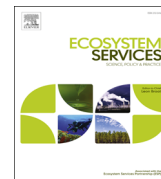




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Site-specific factors in the production of local urban ecosystem services: A case study of community-managed green space

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ABSTRACT

Pockets of green space in cities can provide important ecosystem services for urban residents. As naturalistic spaces in urban areas become increasingly sparse, communities are beginning to co-manage existing incidental pockets of land towards the creation of communal natural resources. Such green commons can be productive in terms of ecosystem services through targeted management such as in the case of urban agriculture. Although some work has been done to explore the motives behind and potential benefits of informal green space management, further research is required to understand those characteristics of site management and community input which contribute to the enhancement of site-specific ecosystem service production. A case study of ten examples of community-managed green space was undertaken to evaluate the contributory factors relating to site character and management which influenced productivity as defined by the cumulative provision of four urban-relevant ecosystem services. The analysis revealed that the level of community involvement, measured as intensity of volunteer hours, was highly instrumental in the productivity of sites. Food production also proved to be catalytic for the enhancement of ecosystem services whereas extent of vegetative cover and increasing site size were, counter-intuitively, detrimental to overall site productivity. The study therefore supports the promotion of participatory approaches to the management of ecosystems services in urban areas, particularly those which take small-scale urban agriculture as a primary practice.

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1. Introduction

Collaborative approaches to environmental stewardship through stakeholder management of ecosystems and the ecosystem services they provide have been given increasing support (Krasny and Tidball, 2015). Public stewardship and participation in nature-based activities were highlighted in the UK National Ecosystem Assessment (UK NEA) report (2011) as significant contributors to both human and environmental health and well-being. In that report it is stated that “a key knowledge gap regarding education and ecological knowledge goods concerns the processes by which adults acquire ecological knowledge, their participation in nature-based educational activities and how knowledge acquisition is influenced by engagement with environmental settings as a form of cultural service” (UK NEA, 2011, p.83). The authors of that report also highlighted, and recommended, increasing public participation in the management of ecosystems. Community-led ecological initiatives aimed at

environmental education and stewardship can go some way to bridging the disconnect that exists between humans and the environment (Miller, 2005). The promotion of environmental awareness and opportunities for positive human-nature interactions may help to reverse this trend and create more environmentally conscious communities and cities. Stakeholder involvement has likewise been promoted through international policies (CBD, 2001; MEA, 2005) which call for the appropriate decentralisation of natural resource management towards more localised and flexible stewardship of ecosystems and the services they provide. These assertions are echoed in the scientific literature where collective management of urban green commons by urban residents has been posited as one social-ecological measure that may be key in the building of more resilient cities in light of the major challenges they face (Ernstson et al., 2008; Biggs et al., 2010; Colding and Barthel, 2013). Civic ecological intervention has been promoted as an effective way of creating and preserving green infrastructure in urban areas (Krasny and Tidball, 2015). Such collaborative approaches to green space management therefore support the UK government's goal to promote green infrastructure in urban landscapes as outlined in the 2011 Environment White Paper (Defra, 2011).

Given these recommendations and that the actual benefits of

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stakeholder-led stewardship of urban spaces remain unclear, an understanding of the actual situation regarding the development and benefits of community-led ecological stewardship represents a contemporary research imperative.

1.1. Participatory approaches to management of urban green commons

Previous studies have highlighted the potential of collaboratively managed urban green space to deliver diverse benefits such as personal well-being and social capital (Hynes and Howe, 2004; Pudup, 2008; Krasny and Tidball, 2015), community cohesion (Okvat and Zautra, 2011) and crime reduction (Kuo et al., 1998). Studies have demonstrated that the stewarding of local urban nature also promotes a sense of place among communities (Stedman, 2003; ODPM, 2004; Kudryavtsev et al., 2012; Tidball and Stedman, 2013) which in turn builds on individual and community well-being.

Barthel et al. (2010) have championed community-horticulture as an important medium for the building of social-ecological memory and adaptive capacity, a theme echoed in studies into civic ecology (Krasny and Tidball, 2015). Although there is much evidence to support these claims, there is a paucity of research which examines such benefits through the lens of ecosystem services. In this regard, the unique productivity of collectively managed green space is often overlooked by local planning authorities (Francis, 1987) in favour of more familiar urban green space types such as municipal parks and nature reserves. Work has been carried out which demonstrates that stakeholder managed gardens exhibit greater biodiversity than more conventionally managed urban green space types (Orsini et al., 2014; Lin et al., 2015; Speak et al., 2015) and that biodiversity increases proportional to levels of user participation (Dennis and James, 2016). However, the benefits issuing from participatory approaches to green space management have yet to be effectively investigated as comprising discrete ecosystem services, nor the relationships between such services.

1.2. Ecosystem services in urban areas

Bolund and Hunhammer (1999), in one of the earliest works on urban ecosystem services, stated that, although all people regardless of whether they live in urban or rural areas are dependent on global ecosystems, “The quality of life for urban citizens is improved by locally generated services, e.g. air quality and noise levels that cannot be improved with the help of distant ecosystems.” (p.8). Despite such locally derived benefits from urban ecosystems, the authors of the *Millennium Ecosystem Assessment* (2005) chose largely to ignore the urban landscape and cities are generally seen as the recipients rather than producers of ecosystem services (Krasny and Tidball, 2015). Urban areas can however harbour biodiverse habitats (Smith et al., 2006; Davies et al., 2009; Goddard et al., 2010; Cameron et al., 2012) and, through forms of social-ecological innovation and civic engagement, provide ecosystem services in the form of pollination (Strauss, 2009), food production (Saldivar and Krasny, 2004; Lawson, 2005) and education (Krasny and Tidball, 2009).

Notwithstanding the presence of these potential gains from urban nature, the majority of research into urban ecosystem services has focused on those accruing to human well-being stemming from living in proximity to green space (Kaplan, 1995; De Vries et al., 2003; Jackson, 2003; Maas et al., 2006; Maller et al., 2006) and interacting with urban nature (Bird, 2007; Tzoulas et al., 2007; Marselle et al., 2014; Carrus et al., 2015); with larger scale studies concentrating on recreation, climate mitigation and water attenuation services (Van der Ploeg and de Groot, 2010; UK NEA, 2011).

The need to evaluate trade-offs, and synergies, associated with the provision of ecosystem services has been presented as a current management imperative in social-ecological systems (MEA, 2005) and, to this end, studies on urban ecosystems services have been carried out (e.g., Nelson et al., 2009; Power, 2010; Raudsepp-Hearne et al., 2010; Haase et al., 2012; Howe et al., 2014). Such studies document relationships between services at the landscape scale, but fail to address design or management considerations contributing to the productivity of urban green space types. Therefore, a better appreciation of on-the-ground service production by, as well as the use and management of, green assets in urban social-ecological systems is still required.

Sites of amenity green space in urban areas have been presented as being important to urban-relevant ecosystem services (Barthel et al., 2010; Niemelä et al., 2010; Ernstson, 2013), though attempts to quantify those services are few and the mechanisms which influence the productivity of such spaces are still little understood. Furthermore, at small scales of natural resource management, such as in the case of urban green space, little is known about the influence of design and management on productivity in terms of ecosystem services. Approaches to management of these green assets are diverse, especially in the case of informally-managed spaces such as community gardens and allotments, and little is understood about the characteristics of informal approaches to urban land use which contribute to the production of ecosystem services. Although the UK NEA Synthesis Report (2011) promotes a participatory approach to natural resource management, it provides little evidence of the mechanisms by which such an approach may effectively manage ecosystem services. The benefits of initiatives involving inclusive, stakeholder-led management of urban green space have been clearly asserted in the literature (Barthel et al., 2010; Ernstson, 2013) but as yet little work has been done to articulate such benefits as specific ecosystem services. Neither has there been any attempt to identify design or management approaches which may be synergistic with the production ecosystem services related to such innovative forms of green space management. Accordingly, the need for an increase in the body of research into ecosystem services production in urban areas was one of the key findings of the UK NEA (2011).

In order to address this gap in knowledge, a case study of ten informal, community-managed green space sites, covering four discrete management approaches, in the Greater Manchester area were examined. The sites were assessed across four ecosystem services (microclimate regulation, food yield, biodiversity potential, and education and well-being) and an evaluation was carried out on the contribution made to overall productivity of case studies by selected physical and management characteristics (vegetation cover, food cultivation area, genera richness, volunteer input, and site size) of the case study sites.

1.3. Study area

The study took Manchester, Salford and Trafford, three adjoining metropolitan districts in the Greater Manchester area, as its focus. This urban zone contains multiple examples of collaboratively managed urban green space (AfSL, n.d.; Dennis and James, 2016) which stem from a strong historical prevalence of social-ecological activism (Ritvo, 2010). Ten examples of autonomous, stakeholder-managed green space associated with four discrete management approaches were selected for the study. Case study locations within the study area are shown in Fig. 1 and site descriptions are presented in Table 1.

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