The Relationship Between Urban Form and Greenspace Distribution:
A Nationwide Spatial-Temporal Study

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Introduction

- As cities develop, it is assumed that greenspace connectivity is decreasing (Kong et al, 2010)
- Greenspace connectivity is known to have a regional pattern and I am interested in furthering this finding (Bereitschaft, 2014)
- This decrease in connectivity and green space in urban areas is shown to be detrimental for the health of ecosystems as well as humans (Cahill, 2003)
- I am completing a geospatial analysis to compare all United States urban areas' change in urban form and the corresponding change in green spaces, looking for interlinkages, patterns, and trends
- I am studying a ten year period from 2001-2011 to show short term, recent trends

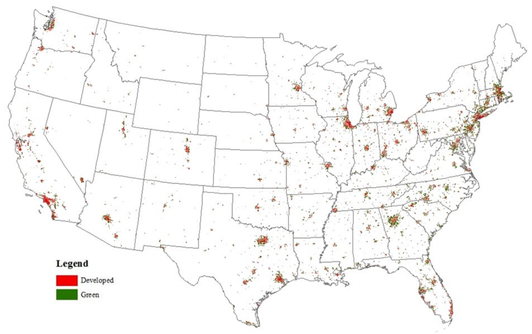
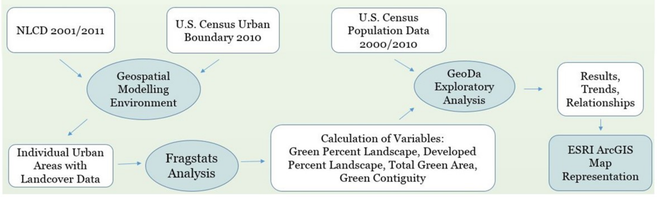


Figure 1. Landcover in the urban areas of study

Methods

- To study these trends, I first extracted landcover (NLCD 2001 and 2011) of urban areas in the US (Census 2010 Urban Area boundary), and then analyzed 3070 urban areas and the corresponding changes in the ten year period.
- Greenspace fragmentation is assessed through the variables total green area, percent of green in the urban area, and greenspace contiguity (Tasi, 2005; Schwarz, 2010)
- Urban form is assessed through the variables of population density and in percent of developed space in the urban area



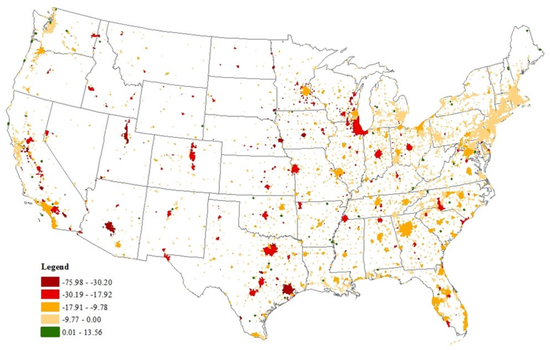


Figure 1. Percent change in the proportion of green landcover from 2001-2011

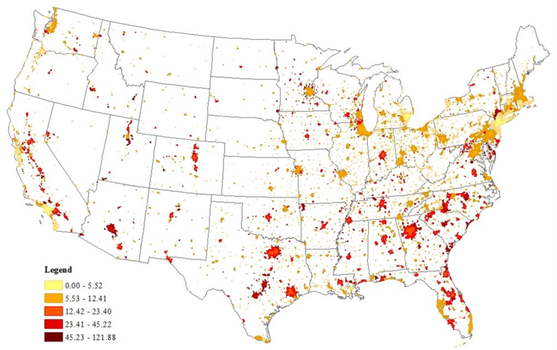


Figure 2. Percent change in the proportion of intensely developed landcover from 2001-2011

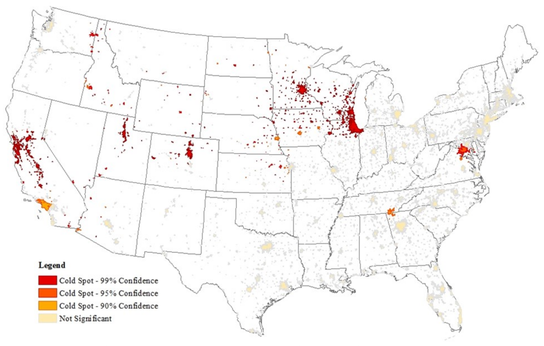


Figure 4. Spatial autocorrelation of the percent change in the proportion of green space landcover from 2001-2011

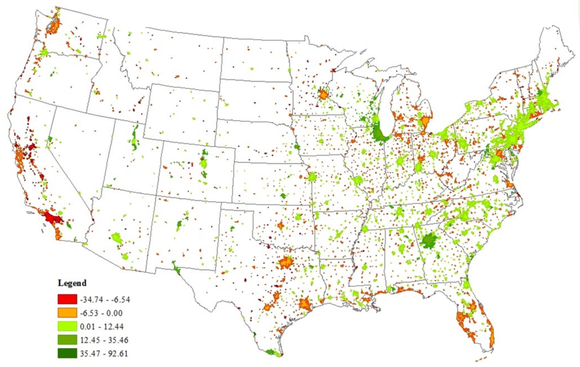


Figure 5. Percent change in the proportion of developed open space from 2001-2011

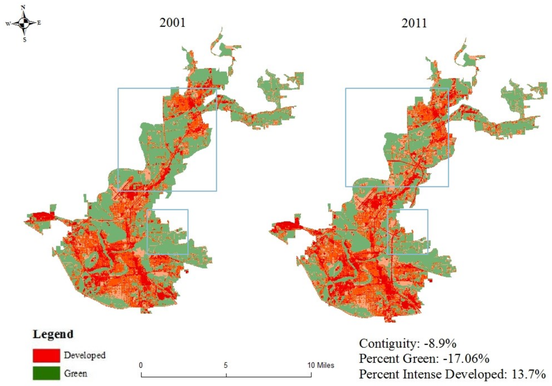


Figure 6. Landcover and contiguity change in Effingham, Illinois from 2001-2011

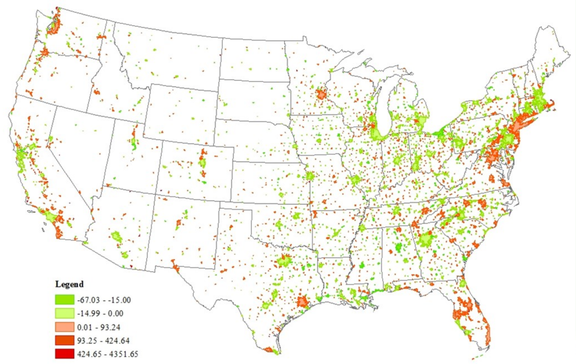


Figure 7. Percent change in population density from 2001-2011

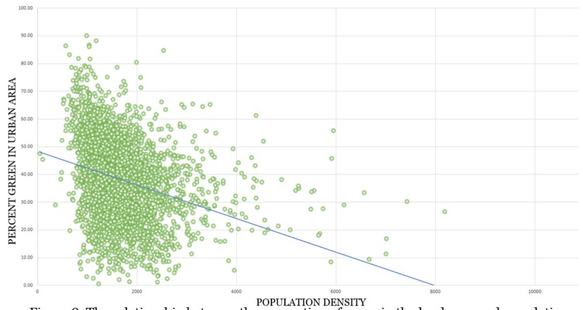


Figure 8. The relationship between the proportion of green in the landscapeand population density for 2001 ($y = -0.006x + 48.303$; $R^2 = 0.0913$)

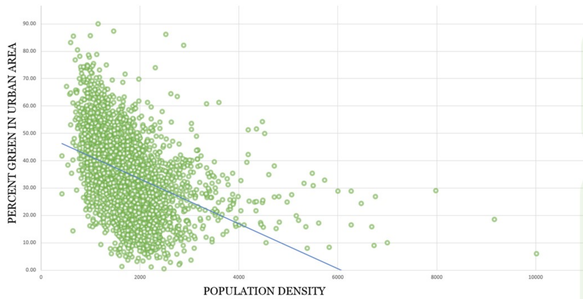


Figure 9. The relationship between the proportion of green in the landscape and population density for 2011 ($y = -0.0082x + 49.639$; $R^2 = 0.1827$)

Results

- Regional change in green, intense developed, and open space percentages (Figure 4,5,7)
- Nearly all urban areas have decreased in total green area and only 2 have seen significant growth in green space, both with total populations <12,000
- Trend of increasing population density, decreasing green space (Figure 1, 7)
- Trend of increasing developed space, decreasing green space (Figure 1,2)
- Trend of increasing population density, decreasing green space (Figure 8,9)
- Trend of increasing population density, increasing developed space
- All trends & relationships have become stronger
- Contiguity represented in Effingham, Illiniois (Figure 6)

Discussion

- The results show that developed space change has a direct affect on greenspace; however, there is an increase in developed open space concurrently in some urban areas.
- Regional trends show the Midwest and Western urban areas are losing greenspace statistically higher than average
- Despite these regional trends in losing greenspace and gaining developed space, areas like Detroit are seeing an increase in developed open space which could be used as parks. This increase in developed space correlates to the decrease in population density
- In contrast, the West and MidSouth are both losing greenspace and developed open space, gaining intense developed space at high rates
- Measures of contiguity do not show consistent trends across the US; however, individual areas such as in Illinois exemplify how contiguity is significantly decreased in only 10 years. The results also show how encroachment of developed areas affect contiguity

Acknowledgements

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