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Growing Nature – The Role of Horticulture in Supporting Biodiversity

Report No. F06AB12

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COMMISSIONED REPORT

Summary

Growing Nature – The Role of Horticulture in Supporting Biodiversity

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BACKGROUND

This report investigates current practices and approaches to promoting biodiversity through horticulture. Wildlife gardening is now a significant strand of horticultural activity in the UK. In the past five years there has been a programme of scientific research (the BUGS project) that has sought to quantify the value of urban gardens and horticulture to biodiversity and, for the first time, to provide a scientifically rigorous statement of what actually benefits biodiversity in terms of horticultural practice that goes beyond anecdote and casual observation. This work has shown that significant improvement in a garden's capacity to support biodiversity is readily achieved within the norms of conventional gardening, and it has challenged some of the previously held tenets of the wildlife gardening movement that relate to the role of native plants and maintenance practices. This report is set firmly in the context of this new thinking. By conducting interviews with a wide range of stakeholders and interested parties from across all fields of horticultural activity a picture is built of current attitudes towards the relationship between horticulture and biodiversity, and in particular of the reasons why that relationship is not more apparent 'on the ground' in both a public and private setting. A snap shot of gardeners' provision for wildlife is provided through an analysis of respondents to the RHS's 'Wild about Gardens' website. A series of case studies embedded in the report provide support and detail to illustrate some of the key points arising from the findings.

MAIN FINDINGS

- The most significant and recurring finding of the interviews with stakeholders in this study was the belief that the best actions to increase biodiversity gain through gardens and gardening is simply to increase the number of people who actively participate in gardening. Although interviewees were universally of the opinion that wildlife gardening is important, even stronger is the view that any gardening is important for promoting wildlife.
- Gardeners neither understand nor use the term 'biodiversity'. 'Wildlife' is a far more meaningful word to the average gardener, even if it often omits the entire dimension of flora and, for most people, invertebrates.
- Audiences react very positively to wildlife-friendly gardening programmes or articles: the media are successful in informing and inspiring those who are already interested – who tune in or read – but may miss completely those who do not. Programmes that inform audiences

about local wildlife, rather than about gardening, may have the greater impact on encouraging garden owners to create 'habitat'.

- All respondents saw biodiversity value in non-native plants.
- Key opportunities for promoting biodiversity through horticulture included the increased awareness of the public to environmental issues; and evidence of changes in gardening practice. There was almost unanimity that there has been a significant change in gardening practice over the past decades, so that wildlife gardening is now more than a niche market; it is an industry. This has been accompanied by a significant increase in purchases of wildlife-friendly products, like bird food, rather than in a reduction in the use of pesticides.
- Barriers to realising these opportunities include lack of public and professional understanding of underlying environmental issues; public opinion - what wildlife gardening looks like is a barrier to many people; a conservative corporate culture; the higher cost of 'eco-products'; and a lack of skills in the horticultural sector.

Methods for overcoming these barriers include having a clear and consistent message; effective leadership; and the development of demonstration projects and education at all levels.

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GROWING NATURE –THE ROLE OF HORTICULTURE IN SUPPORTING BIODIVERSITY

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Table of Contents

Commissioned Report summary	1
Acknowledgements	3
Table of contents	4
1. INTRODUCTION	5
1.1 The resource	6
1.2 Broad definitions of biodiversity	7
1.3 Horticulture and biodiversity	8
1.4 Gardening practice and biodiversity	9
1.5 Emerging research findings on the above	10
1.6 Key areas of interest and debate	11
2. RESEARCH FINDINGS: DATA ANALYSIS	13
2.1 Methodology	13
2.2 Taking action for wildlife	13
3. RESEARCH FINDINGS: INTERVIEWS	16
3.1 Methodology	16
3.2 Attitudes and influences on private gardeners	16
3.3 Issues of practice	22
3.4 Opportunities	33
3.5 Barriers to realising opportunities	33
3.6 Realising opportunities and overcoming barriers	37
4. CONCLUSION	44
5. CASE STUDIES	
Harlow Carr Garden	21
Garden Organic	24
Wiggly Wigglers	25
Dobbies Garden Centres	28
Cally Gardens	29
'Garden for Life'	32
John Little	39
Landlife	41
Threave Castle	42
References	47

1. INTRODUCTION

Wildlife gardening has been a significant strand of horticultural activity in the UK for at least four decades, and for far longer in several other European countries. What started out as a fringe activity promoted by a small band of environmental activists is now a fundamental component of the gardening media: indeed it is virtually impossible to watch a television gardening programme or read a garden magazine without finding mention of environmentally-friendly activities, 'sustainability', organic methods, and wildlife and habitat. This is a huge and exciting advance. Ecological references are everywhere, whether they relate to the nature conservationist's ideal of a native-plant garden full of wild nature, through to the highly stylised designer-gardens with naturalistic swathes of meadow-like grass and perennial plantings, which may not include any native plant species, but which provide an excellent resource for wildlife, and require relatively low inputs to keep them going compared to a traditional garden.

Given this 'mainstreaming' of ecological ideas, why do we regard this report, which considers the relationship between gardening, horticulture and biodiversity, to be essential and extremely timely? Surely there are numerous publications and reports in this field already – why add to this growing pile? We consider that there are two main reasons that support the need for a report investigating current practices and approaches to promoting biodiversity through horticulture.

Firstly, given the high-profile of the publicity and media attention that wildlife gardening has attained, it is apparent that mainstream practice, in both the public and private context, is not necessarily responding to the 'conventional wisdom' that has developed since the 1970s about how best to garden for wildlife and in tune with nature. We have evidence for this all around us, whenever we walk along a suburban street and look at what is happening to front gardens, or when we take a stroll through the local public park. At the garden centre or DIY store, there is very little up-front promotion of what might be called environmentally ethical horticulture beyond the marketing of bird-feeding materials and structures. In this sense, traditional gardening is still very much the economic driver of the horticultural industry. Is this conservatism simply a result of a time-lag between the media and professional message and the way that the public gardens, or is there a more fundamental problem with the message itself?

Secondly, over the past five years there has been a programme of scientific research that has sought to quantify the value of urban gardens and horticulture to biodiversity. For the first time, research is providing a scientifically rigorous statement of what actually benefits biodiversity in terms of horticultural practice that goes beyond anecdote and casual observation. This work (Biodiversity in Urban Gardens or BUGS) is set to revolutionise the way that we view gardens and their contribution to biodiversity, particularly in the urban context. A greater consideration of the findings of the BUGS programme is given later in this report, however many of the tenets that have been promoted as being central to the wildlife gardening movement, and which form the core of the messages referred to above, are being seriously challenged by the BUGS results. These revolve around the necessity to work with native as opposed to non-native or ornamental plants, the need for large gardens as opposed to small gardens, and the requirement to have unmanaged and less tidy areas as opposed to a neat, tidy or ordered garden. Indeed, the key points that arise from the BUGS work are that it is not necessary to follow the wildlife gardening rules that have previously been promoted in order to achieve a significant degree of benefit for biodiversity; that the conventional garden supports a far greater variety of life than has previously been suggested; and that the simple activity of gardening has considerable environmental benefit in itself.

The overall message is an extremely positive one from a horticultural and an ecological viewpoint. It suggests that the greater the variety of plants within a garden, and the greater the number of 'layers' (lawn, perennial, shrub and tree layers), the greater the faunal diversity. The origin of those plants (ie native or non-native) is much less important. However, while the findings of the BUGS project are set to have a profound influence on the way we view gardens, horticulture and wildlife, they also challenge much of what has gone before.

This report aims to investigate current practices and approaches to promoting biodiversity through horticulture. By conducting interviews with a wide range of stakeholders and interested parties from across all fields of horticultural activity we seek to build a picture of current attitudes towards the relationship between horticulture and biodiversity, and in particular on the reasons why that relationship is not more apparent 'on the ground' in both a public and private setting. But secondly, we believe that this report represents the first opportunity there has been to test the validity and acceptability of the concepts and findings of the new thinking on gardening and wildlife amongst a range of practitioners and relevant individuals, bodies and agencies. A series of case studies embedded in the report provide support and detail to illustrate some of the key points arising from the findings.

1.1 The resource

Gardens represent an ideal opportunity to engage people with important environmental issues in a way that is directly relevant to them. Moreover, the garden represents a means by which people can influence directly and exercise some control over environmental indicators, such as biodiversity, recycling and energy use, in a manner that is immediate and obvious to them. There are estimated to be 6 million dedicated gardeners in Britain (Hitchmough, 2005) and 16 million private gardens. Private gardens are estimated to constitute a quarter of the urban land area (Thompson *et al*, 2003) – often covering a greater surface area than the combined area of parks and woodlands of a typical city (Dunnett & Qasim 2000). The percentage of people regularly participating in gardening activities rose from 42% in 1977 to 49% in 1996 (ONS 1998; cited by Bhatti, 2006). The gardening culture in Britain is immense, ranging from home gardeners to the holders of one of the 630 special collections of plants to thousands of private gardeners who open their gardens to the public. Moreover, garden visiting is a major leisure activity, to public and institutional gardens, and also to the thousands of private gardens open regularly under the open garden schemes in England, Wales and Scotland. The relationship between gardens and gardening activities and their wider environmental impact is related not only to the practice and approaches of individual gardeners, and the way their gardens are managed, but also to the sources of information (largely via television) that gardeners receive, which largely dictate prevailing mass gardening fashions. What is possible is also a by-product of what is available and what is economically viable. Environmental auditing of the horticultural supply chain, from product sourcing and production, through to point of sale and marketing, can indicate substantial opportunities for identifying sustainable practice and promotion of environmentally beneficial products.

But it is not just at the level of gardens and gardening that horticulture has an impact on biodiversity. On a wider level, urban green space (parks, allotments, community gardens, cemeteries, woodlands, and countless patches of open space amongst housing or alongside roads and rivers) represents a great resource for supporting wildlife and nature in cities. Because of their size and scale, it is possible to coordinate maintenance and management over a larger area in a way that is not possible with the myriad individual small private spaces. However, until recently, management of such spaces for the benefit of both people and wildlife has taken a back seat to the priorities of a predominantly recreational focus, with parks often

sitting within a 'leisure services' portfolio of a local authority (Dunnnett et al 2002). It is time to update that Victorian vision of parks as places for rest and relaxation in the midst of the grime and smoke of the industrial city, and place biodiversity and nature at the centre of a new vision for rich and exciting green spaces that are healthy, full of chances for play, beautiful and fulfilling for people, and which are alive with interest and fascination (CABE Space 2005).

Figure 1. A wildflower meadow adding colour and biodiversity value to a local urban park



Image: J Hitchmough

On all these levels horticulture matters, and it matters not only in terms of environmental quality but also in terms of human quality of life. With the virtually unchecked simplification of the countryside, almost unprecedented housing development pressures, and the spread of development into greenfield sites, the biodiversity of cultivated green space in private gardens and public parks is becoming more important. There is concern that the general public as well as the authorities need to be informed about the huge significance that conventional gardens have for wildlife, and measures that must be taken to prevent the loss of gardens and the associated wildlife to development and car parking. The newly surfaced apprehension about climate change is adding urgency to this concern.

1.2 Broad definitions of biodiversity

1.2.1 Scientific issues

Biodiversity is generally defined as the variability among living organisms from all ecosystems and the ecological complexes of which they are part. This includes diversity within species, between species and of ecosystems. As such, biodiversity can refer to the richness of life at any scale, from a small back yard through to an entire region, country or continent. In the Scottish Biodiversity Strategy (2004), this is put in simple terms as representing the huge diversity of life at all levels existing in the surrounding environment and its value to human beings. This philosophy underpins Scottish Natural Heritage's guiding principle that, in order to sustain human life, nature has to be looked after (SNH, 2003). The reasons put forward for the importance of biodiversity are varied and remain the subject of ecological debate; nonetheless, it is generally accepted that more complex and diverse biological systems are more resistant to, and resilient against, environmental change than very simple systems of low diversity. Regardless of the academic debate, there are strong moral and ethical reasons for protecting species, ecosystems and genetic diversity (Attfield, 1999), and many would also argue that

aesthetically, complex and diverse systems are more attractive and beautiful than systems with low diversity. Indeed, in a horticultural context, the promotion of a rich variety of wildlife in a garden will generally be motivated through the feelings of pleasure and well-being to the gardener that this wildlife brings, rather than as a result of a fundamental understanding of the principles of nature conservation.

The concept of biodiversity masks a multitude of hidden meanings. At the most basic level it simply relates to the number of different species in a given area. However, there is a debate amongst scientists as to what is more important in biodiversity: the number of species or whether those species are rare or common (Bengtsson, 1998; Savard *et al*, 2000). It is now generally accepted that it is too simplistic to view biodiversity as a list of species (Purvis & Hector, 2000). When considering biodiversity in gardens, is the central concern the range of different fauna and flora, the rarity of the species sighted, or simply the abundance of wildlife? Is it just as valid to have a large number of common species, as it is to have one rare species?

1.2.2 *Biodiversity and wildlife*

It is important at this stage to make the distinction between the scientific notion of 'Biodiversity' and the more popular notion of 'Wildlife'. Biodiversity is a term rarely used by gardeners. The average gardener (and non-gardener) may refer to wildlife and nature. People will usually be selective in what they regard as positive wildlife, and will be thinking of birds, butterflies and hedgehogs. Wildlife in a garden context is generally highly visible and attractive. People are generally in favour of 'wildlife'. 'Biodiversity' is a very different concept and includes the totality of life. The visible components of biodiversity (birds, mammals, large or colourful insects) represent only a tiny minority of the total biodiversity of a garden. The overwhelming majority of life in a garden is composed of invertebrates, and the majority of these will be small or insignificant or hidden, but nonetheless form the basis of wider food chains or ecological processes. It remains unclear, therefore, what concepts relevant to biodiversity mean to the average person.

1.3 **Horticulture and biodiversity**

Horticulture is viewed as a low-technology, low-status industry (Fitzgerald, 2003). It is therefore not surprising that, in Britain, the sector is experiencing a severe shortage of both recruits and skills, and research and development (R&D) is suffering severe cut-backs (Dixon, 2002; Jamieson & Associates, 2004). These factors inhibit the sector's contribution to biodiversity.

The skills shortage has a particular influence on the quality of the public realm, which is further constrained by financial resources. Maintenance is aimed at efficiency rather than at diversity or sensitivity to habitat, and is carried out by poorly trained staff. Some conservation charities, like the National Trust (of both England and Scotland) and the British Trust for Conservation Volunteers, are offering training courses (Jenkins, 2002; Weston, 2002) but this is insufficient to meet current or future demand. Only one university, Reading, offers a graduate training scheme for horticulturalists. Poor wages and low status perpetuate the lack of interest in professional qualifications in the sector.

Public funding for 'production-oriented' R&D is falling continually (Spedding *et al*, 2002; Seabrook, 2006). Research is needed for growers to assist them in such areas as chemical input reduction, integrated pest management and organic horticulture, as well as helping the industry to adjust to government objectives, such as reduced peat use and sustainable water management. In contrast to cuts in funding for horticulture in Britain, the Dutch government is

injecting a further £1.5 million per annum for the next four years to the protected ornamentals branch of horticulture alone (Sawyer, 2002; Spedding *et al*, *op.cit.*).

The lack of knowledge, skills and technologically-efficient alternatives is viewed as an impediment to more sustainable horticultural practice. Some messages are getting through. There has been a significant switch to using grey water for irrigation amongst commercial growers. In addition, professional growers have, over the period 2000-06, reduced the proportion of peat they use by 15%. The government's target of a reduction in peat use of 90% by 2010 is regarded as unrealistic, although the Growing Media Association believes that the current state of scientific knowledge on peat and peat alternatives means that a target of 60% peat replacement is achievable. The National Farmers' Union claims that the government fails to appreciate the costs involved in switching an entire industry to reduced-peat and peat-free media, and that it does not understand how its policy disadvantages UK growers vis-à-vis competitors, who are not constrained by the same rules (NFU, 2006).

Much transport of horticultural products takes place by road, incurring some costs in terms of congestion, pollution, accidents, noise and road maintenance, construction, enforcement and administration. The cost to the user of most modes of transport has been going down year on year and does not reflect either its social or carbon cost (Anon, 2006r; Whitelegg, 1992). This is particularly true for the long-haul trucking involved in the transportation of plants, and air transportation of horticultural perishables. Shipping is a far more fuel-efficient form of transport, but is problematic for horticultural products that are highly perishable.

The introduction of plants from other parts of the world increases local biodiversity in British horticulture, but there are costs. There are now very strict regulations governing the importation of plant material via the CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora). Some plants may not be imported at all, and introductions should largely be restricted to seed. Propagation should be made as widely available as possible to deter illegal trafficking and satisfy demand. Local people in developing countries may make a living by propagating plants (especially bulbs) which are wanted for sale in other countries (RHS 2006). However, importing vegetative plant material (as opposed to seeds) from all over the world potentially introduces new pathogens and pests into Britain every year (Anon, 2002c; Anon, 2003g). Climate change is likely to exacerbate these risks.

1.4 Gardening practice and biodiversity

The debate about the relative roles of art and nature in gardening is centuries old (Woudstra & Hitchmough, 2000), although it is only since the 19th century that 'nature' has been endued with the principles of ecology. Indeed, only in the past few decades have approaches to planting design been informed, to a varying extent, on ecological principles (Dunnett, 2004), influenced by German, Dutch and Swedish practice and it is only in the past decade that the concern about gardening for wildlife has become an issue for more than a handful of private gardeners.

The concern for nature conservation has developed in parallel. This has a 150-year history in Britain, which now has more voluntary conservation groups than any other country (Marren, 2002). Until the 1970s, nature conservation was primarily a rural pursuit. 'Habitat creation' in urban areas has been pursued since the late 1970s. Initially, this took the form of imitation-countryside wildlife havens. A significant volume of research on urban ecology in the 1980s and 1990s has refined views on what supports urban biodiversity, although the dominant culture of nature conservation in Britain remains rural in perspective, and many in the conservation profession still see gardens (and horticulture) as an irrelevance in terms of biodiversity (McIntyre

et al 2000). Nevertheless, many urban people make 'wildlife gardens' because of a feeling of responsibility towards native wildlife and a concern about the loss of the traditional countryside (Baines, 2006).

These two strands – of art vs. nature and of nature conservation – are being woven together at the beginning of the 21st century. SNH's Plant for Wildlife initiative began in 1999, and English Nature's first project on wildlife gardening was launched in the spring of 2000. Since then, there has been an increasing flow of leaflets, guides, magazine articles, websites and television programmes from an increasing number of sources, and growing interest on the part of amateur gardeners. A MORI poll commissioned by the Royal Horticultural Society in 2003 found that 70% of respondents said that they were prepared to consider wildlife in their gardening practices (Thompson, 2006b). The evidence that the wildlife message is being picked up is shown by the huge increase – over 30% annually for the past decade – in the sales of 'wildlife-friendly' products, like winter bird food, bird boxes and bug houses.

This does not imply a consensus view. Many gardeners have an either/or approach to quality horticulture and habitat diversity, believing that the pursuit of one objective automatically rules out attainment of the other.

Mixed messages from the conservation movement are also a problem. For example, a section of the wildlife movement in Britain at one time adopted a rigid 'natives only' stance on species selection. While this view has changed amongst experts, there is still a strong grassroots belief in the conservation community that native is fundamentally best.

1.5 Emerging research findings on the above

Although still a relatively young field of research, there is mounting evidence that a conventional garden can be as attractive to wildlife as a wild garden. Gardens, as they currently exist, and even where gardeners are not consciously intending to support wildlife, show high levels of biodiversity. This is not dependent on how wild a garden is. Formal gardens may be as good for some species as more unkempt gardens. Moreover, it appears that a garden's wildlife value can be increased by manipulating it in minor rather than radical ways.

The most thorough investigation yet of biodiversity supported by urban gardens and the factors that influence this – the Biodiversity in Urban Gardens (BUGS) project (Smith *et al*, 2005; 2006b; Gaston *et al* 2007) – found that the following factors improve biodiversity:

- the height of vegetation, especially canopy over 2m high (trees and large shrubs);
- the number of trees;
- the amount of leafage;
- the number and range of different flowering varieties (a mix of flower types -flat, tubular, night-scented, long flowering periods and seasonal variety are important as nectar sources for invertebrate diversity);
- ponds, compost heaps, hedges, dry walls, log piles, litter and long grass are also important.

The provenance of plants does not appear to be a particularly important factor in supporting wildlife, because many herbivores select species within a genus or family, regardless of original

provenance. Also of dubious importance is the size of garden and diversity of features in a single garden (lawns, flower beds, etc.). These do not matter, because gardens exist as part of a mosaic of gardens, so that the aggregate provides size and variety to support different taxa of fauna (Baines, 2006). This heterogeneity produces many niches or opportunities for many different types of insects (Thompson *et al*, 2003).

The primary negative factors for biodiversity are hard surfaces and extreme tidiness. There is still work to be done on the effects of chemicals used in garden management, although the BUGS study suggested that high invertebrate diversity was also found in gardens subject to some pesticide use, probably because gardeners apply pesticides only occasionally in particular areas at particular times.

The BUGS study supports other studies made of individual gardens, for example, Owen (1991). From work on her own garden in Leicestershire, Owen suggests that gardens might be the most important nature reserves in the country on the basis of species diversity per unit area. It is estimated that gardens may be able to provide habitat space for half of Britain's invertebrates (Thompson, 2006b). Gardens are becoming refuges for both common and rare species, like the stag beetle (London Wildlife Trust, 2005). Most species of ladybird now live in gardens, rather than the countryside (Marren, 2002).

The BUGS study covers the urban areas of six cities (Belfast, Cardiff, Edinburgh, Leicester, Oxford and Sheffield and, it has important implications for all urban locations. Domestic gardens typically comprise 27% of urban areas of towns and cities in the U.K (Loram *et al*, 2007), and play a critical role in the maintenance of biodiversity, as they network to form a varied habitat over a large area (Smith *et al*, 2005). Together with other forms of urban green space, private gardens help to lessen the impact of urbanisation on biodiversity (Mason, 2000; Smith *et al*, 2006a).

1.6 Key areas of interest and debate

1.6.1 Origin of plant materials

The provenance of plants is a complex debate. There are several issues in the native vs. non-native debate. The first is the number of other species a species supports. It has been found, for example, that common native woodland species support a greater number of invertebrate species than less common natives and non-natives (aliens) (Kennedy & Southwood, 1984). On the other hand, ash, hazel, yew and holly, all natives, support very few native species. It remains an open question amongst scientists as to which is more important: the number of different species or the total biomass supported. For example, the alien sycamore is known for its attractiveness to aphids, and is therefore important to some bird species. Despite its vilification by some conservationists, it is a better host than most other species for mosses, lichens and liverworts, and may adapt faster to increases in temperature than other species of tree (Mabey, 2005). Some researchers would go further than this, arguing that it is clear that some exotic plants support greater diversity than some natives (Kendle and Rose, 2000).

Indeed, there is an emerging view in the literature that the provenance of plants does not appear to be a particularly important factor in supporting wildlife, because many herbivores select species within a genus or family, regardless of original provenance (Smith *et al*, 2006b citing Hodkinson and Hughes, 1982). Non-native species may be as (or more) effective in supporting biodiversity, especially if the aliens belong to native genera. A study for Scotland

found that even though non-native plant species dominated the study gardens, at least half of these belonged to native genera (Saville 1997). This is what matters for wildlife.

Figure 2. Single flowered Dahlia; an example of an exotic plant that is exceptionally attractive to butterflies



Image: J Hitchmough

The fact that non-native species are also good for biodiversity in no way diminishes the importance of native species in supporting biodiversity. Native plants are clearly vital in this regard, and this is particularly important for fauna such as butterflies that depend on a specific native food plant. Common native species, and trees in particular, often give a region its distinctive character. They create a sense of place, and aid conservation education through learning to understand local surroundings, which facilitates a greater understanding about the broader context (Kendle & Forbes, 1998). Rare native species are often culturally valued for the very fact that they are rare, more exciting and interesting to spot. These 'flagship species' may aid conservation efforts by increasing interest and support, including financial, but these species may in themselves support few other species. In a garden setting, however, choice of plants is driven largely by appearance and performance rather than by rarity or geographic origin. Hence the most attractive native species are widely cultivated. Those judged less attractive, however worthy in ecological terms, are not. This conundrum is difficult to overcome in garden contexts, where personal choice rather than biodiversity policy dominates. In other urban situations, for example parks and public greenspace, there is a greater opportunity to integrate ecologically important, but less obviously attractive native species into the fabric of the landscape.

1.6.2 Garden styles

A cycle of the dominance of nature and then art in gardening fashion has existed for centuries (Woudstra & Hitchmough, 2000). There are swings in garden style over time, from the formal to the informal, from tight control to a looser more naturalistic style of planting. However, since the Victorian period, there has been no dominant domestic style, and amateur gardeners draw from a variety of influences. Nevertheless, there are still gardening fashions, which tend to be guided by the gardening media, especially television. The past few decades have witnessed new approaches to planting design, variably informed by ecological principles in combination with aesthetics (Dunnett, 2004; Kingsbury, 2004). The main journal of the Royal Horticultural Society, 'The Garden', has featured this style consistently for several years (Dunnett, 2000;

Dunnett & Hitchmough, 2001; Hitchmough & Stokes, 2002; Ardle, 2005). These new approaches present a challenge to the widely held notion that to be attractive to wildlife gardens must be unattractive to humans and vice-versa.

Figure 3. An example of garden planting design informed by ecological principles



Image: J Hitchmough

2. RESEARCH FINDINGS: DATA ANALYSIS

In 2006 the RHS ran a web based survey 'Wild about Gardens' to reveal more about gardeners' activities to attract wildlife. The survey ran between 2 and 17 September 2006, and was completed by 1,501 people from nine English regions, Wales, Scotland and Northern Ireland. There are inherent problems with the data collected in this survey. Respondents were a self-selecting sample of 'wildlife-friendly' gardeners. One indicator of this is that over 50% of respondents had garden ponds, which is unlikely to be the case for the general population. On the other hand, what was observed from gardens with ponds is consistent with the findings of more scientifically rigorous research. The web-site data are best viewed as a snap shot of gardeners' activities and observations. Although the respondents were clearly interested in garden wildlife, there is no indication to suggest that they were in other regards anything other than fairly typical gardeners. Little expert knowledge exists in this area of gardening, and very little systematic research has been carried out examining the relationship between wildlife and gardens until recently. For these reasons, an examination of the data is interesting.

2.1 Methodology

Data were tabulated to assess frequency of occurrence of different activities and sightings, and then chi-squared tests were performed to ascertain the significance of cross-tabulations of data. The findings are summarised below.

2.2 Taking action for wildlife

2.2.1 General features that encourage wildlife

Gardeners were asked about whether they included plants in their gardens specifically to encourage wildlife, whether they had areas of long grass, and whether they had a pond, marshy area or other water feature. Also explored was the extent to which tidiness was foregone in order to accommodate biodiversity, eg by leaving perennials standing in autumn and winter and by heaping leaves or spreading them on beds rather than clearing them.

Table 1: Q3, Q8, Q9, Q11, Q13

	Yes (garden < 30m ²)	Yes (garden 30-100m ²)	Yes (garden > 100m ²)
Plants to encourage wildlife	77%	75%	80%
Areas of long grass	34%	44%	62%
Pond	36%	47%	59%
Leave perennial plants standing	59%	65%	72%
Heap leaves into a pile or spread	40%	50%	62%

Q corresponds to the numbering on the RHS questionnaire

Gardens of all sizes have features that provide cover and food for wildlife. The most widely practised activity, in all sizes of garden, is including plants specifically to encourage wildlife. Analysis of the data revealed that there is a significant correlation between the size of garden and provision of these features. This may be a reflection of attitudes to tidiness: unkempt areas are harder to tolerate in smaller gardens where less space is available. This finding supports that of the BUGS research, which showed that larger gardens tended to have more uncultivated or undisturbed areas. (Smith et al., 2005)

2.2.2 Providing food and habitat for vertebrates

The Wild about Gardens project collected data on whether respondents put out food or nesting boxes for different kinds of vertebrates: birds, hedgehogs, foxes badgers and bats.

Table 2: Q14, Q15, Q16

	Yes
Food left out for birds	93%
Food left out for hedgehogs	25%
Food left out for foxes	10%
Food left out for badgers	4%
Have bird nest box(es)	67%
Have bat boxes	8%

The most popular activity related to wildlife gardening in Britain is putting out bird food, and the data show that 93% - nearly all - of respondents engage in this activity. A comparatively high proportion of the gardeners also attempt to attract hedgehogs by leaving food for them. The data also show that people with smaller gardens are marginally more likely to put out food for hedgehogs. Smaller gardens tend to be further from traditional hedgehog habitat, but this may be precisely why gardeners go to additional effort to attract them.

The majority of participating gardeners also have bird boxes in their gardens. This practice is significantly correlated with garden size (which, in turn, correlates with the greatest number of trees). Indeed, less than half (46%) of gardeners with gardens under 30m² had bird boxes, compared with 76% in gardens over 100m². The likelihood that gardeners will put up bat boxes was also found to increase significantly with larger gardens.

2.2.3 Providing food and habitat for invertebrates

A sizeable proportion of gardeners deliberately provide food and other support for insects, earthworms and other invertebrates.

Table 3: Q12, Q14

	Yes
Have open compost bins	37%
Have enclosed compost bins	60%
Have woodpile or heap of stones	71%
Have other undisturbed area	55%
Have artificial insect nests	26%

There appears to be a high consciousness amongst the gardeners participating in the Wild about Gardens project of the range of things that attract wildlife. The presence of compost bins is ambiguous, as their primary purpose may be recycling rather than biodiversity. Nevertheless, a sizeable proportion does engage in a range of activities to encourage invertebrates. Analysis of the data showed that garden size is again significant in all the most important factors for encouraging wildlife shown in Table 3.

2.2.4 Sightings of declining species

Data collected show that larger gardens generally provide more sightings of wildlife, including species believed to be in decline, although it is not possible to correlate sightings with specific actions to encourage biodiversity. There are other reasons why larger gardens have more birds, reptiles, mammals or insects: they have more trees or are closer to other habitat. Moreover, casual sightings by gardeners are rarely recorded systematically over time or space, and observers may not be sufficiently knowledgeable to know what they need to look for.

However, the data do show that all species of wildlife that were monitored, even those that are considered to be declining, were seen in all sizes and locations of garden. In many of these gardens, the gardeners do engage in activities to attract wildlife.

2.2.5 What can be learned?

The 'Wild about Gardens' data provide evidence that at least some gardeners are informed about which activities support and attract wildlife, and that they engage in these activities. Almost all make an effort to encourage birds. A significant number of gardeners makes provision for invertebrates, and are willing to tolerate some 'wildness' in order to create habitat. While some activities undertaken by participating gardeners are eco-friendly maintenance practices that do not involve purchases, by far the most frequently practised do involve the purchase of plants, food and other eco-friendly products. There are therefore commercial benefits to promoting wildlife gardening.

3. RESEARCH FINDINGS: INTERVIEWS

3.1 Methodology

A series of twenty eight hour-long structured interviews was conducted between January and March 2007 with representatives from the 'horticultural supply chain' - businesses, designers, gardening and biodiversity charities, and the gardening media. These are the agencies most likely to influence amateur gardeners, by supporting gardening through the sale of plants and sundries, the provision of information and the creation of cultural expectations and practice.

One primary aim of the research was to ascertain how the horticultural supply chain determines the degree to which private gardening fosters biodiversity. The interviews were conducted to test the ideas that arose from the literature, to explore influences on private gardeners and, more importantly, to identify what are likely to be the key barriers to enhancing biodiversity in gardens in practice, and how policy and practice may address this.

To supplement the interviews, a series of case studies was also undertaken in Scotland and England of people or organisations that are leading the field in delivering biodiversity enhancement within a garden context. The aim of the case studies was to illustrate best practice or ways of overcoming barriers to enhancing biodiversity within public or private gardens.

3.2 Attitudes of, and influences on private gardeners

3.2.1 The meaning of 'biodiversity'

Experts interviewed are overwhelmingly of the view that gardeners neither understand nor use the term 'biodiversity'. It is not often that the word 'biodiversity' arises in any of the gardening magazines read by the public at large, although the term has been appearing more recently in the RHS Journal 'The Garden' (O'Toole, 2003; Anon. 2006m). However, there is a strong feeling amongst interviewees that 'biodiversity' is jargon and does not communicate. 'Wildlife' is a far more meaningful word to the average gardener, even if it often omits the entire dimension of flora and, for most people, invertebrates. Interviewees are universally of the opinion that technical terms switch people off, while the use of familiar language engages people immediately. People need to identify eco-friendly practice with what they see and do in their gardens.

Even amongst interviewees, the definition of 'biodiversity' differs. Several were reluctant to attempt a definition at all. At least three of the respondents stressed the human element in the use of the term biodiversity and wanted people to be seen as important in the applications of biodiversity practice and ethics. For example:

'Biodiversity has to extend to the human community which may surround it. The biodiversity of green space cannot be properly understood without the users appreciating the natural elements of the green space and their role in it.'

3.2.2 Influences on private gardeners

In the past, gardening fashions were determined by royalty and the landed aristocracy. Now, gardening style is very much led by television gardening celebrities and the selling power of garden centres, themselves often responding to recommendations of the gardening media (Anon, 2000b, Perry, 2002). For the mass gardening market, these influences have become

dominant, overtaking long-established methods of gaining information. There are hundreds of flower and produce shows all over the country every year, but these are steadily diminishing, because of competition from television, which offers a broader range of issues as well as coverage of major events, and from garden centres, which offer 'day-out' gardening-related experiences (Swift, 2006).

The media present several versions of biodiversity to viewers. Most nature programmes are international, suggesting that nature is 'over there' rather than nearby in the city. These programmes entertain rather than engage an audience in serious debates about threats to biodiversity. The gardening media tend to connect more with viewers, because they are consulted as much for advice or ideas to inform practice as for entertainment. However, the gardening press and television are as much guided by demand as they are leaders of fashion. The demand for strong colour and scent ('super-nature'), quick and impressive solutions, and, above all, novelty means that the media are dominated by glossy magazines and television programmes featuring perfect flowering exotics in full bloom, low-maintenance hard and soft landscape features, and seasonal change (Hitchmough, 2005; Thompson, 2005). The elements of time and patience – and habitat – are almost entirely absent. Increasing interest in growing one's own food has spawned a different approach in the media, particularly organic methods of cultivation, but generally not for biodiversity.

The above views are derived from reviews of the literature, however these perspectives were also expressed, without prompting, by a number of interviewees for each case study.

All the interviewees felt that the media are the primary source of information on environmental issues. There are positive and negative effects of this.

Negatively, natural history programmes often convey the beauty of remote and exotic 'nature':

'The risk is that the television portrays places that are distant, beautiful and remote. People must understand that the simple earthworm can be a symbol for us about what is good close to home.'

Moreover, several respondents expressed concern about the ignorance of horticultural science by the mass media. Sometimes published or broadcast information glosses over the complexities of issues, or is simply wrong because another point is being made.

Nevertheless, most (non-media) interviewees thought there is much about the dominance of mass media that is positive. Respondents are of the view that the gardening press and television are at the forefront of eco-friendly practice in gardening and grow-your-own. Television in particular is key when it comes to informing the general public.

Television presenters who were interviewed consciously aim at achieving all of these elements: entertainment, inspiration, communication and demonstration.

When people can observe how something is done (the demonstration element) and understand the explanation in accessible language (the communication element), they are more likely to believe that what they see and hear can be brought within their own experience. In addition, the media are important in giving people ideas, and in generating interest (the inspiration element). Since this is all achieved while relaxing (the entertainment element), it is all the more effective.

Two recurring views precipitate an observation that needs to be considered. The first is the view of respondents who are involved with the gardening media that their audiences react very positively to wildlife-friendly gardening programmes or articles – probably with greater interest than the general public. The second is the widely-held view that gardeners are at the forefront of understanding environmental issues. By implication, the media are successful in informing and inspiring those who are already interested – who tune in or read – but may miss completely those who do not.

The media are key to garden centre sales: a huge increase in vegetable plug and seed sales followed last year's Beechgrove programmes. A new RHS programme is expected to do the same. People are more aware of the habitat function of greenery in their gardens following Springwatch programmes. Now that television is no longer 'promoting' decking, it is observed that there is a trend towards less hard surfacing in gardens. Jupiter Wildflower Nursery reported that it frequently has calls from people who want to buy a plant after seeing it on television. Garden centre suppliers are very aware that encouragement by television generates good business. The response is reported to be greatest from older people and women.

The literature cites another important influence on gardeners as 'nurture'. Many gardeners, horticulturalists and designers report that early contact with gardening and/or growing things has had an enduring effect on their own attitudes to nature, gardens and the beauty of these associations (Anon. 2000a & Anon. 2006p). Many of the interview respondents commented that the primary influence on them had been a parent or grandparent, who had encouraged an interest either in nature or in gardening. The point was also made that it is hard to get children enthused, if parents are not interested. There is research support for this: the RHS commissioned a study on what influences gardeners, and found that family was not only the most important influence but also that it was four times more influential than the next most important source of inspiration.

Respondents almost all believed that they – or the organisations they represent – have a positive influence on private gardeners. Evidence cited includes a rise in visitor numbers (gardens and nurseries open to the public); reduced hostility to wildlife conservation in public parks (local authorities); increased audiences (BBC Gardener's World magazine; Beechgrove); increased membership (Garden Organic Ryton; Horticultural Trades Association; Royal Horticultural Society); increased website hits (Garden Organic Ryton; Tern TV); increased profits and sales (Dobbies; Growforth; Jupiter); imitation (John Little); visitor satisfaction (Jupiter); and longevity (Garden Organic Ryton).

Methods used by non-media respondents to influence people include websites, opening to visitors, school and community gardens, leaflets, magazines, books, stands at flower shows (local and national), offering something free to encourage people to experiment, advertising, advice services, activities for children and interpretation.

Local authorities find that the most effective ways of influencing people are (i) ranger service or site-based staff, who explain the rationale for what is being done; (ii) open days, where eco-friendly methods are demonstrated and explained; and (iii) promoting the health benefits of parks and allotments at a local level. Changing planting or maintenance regimes and then observing how successfully they work is also educational. Examples cited were changes to the frequency of mowing and the planting of ornamental grasses which have had an effect in showing people the attractions of both grasses and conservation grassland. Parks managers find that, because people want parks, even very small improvements generate a positive

response. It is possible in the public arena for 'serious' researchers to have an influence. For example, the landscape architect Alan Tate has been an advisor to Edinburgh City Council, and his book (Tate, 2001) has been circulated to politicians. The view that great cities have great parks has prompted a desire to get a Scottish park into the next such book published.

Other influences reported by interviewees include Britain in Bloom, viewed as a good vehicle for attracting interest; the voluntary sector (although only one respondent reported having been personally influenced by the voluntary sector); food (it is argued that more people are wanting to be organic in food production, and that more people are taking up allotments); DIY/lifestyle stores, garden centre staff argue that younger gardeners are more nervous of garden centres, so they go to DIY/lifestyle stores, getting more adventurous as they get older); and schools. The proactive role played by many schools was raised repeatedly. For an example, see the John Little Case Study (page 39). Interestingly, this is one area of growing influence, which in the literature does not appear to have previously played a significant role.

3.2.3 Attitudes

A public survey of attitudes to biodiversity in England conducted in 2001 revealed only about a 5% increase in concern between 1996 and 2001 (DEFRA, 2003). Peat bogs are not valued for either scenic beauty or ecological importance (Gates, 2002), and anecdotal evidence would seem to suggest that the more enthusiastic the gardener, the more action is taken against 'hostile' invertebrates. Yet invertebrates are essential as food for nearly all of the wildlife favoured by the public, like hedgehogs and birds. Any growing awareness that wildlife may be encouraged into gardens is leading to increased sales of items perceived as beneficial to wildlife, especially bird food and bird boxes rather than, for example, decreasing use of pesticides, fertilisers and peat (Berry, unpublished, 2006). It appears that the wildlife message is getting through, but the connection between wildlife and biodiversity is not.

In interviews, nearly all respondents observed that people love wild and natural things generally, although attitudes to specific types of wildlife vary: people like birds, butterflies and wildflowers, but some are afraid of bees and foxgloves. Almost all report a growing awareness and acceptance of gardening for wildlife. One contractor who has initiated wildflower planting on a housing estate in the London Borough of Hackney has found that people's responses to the change in planting regime have been very positive. Local authorities report that people are now much more accepting of conservation areas in parks and public gardens, and that Friends groups are requesting wildlife-friendly areas in their local parks. Planting wildflowers is the change in the public arena that has had greatest response.

'People have learned to appreciate 'weeds'.'

'They do like wildflowers but they like to see them managed, not looking a mess. They don't like a mess, because they think you don't bother [local authority view.]'

Tidiness is an issue:

'I expect the biggest resistance to wildlife gardening is the perception that wildlife-friendly gardening equates with 'wilderness' or 'untidiness'.'

'Generally people are pleasantly surprised that organic gardens are not as scruffy as they expect.'

'People 'get into' wildlife gardening, but want to marry it with tidiness.'

'Improving the way people garden is important, not just making a meadow and then leaving it. Many meadows designed by landscape architects are like this, just abandoned once they are done. Wildlife gardening or landscaping requires work and ongoing management.'

Case Study: Harlow Carr Garden

Harlow Carr Garden is rich in wildlife and demonstrates an intermediate, pragmatic, sustainable approach to biodiversity enrichment. It tries to minimise herbicide use rather than being strictly organic. It has an infrastructure of native woodland into which non-native plants are seamlessly integrated. Flocks of siskins and other native finches feast on the seed of exotic birch species in the arboretum. It is about being exciting to look at and visit whilst at the same time being a major resource for wildlife.

The Royal Horticultural Society's **Harlow Carr Garden** in Yorkshire stands on what was once part of the Forest of Knaresborough, an ancient royal hunting ground. The site of 60 ha is about 200m above sea level in a valley. It is in a frost pocket and cold. It comprises eight hectares of mixed coniferous and broad-leaved woodland, which originates from post-World War One. There are also four hectares of meadows, of which two are high quality. The remainder of the garden is ornamental.

There has always been a strong leaning towards supporting biodiversity on this site. The garden was created in 1949 and its style was fairly naturalistic. This policy was formalised by Matthew Wilson when he became curator of the garden. The only areas where glyphosate herbicide is used is where there is a long-standing problem with *Equisetum*. Bio-controls are used in the glasshouses. Staff try to source locally and with suppliers with the lowest possible carbon footprint. Inputs are kept as low as possible.

Oversight of the management and development of the garden is undertaken by a biodiversity group. The buildings are also audited for their environmental impact. Naturally occurring predators of the locality are encouraged, in order to maintain natural cycles, and every attempt is made to supply appropriate habitat conditions for species, including bird and bat boxes. Natives are used where appropriate, although it is recognised that non-natives also help with biodiversity. Local seed is sourced from a nursery in Yorkshire. Peat use is being reduced, and there is no irrigation scheme. The garden has a loose co-operative arrangement with the Yorkshire Wildlife Trust. The fundamental and major part of the garden's mission centres on biodiversity. This is one of its primary selling points.

The curator commented that the public does not really know what it likes. 'It needs to be shown how different kinds of gardens work in order to understand. But they mostly come because they want to have a relaxing time. They love flowers, colour and butterflies. They adored Nigel's [Nigel Dunnett, University of Sheffield] annual meadows when they were in flower.' Public response to natural planting has been very positive, and interpretation is used in periods when wildflower meadows are germinating or setting seed. Staff recognise that one of their greatest successes is the practical demonstration that eco-friendly methods can work and achieve a cultural change in attitudes.

There is a huge thirst for knowledge, especially for better plant information and other horticultural subjects. In response to customer demand, Dobbies Garden Centres arrange talks, and lecture lunches. Different garden centres have different 'information attractions': there is a variety of mazes, a butterfly farm (Edinburgh), a plant information hut (Dunfermline), and a Plantasia interpretation centre (Warwickshire). These are very popular, and make people more aware of their environment, but they are expensive to build. Dobbies is planning a promotion on wildlife gardening.

There are conflicting influences on private gardening. Probably most significant, according to several interviewees, is that consumer behaviour is changing in response to changes in housing. With smaller gardens, there is a greater emphasis on instant gardening: both container gardening, and the purchase of semi-mature plants, both of which have greater immediate impact. In garden centres, A-Z arrays are shrinking, and layouts are designed to precipitate impulse buying. At the same time, an ageing population and the simultaneous rapid increase in new housing mean that more people are gardening. It is also very important to recognise that whilst impulse purchase drives the garden centre market, this is counterbalanced by the enormous diversity of plants (70,000+ taxa) offered by small specialist UK nurseries who market their products through web sites and text versions of the 'Plant Finder' to more knowledgeable gardeners. Although interviewees were universally of the opinion that wildlife gardening is important, even stronger is the view that *any* gardening is important. There is concern that stressing the importance of gardening for wildlife, rather than gardening *per se*, may discourage potential gardeners by creating guilt rather than incentive.

Selling the idea that gardening is enjoyable, and that gardening for wildlife adds to the reward, is critical. What gardeners like is therefore important:

'Gardeners like all sorts of plants, mostly non-native, which are also good for biodiversity.'

'People like lots of variety, especially ornamentals.'

'The questions people ask are: Does it look good? How much does it cost? Can I find a place for it in the garden?'

'People like a 'soft environment', eating, decent toilets and fair prices.'

'The human in all this doesn't have to be a twitcher or a person obsessed with insects; that's not it. This has to appeal to the person ... and why it is important that we play a part in those creatures' lives and how, actually, we are part of the whole system and what enjoyment we can get out of it. That is the important thing, how can we enjoy our lives better?'

3.3 Issues of practice

3.3.1 Organic v non-organic v sustainable

The Soil Association (2005) reported a sharp rise in the sale of organic food from non-supermarket sources, like farmers' markets. It is to be expected that the ethical and biodiversity dimensions of organic food production drives organic gardeners as much as the perceived benefits to health. These are the motivations most often cited for home and allotment growing of vegetables.

The question of whether to grow organically applies, of course, more broadly than the growing of food. In decorative horticulture, the main motivation for organic methods of cultivation is a concern for biodiversity. However, there is no consensus that organic gardening is the only way to garden for wildlife.

'There are cross-overs, but they are different things.'

'The reverse is true, organic gardening implies wildlife gardening, but wildlife gardening does not imply organic gardening. A garden is not a nature reserve; it can be ornamental. Native is not an issue: there are perfectly good alien varieties that provide nectar and pollen. The best thing is to encourage ponds and provide all the habitat possible. One does not want to discourage gardeners altogether. There are degrees of organic, and some is better than none.'

Indeed, most people interviewed are concerned not to limit people's interest in gardening by conveying messages that are too intimidating. For example:

'We are trying to encourage a lot of people (with different attitudes and approaches) to change and we can't be prescriptive on this.'

It was generally felt that people gardened for enjoyment and relaxation, and that it is counterproductive to make too much of a chore of maintenance or to make gardeners feel guilty about the methods they use.

Most practitioners who were interviewed argued that it is not possible in the public domain to restrict oneself to organic methods of production. Some respondents distinguished between organic and sustainable practices, arguing that while they were not strictly the former, they believed that their practices satisfied the latter. The most strict of interviewees in terms of their own practice were Garden Organic Ryton (formerly HDRA) and Jupiter Wildflower Nursery. Views on specific methods of cultivation are recorded in Section 3.3.3.

Case Study: Garden Organic

Whilst the success of Garden Organic is in part due to the support of its core membership, it is also because it has been able to attract people outwith this niche constituency to visit its gardens. It has done this by recognising that to get its message across it is critical that planting etc., even if relatively untidy, is sufficiently attractive to be valued by potentially non-organic gardeners. There is a parallel here with gardening for biodiversity; if planting looks attractive enough then people who might not otherwise be interested in a particular philosophical position (biodiversity) may be able to 'buy in'.

Garden Organic, formerly the Henry Doubleday Research Association, was established in 1958 with the express aim of advising gardeners about organic methods of cultivation. Garden Organic's main activities are an advisory service covering all aspects of gardening, research and dissemination, and training. The organisation holds the Heritage Seed Library, and has three gardens, at Ryton, Yalding and Saffron Walden. The gardens at Ryton have evolved over 20 years, and cover the conservation and environmental aspects of organic gardening, as well as the organisation's Vegetable Kingdom. They play an important role in demonstration, which is a crucial aspect of disseminating information.

Membership of the organisation stands at around 32,000 private gardeners, and is growing. All members receive guidelines for organic gardening. In addition to eco-friendly cultivation, they are encouraged to put up bird boxes, to recycle and compost, and not to be too tidy. The ethos of Garden Organic is that gardeners can get the balance of nature working for them, and, in turn, create a garden that does positive things for wildlife.

Garden Organic is involved in a programme for schools, sponsored by Duchy Originals. A website is linked to the national curriculum, and the educational team provides lesson plans and advice on setting up organic school gardens. Around 2,500 schools are linked to the programme, which is very successful in disseminating information about organic horticulture, healthy eating and supporting wildlife to children.

Garden Organic's campaign, 'Get Set Grow', was intended to encourage 10,000 people to begin growing their own food by distributing free seed and free advice. The campaign received such overwhelming response – at one stage receiving a new application every 40 seconds – that the first 10,000 packs were sent out within a few weeks of the launch. An additional 5,000 packs were donated and sent out, before the campaign had to close because it could not keep up with demand.

Garden Organic measures its success by its longevity. That it has survived and grown is evidence that the message is not a fad, but that organic horticulture is a viable alternative system of husbandry. The long-term success of the garden shows that the approach is sustainable. Other indicators are a growing membership, increasing visitor numbers to gardens, and the increasing extent to which they are contacted for advice by the gardening media.

Case Study: Wiggly Wigglers

The main focus of Wiggly Wigglers is composting products, biological control agents and wildlife friendly plants. They also sell a range of horticultural products. Their mission is to inform and educate about sustainable gardening, and this is strongly influenced by their concern about the loss of diversity in the countryside. They do not sell products that they feel lie outside this philosophy. They are tapping into and expanding a growing niche market for 'ethical' eco-gardening products.

Wiggly Wigglers is a mail-order company, based on a Duchy farm owned by the Prince of Wales. Its products are based around eco-gardening, with an emphasis on what is practical and natural. Its immediate objective is to support gardening that is more rewarding for the gardener and for the wildlife within it. Its long-term aim is to change UK gardening.

Heather Gorringe, the primary shareholder, wants to see a reconnection between farmers and gardeners. Countryside knowledge and skills have been lost over time, and, as gardeners have urbanised, they have tended to lay down lawns and decking and put up fences. Wiggly Wigglers is aiming to make available to gardeners 'farming' knowledge of planting a native hedge, composting waste, and making a wildlife pond. They encourage thinking about the environment and the positive impact even one gardener can have on it.

The Wiggly Wigglers enterprise occupies an acre, based within a walled garden, with pear and other fruit trees, a garden pond, a wildlife pond (with great crested newts and forty three different species of wildflower around it), two wildflower meadows, chickens in the garden, a nectar border, a wildlife hedge, and a mass of lavender for bees and birds. Native plants are used as far as possible, although some non-native nectar plants are cultivated. The company wants to encourage a re-appreciation of native species 'which have been drowned by exotica which don't suit the soil'. Over 20 nest boxes and many bat boxes have been put up, and about 20kg of seed is fed to birds each week. The result is roosting bats and a full range of bird species.

Although the main farm is not entirely organic, Wiggly Wigglers cultivates organically. No peat or pesticides are used, and all water used is rainwater, collected in the ponds. They operate an active local-sourcing policy, where practical, and an active eco-policy. Products are scrutinised, and if they do not comply with the company's values, they are not included in the catalogue. The most popular products are those that (i) work, (ii) produce something, and (iii) are easy to use.

There are 100,000 people on the company's database and the website gets 45,000 hits a day. They currently record around 20,000 downloads monthly from people all over the world of their weekly radio show podcast. Whether or not listeners are customers, they are able to tune in to advice about nature and farming. The company also has a telephone advice line.

Heather's view is that people – their customers – genuinely do want to make a difference. 'If you can get to the thing that is important to the person, not just to the wildlife, you can get people to adopt these methods.'

3.3.2 Native v non-native

It was pointed out in Section 1.5.1 that the provenance of plants is a complex issue. Scientists are concerned about the number of other species a species supports. It is not a universal truth that native species always support a greater diversity or number of other species of wildlife; some non-natives, especially when of the same genera as natives, may support a significant ecological diversity. However, natives are also important in creating a sense of place through regional distinctiveness, especially in rural contexts. This latter point was not raised by anyone interviewed for the project. However, all had a view about the former.

On the issue of provenance, there was almost unanimity amongst interviewees that, in gardening, it does not matter. Indeed, many respondents have a problem with 'purists', who discourage potential wildlife gardeners by insisting on natives. In providing advice to amateur gardeners, the view is that planting should be encouraged irrespective of the origin of the plants.

'If we tell people that wildlife gardening is only about natives, or that wildlife gardens have to be messy, they would be put off... If people have very large gardens or live in the countryside, then there is a case for planting a lot of natives.'

'There is too much paranoia about all-native. Practical horticulture requires flexibility. Use what works well, and there are likely to be positive spin-offs for biodiversity. For example, introducing non-natives to extend the flowering season is good for bees and butterflies. What matters is a mix of what looks good plus native. An urban area is not a SSSI.'

'It is difficult to have a purely native garden. Most wildlife is in people's gardens – in urban areas. Anyway, because of past actions [cross pollination] plants of purely native provenance do not really exist. Does 'native' in the Scottish context mean native to Scotland or Great Britain? Protecting Scottish plants is important, but promoting them for private gardens not necessary. On the other hand, planting Scottish plants around new roads and other infrastructure for government contracts is important.'

'Most vegetables are non-native.'

'A lot of 'tosh' is talked about native plants. Bedding plants, for example, have a bad name, but can be a fantastic source of food.'

When asked about their own practice, the view is very similar. All respondents see biodiversity value in non-native plants, including one whose mission is to promote the cultivation of natives:

'Last summer, the single dahlias here in the nursery were covered in butterflies!'

'We know, for example, that Verbena bonariensis is wonderful for insects, and we always include it in our designs.'

On the other hand,

'I started the business intending to be eco-friendly; the good design developed over time.'

This statement suggests that eco friendliness was initially seen by the respondent to be a dominant goal in itself, perhaps irrespective of the attractiveness of the resulting planting to people. As the respondents experience grew she came to recognise that good design and attractive appearance were important for people and did not conflict with eco friendliness.

Several respondents commented that the greatest opposition they have found in implementing garden schemes – with or without wildlife habitat as the objective – comes from wildlife and conservation groups, who insist on natives only for integrity. This strong grassroots belief in the conservation community that native is best can dissuade amateur gardeners from attempting horticulture for wildlife.

3.3.3 *Maintenance practices*

Gardeners manipulate and regulate 'nature' in many ways, and most horticultural actions have a negative or positive effect on biodiversity. Attention is paid to some of the issues below.

Water

Gardeners use approximately two thirds of the domestic water supply during hot, dry spells (RHS, 2006). In normal summers, it is difficult to meet demand in England. A summer of hosepipe bans in southern England in 2006 has prompted interest in water butts and grey water recycling, although it will probably take successive hosepipe bans to cause a sea change in attitudes and behaviour. In Scotland, where water is plentiful, gardeners generally use mains water for irrigation. Interviewees use a variety of methods to reduce water consumption. Organic gardeners tend not to irrigate at all. Commercial growers must irrigate, and some are investing in grey water systems. However, most local authorities and businesses are a long way from rainwater harvesting or grey water use, except (sometimes) in new purpose-built offices.

Garden chemicals

The annual spend on fertilisers and chemicals for home garden use in the UK is over £200 million. One study has estimated that garden centre sales of herbicides and pesticides have been increasing at an annual rate of 5% (Berry, unpublished, 2006). Another estimate is that the escalation in pesticide use is closer to 10% a year (Anon, 2002f). Some pesticide use is probably unintentional; many lawn fertiliser products for example, contain herbicides to control lawn weeds. Almost all products used are non-organic. Indeed, only one organic insect control sells in viable quantities, and, generally, organic controls are negligible as a percentage of total sales in this product range (Berry, *ibid.*). There is a vicious cycle of lack of knowledge.

Consumer awareness of organic products is low, because they are not advertised. They are not advertised, because they are not considered capable of generating adequate profits.

The effect of domestic pesticide use is wider than the immediate impact on their target in the garden in which they are used, largely because of ignorance about both application and disposal. They have detrimental effects on non-target organisms, including soil micro-biota (Johnsen *et al* 2001). Pesticides are poured down drains and sent to landfill, finding their way into aquifers (Anon., 2002f).

In interviews conducted for this project, all respondents felt it was possible to make a beautiful garden without pesticides, and that this approach was sustainable in the long term. However, two interviewees pointed out that working in this way was not always easy, as one had to understand rather complex things about nature's interactions, knowledge which may be inaccessible to domestic gardeners.

Case Study: Dobbies Garden Centres

Dobbies has an enlightened approach to many environmental issues and contributing to the education of its customers. Inevitably, however, it has to respond to the wishes of its customers, for whom biodiversity gain is only one of a number of reasons for engaging in gardening. The nature of the garden centre market reinforces the message identified elsewhere in this research study that in terms of the mass market, encouraging more planting of different species and creating structurally complex gardens full of plants is more likely to lead to biodiversity gains than promoting biodiversity as a goal in its own right.

Dobbies Garden Centres have their roots in Scotland. The company began as a family business, but has been a public company for nine years. They now own 20, soon to be 22, sites from Aberdeen to Reading. The business employs around 1,800 people, and employment is growing.

Dobbies Garden Centre offers a day-out family experience that includes restaurants, foodhalls and gifts, as well as the core garden retail business. It aims broadly at the middle market – the home-improvements or lifestyle market. This largely encompasses comparatively well-off people for whom time is precious. Their customers are influenced by gardening fashion, especially as conveyed by television. They are looking for a ‘soft’ environment in which they do not need to hurry, have the opportunity to eat, find decent toilets and fair prices for a good-looking plant.

Because Dobbies caters for a relatively wide market, it cannot limit itself to ‘eco-friendly’ products, although it is becoming more sustainable in its own design-and-build operations. For example, new buildings have features like solar panels, a waste boiler, grey water recycling, and light-sensitive light switches. The company also seeks to purchase timber and timber products from renewable sources. Dobbies has worked with local authorities on composting: its sites are used as depots for compost bins.

However, sales are demand-driven, and until people become more aware of environmental issues, growing media that contain peat, and chemical pesticides, will still be sold. Dobbies is, to some extent, involved in educating the public, arranging talks, and lecture lunches. These tend to be attended by retired people. For families, different garden centres have different ‘information attractions’: there is a variety of mazes, a butterfly farm (Edinburgh), a plant information hut (Dunfermline), and a Plantasia interpretation centre (Warwickshire). These are very popular, and make people more aware of their environment, but they are hugely expensive to build. The company is planning a promotion on wildlife gardening.

The biggest problem faced by the company is finding well-trained horticultural staff. This impedes the giving of good advice to customers and the introduction of different methods of horticulture. The company believes that they will need to adapt as environmental issues become more important, and would like to lead the industry on more sustainable retail horticulture.

Case Study: Cally Gardens

Michael Wickenden, the proprietor of Cally Gardens represents the intellectual plantsman position within the horticultural industry. He is interested in biodiversity at a global scale and how gardeners can continue to tap into its richness within a framework of concern for its ongoing conservation. In common with some other case study interviewees, he has adopted a sustainability friendly but pragmatic approach to horticultural management. He maintains a strong moral and ethical position about the ownership/privatisation of naturally occurring biodiversity.

Cally Gardens in south-western Scotland is a Grade II listed 3-acre walled garden, containing over 3,500 varieties of plants collected over 30 years by nurseryman and plant-hunter, Michael Wickenden. Around 500 of these varieties are propagated and sold each year to finance the maintenance of the carefully restored 18th century walled garden and Michael's plant hunting trips all over the world. The garden is open to the public, but not widely promoted, so it attracts only about 5,000 visitors a year. The 30 borders at Cally provide an opportunity to see many rare and unusual wild plants collected (as seed) from the Americas, Asia, Africa and Europe. The garden also provides training opportunities, taking in horticultural students from different countries over the summer to assist with the work in the garden and nursery. Cultivation at Cally is not strictly organic, although no herbicides are used in the borders. Peat-substitution of 25% has been achieved. Some artificial fertilisers are used, but soil improvement is primarily compost. Rainfall is generally sufficient to irrigate the borders. Greenhouse plants are hand-watered, using water from a spring-fed tank. Over the years toads have been brought into the garden and there is now a thriving population that helps to control slugs.

Two issues that have emerged as prominent objectives for many interviewed in the course of this research simply do not arise at Cally. First, the native/non-native debate is a non-issue for a collector of plants from all over the world; the collection is almost exclusively alien, and plants are propagated in part to test their suitability for British conditions. Second, the collection is not cultivated with the object of supporting a range of indigenous local fauna. Biodiversity is patently an object, but the diversity sought is of global, largely alien, flora.

Not surprisingly, a nurseryman propagating unusual plants for sale in Scotland, where there remain large 'wild' areas rich in native species, does not see wildlife gardening as the primary issue for Scotland. Michael is, however, deeply concerned about the transformation of natural genetic material, including plants, from freely available common property to patented private property using Plant Breeders' Rights (PBR). 'The sole purpose of PBR (and one of the purposes of The Convention on Biodiversity) is to gain indefinite control of genetic material for the purpose of profit. With PBR it is not necessary even to prove that breeding has taken place; many patented plants are chance finds, 'sports' (chance mutations maintained as cultivars by vegetative propagation) or renamed old varieties'. This affects not only nursery stock, but also food and medicinal plants, significantly raising costs for consumers. This is different from the important and necessary protection of endangered species, and prevention of widespread harvesting from the wild of orchids, cacti and bulbs, via CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora). He believes that government should look again at ill-considered legislation that prevents propagation for sale of naturally-occurring plants in situations where conservation is not an issue.

Most local authorities still use some pesticides although there is a general commitment to reduce application year on year. In the public sphere, almost all people interviewed saw the need for some use of herbicides, because the wildlife message is lost if its public face is unkempt. It was argued by some that, without the herbicide glyphosate, it would be impossible to create habitats in urban space. In particular, it is necessary to use herbicides to prepare sites for wildflower sowing and planting in public areas:

'It is the only way to get a wildflower meadow in one year. One cannot use polythene in a public place.'

It was also pointed out that issues of sustainability may produce conflicts, and that choices need to be made as to which practice to pursue.

'For example, most organic people would not use glyphosate, but hand-weeding could be counter-productive because the transportation of staff to the site every two weeks to hand-weed would not be good for the carbon footprint.'

On the other hand, the almost universal view of the interviewees was that there is no need for insecticides.

Peat

Annual sales of peat to commercial and amateur gardeners amount to around 3.4 million cubic metres (Gates, 2002). The UK government has set a target of limiting peat use to only 10% of growing media by 2010. While there has been about a 15% reduction in use by professional growers since 2000 (NFU, 2006), there has been no corresponding fall in purchases by private gardeners. The proportion of peat in compost appears to make no difference to whether or not it is selected by gardeners. However, sales of peat-free compost are less than 5% of total sales, and private gardeners appear to be showing no signs of either awareness or a willingness to change behaviour (Berry, *op cit*).

Some but not all respondents had ceased to use peat. However, many respondents declared themselves unable to meet the government's target of being virtually peat-free by 2010. They tend to pursue a more modest target of reducing use of peat by employing alternatives where practicable (which usually means alternatives for soil conditioning, while still using peat for sowing seed). Except where the entire supply chain is in the control of the respondent, there was a realism about the avoidance of using peat altogether:

'The peat-free biodegradable pot plant with no pesticides cannot be found.'

'Vocal hardliners insist on no peat, but no-one is doing this in Scotland. A very few are doing this in England, but then one must account for the carbon miles. In the meantime, aim for peat-free, annual planting, with recyclable pots – and get the garden centres to sign up to this.'

Timber and wood products

Although not strictly a British biodiversity issue, timber and wood products are a global biodiversity issue for gardeners. Action on this issue has been taken by suppliers in response to regulation rather than by private purchasers, although it is difficult to exclude completely illegal timber from outdoor garden furniture ((Environmental Audit Committee, 2004-05; WWF, 2002). Stockists of garden furniture in particular will advertise that products are made from certified sustainable sources as a selling point. However, there is no evidence that consumers actually

look for sustainable timber products. Indeed, about 20% of barbeque charcoal comes from tropical sources in Africa (RHS, 2005).

In interviews, the question of sustainably sourcing timber was not at all controversial. There is general consciousness of the issues surrounding use of timber from sustainable sources, and virtually all respondents use certified timber or recycled products or metal.

Wildlife-targeted products

Sales of products associated with birds in particular have shown strong growth over the past few years. Bird-related products tend to be successful in increasing garden wildlife, while other products, like hedgehog houses, show no evidence of efficacy. The problem with unsuccessful products is that they can discourage further provision for wildlife (Thompson, 2006). The other potentially negative impact on attitudes is that these products can obscure the understanding that the presence of wildlife in the garden has more to do with the type and variety of plants than with supplementary commodities (Baines, 2006). On the other hand, the encouragement of birds in particular can help to re-establish some ecosystem connections and to stimulate further engagement of people with nature in the garden.

3.3.4 Non-gardeners, gardens and biodiversity

The loss of garden space is accelerating. Front gardens are being paved over for off-street parking (RHS & HTA, 2005). Back gardens are opportunities for windfalls arising from sale to developers for infill housing, and this is effectively encouraged by government seeking to increase the density of housing in an effort to preserve the countryside (Hodgson, 2006). Smaller gardens around more dense housing make for a patchier environment and less space for undisturbed areas for wildlife.

Low spatial and vegetation complexity around the homes of many non-gardeners greatly diminishes opportunities for biodiversity. In Scotland, it was found that complexity of planting in gardens (in Ayr) decreased with declining affluence and other social indicators (Hitchmough and Bonugli, 1997). There are huge latent opportunities for biodiversity in these landscapes, and also improvement in health and quality of life of residents.



Figure 4. Excessively simple, sparse garden planting reduces the opportunities for biodiversity
Image J Hitchmough

Case Study: 'Garden for Life'

The experience of the 'Garden for Life' project supports the contention of many of the respondents interviewed, ie that the most effective means of promoting biodiversity is by encouraging more gardening *per se*. Increased biodiversity will follow. This directly opposes the supposition that biodiversity somehow requires some alternative form of gardening.

'Garden for Life' is the initiative promoted by Scottish Natural Heritage that seeks to increase understanding and enjoyment of biodiversity, to increase action by gardeners for the benefit of Scotland's biodiversity and to increase people's well being through gardening for health and well-being. Garden for Life developed out of the successful Scottish Natural Heritage 'Plant for Wildlife' project initiated in 1997, and was launched at the Gardening Scotland Show at Ingliston near Edinburgh in June 2001. It has a dedicated member of staff and had a budget of £40,000 in 2006/7. The project is managed by the Garden for Life Forum which includes representatives from a wide variety of Scottish organisations with an interest in this area. Garden for Life has been promoted through products, leaflets, a free video and point-of-sale information in garden centres. It supports the BBC Beechgrove Garden's community gardens each year. Garden for Life had a stand at the Gardening Scotland Show in 2006, which attracted 27,000 visitors over 3 days.

The view of one supporter of Garden for Life is that, in its biodiversity focus, it has been too restrictive. It is necessary to think about gardening as a broader picture:

'There are opportunities, for example, in growing one's own food. More importantly, the secondary feel-good factor matters, and this emphasis is lost. The message needs to be that it looks good, and, by the way, it attracts birds. In smaller gardens, everything must work. The programme also needs to broaden its focus to provide information about recycling of gardening by-products, like pots.'

Perhaps the greatest problem is that 'people don't buy in that way', and so garden centres have stopped signing up to promote the Garden for Life messages: 30 signed up in the first year; 14 the following year; now it has dried up. It was argued that a sophisticated message creates too narrow a market. People need a popular message. Moreover, they will not pay premium prices, and the wildlife gardening market is seen as being for enthusiasts who are willing to pay more. Can this be changed? The previously mentioned supporter is convinced that the Garden for Life Forum believes in what it is trying to do, and that it will adapt to get the message across more effectively.

3.4 Opportunities

3.4.1 A change in awareness

There is a strong perception amongst respondents that people – at least in the UK generally – are now really interested in both understanding issues and in solutions. There has been a significant change in the past thirty years, perhaps even in the last decade. People have gone past the ‘quick-fix’ stage and are now looking more intelligently at the problems. This change is true of both corporate and voluntary sectors, and is now filtering even to government. There is increasing awareness particularly of the climate debate and the health debate. This can be used to appeal to people’s self-interest; climate and health are seen to be the pressure points to stimulate individual action.

One interviewee, however, considers that more work needs to be done in Scotland:

‘People in Scotland have awareness without urgency.’

3.4.2 A change in practice (sometimes)

Trends in consumer behaviour demonstrate that different issues within the conservation-biodiversity framework have not attracted equal attention. The huge increase in sales in garden centres of bird feeders and foods, for example, is cited as clear evidence that more people are taking an interest in wildlife in the garden. The same evidence is found in the fact that more people take part year by year in surveys like the RSPB Garden BirdWatch. On the other hand, sales of peat have shown no appreciable decline, even though government bodies and NGOs have been publicising the issue for two decades. It was observed that perhaps people just cannot relate positively to peat bogs.

However, there was almost unanimity that there has been a significant change in gardening practice over the past decades, so that wildlife gardening is now more than a niche market; indeed it is an industry. Even so, there is potential for further development, particularly in working with the garden centres. In order to excite the garden centres, it was suggested that biodiversity organisations try to promote what they do with private gardeners using, for example, Beechgrove TV programmes and Garden for Life projects, rather than simply expecting the garden centres to take the initiative in promoting what people may not instinctively want.

3.5 Barriers to realising opportunities

3.5.1 A lack of understanding

Ignorance and misunderstanding was cited in passing by many respondents, although few reported this as a factor when asked about major barriers.

A shift towards organic methods is particularly susceptible to ignorance. A lack of understanding is seen by Garden Organic as the main barrier to change. The example chosen was interesting, because it highlighted not ignorance preventing experimentation but ignorance preventing learning: allotment holders are often polarised over the organic-cultivation issue, with several reported cases of organic growers being thrown off allotment sites by allotment committees complaining of untidy practices.

One respondent, who did not want to be identified, was concerned about misinformation, especially poor advice disseminated popularly (for which read 'by the media').

Where there is no understanding, there is no pressure for change. The example cited was that of house buyers: since they do not understand the issues, there is no appreciation of the need to pay a premium for eco-friendly housing estates (incorporating, for example, sophisticated sustainable urban drainage systems, and extensive use of tree planting), and consequently there is no incentive for developers to build in this way.

A lack of understanding – and an unwillingness to invest in change – affects the horticultural sector itself:

'Horticulture itself is part of the problem. The horticultural sector is full of opportunity, but it needs to clean up its own act. It could be at the centre of thinking about biodiversity. This is coming.'

3.5.2 Public opinion

The issue of what traditional wildlife gardening looks like is a barrier to many people. It may even be necessary to compromise biodiversity to keep the goodwill of local residents. At the very least, it is important to get the balance right between achieving the natural look – and getting the biodiversity – and neatness or formality.

Local biodiversity and conservation groups can be more of a problem than the general public or the authorities. They tend to want – and insist on – native planting, and they are concerned about the migration of non-native varieties. Their hardline approach can deter experimentation with gardening for wildlife.

One barrier to wider practice of organic methods of gardening is the perception that it is for wealthy, middle-class people. Garden Organic is attempting to overcome this by recruiting volunteer mentors from ethnic and underprivileged communities for training funded by membership fees. These volunteers then go back into their communities to disseminate understanding of organic horticulture.

3.5.3 Corporate culture

One interviewee with experience of policy advice over a long period of time sees corporate culture as the primary barrier to change. This is true as much of the voluntary sector as of large private or public organisations. Organisational inertia is the biggest barrier, making any progress in areas like the environment or health very slow to effect. Another interviewee's experience of a large wildlife conservation organisation reinforces this view.

It is very difficult to break out of corporate narrowness, where current practice is seen as 'successful' so there is no need for change. Indeed, change is expensive.

Where change is occurring successfully, one needs to be careful about seeing this as a trend. Eco-friendly businesses do not need conversion; they are converted. It is rare that their example is followed without push factors being applied. This has implications for policy (see below).

3.5.4 Cost, operation of the market and possible consumer resistance

There was divided opinion as to whether economic factors are a barrier to eco-friendly gardening. The cost element is certainly important in the promotion of eco-friendly products: the big chemical giants have money to advertise, while the returns on organic products are insufficient to justify advertising.

The culture of instant results is driven by consumerism as well as advertising. There is a demand for sprays and container-grown plants, because the effects are immediate. Because there is a demand, these are the products that are stocked by garden centres.

'The garden centres - naturally enough, as commercial businesses - will only do it for what money they can make out of it. Industry is pretty amoral and will only change if led by the public.'

The cost element is less obvious in the actual application of eco-friendly products. With some exceptions, like biological pest controls, eco-friendly plants and methods are generally no more expensive, and there may be savings from abandoning conventional maintenance practices (for example, offsetting herbicide and irrigation costs). In public areas, it may be possible to effect savings by compromising on some other parts of maintenance but achieving impressive results with, for example, wildflower plantings.

The primary cost of a maintenance regime that fosters biodiversity is that it is not low maintenance. Where a degree of wilderness is allowed, if the site is not maintained, natural ecological succession takes over, often leading to plant communities which are extremely unattractive to the public. It was argued that people associate wild and natural with easy – or with non-maintenance – while site preparation needs to be done well, and weeds need to be carefully managed.

Change is more costly for small businesses than larger ones. Timescales have become shorter, because of changing fashions, which makes it more difficult to recover a return from an investment in change. Bigger businesses have a critical mass, and can absorb changes relating to both fashion and promotion of eco-friendly products better. Smaller businesses struggle to innovate, because innovation is expensive.

3.5.5 Policy issues

Central government policy can be both a help and a barrier. Tight legislation (especially health and safety) can generate obstacles to innovation. Indeed, the problem with Health and Safety legislation was the most repeated problem raised with regard to central government policy. H&S policy stifles design and the use of some plants (like those that are poisonous), although at least two interviewees say that they ignore the latter, except on school grounds.

On the other hand, if central government were to force local authorities in a different direction in terms of environmental policy, it would be seen as a great help. Central government legislation on environmental policies should be tougher according to two respondents, and one thought that wildlife gardening had benefited from tightening up on the use of garden chemicals.

Local authority respondents also had a view on central government policy:

'Specific funding would help. The government wants new [environmental] policies to be put in place, but expects these to be covered by existing funding'.

The problem with government funding is seen to apply to research as well as policy implementation. It was pointed out, for example, that plant breeders play a significant role in developing pest- and disease-resistant varieties, so reducing the need for chemical applications, and that further research is needed. There was a strong view that the government should take horticulture and its related research much more seriously. Two interviewees went so far as to say that the major policy barrier to biodiversity enhancement is that research funding for horticultural research has been cut. It was also pointed out that there is currently no support for business development, and that government support is necessary to redirect investment into more eco-friendly methods and products. Government cuts in spending on wildlife gardening initiatives begun by English Nature is also seen as problematic in England. All the momentum built up is now at risk of being lost, with all the existing publications being allowed to go out of print, a ban on new publications, and the threat of further budgetary cuts.

Most interviewees thought that local government is insufficiently proactive or simply ineffective on environmental issues. The primary positive contribution by local authorities is seen to be recycling. Better local policy - making recycling easier and making it a more prominent local issue - encourages greater efforts by residents. Local authorities are, however, seen to be open. Policy at the local level is not a problem, although councillors' personal preferences can stifle innovation and consequently eco-friendly changes.

Local authority planning enforcement is a greater problem than policy. Planning departments do not always check that landscape conditions are complied with. It has been estimated that only 50% or less of the landscape works specified in planning applications are delivered. The result for the horticultural sector is that the value of amenity contracts is halved. The result for residents is reduced quality of life, and fewer opportunities for biodiversity. National government could assist by drafting statutory planning statements on planting and policing conditions.

Local authorities themselves point out that their thinking tends to be dominated by the need for resources. Officers are constrained by the views of elected members, but there is scope for innovation in maintenance of the public realm, if not in investment. The other constraint on improving the biodiversity of public parks is public opinion. The public has fixed opinions in both directions on the scale of 'only bedding' to 'only wildlife'. This needs leadership and management, expressed in a policy that provides the whole range across the city, while doing the 'best' thing for each park. Allowing influence by, for example, Friends groups, encourages local ownership of what is done.

Local authorities want more sustainable practice, but do not always like the specifics, primarily because of a lack of their own and/or public understanding. For example, it is virtually impossible to escape the use of residual herbicides on pavements. The lack of public understanding about weedy walkways is a significant barrier.

In Edinburgh, there were initially concerns with changing maintenance regimes for reasons of biodiversity enhancement. Now there is a better public understanding because of publicity and interpretation. This does not mean that more understanding in one area translates naturally into other areas. Winning the debate about conservation oriented grassland will not stop public criticism of no longer manicuring the pond in the park so that it can support more wildlife.

3.5.6 Shortage of skills in the horticultural sector

The horticultural skills shortage is a problem for the private nursery and retail sector as well as for local authorities. This affects, for example, changes in use of pesticides and herbicides: traditionally trained staff tend to use residual herbicides as a matter of course. It also affects the advice given to customers by garden centre staff (one of the main sources of information for amateur gardeners).

This creates the need for in-house training, which adds to costs. In Edinburgh's parks, biodiversity officers coordinate training on biodiversity issues for grounds maintenance staff in November and December, explaining things like conservation grassland (the differences between when to cut and rake off depending on whether spring or summer flowering wildflowers are planted); maintenance of riparian systems; and the differences between tree maintenance in woodlands and parkland. Dobbies Garden Centre in Edinburgh arranges a training half-hour every Tuesday morning with a different focus on, for example, bulbs, seeds and sowing, or gardening for wildlife.

3.6 Realising opportunities and overcoming barriers

All respondents repeatedly stressed as important a greater understanding of issues and of what can be done. This section sets out how this might be achieved.

3.6.1 The message

It is essential to provide a clear, consistent message. A consistent message is not licence for dogmatism. This message needs to be as encouraging of 'gardening' as possible, without imposing actual or perceived constraints. A key message to come out of the research was:

'I think that encouraging gardening is key to biodiversity. Everybody has ownership of gardening as such, whereas not everybody has ownership of 'wildlife' gardening.'

Always keep eco-friendly issues on the agenda, even when fashion moves on. The message also needs to be brief. People do not read much on plant labels, and most will not read much at the garden centre or in a leaflet. In fact, too much information is intimidating. A complex message is also hard for garden centres to hook into, or to display.

The message needs to have personal application, so that people understand about how they could make a difference themselves as individuals.

The message must convey benefits beyond biodiversity enhancements. Commercial benefits must be evident if producers and distributors are to promote it, and it must manifestly have personal benefits for gardeners if they are to engage with it.

'How one sells ideas is important: rather than 'biodiversity is good for the planet', 'do you like birdsong and butterflies in your garden?' Think about communication channels.'

There are other ways of appealing to self-interest: for example, garden renovations increase house prices.

Many interviewees stressed the importance of attracting people in, by giving them ideas as to what they can do, and by removing the guesswork by promoting products and methods that

'work'. Success is necessary for persistence, and this applies as much to the horticultural suppliers as it does to the demand side.

3.6.2 *Leadership*

Delivery of sustainable development requires changes to practice. The missing ingredient for progress on biodiversity issues is enough people in positions of influence to think in a fresh way and to follow new ideas through. John Little (see Case Study) is an inspirational example of what leadership can achieve in practice. There is all to play for in the landscape sector. At the top of government or private business, the landscape sector is still viewed as cosmetic, in part because of the unhelpful and patently false dichotomy that biodiversity is only about 'wild vegetation' whilst horticultural/designed vegetation has little value for biodiversity.

It was suggested that the main issues for the authorities should include urban nature conservation, sustainable drainage and flooding, climate change, the health functions of urban parks, and sustainable communities (meaning improvements to quality of life). At the level of policy, national players, including SNH, should set stricter targets for big developments in terms of landscape setting and integrity, but should be accommodating about small-scale urban gardens, which are part of the complex mosaic of the landscape. An holistic approach to urban ecology is better, rather than being precious about a particular site or a particular way of gardening. People must have access to the living world, and, in fact, any greenery is better than nothing.

Engagement with leaders needs to occur at all levels, in the public sector, business sector, and voluntary sector. Group leaders at the most local level can have as much – or more – impact on practice as national organisations. Often local groups have entrenched ideas, and find change and accommodation of differences very difficult. The corporate and utilities sectors are important players, and also need to be engaged. This requires advisers who understand biodiversity issues, commercial constraints and organisational inertia. Unless large players are realistically engaged, there is no change to corporate culture (meaning organisational mindsets). Overcoming organisational inertia requires lateral as well as vertical connections.

It *is* possible to achieve trickle-down of ideas, if there are sufficient thin threads, like bird boxes in new developments, but the process is very slow. Organisations need to learn from one another, particularly from other similar establishments.

3.6.3 *Garnering public opinion*

The spread of ideas is important, and the way in which this is done is as important as the message.

Many interview respondents pointed out that people learn from observation; what works in one place is copied. Experimentation is important, but support for demonstration projects that are sure to succeed will encourage other people to adopt ideas. This is easiest with public planting schemes, and most advice relates to this.

Case Study: John Little

John Little's success based is on a number of factors. He has engaged with people 'where they are' in terms of their attitudes to untidiness and their preferences for bright colourful vegetation. He has used a long season of colour to win the support of people for planting that is excellent for biodiversity - people who would not necessarily have supported biodiversity as a goal in its own right. His work emphasises how important it is to be able to demonstrate success, and how leadership eventually inspires and motivates the public.

John Little is a partner in a landscape design and management company that designs and builds green-roof buildings, designs and maintains school grounds, and undertakes grounds maintenance work on behalf of local authorities. The ethos of the company is eco-friendly.

Making spaces that children use is central to the school gardens projects. Children are asked to submit ideas that are incorporated in the garden design. They are also involved in planting bulbs or trees. Hard landscaping makes as much use as possible of recycled materials. The company's maintenance of the new gardens provides opportunities for follow-up. They will organise a 'Green Day' once a year at the school, working with local wildlife trusts or the local authority, providing information and events for parents, children and school staff on, for example, wildlife, recycling and allotments. The event is usually a picnic lunch followed by activities. Children may make bird or bug boxes to take home, or wildflower buttonholes. The local press are invited to cover the event. The advantages are the long-term engagement of children and their parents in green issues.

The grounds maintenance contract for Hackney London Borough Council has been very successful. In order to achieve a shift in maintenance regime from traditional to eco-friendly methods, it was necessary to secure the Council's herbicide contract. Controlling herbicides applications has allowed John Little to sow annuals along fencelines instead of spraying. Initial results were mixed: wonderful success with annual wildflowers but problems with prairie planting which was found to be high maintenance. 'Selling' the changes has required engagement with the housing estate community. A4 interpretation boards explain that sowings are not 'weeds'; residents are encouraged to help themselves to wildflower seeds, and non-native wildflowers have been introduced to extend the flowering season. Poppies are used widely, as they are the most popular of wildflowers, and geraniums are added to the seed mix. After residents had discovered that, between the 'weed' period and the 'brown' period, the effect was stunning, they far prefer the new regime to traditional grounds maintenance. Residents are currently working with John on a garden for the Chelsea Flower Show where everything on the stand will be taken from the estate.

The company measures its success by the enthusiasm and participation of increasing numbers of people, and by the adoption of its methods by other local authorities. For example, Thurrock Council is now following the lead set in Hackney in planting wildflowers in public places, especially hard-to-maintain areas.

Ideas should be promoted and support provided at the local level, for example to schools and councils. While SNH may want to brand what it does, there may be more success in spreading the message if aspects of it are seen as a local initiative. One way of doing this is by practical example; for example free wildflower sowing for the local council for a year or two, so that the results can be seen and public opinion assessed. The handing out of free seed from public planting to members of the public encourages private adoption of similar planting.

Consultation and interpretation matter. It is important to approach the (local) media, so that ideas are explained to as broad an audience as possible early on. On public projects, interpretation boards should be used as a matter of course, so that locals are enlightened as to the objectives of changes and the need to wait for results. Interpretation is needed to win people over, especially for conservation grassland, prairie and meadow planting: 'weeds' before and 'brown' after is a tricky combination to sell, even when the effect between is beautiful. It may therefore be better to include non-native annuals to extend the flowering season. Again, encourage people to take seed.

Some 'supernature' is needed to sell ideas; successful plantings have to be 'in your face'. Dramatic colour displays are particularly important in gaining public support.

Success is important in encouraging persistence. This was the main factor cited by interviewees. If wildlife comes in response to a change, then people are encouraged. They may not only persist, but try something else. For this reason, what is promoted by organisations such as SNH and the Garden for Life Forum must work. Indeed, even where one is well-informed, failure, particularly if it is public, will discourage perseverance. For example, one interviewee has trialed both wildflower and prairie planting in public places with advice from the Department of Landscape at the University of Sheffield. The wildflower planting has been a spectacular success. Prairie planting (contemporary, natural, perennial planting) has not, largely because of the high maintenance requirements ('it is too labour-intensive'), and he is considering abandoning this. He and others re-iterated the importance of talking to the universities and other sources for advice early, so that time and goodwill are not lost through making mistakes.

3.6.4 Education

Education was seen as being important by nearly all respondents in changing attitudes and persuading people to adopt eco-friendly methods/products.

There is a role for formal education in schools, particularly via advice to schools on wildlife gardening on site. This was felt to be vital by many respondents who work in the area. It is an effective way of spreading the message, as children involve their parents, by bringing them along to open days or by taking messages home. It is also a way of influencing the future. Organisations like Garden Organic are now training people to work in schools in an attempt to get the message across to people while they are still young.

Informal education is probably best done by the media, as they reach a wide audience in an accessible and non-intimidating way. The media also have an indirect effect by 'creating' fashions, which influence gardeners who may not watch television or buy magazines and journals. Most people respond to peer pressure and fashion, and advertising and trends play a large part in what people choose to do. According to many respondents, the adoption and purchasing of eco-friendly products is now becoming more 'mainstream', which may reflect changing attitudes and increased awareness of the issues.

Case Study: Landlife

Being based in the inner area of a major city has allowed Landlife to break away from the straitjacket of traditional rural-focused conservation. They have challenged the idea that 'nature is good for you' irrespective of what it looks like, in order to gain the support of ordinary people. This has led to their development of 'Creative Conservation', a fluid, pragmatic approach to melding together new native plant communities that are sustainable on a given site with the hopes and fears of local people, to produce inspirational life affirming partnerships.

Landlife, based in Liverpool, started as an urban wildlife charity, to bring ecology into the city. They also engage people in environmental education working mainly in urban and urban fringe areas. When, initially, the organisation had difficulty getting the plant material it needed, it established a plant nursery. Selling plants contributes to its fund raising efforts.

In 1996-97 Landlife won £2.1 million of millennium funding to set up the National Wildflower Centre and to create an effective demonstration site for its work. Landlife and the Wildflower Centre are separate charities, but based on the same site in a 16 hectare Council-owned public park in Knowsley, Liverpool. Landlife negotiates with the Council to use parts of the park for demonstration plantings.

One objective of Landlife is to inform people about new habitats for wildlife, to inspire 'creative conservation' whilst recognising the importance of achieving an appropriate balance between people's aspirations and habitat provision. The charity caters for private gardeners, for landscape architects, architects and other relevant professionals. Attempts are made to get the local authority to take on their ideas, but there are barriers to ideas filtering down to all levels. Landlife also engages with a wide range of other organisations, for example, the University of Sheffield, CABE (Commission for the Built Environment) Space and the Eden Project.

The nature of the organisation does not allow it to promote non-natives. Nevertheless, staff recognise that urban environments are not natural and that there is a need to bring evocative landscapes to those who have never seen them. They have collected seed of non-natives, like lupins, which survive well on managed grassland, and have made 'prairie mixes' for appropriate landscapes. No peat is used. Green waste is used where additional fertility and mulching is needed.

Landlife has discovered that the public likes being surprised and delighted. Previously, ecologists and nature conservationists overplayed the eco-consciousness side of conservation, and much of the work that was done was not appreciated by the public because the sites looked unattractive. By placing people at the heart of its conservation work, and accepting that people need to find vegetation attractive to value it, they are able to be much more effective in their mission.

Case Study: Threave Castle

Whilst in many ways unique in Scotland as a teaching and training garden, Threave represents the plurality of gardens and gardening throughout Britain. Staff see biodiversity as a desirable product of gardening in a thoughtful way, rather than a primary goal for gardening. A pragmatic approach to gardening is adopted, integrating aspects of organic and non-organic husbandry within the sustainability agenda of the National Trust for Scotland. The difficulties experienced at Threave in attracting local schools to integrate gardening more into the curriculum is possibly due to the widespread notion that gardens are not relevant to conservation, whereas a failing meadow of long grass is.

Threave Castle, owned by the National Trust for Scotland, consists of 26 hectares of ornamental gardens set in an estate of 600 hectares. The ornamental gardens are designed for the students of the Threave School of Gardening, and include a rock garden, a rose garden, a water garden, a walled garden, shrubberies, herbaceous perennials, collections of rhododendrons and camellias, and an arboretum. Threave is different from all other gardens in the care of the National Trust for Scotland in two important respects: it has been created by the Trust and not simply taken over as an established garden, and it is a teaching garden which plays an important part in the training of students who are involved in its design and maintenance.

The gardens are cultivated to meet the needs of the course, which focuses on teaching practical skills and plant knowledge. Biodiversity is therefore not an objective in the ornamental gardens, although the wider estate has largely native plantings with a rich fauna. There is also no explicit objective to achieve organic cultivation, although it is NTS policy to cut down on pesticide use, and semi-organic methods are used in the walled garden, which produces fruit and vegetables (and is abundant in wildlife). It is also NTS policy to reduce the use of peat: however peat is still a component in some composts. The gardens are irrigated when necessary, using mains water stored in a tank and pumped around the gardens.

The gardens attract around 77,000 visitors each year. The favourite areas of the garden are the walled garden and the borders of herbaceous perennials. Informal instruction of visitors occurs through discussions with visitors, guided walks, and talks and demonstrations.

The greatest disappointment of the staff at Threave is the lack of interest by local schools in using the gardens for education. Overtures have been made to local schools but have not been taken up. There is money available to schools to make wildlife gardens, but what tends to happen is either a complete lack of interest, or installation and then a lack of maintenance, until the wildlife area is so overgrown that it gets taken out and paved over. Trevor Jones, Property Administrator and Principal of the School of Gardening at Threave, would like to see fruit and vegetable growing included in the national curriculum. This would have both health and educational benefits, and would provide some protection against the loss of skills that is occurring across the horticultural sector.

3.6.5 *Public arena*

Getting more resources for parks and the rest of the public realm is crucial to mobilising public response. Where there is Lottery or other funding for parks upgrading, it is far easier to initiate and sustain a Friends group. This tends to create a virtuous cycle of generating additional funds for more facilities, either from separate grant applications or via elected member interest.

One method of influencing elected members is by parks delivery becoming 'more local'. If councillors are expected to attend neighbourhood-level meetings about parks and other public-realm improvements, where residents are asking questions, it becomes possible to divert more resources to greener issues.

A ranger service (or site-based gardeners) helps, because the Parks Department can interface directly with the public about the changes that are being made. Explanations are generally effective: if people understand the rationale, they accept more.

Greenspace Scotland is doing a great job raising awareness of the value and health benefits of greenspaces. There has been nothing in Scotland like the Living Spaces programme in England and Wales, which is seen as having been a great success in both sourcing funds and securing local involvement in public open space. There have however been a number of small Lottery funded programmes encouraging community led environmental projects, including greenspace projects.

3.6.6 *Horticulture industry*

Rationalisation of the industry is happening more quickly than expected. This creates an opportunity for getting across a biodiversity message, as there are fewer and more influential players to engage. Competition, and therefore changes to industry practice, may come from other big companies, like M&S and Sainsbury's, which may enter the 'green business'. Early engagement with these emerging players may give SNH an opportunity to shape the future of retail horticulture.

3.6.7 *Policy incentives and sanctions*

The view was recorded above that it is rare that organisations change their existing practices radically without push factors being applied. Demonstration and persuasion are best, and most effective, when the target audience is private gardeners. Large developers and corporations may require more direct methods. The clarification of planning guidelines and tightening of planning enforcement with respect to landscape conditions is an issue that government has not yet confronted adequately. SNH should consider working with public and professional organisations to give commercially viable and ecologically desirable guidance on this issue, with a view to establishing enforceable biodiversity enhancements related to large developments.

3.6.8 *Monitoring*

Very little was said about monitoring trends over time, although one interviewee pointed out that measurable performance targets are needed. There would be value in selecting several key performance targets that indicate behaviour and are easy to measure, like sales of particular products, or hits on selected websites, or allotment uptake in Scotland, or entries of private gardens in Britain in Bloom (perhaps in a new wildlife garden category), and assessing how these change over time and in response to particular initiatives. While this does not substitute

for scientific analysis, these data can be cheaply collated and analysed internally for monitoring the effectiveness of campaigns.

4. CONCLUSION

Gardening is immensely important in British culture, possibly more so than in any other country. Within individual cities, gardens form a contiguous network composed of complex and heterogeneous individual gardens. These gardens are of huge importance for urban biodiversity.

Just how significant these gardens are has recently been confirmed by the Biodiversity in Urban Gardens Project (BUGS). More importantly, this study has shown that conventional gardens, many of which are dominated by non-native plants, and are rarely 'wild' in character, are also extremely good for biodiversity. This is the case even when gardeners make no substantive effort to encourage wildlife through their gardening practice. The simple view of the conventional garden being bad for biodiversity and the unkempt 'wildlife' garden being good, is false. The same study has shown that significant improvement in a garden's capacity to support biodiversity is readily achieved within the norms of conventional gardening.

The implications of this new understanding are profound. In particular it suggests a need to re-think the traditional presumption of British nature conservation policy that landscapes that look like the countryside are good for biodiversity whilst those that do not (ie gardens) are merely cosmetic assemblages of little value. The biodiversity support achieved by gardening and horticulture is not, however, achieved without a cost. Gardeners consume resources in order to maintain the environments in which this biodiversity lives, sometimes to the short-term detriment of this biodiversity, and some of these resource inputs are not sustainable. The challenge is therefore to maintain and expand current biodiversity as well as social and cultural benefits, whilst trying to reduce resource input or, where possible, to substitute more sustainable alternatives. This process is not straightforward, as changing the values and culture associated with consumer choice is extremely difficult. This is clearly illustrated by the negligible success that has been achieved in attempting to switch consumers away from peat-based composts, despite concerted media campaigns over a long period of time. This is most difficult to achieve when the resource in question is demonstrably highly effective and inexpensive, and the alternatives less so. Clearly the supply chain has an important part to play in influencing these decisions through providing more information, and in some areas - for example, garden timber products – it is already doing so.

Amongst our expert respondents, there was much greater support for this process of resource substitution or reduction than is currently apparent in the gardening population as a whole. It may just be that there is an inevitable lag before the values of those in the vanguard become mainstream. Our respondents certainly believed a sea change of this nature was beginning to take place. Whilst it is clearly necessary to try to move incrementally towards more sustainable garden practice, it is also important to recognise that the equation between resource consumption in gardening and biodiversity benefits is far less negative than conservation bodies have traditionally believed.

Greater opportunities for biodiversity in gardens and public landscapes can be achieved through a number of strategies:

- Increasing the number of people who actively participate in gardening.

- Increasing the spatial, structural and taxonomic complexity of gardens, new building developments, public parks and greenspace in general.
- Increasing the area of planting relative to both hard surfaces and closely mown grass.
- Increasing the area covered by tree canopy in new and existing landscapes.

It is both desirable and inevitable that the planting involved in the above should be essentially plural in nature, to reflect what is sensible in a given set of circumstances; should involve both native and non-native plants as appropriate; and should embrace a broad spectrum of gardening practice. Perhaps the most significant and recurring finding of the interviews in this study was the belief that past approaches to encouraging biodiversity gain through gardening, such as those pursued by nature conservation agencies, have been essentially back to front. Rather than attempting to encourage the pursuit of biodiversity in a way that requires changes in gardeners' deeply held views about how gardens should look, and what plants they should contain, a more effective approach is to emphasise that what gardeners currently do is good both for themselves and for biodiversity. Gardeners need to be aware that, by increasing the area planted, by increasing the diversity of plants used in terms of species and cultivars, and by making small changes to their practice, they can support even more wildlife. Messages should focus on the likely rewards rather than generating guilt: for example, garden to produce complex environments, and the biodiversity will follow. Changes to practice with the aim of improving biodiversity both within and beyond gardens would involve reducing use of peat (and other unsustainable organic compost component such as coir), pesticides and water; avoiding plants that are known to be of lesser value to wildlife; and increasing the use of trees and shrubs.

This 'garden first, biodiversity second' approach is more likely to succeed, as it addresses people as they are, rather than where biodiversity policy might wish them to be. Policy makers need to understand gardening culture. It will be much easier to encourage people who currently do not garden, or do so very timidly, to get started. They are more likely to become more ambitious when operating within, rather than outside, the norms of their gardening peer group.

This approach potentially presents a win-win situation; gardeners can continue to enjoy colourful super-nature in their gardens whilst simultaneously boosting opportunities for biodiversity, and will become more confident and engaged with the biodiversity they can see and recognise, incrementally moving to adopt more sustainable forms of management. Adopting this mainstreaming approach would allow the retail supply chain to offer more wholehearted support, as it provides more opportunities to promote and sell a wider range of plants and products. Marketing campaigns that imply, either directly or by default, that only a small subset of the plants sold by garden centres and other outlets are beneficial for biodiversity, place such retail outlets in an impossible position and are simply counterproductive. Gardeners whose primary motivation is provision of a wildlife habitat will continue to do this. At present, however, it seems likely that this group represents a relatively small percentage of gardeners as a whole, as is reflected in the number of respondents to the RHS web survey: less than 5% belonged to- this society whose membership is extremely well informed on biodiversity and gardening.

Government and agency support will be important in encouraging gardeners and other horticulturalists to facilitate greater urban biodiversity. At a strategic level, maintaining and extending the opportunity for people to garden is critical, by restricting the conversion of gardens into car parks and new building plots, by retaining allotments, and by encouraging gardening programmes in schools and amongst communities which lie outside gardening tradition. Demonstration and interpretation of new approaches to biodiversity-friendly but

diverse horticulture, involving natives and non natives as appropriate, are particularly important in the public realm if we are to win support and raise the level of understanding. The identification of inspirational and successful projects, and the promotion of these by opinion leaders and practitioners, is very important. There is a need for local authorities to recognise and encourage greater complexity in public landscape planting, both in new projects and in existing public open spaces as a whole. There are, however, serious difficulties in attracting suitably trained staff, especially at a hands-on level, in both in public horticulture and the horticultural supply chain. This may be turned around by raising the status and profile of this activity, by paying better wages for better-trained staff in the public sector, which will force up wages in competing sectors. In Britain, funded research to guide and underpin the conversion of traditional horticulture to a more sustainable, biodiverse model is seen by government as an industry responsibility and, as a result, is largely absent.

Many respondents voiced concern that biodiversity was not well understood, and was often seen to be associated with wild places in which people were conspicuously absent. Placing people squarely in the centre of the biodiversity concept, and recognising that biodiversity is potentially everywhere, and not exclusively in areas designated as being 'for nature', will engage people, encouraging more responsible actions generally.

All of the respondents interviewed felt strongly that, as a result of a range of influences, many gardeners are increasingly receptive to environmentally-friendly ideas, as long as these do not conflict seriously with their primary motivation for gardening, which was the creation of beauty and utility. There is a sense of being at a tipping point. There is a real opportunity to construct a new, fundamentally cultural approach to the management and advancement of urban biodiversity based on gardening and more eco-friendly horticulture. This will reconcile what traditional wisdom has seen as apparent opposites - nature vs. culture, design vs. wildness, natives vs. exotics, rural richness vs. urban poverty. We should embrace this opportunity.

REFERENCES

- Ackroyd, Peter (2002) *Albion The Origins of the English Imagination* (London: Chatto & Windus).
- Anon. (2000a) 'In their own words'. Reflections *The Garden* Vol. 125 Part 1 January 2000, pp. 42-47
- Anon. (2002b) 'Buying habits influenced by TV gardening'. *Horticulture Week* February 7th, 2002, p. 2002.
- Anon. (2002c) 'More imports infected with rare pests'. *Horticulture Week* February 7th, 2002, p.4.
- Anon. (2002d) 'Tree ferns top list of illegal plant imports'. *Horticulture Week* February 21st, 2002, p.3.
- Anon. (2002e) 'Peat free composts grow in popularity'. *Horticulture Week* February 24th, 2002, p.7.
- Anon. (2002f) 'Garden chemical timebombs'. *Urbio urban biodiversity and human nature* Issue 2 May, 2002. (Peterborough: English Nature).
- Anon. (2003g) 'Bumper year for bugs'. *The Garden* Vol. 131 Part 4 April, 2006, p.238.
- Anon. (2004h) Retail News Briefs 'Haith's etc'. *Horticulture Week* 25th November, 2004, p.10.
- Anon. (2005i) 'Gardening trends More to grow their own'. Gardeners' Digest *The Garden* Vol. 130 Part 1 January 2005, p.4
- Anon. (2005j) 'Plant sales under pressure'. Market Review *The Garden* Vol. 130 Part 10 October 2005, p.702.
- Anon. (2005k) 'Trends, predictions, responses. The latest news on what to expect from climate change in our towns and cities'. *Urbio urban biodiversity and human nature* Issue 10: Autumn 2005 (Peterborough: English Nature).
- Anon. (2006m) 'Green roofs Sky-high biodiversity'. Gardeners' Digest *The Garden* Vol. 131 Part 1 January 2006, p.4.
- Anon. (2006n) 'Drought forces changes'. Gardeners' Digest *The Garden* Vol. 131 Part 4 April 2006, p.224.
- Anon. (2006p) 'What is a garden for?' Reflections *The Garden* Vol. 131 Part 10 October 2006, pp.702-707.
- Anon. (2006q) 'Foreign invaders from the past occupy English countryside'. *New Scientist* 21st October, 2006.
- Anon. (2006r) 'Britain isn't moving.' *The Economist* December 2nd to 8th 2006.
- Appleby, Matthew (2004) 'Cure for tunnel vision'. *Horticulture Week* September 25th, 2004, p.11.
- Ardle, Jon (2005) 'Wild, but with style'. *The Garden* Vol. 130 Part 6 June 2005, pp. 440-441.
- Attfield, R. (1999). *The Ethics of the Global Environment*. (Edinburgh: Edinburgh University Press).
- Baines, Chris (1984) *How to Make a Wildlife Garden* (London: Elm Tree Books/ Hamish Hamilton).
- Baines, Chris (2005) 'Wild about gardens'. *The Garden* Vol. 130 Part 4 April, 2005 pp. 254-257.

- Baines, Chris (2006) *Nature* BBC Radio 4 Monday Oct 9th.
- Barber, Alan (2005) 'Future-proofing parks'. *Urbio urban biodiversity and human nature* (10) Autumn Issue 2005 (Peterborough: English Nature).
- Barnett, Sophie (2006) 'Greener cities will keep cool as climate change warms up'. *Horticulture Week* September 28th, 2006. Retrieved 26th October, 2006
www.sed.manchester.ac.uk/research/cure/downloads/asccue
- Baulkwill, Alexandra (2005) 'Plot rehabilitation'. *The Garden* Vol. 130 Part 10 2005, pp. 726-729.
- BBC News (2004) 'British horticulture is desperate for new recruits'. Thursday March 11, 2004.
- BBC The Food Programme (2006) 'National Apple Day'. 19th October, 2006.
- Bengtsson, J. (1998). 'Which species? What kind of diversity? Which ecosystem function? Some problems in studies of relations between biodiversity and ecosystem function'. *Applied Soil Ecology*, 10, (3) pp.191-199.
- Berry, S. (2006) 'The English Nature Wildlife Gardening Initiative – Past, Present and Future' (unpublished: English Nature).
- Bevan, David (2005) 'Lessons from London's exotics'. *Urbio urban biodiversity and human nature* (10) Autumn Issue 2005 (Peterborough: English Nature).
- Bhatti, Mark (2006) 'When I'm in the garden I can create my own paradise': Homes and gardens in later life. *The Sociological Review* (Oxford: Blackwell).
- Bisgrove, Richard (1992) *The Gardens of Gertrude Jekyll*. (London: Francis Lincoln).
- Blunt, Wilfrid (1971) *The Art of Botanical Illustration* (London: Collins)
- Blythman, Sophie (2004) *Shopped: The Shocking Power of British Supermarkets* (London: Fourth Estate).
- Bourassa, S.C. (1991) *The Aesthetics of Landscape* (London: Bellhaven Press).
- Brady, Nyle, C.; Weil, Ray, R. (2002) *The Nature and Properties of Soils* [Thirteenth Edition] (New Jersey: Prentice-Hall)
- Brasier, Clive (2005) 'Preventing invasive pathogens: deficiencies in the system An analysis of import controls' *The Plantsman* Vol 4 (1) pp.54-58.
- Brown, Jane (1999) *The Pursuit of Paradise A Social History of Gardens and Gardening* (London: HarperCollins).
- British Trust for Conservation Volunteers (BTCV). Retrieved November 26th 2006.
http://www2.btcv.org.uk/display/btcv_scotland
- Burgess, Stuart (2006) 'Idyll Threats' *The Guardian* Comment Wednesday, July 19th, 2006.
- Burgess, J.; Harrison, C.M.; Limb, M. (1988) 'People, parks and the urban green: a study of popular meanings and values for open spaces in the city'. *Urban Studies* 25 pp.455-473.
- CABE Space (2004) 'Parks need people; The skills shortage in parks – summary of research'. (London: CABE Space).

- Caffrey, J.M. (1994) Spread and management of *Herculeum mantegazzianum* (Giant Hogweed) along Irish River Corridors. In De Waal, L.C., Child, L.E., Wade, M., Brock, J.H.(eds)*Ecology and management of riverside plants*. (England: Wiley) pp. 67-76.
- Chiesura, A. (2004) 'The role of urban parks for the sustainable city'. *Landscape and Urban Planning* 68 (1) pp.129-138.
- Clayton, Philip (2003) 'Allotment King'. Garden Profile *The Garden* Vol.128 Part 8 August 2003, pp.596-597.
- Collinson, Nick (2005) 'The challenge of change'. *Urbio urban biodiversity and human nature* (10) Autumn Issue 2005 (Peterborough: English Nature).
- Crane, Peter (2005) 'Tree fern trading'. *The Garden* Vol 130 Part 1 January 2005, pp.62-63.
- Davies, Norman (1996) *Europe: A History* (Oxford: Oxford University Press).
- Davis, M.A.; Thompson, K.; Grime JP. (2000) 'Fluctuating resources in plant communities: a general theory of invasibility'. *Journal of Ecology* Vol. 88 Issue 3 pp. 528-534.
- Davis, Rob (2006) 'The toxic Tree of Heaven threatens England's green and pleasant land'. *The Observer* September, 17th, 2006.
- DEFRA (Department for Environment, Food and Rural Affairs) (2000) Landscape Protection, Recreation and Public Access Countryside and Rights of Way Act (CROW). Retrieved 10th October 2006 <http://www.defra.gov.uk/wildlife-countryside/cl/accessopen/index>.
- DEFRA (2003) A Draft Biodiversity Strategy for England: Part 2 Indicators. Retrieved 28th November 2006. <http://www.ukbap.org.uk/ebg/library/ebg/ebg-03-01.pdf>
- DEFRA (2005) Helping to prevent the spread of invasive non-native species. Horticultural Code of Practice. <http://www.defra.gov.uk/wildlife-countryside/non-native/pdf/non-nativeecop.pdf>
- DEFRA Working with the Grain of Nature A Biodiversity Strategy for England. Retrieved 1st October, 2006. <http://www.defra.gov.uk/wildlife-countryside/biodiversity/biostrat/index.htm>
- DEFRA (2006) Section Part 3 of the Natural Environment and Rural Communities Act (NERC) 2006 for England, Wales and Northern Ireland. Retrieved 10th October 2006 www.defra.gov.uk
- De Groot, W.T.; van den Born, R.J.G. (2003) 'Visions of nature and landscape type preferences: an exploration in The Netherlands'. *Landscape and Urban Planning* 63 pp.127-138.
- DETR (Department of Environment, Transport and the Regions) 2000 Local Government Act Chapter 22, Section 4: Promotion of environmental, social and economic well-being. Retrieved 7th October 2006. www.opsi.gov.uk/ACTS/acts2000/00022
- Dewey, J. (1929) *Experience and Nature* (London: Allen & Unwin) Cited by Punter, John (1994) 'Aesthetics in Planning'. In Thomas, Huw (Ed.) *Values in Planning* (Aldershot: Avebury).
- Dixon, Geoffrey, R. (2002) 'Interference impedes research development'. Comment *Horticulture Week* January 17th 2002, p.13.

- Dixon, Geoffrey, R. (2002) 'Industry is burdened by bans on chemicals'. Comment *Horticulture Week* February 28th 2002, p.15.
- Dunnett, Nigel (2000) 'At the cutting edge'. *The Garden* Vol.125 Part 5 May 2000, pp.338-391.
- Dunnett, N.; Qasim, M. (2000) Perceived benefits to human well-being of urban gardens. *Horticulture Technology* 10: pp. 40-54.
- Dunnett, Nigel (2002) 'Up on the roof'. *The Garden* Vol. 127 Part 5 May 2002, pp.380-383.
- Dunnett, Nigel (2004) 'The dynamic nature of plant communities'. In *The Dynamic Landscape* Dunnett, Nigel & Hitchmough, James (Eds.) (London: Spon Press)
- Dunnett, Nigel (2006) 'Learning from nature'. Garden profile. *The Garden* Vol. 131 Part 3 March 2006, p.188-193.
- Dunnett Nigel & Hitchmough, James (2001) 'First in, last out'. *The Garden* Vol. 126 Part 3 March 2001, pp.182-183.
- Eckersley, Robin (2004) *The Green State Rethinking Democracy and Sovereignty* (Cambridge MA: MIT Press)
- England Biodiversity Group (2003). *Natural Partners: The achievements of local biodiversity partnerships in England*. (Newark: The Wildlife Trusts).
- FCCFG (Federation of City Farms and Community Gardens) Retrieved October 26 2006. <http://www.farmgarden.org.uk/>
- Ferguson, William (1968) *The Edinburgh History of Scotland 1689 to the Present* Vol 4 (Edinburgh: Mercat Press)
- Fitzgerald, Catherine (2003) 'Why choose horticulture as a career?' Viewpoint *The Garden* Vol. 128 Part 10 October 2003, pp.796-797.
- Fjortoft, Ingunn; Sageie, Jostein (2000) 'The natural environment as a playground for children'. Landscape description and analyses of a natural playscape. *Landscape and Urban Planning* (48) pp.83-97.
- Fox, Richard (2006) Humming-bird Hawk Moths arrive In Scotland, but locals lose out Surveys Manager :Butterfly Conservation. Retrieved 26th November 2006. rfox@butterfly-conservation.org
- Garbutt, Simon (2005) 'Gardens in the sky' Urban Environment *The Garden* Vol. 130 Part 11 2005, pp.792-797.
- Gaston, K. J. and Spicer, J. I. (1998). *Biodiversity: An Introduction*. (Oxford Blackwell Science).
- Gaston, Kevin, J.; Warren, Philip, H.; Thompson, Ken; Smith, Richard, M. (2005) 'Urban domestic gardens (IV): the extent of the resource and its associated features'. *Biodiversity and Conservation* 14, pp.3327-3349.
- Gaston, K. J.; Cush, P.; Ferguson, S.; Frost, P.; Gaston, S.; Knight, D.; Loram, A.; Smith, R. M.; Thompson, K. and Warren, P. H. (2007) 'Improving the contribution of urban gardens for wildlife: some guiding propositions'. *British Wildlife* 18(3), pp 171-177.

- Gates, Phil (2002) 'Peat, gardeners and conservation'. Conservation *The Garden* Vol. 127 Part 3 March 2002, pp.200-203.
- Geoffrey, Peter (1998) *Sociable Cities: The Legacy of Ebenezer Howard* (New York: Wiley)
- Gilbert, O.L. (1989) *The Ecology of Urban Habitats* (London: Chapman & Hall).
- Giller, P. S. and O'Donovan, G. (2002). 'Biodiversity and Ecosystem Function: Do species matter?' *Biology and Environment: Proceedings of the Royal Swedish Academy*, 102B, (3) pp.129-139.
- Glacken, C. J. (1976) *Traces on the Rhodian Shore : Nature and Culture in Western Thought from Ancient Times to the End of the Eighteenth Century*. (Berkeley, University of California Press).
- Gobster P. H. (2005) 'Invasive species as Ecological Threat: Is restoration an alternative to fear-based resource management?' *Ecological Restoration* 23 (4) pp.261-270.
- Gobster, P. H.; Westhal, L.M. (2004) 'The human dimensions of human greenways: planning for recreation and related experiences.' *Landscape and Urban Planning* 68 pp.147-165.
- Gordon, Chris; Shirley, Peter (2002) *All things to all people Parks and semi-natural open spaces in 21st century Britain Review of current thinking*. UK-MAB Urban Forum. Retrieved 7th November, 2006. http://www.ukmaburbanforum.org.uk/Publications/Parks_Gordon/Parks_Gordon2
- Gould, S.J. (2003) 'An evolutionary perspective of native plants.' In Gould S.J. *I have landed. Splashes and Reflections in Natural History*. (London: Vintage) pp. 335-346.
- Greenfield, Baroness Susan et al (2006) 'Modern life leads to more depression among children'. Daily Telegraph, Letters 12. 09. 2006
- Grime, J.P. (1998a) 'Benefits of plant diversity to ecosystems: immediate, filter and founder effects'. Essay Review: *Journal of Ecology* Vol. 86 Issue 6 pp. 902-910.
- Grime, J. Philip (1998b) In: 'Life support Why bother to save every last species on the planet? Because they are the Earth's insurance policy'. Cited by Holmes, Bob. *New Scientist* 15th August, 1998.
- Grime, J. Philip (2002) *Plant Strategies, Vegetation Processes and Ecosystem Properties*. Second Edition (Chichester: John Wiley)
- Grime, J.P. (2005) 'Alien Plant Invaders: threat or side issue?' *Ecos* 26 (3/4) pp. 33-40.
- Groning, G.; Wolschke-Bulmahn, J. (2003) 'The native plant enthusiasm: ecological panacea or xenophobia?' *Landscape Research* 28 (1) pp.75-88.
- Haila, Y. (1999) 'Biodiversity and the divide between culture and nature'. *Biodiversity and Conservation* Vol. 8 No.1. 165-181.
- Hardin, Garrett, (1968) 'The Tragedy of the Commons' *Science* 162, pp.1243-1248.
- Hall, Peter (2002) *Urban Regional Planning Fourth Edition* (London: Routledge).
- Hill, M.O.; Pearman, D.A.; Roy, D.B.; Smart, S,M, (2002) *The Changing Flora of the UK*. (London: DEFRA).
- Hitchmough, J.D., and Bonugli, A. M. (1997) 'Attitude of residents of a medium sized town in South West Scotland to Street Trees.' *Landscape Research* 22 (3) pp.327-337.

- Hitchmough, James & Stokes, Amanda (2002) 'Working with nature.' *The Garden* Vol. Part 8 August 2002, pp.596-599.
- Hitchmough, James (2004) 'Selecting plant species, cultivars and nursery products.' In Hitchmough, James & Fieldhouse, Ken (Eds.) (2004) *Plant User Handbook A guide to effective specifying* (Oxford: Blackwell).
- Hitchmough, James (2005) 'What value exotic plant species?' *Ecos* 26 (3/4) pp.28-32.
- Hitchmough, James; de la Fleur, Marcus (2006) 'Establishing North American prairie vegetation in urban parks in Northern England: Effect of management and soil type on long-term community development.' *Landscape and Urban Planning* 78, pp.386-397.
- Hodkinson, I.D.; Hughes, M.D. (1982) *Insect Herbivory* (London: Chapman & Hall). Cited by Smith, R.M.; Thompson, K.; Hodgson, J.G.; Warren, P.H.; Gaston, K.J. (2006) Urban domestic gardens (IX): Composition and richness of the vascular plant flora, and implications for native biodiversity. *Biological Conservation* 129, 312-322.
- Hodgson, Ian (2006) 'Say goodbye to the urban garden?' *The Garden* Vol.131 Part 11 November 2006, pp. 80-781.
- Holmes, Bob (1988) 'Life support Why bother to save every last species on the planet? Because they are the Earth's insurance policy.' *New Scientist* 15th August 1998.
- House of Commons (2004-2005) Second Report of the Environmental Audit Committee, Sustainable Timber
- Ingram, David (2005) 'Time to avert disaster.' *The Plantsman* Vol 4 (1) pp.58-60
- Institute of Horticulture Home Page Retrieved 2nd October 2006 <http://www.horticulture.org.uk>
- Jamieson Brian, & Associates (2004) Skills Audit of Horticultural R & D *Report to the National Horticultural Forum*.
- Janek, Jules (2003) *History of Horticulture* (West Lafayette: Tippecanoe Press).
- Jellicoe, Geoffrey and Susan, (1995) Third Edition *The Landscape Of Man Shaping The Environment From Prehistory To The Present Day* (London: Thames & Hudson).
- Jenkins, Amy (2002) 'Heritage bodies strive to keep skills alive.' *Horticulture Week* January 31st, 2002, p.13.
- Jenkins, Simon (2006) 'A Bridge between now and eternity and how to fend off a furious swan'. *The Guardian* September 22nd 2006.
- Jermyns, J. (2003) *The Himalayan Garden*. Timber Press, London
- Johnsen, K'; Jacobsen, C.S.; Torsvik, V.; Sorensen, J. (2001) 'Pesticide effects on bacterial diversity in agricultural soils - a review' *Biology and Fertility of Soils* Vol. 33 No. 6, pp.443-453.
- Jorgensen, A. (2001) *Why is it important to encourage nature and wildlife near the home?* Retrieved 20 October 2006 from <http://www.making-places.info/overvecht/papers/natben.htm>

- Kaplan, R. (2001) 'The nature of the view from home: psychological benefits'. *Environmental Behaviour* 33 (4) pp. 507-542. Cited by Jorgensen, Anna; Hitchmough, James; Dunnett, Nigel (2006) In 'Woodland as a setting for housing-appreciation and fear and the contribution to residential satisfaction and place identity in Warrington New Town, UK' *Landscape and Urban Planning* (in press).
- Kaplan, R.; Kaplan, S. (1989) *The Experience of Nature: A Psychological Perspective* (Cambridge: Cambridge University Press)
- Kaplan, R.; Kaplan, S. (2005) Preference, restoration and meaningful action in the context of nearby nature. In Barlett, P.F. (Ed.) *Urban Place: Reconnecting with the natural world*. (Cambridge, MA: MIT Press).
- Kellert, Jonathan, E. (1982) 'The Private Garden In England And Wales.' *Landscape Planning* (9) 105-123.
- Kendle, A. D. and Rose, J. E. (2000). 'The aliens have landed! What are the justifications for 'native only' policies in landscape plantings?' *Landscape and Urban Planning*, (47) 19-31.
- Kendle, T. and Forbes, S. (1998). *Urban Nature Conservation*. (London: E & FN Spon).
- Kendle, Vanessa (2006) 'The Garden of England Under Threat'. *BBC Food Programme Radio 4* 22 October, 2006.
- Kennedy, C. E. J. and Southwood, T. R. E. (1984). 'The number of insects associated with British trees a re-analysis'. *Journal of Animal Ecology*, (53) pp.455-478.
- Kimbrell, Andrew (2002) (Ed.) *Fatal Harvest: the tragedy of industrial agriculture* (Washington: Island Press).
- Kingsbury, Noel (2002) 'Roofing Veldt' *The Garden* Vol. 126 Part 6 June 2001 pp.446-449.
- Kingsbury, Noel (2004) 'Contemporary overview of naturalistic planting design'. In Dunnett, Nigel and Hitchmough, James (Eds.) *The Dynamic Landscape* (London: Spon Press).
- Kingsbury, Noel (2006) 'Guarding the landscape'. Viewpoint. *The Garden* Vol. 131, Part 3 March 2006, pp. 202-203
- Knox, W.W. (2006) *A History of the Scottish People Chapter 4 Urban housing in Scotland 1840 to 1940* http://www.scran.ac.uk/scotland/pdf/SP2_4Housing.pdf?PHPSESSID=...
- Kowarik, I. (2003) 'Human agency in biological invasions: secondary releases foster naturalisation and population expansion of alien plant species'. *Biological Invasions* 5 (4) pp.293-312.
- Landes, David, S. (1969) *The Unbound Prometheus. Technological Change and Industrial Development in Western Europe from 1750 to the Present* (Cambridge: CUP).
- Landlife 2006 *Creative Conservation*. Retrieved 10 October, 2006 info@landlife.org.uk
- Landsberg, S. (1996) *The Medieval Garden* (1996) (London, British Museum Press).
- Leopold, Aldo (1981) [Second Edition] *A Sand County Almanac and sketches here and there* (New York: Oxford University Press).
- Lloyd, Christopher (2004) *Meadows* (London: Cassell)

Local Biodiversity Action Plans Retrieved 11 October 2006

<http://www.ukbap.org.uk/default.aspx>

London Wildlife Trust 'The Stag Beetle'.

Retrieved 10th November 2006. http://www.wildlondon.org.uk/stag_beetle.php

Loram A, Tratalos J, Warren PH & Gaston KJ. (2007). Urban domestic gardens (X): the extent & structure of the resource in five major cities. *Landscape Ecology* 22, 601-615.

Lovelock, James (2006) *The Revenge of Gaia*. (London: Penguin)

Lyons, K. G., et al. (2005). 'Rare Species and Ecosystem Functioning'. *Conservation Biology*, 19, (4) pp.1019-1024.

Mabey, Richard (2005) 'Sycamore squabbles'. *Urbio urban biodiversity and human nature* (10) Autumn Issue 2005 (Peterborough: English Nature).

MacLeod, John (2000) 'On an equal footing'. *The Garden* Vol. 125 Part 11 November 2000, pp.850-851.

Maller, Cecily; Townsend, Mardie; Pryor, Anita; Brown ; St Leger, Lawrence (2006) Healthy nature healthy people: 'contact with nature' as an upstream health promotion intervention for populations *Health Promotion International* 21(1), pp. 45-54;

McIntyre, N.E.; Knowles-Yanez, K. and Hope, D. (2000) 'Urban ecology as an interdisciplinary field: differences in the use of 'urban' between the social and natural sciences'. *Urban Ecosystems* 4 (1) pp.5-24.

McCann, K.S. (2000) 'The diversity and stability of ecosystems'. *Nature* 405, pp.228-233.

Mammals Trust UK (2005) 'Mammals on Roads' July Newsletter, London. Retrieved November 12th 2006. <http://www.mtuk.org/>

Marren, Peter (2002) *Nature conservation: a review of the conservation of wildlife in Britain 1950-2001* (London: HarperCollins).

Mason, C.F. (2000) Thrushes now largely restricted to the built environment in eastern England. *Diversity and Distributions*. 6 pp 189-194

Merchant, C. (1989) *The Death of Nature* (New York, HarperCollins).

Mercier, Michel, J. (2006) *Scope 49 Methods to assess adverse effects of pesticides on non-target organisms*. International Programme on Chemical Safety (IPCS).

Messervy, J.M. (1995) *The Inward Garden: Creating a Place of Beauty and Meaning* (Boston: Little John Limited).

Michaud, Michael (2006) 'The world in an allotment'. Community Gardening *The Garden* Vol.131 Part 4 April, 2006, pp.272-273.

Miller, David (2004) 'The Industry's Representative'. (Interview) *Horticulture Week* 2nd December, 2004,p.11.

Mitchell, A. (1978) *Trees of Britain & Northern Europe Collins Field Guide* 2nd Edition (London: HarperCollins).

- Monbiot, George (2006) 'The freshwater boom is over. Our rivers are starting to run dry'. *The Guardian* Tuesday, October 10th, 2006.
- Morrison, Alasdair (2000) 'Our collective responsibility'. Viewpoint *The Garden* Vol. 125 Part 4 April 2000, pp.304 - 305
- Munroe, Jennifer (2006) 'Gender, Class and the Art of Gardening. Gardening Manuals in Early Modern England'. *Prose Studies* Vol. 28 No. 2 197-210.
- Myers, Norman (2006) 'Earth in grip of mass extinction'. *ABC News Online* March 7th 2006. Retrieved December 2nd 2006.
<http://www.abc.net.au/news/newsitems/200603/s1586235.htm>
- National Farmers' Union (NFU) (2006) The State of Agriculture and Horticulture – October 2006 NFU Information and Analysis 2006.
<http://www.nfuonline.com/>
- Nature Conservancy (1984) *Nature Conservation in Great Britain* (London: HMSO).
- Nature Conservation (Scotland) Act 2004 Retrieved 3rd December 2006.
<http://www.opsi.gov.uk/legislation/scotland/en2004/2004en06.htm>
- Naveh, Zev (2001) 'Ten major premises for a holistic conception of multifunctional landscapes'. *Landscape and Urban Planning* 57, pp. 269-284.
- Nicolson, Adam (2006) 'Where have all our hedgehogs gone?' *The Guardian* Tuesday, January 17th, 2006.
- Nicholson-Lord, David (1978) *The Greening of Cities* (London: Routledge & Kegan Paul).
- ODPM (Office of the Deputy Prime Minister) (2005) *National Planning Guidance Note 3 Supporting the Delivery of New Housing* (London: ODPM).
- Oliver, Tom (2006) of The Campaign for Rural England. Cited by: Kendle, Vanessa 'The Garden of England Under Threat' *BBC Food Radio* 4 October 22nd, 2006.
- O'Malley, Therese (1998) Introduction to John Evelyn and the 'Elysium Britannicum'. In O'Malley, Therese & Wolschke-Bulmahn, Joachim (Eds.) *John Evelyn's 'Elysium Britannicum' and European Gardening*. (Washington DC: Dunbarton Oaks, Harvard University).
- O'Neill, J. (1993). *Ecology, Policy and Politics: Human well-being and the natural world*. Routledge, London.
- ONS (1998) *Living in Britain: Results of the General Household Survey 1996*. Office of National Statistics. Cited by Bhatti, Mark (2006) 'When I'm in the garden I can create my own paradise': Homes and gardens in later life. *The Sociological Review* 2006 (Oxford: Blackwell Pubs.)
- O'Toole, Chris (2003) 'Welcome garden visitors'. *Wildlife The Garden* Vol.128 Part 4 April 2003, pp.258-259
- Owen, J. (1991) *The Ecology of a garden: The first fifteen years*. (Cambridge,UK: Cambridge University Press. Cited by: Thompson, Ken; Austin, Kevin, C.; Smith, Richard, M.; Warren, Philip, H.; Angold, Penny, G.; Gaston, Kevin, J. (2003) In 'Urban domestic gardens (1): Putting small-scale plant diversity in context'. *Journal of Vegetation Science* 14: pp.71-78.
- Owen, Jennifer (2002) Watching the wildlife *The Garden* Vol. 127 Part 11 November 2002, pp.850-853.

- Parsons, M. S. (2004). 'The United Kingdom Biodiversity Action Plan moths - selection, status and progress on conservation'. *Journal of Insect Conservation*, 8(2-3), pp.95-107.
- Parsons, Russ (1995) 'Conflict between ecological sustainability and environmental aesthetics: Conundrum, carard or curiosity'. *Landscape and Urban Planning* 32, pp.227-244
- Pearce, Fred (2006) 'Eco-Cities Special: Ecopolis Now' *New Scientist* 16th June, Issue 2556.
- Peel, D. (2005) 'The 'ah-ness' of learning'. *Journal of Generalism and Civics* Issue VI August, pp. 32-35. Retrieved 2nd December 2006.
<http://www.trp.dundee.ac.uk/general/geddes.html>
- Perry, Hugh, (2002) 'Garden centre sales soar after TV show'. *Horticulture Week* March, 7, 2002. p.8.
- Petts, James (2001) 'Urban Agriculture in London Series on Urban Food Security Case Study 2' *World Health Organisation* (Copenhagen: WHO).
- Potts, Don (2005) 'The nature of government – an insight into the politics of wildlife conservation'. *Ecos* 26 (3/4) 104-106.
- Preston, C.D; Telfer, M.G.; Arnold, H.R.; Carey, P.D.; Cooper, J.M.; Dines, T.D. (2002) *The changing flora of the UK*. (London: DEFRA).
- Purvis, A. and Hector, A. (2000). 'Getting the measure of biodiversity'. *Nature*, 405, pp.212-219.
- Pye-Smith, Charlie; Low, Philip (1980) 'Landmarks In Conservation Max Nicholson talks to Charlie Pye-Smith and Philip Lowe. *Ecos* Vol. 1 No. 1 pp 4-8.
- Pysek, P. (1994) 'Ecological aspects of invasion by *Heracleum mantegazzianum* in the Czech Republic'. In De Waal, L.C., Child, L.E., Wade, M., Brock, J.H.(eds) *Ecology and management of riverside plants*. (England: Wiley) pp. 45-54.
- Pyšek, P. (1998). 'Alien and native species in Central European urban floras: a quantitative comparison'. *Journal of Biogeography*, 25(1) pp.155-163.
- Quest-Ritson, Charles (2001) *The English Garden A Social History* (London: Viking).
- Rackham, O. (2001) *Trees and Woodland in the British Landscape- the Complete History of Britain's Trees, Woods and Hedgerows*. (London, Phoenix Press).
- Raven, Peter H. (2002) Science, sustainability and the human prospect. Presidential Address. *Science* 9 Vol. 297 No. 5583, pp. 954-958.
- Ribe, R.G. (1989) 'The aesthetics of forestry: What has empirical preference research taught us?' *Environmental Management* 13, pp.55-74.
- Rice, Graham (2006) 'Too much gardening in the wild'. *The Plantsman* Vol. 5 Part 2, June 2006, pp.130-131.
- Richardson, D.M.; Pysek, P.; Rejmanek, M.; Barbour, M.G.; Panetta, F.D.; West, C.J. (2000) 'Naturalization and invasion of alien plants: concepts and definitions'. *Diversity & Distributions* 6, pp.93-107.
- Robinson, William (1883) *The English Flower Garden* [Fifteenth Edition (1933) Reprint 1995]. (New York:Sagapress).

Rodwell, J.S. (2000) *British Plant Communities Vol.5 Maritime communities and vegetation of open habitats*. (Cambridge, UK: Cambridge University Press).

RHS (Royal Horticultural Society) Retrieved 2nd October 2006.
<http://www.rhs.org.uk/about/index.asp>

RHS (2006) Trustees' Annual Report and Consolidated Financial Statements 2005/06. Retrieved 3 October 2006.
<http://www.rhs.org.uk/about/pdf/trusteesreport.pdf>

RHS & Horticultural Trades Association (2005) *PlantforLife* Campaign. Retrieved 3rd October 2006.
http://www.the-hta.org.uk/press_releases.asp?newyear=2006&newmonth=8&c=2271&m_idno=&s_idno=

RHS (2005) 'Conservation and Environment Guidelines: Wild and Endangered Plants in Cultivation'. (Wisley, RHS). Retrieved 10th November 2006
<http://www.mtuk.org/>

RHS (2006) 'Gardening Matters Water in the Garden'. (London: RHS)
<http://www.rhs.org.uk/Learning/research/gardeningmatters/>

RHS (2005) 'Conservation and Environment Guidelines: Trees and Timber Products'. (Wisley: RHS).
<http://www.mtuk.org/>

Ryan, R.L. (2006) 'Comparing the attitudes of local residents, planners and developers about preserving rural character in New England'. *Landscape and Urban Planning* 75 (1/2) pp.5-22.

Sagoff, M. (2005). 'Do non-native species threaten the natural environment?' *Journal of Agricultural and Environmental Ethics*, 18 (3), pp.215-236.

Sample, Ian (2006) 'Pollution putting groundwater supplies at risk'. *The Guardian* October 18th, 2006.

Sample, Ian, (2006) 'Moths Decline may Herald Crises in UK Biodiversity'. *The Guardian* July 14th, 2006.

Savard, J-P. L.; Clergeau, P.; Mennechez, G. (2000) 'Biodiversity concepts and urban ecosystems'. *Landscape and Urban Planning* 48, pp.131-142.

Saville, B. (1997) *The Secret Garden: Report of the Lothian Secret Garden Survey*. Lothian Wildlife Information Centre, Edinburgh. Cited by Smith, R.M.; Thompson, K.; Hodgson, J.G.; Warren, P.H.; Gaston, K.J. (2006) Urban domestic gardens (IX): Composition and richness of the vascular plant flora, and implications for native biodiversity. *Biological Conservation* 129, 312-322.

Sawyer, Geoff (2002) 'Whitehall snub for horticulture'. *News Horticulture Week* February 21st, 2002, p.3.

Schwartz, M. W., et al. (2000). 'Linking biodiversity to ecosystem function: implications for conservation ecology'. *Oecologia*, 122(3), pp.297-305.

Scottish Executive (2001) '*The Nature of Scotland — A Policy Statement*'.

Scottish Executive (2004) *Scotland's Biodiversity It's in your hands. A strategy for the conservation and enhancement of biodiversity in Scotland*. (Edinburgh: Scottish Executive).

Scottish Natural Heritage (2003) *Scottish Natural Heritage's Corporate Strategy Looking forward 10 years*. (Perth: SNH Pubs.). Retrieved 27th November 2006.
<http://www.snh.org.uk/>

- Seabrook, Peter (2006) 'Who pays for progress?' Viewpoint *The Garden* Vol. 131 Part 8 August 2006 pp.580-581
- Sempik, Joe, Aldrige, Jo & Becker, Saul (2005) *Health, Well-being and Social Inclusion Therapeutic Horticulture in the UK* Executive Summary (Reading: Thrive).
- Sixsmith, Rachel (2006) 'An insurance policy for the future'. *Horticulture Week* 28th September 2006, p.12.
- Smart, S.M.; Bunce, R.G.H.; Marrs, R.; LeDuc, M.; Firbank, L.G.; Maskell, L.C.; Scott, W.A.; Thompson, K. & Walker, K.J. (2005) 'Large-scale changes in the abundance of common higher plant species across Britain between 1978, 1990 and 1998 as a consequence of human activity: Tests of hypothesised changes in trait representation'. *Biological Conservation* 124 pp.355-371
- Sardon, R.C. (1988) 'Perception and aesthetics of the urban environment: Review of the role of vegetation'. *Landscape and Urban Planning* 15: pp.85-106.
- Smith, Richard, M.; Gaston, Kevin, J.; Warren, Philip, H.; Thompson, Ken. (2005) 'Urban domestic gardens (V): relationships between landcover composition, housing and landscape. *Landscape Ecology* 20, pp.235-253.
- Smith, R.M.; Thompson, K.; Hodgson, J.G.; Warren, P.H.; Gaston, K.J. (2006a) Urban domestic gardens (IX): Composition and richness of the vascular plant flora, and implications for native biodiversity. *Biological Conservation* 129, 312-322.
- Smith, R.M.; Warren, P.H.; Thompson, K.; Gaston, K.J. (2006b) 'Urban domestic gardens (VI): environmental correlates of invertebrate abundance'. *Biodiversity and Conservation* 15 (8), pp. 2415-2438.
- Smithers, Richard (2002) 'Woodland Biodiversity Expanding our Horizons' *Landscape Research* 25 (3) pp.386-391.
- Smythe, M. A. (2002). *Biodiversity in Scotland: Progress Report*. (Edinburgh: Stationary Office).
- Soil Association (2005) 'Organic food sales growing by £2.3 million a week as local markets boom'. Soil Association Press Release 11.18.2005.
- Spedding, Colin; Hillier, Robert, T.; Jamieson, Brian, G. (2002) *The Spedding Report A Vision for Horticulture A Review of Horticultural R & D* (London: DEFRA).
- Starfinger, U.; Kowarik, I.; Rode, M.; Schepker, H. (2003) 'From desirable ornamental plant to pest to accepted addition to the flora? The perception of an alien tree species through the centuries'. *Biological Invasions* 5, pp.323-335.
- Steiner, Frederick (2004) 'Urban human ecology' *Urban Ecosystems*, 7 pp.179-197.
- Strong, Roy (1999) *The Spirit of Britain A Narrative History of the Arts* (London: Hutchinson).
- Sukopp, H. (1998) 'Urban Ecology – Scientific and Practical Aspects'. In Breuste, J. Feldmann, H. Uhlmann, O. (Eds.) *Urban Ecology* pp.3-16 (Berlin Heidelberg: Springer-Verlag)
- Sukopp, H and Werner, P. (1982) *Nature in Cities* European Committee for the Conservation of Nature and Natural Resources (Strasbourg: Council of Europe)

- Swan, M.J.S.; Oldham, R.S. (1993) *Herptile Sites Volume 1: National Amphibian Survey Final Report* English Nature Research Report No. 38 (Peterborough: English Nature).
- Swift, Joe (2006) 'We need to be more adventurous'. In *Conversation The Garden* Vol. 131 Part 9 September 2006, pp.646-647.
- Tait, A.A. (1980) *The Landscape Garden in Scotland 1735 – 1835*. (Edinburgh: Edinburgh University Press).
- Tate, A (2001) *Great City Parks*, Taylor and Francis
- Tanksley, Steven, D.; McCouch, Susan, R. (1997) Seed Banks and Molecular Maps: Unlocking Genetic Potential from the Wild. *Science* Vol. 277, pp. 1062-1066
- Taylor, Patrick (2006) *The Oxford Companion to the Garden* (New York: Oxford University Press).
- Thirsk, Joan (1990) *Agrarian History of England and Wales* (Cambridge: Cambridge University Press).
- Thomas, K. (1984) *Man and the Natural World: Changing Attitudes in England 1500-1800* (London: Penguin).
- Thompson, Guy (2005) 'A Child's Place: why environment matters to children'. *Ecos* 26(1) pp.9-12.
- Thompson, Ken (2006a) Personal interview.
- Thompson, Ken (2006b) *No Nettles Required The Reassuring Truth About Wildlife Gardening* (London: Eden Project Books).
- Thompson, Ken; Austin, Kevin, C.; Smith, Richard, M.; Warren, Philip, H.; Angold, Penny, G.; Gaston, Kevin, J. (2003) 'Urban domestic gardens (1): Putting small-scale plant diversity in context'. *Journal of Vegetation Science* 14: pp.71-78.
- Thornton-Wood, Simon (2002) 'Gardening for the future'. *The Garden* Vol. 127 Part 11 November 2002 pp.844-848.
- Townsend, Mike (2005) 'Is the social construction of native species a threat to biodiversity?' *Ecos* 26 (3/4) pp.3-9.
- Thompson Klein, J. (1996) *Crossing Boundaries: Knowledge, Disciplinarity and Interdisciplinarity*. (Charlottesville: University Press of Virginia)
- Thrive (2006) Using Gardening to Change Lives. Retrieved 30 October 2006. <http://www.thrive.org.uk/social-therapeutic-horticulture>
- Tilman, David (2000) 'Causes, consequences and ethics of biodiversity' Insight Overview *NATURE* Vol.405, pp.208-211.
- Tyler, S.; Perks, W.R. (1998) 'A synthesis for urban ecology'. In Thompson, George, F.; Steiner, Frederick, R. (1997) *Ecological Design and Planning* (New York: Wiley).
- Ulrich, R. S. (1984). 'View Through a Window may Influence Recovery from Surgery.' *Science* 224, pp.420-421.
- Ulrich, R.S. (1986) 'Human responses to vegetation and landscapes'. *Landscape and Urban Planning* 13, pp.29-44.

- Ulrich, R.S.; Simons, R.F.; Losito, B.D.; Fiorito, E.; Miles, M.A.; Zelson, M. (1991) 'Stress recovery during exposure to natural environments'. *Journal of Environmental Psychology* 11, pp.201-230.
- Venables, Chris (2006) Personal communication October, 2006.
- Vermeij, G. (1996). 'An Agenda for Invasion Biology'. *Biological Conservation*, 78(1-2), pp.3-9.
- Vickers, Brian (1996) (Ed.) *Francis Bacon Essays* (Oxford: OUP).
- Ward Thompson, C., Aspinall, P., Bell, S., Findlay, C., Wherrett, J. and Travlou, P. (2004) 'Open Space and Social Inclusion: Local Woodland Use in Central Scotland'. (Edinburgh: Forestry Commission).
- Warren, Charles (2005) 'The concept of alien and native species: time for a rethink'. *Ecos* 26 (3/4) pp.10-18.
- Watson, John (2006) 'While Rome Burns'. *The Plantsman* Vol 5 Part 1 March 2006 pp. 60-62.
- Webb, D.A. (1985) 'What are the criteria for presuming native status?' *Watsonia*, 15, pp.231-136
- Wells, N.M. (2000) 'At home with nature: effects of 'greenness' on children's cognitive functioning'. *Environment and Behaviour* 32 (6) pp.775-795.
- Werritty, A. (2002) 'Living with uncertainty: climate change, river flows and water resource management in Scotland' *The Science of the Total Environment* 294(1-3), pp.29-40.
- Weston, Pete (2002) 'Helping to restore traditional skills'. Editorial *Horticulture Week* January 1st 2002, p.14
- Wheater, C. Philip (1999) *Urban Habitats habitat guides* (London: Routledge)
- White, Lynn (1969) 'The historical roots of our ecologic crisis'. *Journal of the American Scientific Affiliation* 21, pp. 42-47.
- Whitelegg, J. (1992) 'Jammed in a Cul-de-sac'. The Times Higher Education Supplement, 24 April. p.31.
- Whittingham, Jo (2006) 'Keeping a check on the wild. Naturalistic Planting'. *The Garden* Vol. 131 Part 3 March 2006 pp.172-175.
- Williams, Raymond (1976) *Keywords : a Vocabulary of Culture and Society*. (London, Fontana/Croom Helm)
- Williams, Raymond (1979) *Culture and Society 1780 – 1950* (London: Penguin).
- Wilson, Edward, O. (1984) *Biophilia* (Cambridge MA: Harvard University Press).
- Wilson, Edward, O. (2004) *For the love of life* Acta Horticulturae (ISHS) 642 71-78 Retrieved October 28th 2006 http://www.actahort.org/books/642/642_8.
- Wolschke-Bulmahn, J. (1997) (Ed.) *Nature and Ideology: Natural Garden Design in the Twentieth Century* (Washington DC: Dumbarton Oaks Harvard).
- WHO (World Health Organisation) Regional Office for Europe Programme for Nutrition and Food Security (2001) Urban and Peri-Urban Food and Nutrition Action Plan (Copenhagen: WHO Regional Office for Europe).

WWF (World Wide Fund for Nature) (2002) 'Illegal logging fuelled by G8 governments' *WWF News* Autumn, 2002, p4.

Woudstra, Jan and Hitchmough, James (2000) 'The Enamelled Mead: history and practice of exotic perennials grown in grassy swards'. *Landscape Research* Vol.25 No. 1, pp.29-47.

Wyndham, F.S. (2000) 'The sphere of the mind: reviving the noosphere concept for ecological anthropology'. *Journal of Ecological Anthropology* 4, pp.87-91.