Local Decisions – Global Consequences: Determinates of Lawn Cover and Quality and Implications for Resource Use

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INTRODUCTION

URBAN AND SUBURBAN ecosystems and the environmental problems associated with them have received less research attention than other landscapes due in part to the complexity of individual and local decisions that drive landscape structure (Botkin and Beveridge, 1997). This study investigates one of the most pervasive and high-input habitat typologies found in suburban residential ecosystems – the lawn (Falk, 1976; Barth, 2000). Lawn estimates in the United States range between 10 and 16 million hectares. (Borman *et al*, 1993). An overview of surveys of lawn-care practices indicates that about 70 percent of lawns receive fertilisation (Barth, 2000). Likewise, stream researchers detect a wide range of pesticides, albeit in low concentrations, in urban watersheds (Schueler, 2000). While impervious/pervious cover is often used as an indicator of environmental quality in metropolitan environments, Robbins and Birkenholtz (2003) suggest that the specific character and amount of the cover of surfaces, in particular lawns, should be investigated because of associated high inputs. What are the most important influences in determining lawn cover as one surrogate method of indicating resource use? The hypothesis of this study was that socio-economic character, yard position (front or back yard), and initial condition of the canopy at the time of development, were the most influential determinants. Results from this study contribute to understanding better the influential factors of lawns and associated resource issues in suburban landscapes. The adoption of suburban detached housing as a global land-use typology, for example, in East Asia (Chang and Hester, 1998; Chang, 2002), may result in the adoption of associated high-consumptive lawns.

STUDY AREA

The study area is the northeastern suburbs of metropolitan Atlanta, Georgia, in the Piedmont physiographic province. The climate is humid subtropical with a mean annual precipitation of 125 centimetres, which is distributed evenly annually, and a mean annual temperature of 16 Celsius. Braun (1964) categorised the area vegetation in the oak-pine association with mesic mid-slope environments dominated by *Quercus sp* and *Carya sp*. The study area is dominated by single-family, detached housing subdivisions.

METHODS

Three neighbourhoods, with similarity in the canopy cover, were selected along a socio-economic gradient (mean neighbourhood value ranged from $65,000 to $149,730). Neighbourhoods were predominately owner occupied, ethnically European-American, had no homeowners associations and no landscape covenants. A front and back yard in each of 90 lots provided a total of 180 yard samples. Initial conditions, the condition of the canopy of the yard immediately after development of the property, were classified as open, scattered, or closed. Lawn quantity and quality was field measured in both front and back yards for each of 90 yards. One-way analysis of variance (ANOVA) was performed separately for cover and quality measurements to determine whether mean characteristics differed significantly by class (yard location, neighbourhood, and initial conditions). Where significant overall differences existed, Tukey multiple comparison tests were then used to identify which specific pairs of classes differed (Zar, 1984).

RESULTS

Average lot sizes increased from Neighbourhood A (1329.4 m^2), to Neighbourhood B (1555.2 m^2), to Neighbourhood C (2084.9 m^2). Average lawn cover for all yards was 44.6 percent. Mean front yard cover (54.8 percent) was significantly larger than mean back yard cover (34.3 percent). This in part reflected differences in average front yard area (599.7 $meters^2$) and average back yard area (733.6 $meters^2$). Notably, there were no significant differences between yards by neighbourhoods. The data suggested that a mean lawn cover of 42–45 percent was constant within this socio-economic range of neighbourhoods. Lawn quality was significantly higher in front yards (79.3 percent) than in back yards (61.2 percent). Although not statistically significant, back yard cover in the neighbourhoods indicated an increasing trend with back yard lot size (A - 30.3 percent, B - 34.9 percent C - 37.7 percent). This increasing percentage of lawn cover in back yards in bigger lots resulted in an increasing absolute amount of lawn. The overwhelming need to establish lawns in front yards overshadowed the impact of initial conditions. Front yards with open initial conditions, scattered initial conditions, and closed initial conditions had lawn cover of 55.0 percent 51.3 percent and 59.6 percent, respectively. The high amount of lawn cover and high quality underneath closed canopy initial conditions suggests how pervasive the need is for a lawn in front yards.

DISCUSSION

This study has implications for expanding suburban land use in the urbanised areas of the United States (Maryland Department of Planning, 2001), as well as for suburban growth globally, which may adopt high-resource consumptive lawns as a dominant landscape typology. Per area Barth (2000) indicates that fertiliser input

is significant in residential settings (Table 1). While resource inputs in residential lawns vary dramatically (Schueler, 2000), studies indicate that about one-third of lawn care is serviced professionally and that this increases with lot size (Schueler, 2000). This study also suggests that front yards, as expected, also receive a greater amount of inputs as reflected by quantity and quality of lawn. In addition, it is likely with an ageing population that the percentage of lawns cared for professionally will increase and thus may give reason for significant environmental concerns.

Not surprisingly, the greater cover and quality in front lawns compared with back lawns reflects a variety of factors in both creating and maintaining a savannah-like landscape. During development, a greater number of front yards are cleared for construction to create a view of the house and so a greater number of front yards have open or scatted initial conditions. In subsequent management of these yards, homeowners apply a disproportionate amount of inputs, for example, mowing, fertilisers and pesticides in order to maintain the lawn as a dominant front yard habitat. Reduction in house street setback, popular in new urbanism design standards, may be one method of reducing absolute front lawn areas (and thus resource use) in residential settings. Alternate front yard images in residential settings should also be promoted. Initial conditions play a less important role than yard location, because inertia of landscape condition is very important in determining resultant vegetation. Policies for vegetation retention and establishment at the time of initial development may provide for a long-term impediment to the establishment of a lawn and the concomitant use of resources on lawns. However, this study suggests that vegetation retention will not mitigate lawn amounts and high resource use in front yards in settings similar to the study area.

Although Robbins and Birkenholtz (2003) found that median property value was a useful indicator in measuring lawn cover, this study did not indicate that property value was a major factor in determining lawn cover, which may reflect the relatively narrow range of the neighbourhoods in the study. Studies do indicate, however, that the level of professional lawncare increases with income (Schueler, 2000). Alternatives to the high consumptive lawns are problematic, particularly with increasing landuse and demographic trends. Nassauer (1995) suggests that alternative non-lawn additions to the traditional lawn-dominated front yards might be attractive to suburban homeowners. However, Feagan and Ripmeester

Table 1: Comparative Chemical Application Rates in pounds/acre/year in Maryland

	Cropland Corn/soybean rotation	Golf fairway	Green	Home Lawns (do it yourself)	Home Lawns (lawn service)
Nitrogen	184	150	213	44–261	194–258

Source: Barth, 2000.

(2001) suggest that progress in challenging the overwhelming dominance of lawns will be very difficult, and lawns will remain a dominant feature in expanding suburban residential landscapes. Accurate assessments of both the cultural and physical ecology of suburban lawns is needed to understand their associated impacts on the surrounding ecosystems. Globally, the adoption and use of the lawn as a dominant residential landscape typology and the associated high consumptive and potential environmental degradation, should be a cause for concern. The challenge of protecting regional and global ecosystem health is in understanding and addressing the collective consequences of individual local actions in highly consumptive landscapes like lawns.

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