ANALYZING CHANGES IN URBAN AREAS USING LANDSCAPE PATTERN METRICS

Benjamin J Davis and Jennifer Koch
Department of Geography and Environmental Sustainability, University of Oklahoma

ABSTRACT

Determining how landscape patterns are changing in urban areas is important to modeling future changes in cities. We performed a literature review to determine some of the most commonly used pattern metrics. These metrics were then applied to the 2001, 2006, and 2011 National Land Cover Dataset for a region in the state of Oklahoma stretching from Oklahoma City in the Southwest to Tulsa in the Northeast using Fragstats, a computer program for calculating landscape metrics. The results were compared to determine if there is evidence for the value of these metrics changing over time. Patterns in any observed changes could be incorporated into urban landscape models.

OBJECTIVES

The following were the goals for this research:

- Determine commonly used Landscape pattern metrics
- Determine if there are temporal trends in the values of the metrics

METHODS

The following steps were taken to determine whether possible trends could be found in urban landscape metrics:

- Download National Landcover Dataset (NLCD) files for 2001, 2006, and 2011, and crop them to the domain of the study (Figure 1.). Additionally, set all cells as either Urban or Non-urban. This was done using the model builder functionality in ArcMap.
- Select commonly used landscape and class metrics by conducting a literature review. Selected metric include Class Area, Patch Density, Edge Density, and Clumpiness at the class level, and Mean Euclidean Nearest Neighbor Distance, and Mean Perimeter-Area Ratio at the landscape level
- Analyze the landcover data in Fragstats using the metrics selected in the literature review.

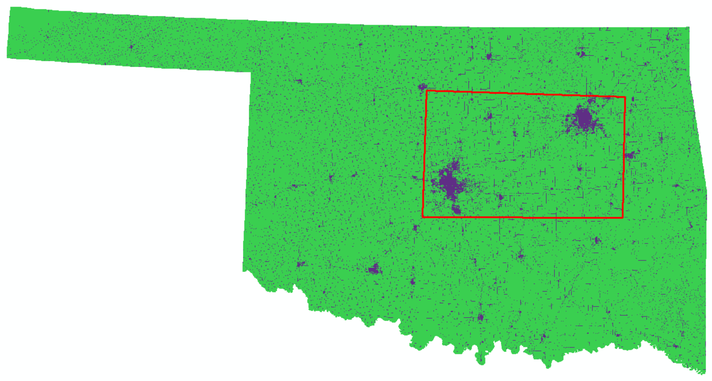

Figure 1: 2011 NLCD data for the state of Oklahoma with the analysis domain outlined in red. Blue shaded areas are urban land use categories and green areas are non-urban land use categories

RESULTS

	2001	2006	2011
Class Metric			
Class Area (CA)	325351.5	336793.7	346850.2
Patch Density (PD)	0.1479	0.1436	0.1461
Edge Density (ED)	29.8655	30.0251	30.0945
Clumpiness (CLUMPY)	0.7657	0.7709	0.7762
Landscape Metric			
Mean Euclidean Nearest Neighbor Distance (ENN_MN)	638.0252	630.049	626.2869
Mean Perimeter-Area Ratio (PARA_MN)	111.8201	112.5264	112.7473

- Table of values for selected metrics for the NLCD years available.

CONCLUSIONS

- CA, ED, CLUMPY, and PARA_MN increase each timestep.
- ENN_MN, decreases each timestep.
- PD shows no clear trend
- 5 of the 6 metrics appear to change over time, indicting that there may be a quantifiable trend that could be incorporated into a model projecting future land use changes.

This material is based on work supported by the National Science Foundation under Grant No. IIA-1301789.