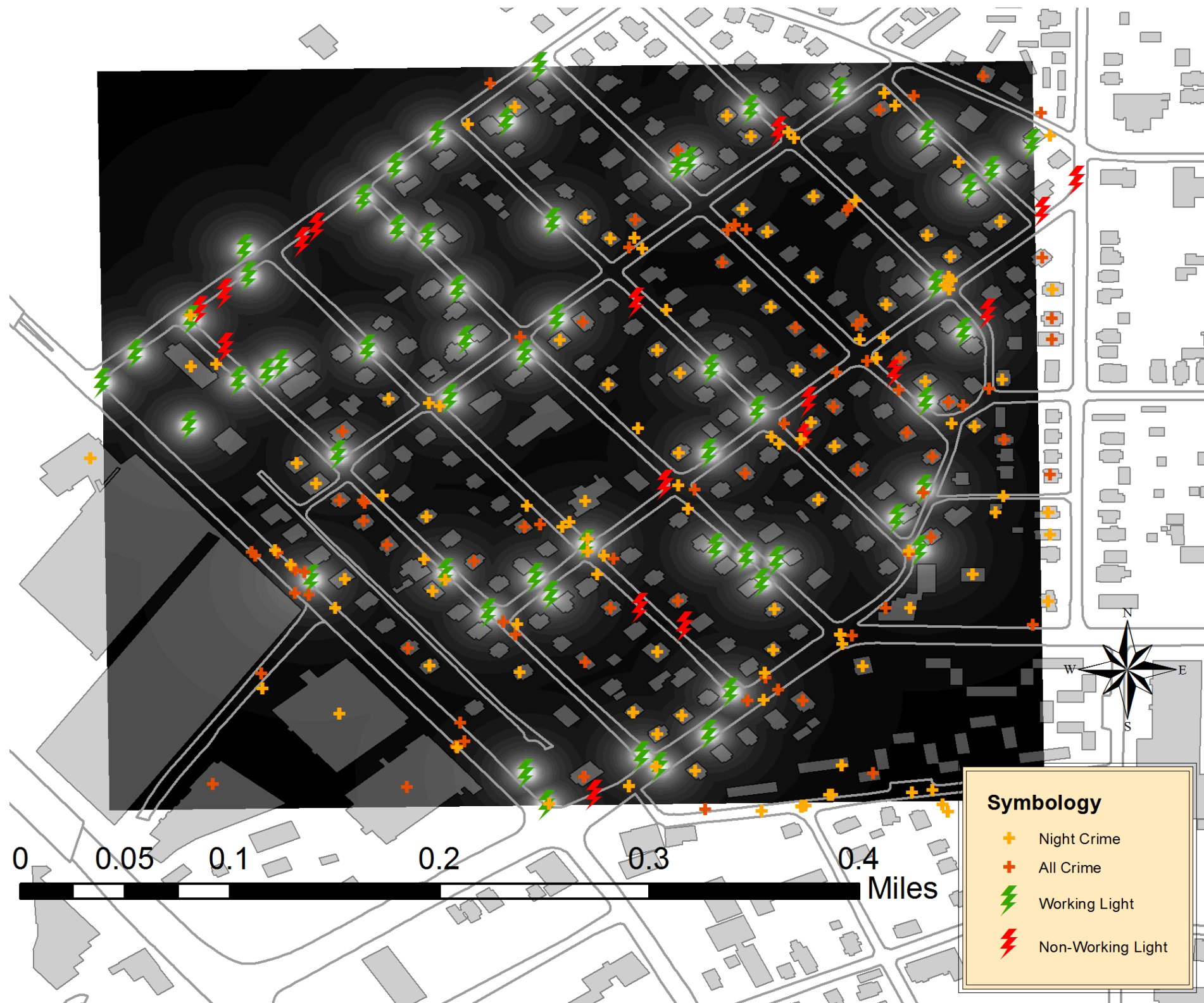
Poe Mill
24 Hr Crime Kernel Density



Poe Mill
Nighttime Crime Kernel Density



Poe Mill Isolux Map



Results and Discussion

Our results showed significant variance between the two neighborhoods. In Poe Mill crime skewed towards areas with fewer streetlights, supported by the increase in crime hotspots in these areas at night, particularly in non-residential areas. In New Washington Heights, however, the streetlights appeared to have little impact and actually increased the overall reporting of crime. Many factors are at work here; while in some cases crime could be reduced due to the illumination of the streetlights, they also could be increasing the reporting of crimes due to visibility and community pride. For example, community leaders have informed us of hotspots of criminal activity not visible in our maps due to underreporting. Additionally, our sample size is small enough that natural variance could cause significant discrepancies in the data. We would recommend that community leaders use these maps as a supplement to their current knowledge of criminal activity in the community rather than relying solely on statistical analysis.

Future Research

Further research could be conducted in the differences between types of streetlights. Most streetlights in these two areas are 175W mercury vapor lamps and 100W high-pressure sodium lamps. Despite the difference in wattage, the newer high-pressure sodium lamps provide greater illumination for a lower cost. LED lighting, which is not present in these neighborhoods, will move further along the trend of greater illumination for lower energy input. Modeling the actual ground illumination of these streetlights and the effect of different light levels on crime could play a major role in determining how communities should apply lighting to create a safer community.

References/ Data Sources

Atkins, S., Husain, S., Storey, A. (1991). "THE INFLUENCE OF STREET LIGHTING ON CRIME AND FEAR OF CRIME" CRIME PREVENTION UNIT PAPER NO. 28 iii-14
Pain R, MacFarlane R, Turner K, Gill S, (2006). "'When, where, if, and but': qualifying GIS and the effect of streetlighting on crime and fear" Environment and Planning A 38(11) 2055 – 2074
City of Greenville Official City Website Crime Data (2013), <http://www.greenvillesc.gov/GIS/GISData.aspx>

Acknowledgements

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