Cross-City Comparison of Green Space Distribution and Characteristics

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How do cities across the United States vary in their distribution of green space?
What are the implications for ecosystem services derived from these green spaces, particularly those related to flooding and heat?

Overview

Vegetated or "green" spaces in cities can potentially provide a wide range of benefits, such as stormwater retention and mitigation of urban heat. The spatial distribution of green space influences both its ecosystem function and the services derived from it, depending on who has access to it.

We aim to evaluate the current distribution of green space in several cities and assess how distribution is similar or different across these cities.

Sites & Methods

Map of selected cities

The selected cities are a subset of the Urban Resilience to Extremes Sustainability Research Network and encompass a range of biophysical settings and development trajectories

Land cover derived from satellite imagery was resampled to 5m and classified into trees & grass/shrubs

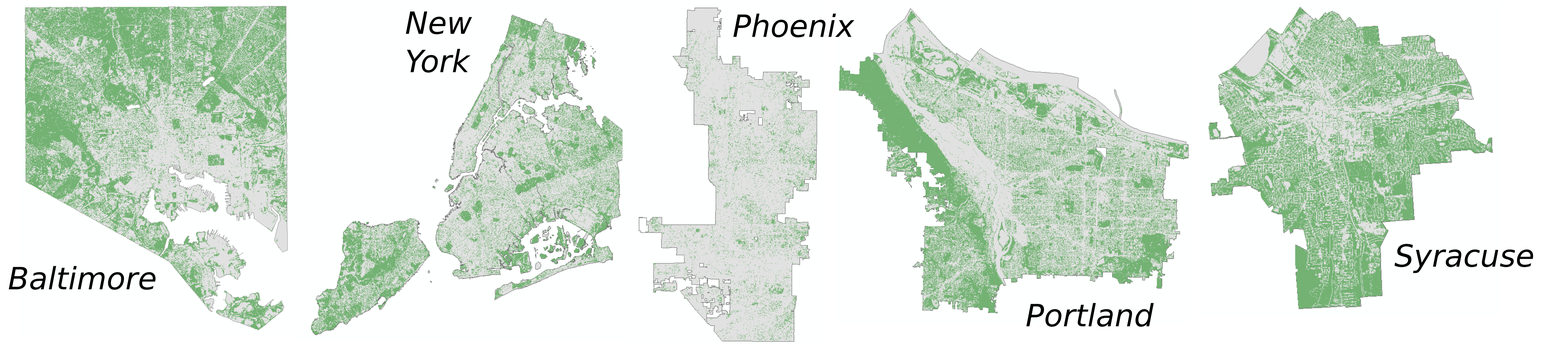

Example land cover

Census & FEMA floodplain data were acquired for spatial comparison

Spatial analysis was conducted in ArcGIS10

Results

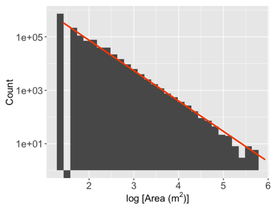
Green space extent



Green space summary

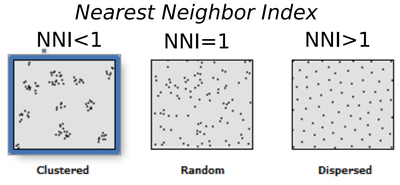
City	Green: Total Area	Tree Canopy: Total Green	Median Patch Area (m^2)	Median Patch Complexity (Perim:Area)	Nearest Neighbor Index	Pareto Slope
Baltimore	0.49	0.56	75	0.53	0.67	-0.79
New York	0.39	0.53	50	0.60	0.58	-0.92
Phoenix	0.12	0.35	25	0.80	0.76	-1.23
Portland	0.42	0.75	100	0.50	0.66	-0.88
Syracuse	0.56	0.48	75	0.53	0.65	-0.67

Phoenix green space is dominated by small, irregular patches. Among the more humid cities, NYC has the smallest, most irregular and clustered patches while Syracuse has the greatest % of green space, which is dominated by relatively larger patches

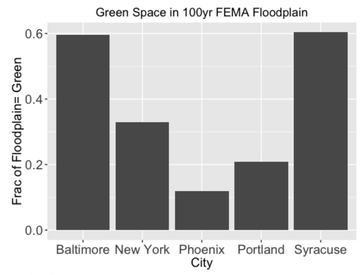


Example of Pareto slope determination from log-log distribution of green patch size. More negative slope= more small patches

Nearest Neighbor Index

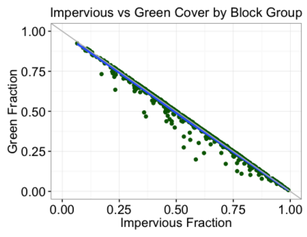


Where is green space located?

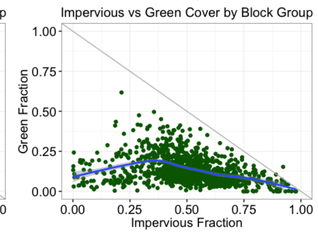


Baltimore & Syracuse have more than 50% of the 100 year floodplain as green space

Baltimore

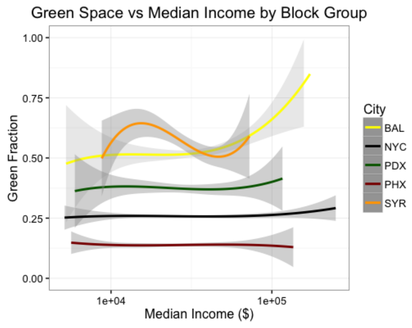


Phoenix



Humid cities like Baltimore have the greatest green space with lowest development; Phoenix has 'peak green' in moderately developed areas

Who has access to the benefits of green space?



Baltimore & Syracuse have less equitable (according to income) distributions of green space

Implications

--As a desert city, Phoenix has less than a third of the green space of humid cities, and it's concentrated in moderately developed areas. Highly dev. areas will need to consider how to increase heat mitigation
--NYC and Portland should consider increasing their green space in the 100 year floodplain

Next Steps

--Addition of other cities and ancillary data (e.g. heat) for comparison to green space distribution
--Cross-city comparison of engineered green stormwater infrastructure & vacant lots

Acknowledgements

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