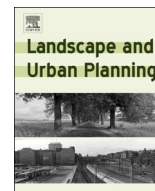




ELSEVIER

Contents lists available at ScienceDirect

Landscape and Urban Planning

journal homepage: www.elsevier.com/locate/landurbplan

Research Paper

A multi-city comparison of front and backyard differences in plant species diversity and nitrogen cycling in residential landscapes

Dexter H. Locke^{a,*}, Meghan Avolio^b, Tara Trammel^c, Rinku Roy Chowdhury^d, J. Morgan Grove^{a,e}, John Rogan^d, Deborah G. Martin^d, Neil Bettez^f, Jeannine Cavender-Bares^g, Peter M. Groffman^{h,f}, Sharon J. Hallⁱ, James B. Heffernan^j, Sarah E. Hobbie^g, Kelli L. Larson^k, Jennifer L. Morse^l, Christopher Neill^m, Laura A. Ogdenⁿ, Jarlath P.M. O'Neil-Dunne^o, Diane Pataki^p, William D. Pearse^q, Colin Polsky^r, Megan M. Wheelerⁱ

^a National Socio-Environmental Synthesis Center (SESYNC), 1 Park Place, Suite 300, Annapolis, MD 21401, USA

^b Department of Earth and Planetary Sciences, Johns Hopkins University, Baltimore, MD, USA

^c Department of Plant and Soil Sciences, University of Delaware, USA

^d Graduate School of Geography, Clark University, 950 Main Street, Worcester, MA 01610-1477, USA

^e USDA Forest Service, Northern Research Station, Baltimore Field Station, USA

^f Cary Institute of Ecosystem Studies, USA

^g Department of Ecology, Evolution and Behavior, University of Minnesota, Saint Paul, MN, USA

^h Advanced Science Research Center at the Graduate Center of the City University of New York, USA

ⁱ School of Life Sciences, Arizona State University, Tempe, AZ, USA

^j Nicholas School of the Environment, Duke University, USA

^k School of Geographical Sciences and Urban Planning and School of Sustainability, Arizona State University, AZ, USA

^l Department of Environmental Science and Management, Portland State University, USA

^m Ecosystems Center, Marine Biological Laboratory, USA

ⁿ Department of Anthropology, Dartmouth College, USA

^o Spatial Analysis Laboratory, Rubenstein School of Environment & Natural Resources, University of Vermont, USA

^p Department of Biology, University of Utah, USA

^q Department of Biology & Ecology Center, Utah State University, Logan, UT, USA

^r Florida Atlantic University, USA

ARTICLE INFO

Keywords:

Land management
Urban ecology
Residential landscapes
Plant diversity
Urban soils

ABSTRACT

We hypothesize that lower public visibility of residential backyards reduces households' desire for social conformity, which alters residential land management and produces differences in ecological composition and function between front and backyards. Using lawn vegetation plots (7 cities) and soil cores (6 cities), we examine plant species richness and evenness and nitrogen cycling of lawns in Boston, Baltimore, Miami, Minneapolis-St. Paul, Phoenix, Los Angeles (LA), and Salt Lake City (SLC). Seven soil nitrogen measures were compared because different irrigation and fertilization practices may vary between front and backyards, which may alter nitrogen cycling in soils. In addition to lawn-only measurements, we collected and analyzed plant species richness for entire yards—cultivated (intentionally planted) and spontaneous (self-regenerating)—for front and backyards in just two cities: LA and SLC. Lawn plant species and soils were not different between front and backyards in our multi-city comparisons. However, entire-yard plant analyses in LA and SLC revealed that frontyards had significantly fewer species than backyards for both cultivated and spontaneous species. These results suggest that there is a need for a more rich and social-ecologically nuanced understanding of potential residential, household behaviors and their ecological consequences.

1. Introduction

The spatial extent of private residential land use, which includes

yards, is rapidly expanding in the United States (Brown, Johnson, Loveland, & Theobald, 2005). Lawns, the dominate component of most residential yards, cover ~163,800 km² of 48 contiguous United States

* Corresponding author.

E-mail addresses: dexter.locke@gmail.com, dlocke@sesync.org (D.H. Locke).

(Milesi et al., 2005), which is larger than the entire state of Georgia. Americans spent nearly \$50 billion on lawn care, supplies, and equipment in 2013 and 2014 (ESRI, 2016), suggesting that residential ecosystems are resource-intensive. However, the spatial variation of yard management practices and intensity remains uncertain at multiple scales: variations within parcels between frontyards versus backyards, among neighborhoods within a metropolitan region, and among metropolitan regions in different climatic regions (Groffman et al., 2014; Groffman et al., 2017; Larson et al., 2015; Polsky et al., 2014). Given the vast extent of lawns and their potential environmental consequences, more research is needed to understand the geographic variations, drivers, and outcomes of yard care.

Despite a growing literature examining the social drivers of urban and suburban land management (Cook, Hall, & Larson, 2012; Robbins, 2007), surprisingly little attention has been paid to the variation within residential parcels. Robbins (2007) has hypothesized that self-presentation and social norms may affect how residents maintain their frontyard because of its public visibility. A potential corollary to this observation is that less-visible backyards are guided by a different set of socially-driven land management principles that do not include an outward display of ‘fitting in’ with a particular neighborhood aesthetic (Larsen & Harlan, 2006). For example, backyards may be used for growing food, recreation (Harris et al., 2012), or other purposes. Differences between front and backyard residential land may have implications for its ecological structure and function. For instance, several studies have shown lower vegetation species richness (Dorney, Guntenspergen, Keough, & Stearns, 1984) and more ornamental plants in frontyards (Daniels & Kirkpatrick, 2006; Vila-Ruiz et al., 2014), and better habitat features for birds in backyards (Belaire et al., 2015).

Building on previous work to understand the social drivers and ecological properties of residential land management (Larson, Casagrande, Harlan, & Yabiku 2009; Stehouwer, Nassauer, & Lesch, 2016; Larsen and Harlan, 2005), we hypothesize that frontyards are simpler and more clean-cut, reflecting an American aesthetic perceived as a shared neighborhood ideal and norm (Jackson, 1987; Robbins, 2007), while backyards are wilder and more diverse, reflecting an array of personally-held values and/or priorities. In this paper, our objective is to better understand the relationships among public visibility, social norms, ecosystem processes, and biodiversity by measuring ecological differences between front and backyards across climatically diverse regions. To achieve this objective, we evaluate variations between front and backyards with multiple measures of ecological structure, function and plant diversity. We analyze plant species in lawns in seven cities, soil properties related to nitrogen cycling processes in six cities, and entire-yard plant species differences between front and backyards in two of those cities (Salt Lake City and Los Angeles). In our entire-yard analyses for Salt Lake City and Los Angeles, we compare differences in cultivated (intentionally planted by people) and spontaneous (self-regenerating) plant species richness.

1.1. Theoretical underpinnings

We employ two social science theories to explore variations in residential land management: reference group behavior theory and its extension the ecology of prestige, and the moral economy. Reference group behavior theory posits that individuals seek membership in and identify with social groups they perceive as desirable and adopt the values, judgments, standards, attitudes, behaviors, and norms of those social groups (Hyman, 1942; Merton & Kitt, 1950). The extension of reference group behavior theory to residential land management is an ecology of prestige (Grove et al., 2006). Ecology of prestige theory posits that residential yardcare expenditures and behaviors are motivated in part by group identity and perceptions of inclusion in distinct lifestyle groups (Grove et al., 2006; Zhou, Troy, Grove, & Jenkins 2009). Because neat, picturesque, safe, and inviting landscapes may require substantial financial inputs, they may indicate to casual

observers that residents belong to a certain socioeconomic class (Nassauer, 1988, 1995), or social group. This is “cues to care” concept. Research in Baltimore, MD (Troy, Grove, O’Neil-Dunne, Pickett, & Cadenasso, 2007), New York, NY (Grove, Locke, & O’Neil-Dunne, 2014) and Philadelphia, PA (Locke, Landry, Grove, & Roy Chowdhury, 2016) show that the distribution of existing vegetative cover, as well as the space potentially available for expanding vegetation on residential lands, are better correlated with different lifestyle measures (e.g. family size, marital status, housing styles) than with measures of socioeconomic status alone.

While ecology of prestige theory explains yardcare practices in terms of goal seeking, moral economy theory explains yardcare practices in terms of avoiding disapproval or sanctions. In this case, the idea of a moral economy explains household behavior in terms of shame or guilt because they failed to meet their neighbors’ expectations if they do not maintain a particular lawn appearance (Robbins, 2007). Whether motivated by anxiety, shame, or guilt (moral economy), or by pride or desire to uphold the image of the neighborhood (ecological prestige), or a mix of both, neighbors can be an important reference group for landscaping practices. For instance, several studies have shown that neighborhood social norms influence household land management behaviors (Carrico, Fraser, & Bazuin, 2012; Fraser, Bazuin, Band, & Morgan Grove, 2013; Larson & Brumand, 2014; Nassauer, Wang, & Dayrell, 2009). In a cross-site study of yard care behaviors among ~7000 households, [authors name blinded for review] found that when residents know more neighbors by name, the odds of their irrigating and fertilizing any part of their parcels – front or back – is ~8% greater.

In both cases, ecology of prestige and moral economy theories, explanations of yardcare behaviors depends upon self-presentation; and self-presentation can only occur where it is visible (Nassauer et al., 2014). Thus, the social pressure to maintain group conformity and a particular aesthetic may be reduced when yardcare practices, such as those in a backyard, are no longer visible. However, little is known if or how social norms and residential land management is spatialized within parcels, from publically-visible frontyards to relatively more concealed, private backyards.

1.2. Empirical foundations

A review of more than 250 research papers on residential lands in urban areas found that, “most residential vegetation studies focus on frontyards because they are readily surveyed through field observations” from the public-right-of way and not requiring homeowner permission (Cook et al., 2012: 24). The few explicit comparisons between urban residential front versus backyards show substantial differences in vegetation structure. For example, across neighborhoods in Syracuse NY, there was 1.5–2.4 times more vegetated area and 0.9–1.8 times more tree canopy in backyards compared to frontyards (Richards, Mallette, Simpson, & Macie, 1984). Care for shrubs in frontyards was observed to be more intense than for backyard shrubs, and food-producing gardens were found to be absent from most front and side yards, but common in backyards (Richards et al., 1984). A study in Shorewood, WI found high species richness in frontyards (30 tree species) compared to backyards (21 species; Dorney et al., 1984). However, the number of trees was higher in backyards due to greater seedling survival of spontaneous regeneration near fences, garages, and other structures in these more private spaces (Dorney et al., 1984). In a suburb of Chicago, neighbors’ yards and socioeconomic characteristics best explained residents’ frontyard vegetation, while perceptions of and habitat resources for birds were most important for backyard vegetation structure and wildlife-friendly attributes (Belaire et al., 2015). A study of ten suburbs around Hobart, Tasmania, Australia, showed similar species richness across front and backyards when controlling for yard size, but the *types* and *purpose* of vegetation was significantly different (Daniels & Kirkpatrick, 2006). For example, there was more shrub cover

Download English Version:

<https://daneshyari.com/en/article/7459519>

Download Persian Version:

<https://daneshyari.com/article/7459519>

[Daneshyari.com](https://daneshyari.com)