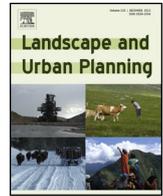




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Assessing and comparing relationships between urban environmental stewardship networks and land cover in Baltimore and Seattle

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HIGHLIGHTS

- We explore environmental stewardship network structures in Baltimore and Seattle.
- We combine network and spatial analyses to assess network/land cover relationships.
- We find higher incomes and more groups in well canopied neighborhoods in Baltimore.
- Home ownership is the principal explicator of tree canopy in Seattle.
- We suggest enhanced methods for continued study of stewardship causes and outcomes.

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ABSTRACT

Implementation of urban sustainability policies often requires collaborations between organizations across sectors. Indeed, it is commonly agreed that governance by environmental networks is preferred to individual organizations acting alone. Yet research shows that network structures vary widely, and that these variations can impact network effectiveness. However, largescale studies of environmental network structure and outcomes are rare. Little research exists that evaluates whether local environmental conditions impact network structure, and whether the structure, or even the existence of a network has measurable impact on local conditions. These research gaps may be partially attributed to methodological challenges in studying networks across geographic space. This study addresses these challenges and examines the question, “what are the relationships among environmental conditions and environmental stewardship networks in Baltimore and Seattle, and how do these two cities compare?” We surveyed environmental stewardship organizations in each city to collect data about organizational relationships and locations of stewardship activities. Social network and spatial regression analyses were applied to these data to explore relationships among variations in neighborhood land cover and network measures. Land cover was not found to be a strong predictor of organizational presence or network structure in either city. However, both the number of organizations and the number of ties between them correlated significantly with the percentage of tree canopy in Baltimore neighborhoods. Seattle had similar trends, but the relationship appeared weaker. Findings contribute to the nascent field of urban environmental stewardship, and thus results are discussed in relation to their ability to inform future research.

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1. Introduction

In this paper, we present findings from a study that assessed relationships among land cover and stewardship networks in Baltimore and Seattle, both within and across these cities. Specifically,

we asked the question, “what are the relationships among environmental conditions and environmental stewardship networks in Baltimore and Seattle, and how do these two cities compare?” This research was driven by a number of theoretical, methodological, and practical motivations, and the results contribute to the growing field of urban environmental stewardship research.

First, we sought to inform the development of a theory of urban environmental stewardship networks. The urban fabric is fragmented into many parcels under different uses and ownerships, producing a large, diverse group of stakeholders with an interest in resource management decisions (Svendsen & Campbell,

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2008). Environmental stewardship organizations are actors of particular interest because they interact with both natural resources and the social system (Svendsen, 2010). Stewardship groups can be any combination of non-profit, state, and private sector stakeholders working to conserve, manage, monitor, advocate for, and educate the public about their environments (Fisher, Campbell, & Svendsen, 2012; Svendsen & Campbell, 2008). An emergent body of urban stewardship research includes work in New York City, where researchers have characterized the organizational structure of environmental stewardship (Fisher et al., 2012), and the roles that “bridging” organizations play in managing natural resources (Connolly, Svendsen, Fisher, & Campbell, 2013). In Seattle, pilot stewardship research efforts have resulted in an organizational census of stewardship organizations in the Puget Sound Region (Wolf, Blahna, Brinkley, & Romolini, 2013) and the development of a practitioner-derived conceptual framework of urban environmental stewardship (Romolini, Brinkley, & Wolf, 2012; Wolf et al., 2013). In Chicago, researchers found that geographic proximity of office location and field sites increased interactions among stewardship organizations (Belaire, Drilbin, Johnston, Lynch, & Minor, 2011). To date, there have been no empirical cases of how stewardship networks relate to the environments in which they operate, as measured through biophysical features in the cityscape.

Next, addressing the posed research questions required methodological developments, including a unique combination of social network and spatial data for analyses. In recent years, some researchers have directed their attention to the application of social network analysis to better understand collaboration in social-ecological systems (Crona & Bodin, 2006; Ernstson, Sorlin, & Elmqvist, 2008; Lauber, Decker, Knuth, & 2008; Muñoz-Erickson et al., 2010). Relevant examples include using network analysis to categorize and assess stakeholder relationships in resource management (Prell, Hubacek, & Reed, 2009), to evaluate social capital in collaborative planning (Mandarano, 2009), and to examine structure (Schneider, Scholz, Lubell, Mindruta, & Edwardsen, 2003) and effectiveness (Laven, Krymkowski, Ventriss, Manning, & Mitchell, 2010) of networks facilitated by federal programs. Research (cf. Bodin & Crona, 2009) suggests that the structure of an organizational network matters in natural resource governance. The values of certain structural measures, such as network density and network centrality, may affect network qualities such as adaptive capacity, learning, and trust, which are known to be important for adaptive management of natural resources (Bodin, Crona, & Ernstson, 2006). Yet there has been little research examining the relationship between network structures and on-the-ground measures of effectiveness, or outcomes (Provan & Milward, 2001).

Particularly in urban areas with a mosaic of multiple land uses and varying definitions of boundaries, researchers face methodological challenges in combining network analysis with analyses of variations in local social and ecological conditions. With this study we address this obstacle by capturing the geographic scope, defined at the neighborhood scale, of each organization’s stewardship activities. Social network analyses of spatially explicit data make it possible to link stewardship presence and activity, network relationships, and associated neighborhood-level environmental variables such as land cover. Methodological advances combining these approaches can provide insight into how variations in network structures are associated with variations in land cover, generating the opportunity to understand social-ecological governance structures and related outcomes in a novel way.

Finally, assessing stewardship networks in urban areas is also of practical importance. In the US, the population continues to move to cities, with over 82% of the population now residing in urban areas (United Nations, 2012). As urbanization takes on new scales, rates, locations, forms, and functions (Seto, Sánchez-Rodríguez, & Fragkias, 2010), cities must not only adapt to the

resulting ecological and social changes, but also anticipate and respond to future changes. This may require a shift in governance towards the adaptive management strategies best provided by mixed-form networks. Managing or actively fostering these networks may be facilitated by a basic understanding of the relationships among environmental features and network presence, structure, and variation. Few studies have focused on the networks that operate in urban social-ecological systems, with scholars such as Ernstson, Barthel, Andersson, and Borgström, 2010 acknowledging and seeking to address this research need (Ernstson et al., 2010). In this study, we conduct both intra-city and inter-city comparisons of stewardship networks and land cover. Intra-city neighborhood-scale stewardship network comparisons provide assessments across urban and socio-demographic gradients, while inter-city comparisons of environmental governance structures will bolster interpretations of outcomes, and provide a basis for the development of best practices for urban stewardship networks. Our research represents the first inter-city comparative study within a national urban stewardship research program conducted by the USDA Forest Service and partners (see, for example: www.stewmap.net). This multi-city research offers the opportunity to compare environmental network structures and outcomes in urban areas across the country. The success of such networks of environmental stewards could be key to advancing sustainability of cities. Further, a heightened understanding of network structure, function, location, and outcomes could contribute to the likelihood of their success.

2. Methods

2.1. Study sites: Baltimore, MD and Seattle, WA

The cities chosen for this study were Baltimore, MD and Seattle, WA. Table 1 displays some characteristics of the two metropolises that make them particularly well suited for cross-site analyses. Baltimore is located in the Mid-Atlantic region of the US, and is an older, post-industrial, majority Black, less wealthy, less educated city with declining population. In contrast, Seattle is located in the Pacific Northwest, and it is a younger, majority White, wealthier, highly educated city with rising population. These socioeconomic and historical differences are striking and likely to impact both the land cover and stewardship variables examined in this study. Yet there are many similarities that provide a foundation for comparison. The population and land areas of the cities are nearly

Table 1
Socioeconomic and environmental conditions in Baltimore and Seattle.

Attribute	Seattle	Baltimore
Year founded (by European settlers)	1853	1729
Population ^a	608,660	620,961
Population change, 2000–2010 ^{a,b}	45,286 (+)	30,193 (–)
Median household income (dollars) ^a	60,212	38,346
% White ^a	69.5	29.6
% Pop. with Bachelor’s degree or higher ^a	56.0	24.2
Land area (sq mi) ^b	83.0	80.8
% Tree canopy cover ^{c,d}	28.1	27.4
Impacted water body	Puget Sound	Chesapeake Bay
No. of neighborhoods ^{e,f}	93	271
No. of groups engaged in environmental stewardship activities ^g	568	607
No. of survey respondents (response rate)	144 (25.4%)	163 (26.9%)

^a 2010 US Census.

^b 2000 US Census.

^c Land use/land cover, Seattle, WA 2009.

^d Land Cover, Baltimore, MD 2007.

^e cityview.baltimorecity.gov.

^f <http://clerk.seattle.gov/public/nmaps/fullcity.htm>.

^g Romolini (2013).

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