



## Is colourful self-sustaining forb vegetation mere fantasy?



Mona Chor Bjørn<sup>a,\*</sup>, Jacob Weiner<sup>b</sup>, Marian Ørgaard<sup>b</sup>

<sup>a</sup> Department of Geoscience and Natural Resource Management, University of Copenhagen, Rolighedsvej 23, DK-1958 Frederiksberg, Denmark

<sup>b</sup> Department of Plant and Environmental Sciences, University of Copenhagen, Thorvaldsensvej 40, DK-1871, Frederiksberg C, Denmark

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### ABSTRACT

Biodiversity in urban and suburban environments can be supported through establishment of low maintenance-requiring herbaceous vegetation types. Here, we attempt to provide a perspective on the possibilities and limitations of establishing forb-dominated vegetation to support local biodiversity and contribute to changing public aesthetics concerning green spaces. Plant ecological theories, methods and experiences are the foundation for the design and establishment of such vegetation types. We emphasise the importance of high plant density and recurrent disturbance for the maintenance of forb communities. Well-established ecological theory tells us that totally self-sustaining herbaceous vegetation is not a realistic possibility. Without intervention, herbaceous vegetation will change over time and eventually be colonized by woody species through the process of succession. However, by applying a creative and strategic approach to establishment and subsequent management involving small scale disturbances, rather than solely a uniform maintenance regime, it may be possible to maintain a colourful, aesthetically appealing and species-rich forb dominated community that will support biodiversity and increase public acceptance of alternatives to conventional lawns in urban and suburban environments.

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### Introduction

Forb dominated herbaceous vegetation may become important in urban planning as one way to balance the important agenda of halting the loss of biodiversity and degradation of ecosystem services (EU, 2014) with preferred nature qualities of urban dwellers (Grahn and Stigsdotter, 2010; Peschardt and Stigsdotter, 2013). It has been shown that semi-natural herbaceous vegetation may be appreciated and accepted by many lay people but the perception is influenced by factors such as gender, age and education (van den Berg and van Winsum-Westra, 2010; Petersen et al., 2011; Qiu et al., 2013; Schipperijn et al., 2013).

Compelling arguments for introducing semi-natural herbaceous vegetation types to urban green space have been the lower establishment costs by sowing seeds rather than transplanting container-grown plants, and the lower maintenance costs, since municipalities across many countries have experienced budget cuts for park management over the last decade (Hitchmough et al., 2006; Randrup and Persson, 2009).

Naturally-occurring herbaceous vegetation has been the source of inspiration for semi-natural vegetation types, since these plant communities are generally maintained with limited biotic intervention such as grazing, mowing or burning (Smith and Rushton, 1994; Hansson and Fogelfors, 2000; Socher et al., 2013). Preserving species-richness in herbaceous vegetation is a major challenge (Tilman et al., 2006).

Forb vegetation is defined as herbaceous vegetation with less than 50% graminoid cover (UNESCO, 1973). We define colourful forb vegetation as species-rich forb-dominated vegetation with visual appeal across the growing season and a long flowering period, including attractive flowering peaks. Here we attempt to provide a new perspective on the possibilities and limitations of introducing colourful forb vegetation using local occurring plants in urban and suburban environments as alternative biotopes to conventional lawns, which covers up to 80% of urban green space (Pauleit and Duhme, 2002; Ignatieva and Ahrné, 2013).

### A synthesis between design and ecology

In the early 20th century a naturally-occurring plant community was considered by some ecologists to be a coevolved and highly integrated unit, which develops towards a climax community through germination, growth, flowering and seed dispersal

\* Corresponding author. Present address: University of Copenhagen, Department of Plant and Environmental Sciences, Thorvaldsensvej 40, DK-1871 Frederiksberg C, Denmark. Tel.: +45 29929278.

E-mail address: [chor@plen.ku.dk](mailto:chor@plen.ku.dk) (M.C. Bjørn).



**Fig. 1.** Limestone grassland is one of the most species rich herbaceous vegetation types in Northern Europe (Poschlod and WallisDeVries, 2002; Newton et al., 2012; Redhead et al., 2014). While botanists and ecologists recognize the diversity of such a community, it may at a first glance appear as homogeneous grassland comparative to lawns to the public i.e. it is not visually diverse (Photo: Jydelejet/Møn Denmark. M.C. Bjørn).

and death of individuals (Clements, 1936). Plant communities were classified after floristic-sociological principles (Braun-Blanquet et al., 1932). In horticulture the 'Lebensbereich' planting design tool was developed to assist the designer in matching the site conditions with the ecological requirements of the species used (Hansen and Stahl, 1981; Kingsbury, 2004; Kühn, 2011). Gleason (1926) argued that specific and well-defined community types do not exist in nature, because vegetation varies continuously in response to environmental conditions. In this view species have different niches

and will establish, mature and reproduce whenever environment is favourable. The weight of evidence over recent years has supported Gleason's view, so we argue that designers can use this theoretical framework to obtain persistent colourful forb vegetation along a continuum of environments (Figs. 1 and 2.). Although the factors maintaining coexistence of many plant species in a diverse community are not completely understood, we do have much applicable information about patterns of diversity (Grace, 1999; McCann, 2000; Tilman et al., 2006).



**Fig. 2.** Experimental species-rich forb vegetation (2 years old) at high planting density (30 plants  $m^{-2}$ ) established on inverted top/sub soil on ex-arable land. The experiment is part of a long-term study at the University of Copenhagen on plant community development after high-density transplanting of local and commonly found forbs from Northwest Europe (Bjørn, 2015) (Photo: University Research Farm in Taastrup/Denmark, M.C. Bjørn).

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