



Does ecological gardening increase species richness and aesthetic quality of a garden?



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ABSTRACT

Private gardens can incorporate a diversity of habitats for wild species and also provide a valuable network for meta-populations. Recently, attempts have been made to promote garden practices that increase native biodiversity and structural heterogeneity relevant to plants and animals. However, little is known about whether such practices contribute to the aesthetic quality of gardens. This study was based on a survey of 36 garden owners in Switzerland, a species count in their gardens, and a photo-questionnaire with 249 Swiss residents who rated the attractiveness of the gardens. The gardens included a gradient from conventional orthodox (frequent lawn mowing and weeding, intensive use of pesticides and fertilizers) to ecological unorthodox (infrequent lawn mowing and weeding, no use of pesticides and fertilizers) gardening practices. Our results clearly show that scientific concepts of ecological quality can align with cultural concepts of aesthetic quality. The more ecologically managed a garden, the more species it contained. The more species the garden contained, the more attractive it was to the sample population. Aesthetically pleasing gardens were characterized by the public as natural and species-rich, whereas aesthetically displeasing gardens were characterized as boring, normal, and species-poor. Ecological gardening was not considered to be more time consuming than conventional gardening. A lack of practical know-how was a greater constraint. Respondents were tolerant towards ecological gardening, but would not want their garden to be considered as chaotic.

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1. Introduction

Private gardens in Switzerland cover an area of 46,000 ha, i.e. greater than 1% of total land area (<http://www.bfs.admin.ch/bfs/portal/en/index.html>). They are concentrated in the Swiss midlands, a moderately species-rich area dominated by settlements and farmland. Compared to farmland, private gardens are relatively small. However, they constitute a substantial proportion of “green space” and hence are of potential significance for the maintenance of biodiversity (Gaston et al., 2005; Loram et al., 2007). In line with Gaston et al. (2005), we defined a garden as the private spaces adjacent to or surrounding dwellings. Gardens may comprise lawns, ornamental and vegetable plots, ponds, paths, patios, and temporary buildings such as sheds and greenhouses.

Private gardens can incorporate a variety of native wild plant and animal species (Thompson et al., 2003, 2004; Cannon et al.,

2005; Osborne et al., 2008), and provide a large variety of small-scale structures like ponds, wood piles, hedges or fences that can act as habitats for wild species (Osborne et al., 2008; Davies et al., 2009). Even when private gardens are too small to support viable populations of most species, they may act in fragmented landscapes as stepping stones for many species and provide a valuable network of habitats for meta-populations (Rudd et al., 2002; Smith et al., 2005).

Recently, attempts have been made to promote ecological gardening approaches with the aim of increasing native biodiversity (Matteson and Langellotto, 2011; Sperling and Lortie, 2010). These approaches are called “wildlife gardening”, “ecological gardening”, or “naturalistic gardening” (e.g. Gaston et al., 2007; Kiesling and Manning, 2010; Sperling and Lortie, 2010). We use the term “ecological gardening”. Ecological gardening is characterized by gardening practices like the use of organic compost, no or only minimal pesticide and artificial fertilizer use and weeding, and rather infrequent lawn mowing (Kiesling and Manning, 2010). Ecological gardening also includes the provision of a diversity of resources and habitats for wild species (Davies et al., 2009; Sperling and Lortie, 2010). This may include the feeding of birds, the provision of nesting opportunities for wild bees or birds, and the

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provision of ponds to attract amphibians (examples in Gaston et al., 2007; Osborne et al., 2008; Davies et al., 2009). Even the addition of a small patch of soil was found to provide space for seeds and invertebrates, and to significantly increase species richness (Sperling and Lortie, 2010).

Interest in ecological gardening has increased because of perceived benefits for native plant and wildlife populations. However, little is known about whether ecological gardening practices not only increase species richness, but also contribute to the aesthetic quality of gardens. People are more likely to engage in ecological gardening if they feel that the results are aesthetically appealing (van den Berg and van Winsum-Westra, 2010). Feelings concerning aesthetic appearance are influenced by visual appearance and underlying garden design, and aesthetic appearance may or may not lead people to garden designs that are consistent with an ecological function. Moreover, individuals are more likely to implement ecological gardening if they feel their neighbors also are doing so, or feel that their neighbors support their effort (Nassauer et al., 2009).

Recent studies have shown a growing nature-friendliness in European countries with strong preference for variation, naturalness, and diversity in natural ecosystems (van den Born et al., 2001; Nielsen et al., 2007; Lindemann-Matthies et al., 2010; Junge et al., 2011). Moreover, results from diversity manipulation experiments and field studies have consistently shown that people's aesthetic appreciation of plant communities increase with species richness (Lindemann-Matthies et al., 2010). The presence of certain herbs with brightly colored flowers like *Papaver rhoeas* increased the appreciation of communities, while the presence of some grass species decreased it. Other studies have also found a preference of humans for brightly colored flowers (Heerwagen and Orrians, 1993; Lindemann-Matthies, 2005; Lindemann-Matthies and Bose, 2007). Psychologically, the increase in visual complexity with increasing species richness might explain the higher aesthetic appreciation of high-diversity communities (Leder et al., 2004 and references therein). On a larger scale, humans prefer landscape scenes with moderate to high levels of complexity, measured as the number of independently perceived elements in the scene (e.g. Ulrich, 1986; Kaplan and Kaplan, 1989; Junge et al., 2011).

We therefore hypothesized that ecological gardening will increase both the species richness and aesthetic quality of gardens. To test our hypothesis, we investigated 36 private gardens in the canton of Zurich, Switzerland. We obtained (1) an ecological-gardening index (number of particular practices and features that may promote biodiversity) from a questionnaire with garden owners, (2) an index of species richness based on a 75-min count of local wild plant and animal species in the gardens, and (3) an aesthetic-rating index, obtained from a survey in which photographs of our study gardens were shown to the public. Our results contribute to the discussion whether cultural nature concepts are different from scientific concepts of ecological function (Nassauer, 1995a), and how species richness as an indicator for ecological quality in human-dominated landscapes can be enhanced while simultaneously enhancing their aesthetic quality for humans (Gobster et al., 2007; Miller, 2008; Lindemann-Matthies et al., 2010).

We hypothesized that women would be more in favor of ecologically-managed gardens as they had shown greater affinity for plant species richness than did men (Strumse, 1996; Lindemann-Matthies and Bose, 2007). It was also hypothesized that older people would prefer conventional gardens as they had been exposed to neat and tidy flower beds and mown grass over a long period of time (Özgüner and Kendle, 2006). Younger people, in contrast, might prefer ecologically-managed gardens due to increased ecological education in school.

We set out to investigate the following questions:

- (1) Does the number of local wild species in a garden increase with increasing ecological management, i.e. the number of ecologically beneficial practices applied and features present in the garden?
- (2) Does the ecological management of a garden depend on its owner's age and sex, knowledge about ecological gardening, time commitment to ecological gardening, and internalized sense of what others might find acceptable in a garden?
- (3) Is the public perception of garden attractiveness influenced by richness of wild species and ecological management?
- (4) Which attributes are used by the public to characterize differently managed gardens, and are they related to garden management, species richness and aesthetic ratings?
- (5) Are species-rich and ecologically-managed gardens characterized as species-rich and natural by the public?
- (6) Does the public have positive attitudes towards ecologically-managed gardens?

2. Methods

2.1. Selection of gardens

Overall, 36 gardens of owner-occupied, detached houses were selected in eight midsize towns (between 5000 and 30,000 inhabitants) in the canton of Zurich, a densely populated and economically important region in the Swiss lowlands. It is characterized by a mixture of settlement areas and intensively-managed farmland. Today's private gardeners are applying a variety of gardening approaches from conventional orthodox to ecological unorthodox (Kiesling and Manning, 2010). A conventional orthodox approach implies the frequent use of artificial fertilizers and pesticides, frequent lawn mowing and weeding. In contrast, an ecological unorthodox approach implies the mere use of organic compost, no pesticide use, the presence of a wildflower meadow rather than a lawn, and little weeding. Most private gardeners will not be purists of either extreme (Kiesling and Manning, 2010), but will use gardening approaches somewhere along the scale.

To increase variation, the 36 study gardens were chosen deliberately to vary in garden management (conventional orthodox to ecological unorthodox; see introduction). All study gardens were located in similar natural surroundings, i.e. a mix of urban settings and farmland, and at an elevation of 400–600 m a.s.l. To minimize the effect of scale on species richness (e.g. Whittaker et al., 2001; Thompson et al., 2003), all gardens covered an area of 500–1000 m², which is also the typical size of a Swiss private garden.

2.2. Data collection

2.2.1. Survey with garden owners (step 1)

After the gardens had been selected, their owners were visited at home and asked to participate in our study. Participation committed them to fill-in a standardized written questionnaire and to allow researchers access to their properties during species counts in June 2009. All garden owners we contacted (53% women) agreed to participate. They were between 38 and 85 years old (mean age = 62 years). About 78% shared their garden with at least one more person, but only one person reported disagreements with the other decision makers about garden design and management.

The first part of the questionnaire investigated the degree of ecological gardening in the 36 study gardens. In multiple choice questions, garden owners were asked about the frequency of lawn mowing (once per week, every second week, once per month, 2–4-times per season, once per season), use of artificial fertilizers, use of pesticides (herbicides, insecticides, fungicides, etc.) and weeding frequency (regularly, rarely, never). Moreover, they were asked to

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