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The grass-free lawn: Floral performance and management implications

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ABSTRACT

Grass lawns are a ubiquitous feature of urban green-space throughout much of the temperate world. Species poor and intensively managed, lawns are ecologically impoverished, however environmentally aware lawn owners are reluctant to implement alternatives due to aesthetic concerns. Developing an alternative lawn format which is both biodiversity friendly and aesthetically pleasing is an imperative for urban greening.

We suggest that such an alternative can be provided by replacing the grass lawn by a forb-based mix. To advance this, we tested the floral performance of three groups of clonal perennial forbs (native, non-native and mixed), each maintained using standard lawn management mowing regimes.

Our findings show that both the frequency of mowing and the height at which mowing is applied influence floral performance and lawn aesthetics. Species origin was found to influence floral productivity, floral visibility and floral variety within grass-free lawns, with native species providing the greatest floral performance. The behaviour and management of grass lawns was not found to be a suitable analogue for the management of grass-free lawns and grass-free lawns are sufficiently different from grass lawns to require an entirely original management approach. We suggest that the grass-free lawn can provide an aesthetically and environmentally relevant replacement for the ubiquitous and ecologically poor grass lawn.

Introduction

Originally composed of a mixture wild grasses and mowing tolerant wildflowers native to the relatively moist and mild maritime climate of NW Europe, the pedigree of the lawn can be traced back nearly a 1000 years (Fort, 2000; Smith and Fellowes, 2013). During this time continuous social and economic changes combined with greater general access to improving horticultural technology have seen the ornamental lawn extend its original range, moving from private country estates and parks and into the urban landscape (Macinnis, 2009). This journey transformed the lawn. Although a climatically suited mixture of grasses and forbs is still commonly found throughout lawns in NW Europe (Fogelfors, 1983; Müller, 1990; Godefroid, 2001; Thompson et al., 2004), horticultural and aesthetic refinements have been applied to it. The aesthetically refined lawn has taken on very particular characteristics that separate it from its original mixed species composition. The refined or 'perfect' lawn is a low, evenly planed, grass-only format that is required to be a rich green monotone in colour without mottling or spoil that should be dense and soft of texture (Steinberg, 2007; Slater, 2007). Only very few grass species can meet these requirements and the perfect lawn is inevitably a species poor monoculture. However this refined composition has produced an aesthetic that is much admired; so much so that it has been widely adopted beyond its point of origin and the lawn is now the most common component of urban greenspace worldwide (Stewart et al., 2009; Ignatieva and Stewart, 2009).

Even though it is widely implemented, the monocultural nature of the perfect lawn is not without its critics (Robbins, 2007). Changing perceptions of the urban environment and a new green zeitgeist in gardening now see eco-friendly characteristics, native plants, wildlife and sustainability being included in decisions made by landscapers and gardeners (Helfand et al., 2006; Clayton, 2007; Gaston et al., 2007; Kiesling and Manning, 2010). This has led to lawns and their management being seen as ecologically insensitive, with refined lawns being perceived as 'green deserts' (Allen et al., 2010), and described as 'industrial lawns' due to the high level of inputs required to maintain the refined aesthetic (Borman et al., 2001).

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Intensively maintaining greenspace to be species poor does not fit comfortably within the trend for greener gardening and alternatives to the refined lawn format are suggested by many garden authors, gardening organisations and local authorities (Marinelli, 1993; Daniels, 1995; Ryall and Hatherell, 2003; Thomas, 2010; Anon, 2011a; Brown, 2011). Alternatives can include lawns composed of regionally indigenous grasses (Simmons et al., 2011), species enriched lawns (Cook, 1993) and single forb species replacements (Smith and Fellowes, 2013), but more commonly the suggestion is for the lawn to be replaced entirely, usually with a variety of herbs, shrubs and trees, (Hadden, 2012), often with the condition of being native seen as a positive feature in replacement species choices (McMahan, 2006).

However where the use of lawn alternatives has been investigated (primarily in North America), alternatives are not found to be widely adopted, and there is little correlation between a lawn owners choice of alternatives and their environmental motivations (Henderson et al., 1998; Feagan, 2001); alternatives tend to be implemented on the basis of aesthetic improvement (Purchase, 1997). This is in large part due to cultural norms found in North America where the lawn has particular symbolic value (Feagan and Ripmeester, 1999; Robbins et al., 2003; Steinberg, 2007), but is also indicative of the social dimensions in urban ecology (Pickett et al., 2001) and the role of aesthetics in lawn space management (Byrne, 2005; Piekielek, 2003). For a lawn alternative to sit comfortably within the green paradigm and be socially agreeable it would require an ecological motivation and be both aesthetically relevant and socially acceptable (Nassauer et al., 2009).

A new alternative approach to lawns that retains many of the traditional lawn features but removes both the grass and the monoculture has been trialled at the University of Reading, Berkshire, UK. By showing human intention through careful species selection, retaining the traditional low visual aspect and neatness of a lawn by the application of mowing, and providing a level of cover equivalent to that found in traditional grass lawns, the grass-free lawn keeps some of the key characteristics of the ornamental lawn template, although the requirement for mowing is significantly reduced (Smith and Fellowes, 2014a). Composed of mowing tolerant clonal perennial forbs, the grass-free lawn has greater plant species diversity at inception and by the use of a mixture of species that all have the capacity to produce flowers, grass-free lawns bring floral performance to a space not traditionally managed for flowers. Although not intended for sport or amenity use the increase in plant diversity and floral resource found in a grass-free lawn may fit better within the green zeitgeist than the use of the traditional monoculture, and also be aesthetically pleasing; a feature that has the potential to positively influence its societal acceptability (Nassauer, 1995).

With the exception of its initial and subsequent annual or biannual application in wildflower meadows and prairie (Jefferson, 2007; Wade, 2012), the use of repeated mowing is not traditionally associated with floral management. The influence that different types of mowing regimes and plant species selection will have on the floral performance of grass-free lawns has yet to be reported on. In a preceding paper we identified that mowing can influence the amount of ground cover and plant species survival in grass-free lawns (Smith and Fellowes, 2014a), this has implications for the application of mowing to grass-free lawns for the purposes of floral display. For a grass-free lawn to be maintained as a lawn rather than a low meadow it must be mown more frequently. Mowing will inevitably influence floral visibility by the repeated removal of flowers, and the height at which the cut is applied and interactions between the plants used are also likely to influence the outcome. A mowing regime that results in the greatest level of plant and floral diversity and visual performance can be considered to be the optimum management approach.

To determine this approach while we examined the influence of three mowing regimes on ground coverage and species survival in native, non-native, mixed species and turf lawns, we concurrently examined the biomass production and floral performance. Biomass was recorded to compare the productivity of grass-free lawns with unrefined grass lawns under the different mowing regimes and to identify any biomass related behaviour in the floral performance of the lawns.

Method

Experimental design

As described in greater detail in our preceding paper (Smith and Fellowes, 2014a), three groups of clonal perennial forbs were created from species deemed likely to survive and reproduce in a mown environment; a native species group, a non-native group and a mixed species group. The native group was composed in equal proportions of ten species commonly found in managed grasslands and lawns throughout the UK. The non-native group contained ten species of non-natives also in equal proportion that had been sourced on the basis of commercial availability (Table 1). The mixed group consisted of all the native and non-native species in equal proportion. All species selected had the potential to produce clearly visible, distinct and colourful flowers. For the purposes of comparison grass lawn plots were sourced from a section of the university's lawn that was known not to have received any lawn management treatments beyond regular mowing for a period of over 20 years.

The layout of the experiment consisted of thirty six 60 cm^2 randomised grass-free plots and twelve grass lawn plots. Each grass-free plot contained one hundred plants that had been either propagated via cuttings or from seed where cuttings were impractical. Visual examples of all groups cut at 4 cm in May 2011 are shown in Fig. 1.

Three mowing treatments were applied to designated plots continuously over 2 years from April 2011. The period of mowing the lawns was bound by the start and end of the growing season in both years. Treatments were either (a) a monthly cut where plots were cut down to 4 cm on the same date of each month (weather

Table 1
Species groups and Stellaria values.

Latin	Common Name	Stellaria equivalent
Native Group		
Achillea millefolium L.	Yarrow	80
Bellis perennis L.	Daisy	23
Pilosella officinarum Vaill.	Mouse-Ear Hawkweed	19
Potentilla reptans L.	Cinquefoil	16
Prunella vulgaris L.	Selfheal	23
Ranunculus repens L.	Creeping Buttercup	19
Stellaria graminea L.	Lesser Stitchwort	1
Trifolium repens L.	White Clover	21
Veronica chamaedrys L.	Germander Speedwell	6
Viola odorata L.	Sweet Violet	23
Non-native Group		
Diascia integerrima E.Mey. ex Benth.	Twinspur	10
Lindernia grandiflora Nutt.	Blue Moneywort	9
Lobelia angulata G.Forst	Pratia 'Tredwellii'	7
Lobelia oligophylla (Wedd.) Lammers	Hypsela	5
Lobelia pedunculata R.Br.	Pratia 'County Park'	3
Mazus reptans N.E. Br.	Creeping Mazus	5
Mentha pulegium L.	Penny Royal	7
Parochetus communis D.Don	Blue Oxalis	8
Phuopsis stylosa (Trin.) Hook.f. ex B.D.Jacks.	Crosswort	10
Pilosella aurantiaca (L.) F.W.Schultz & Sch.Bip.	Fox & Cubs	48