Department of
Health, Social Services and Public Safety
www.dhsspsni.gov.uk

AN ROINN
Sláinte, Seirbhísí Sóisialta agus Sábháilteachta Poiblí

MÄNNYSTRIE O
Poustie, Resydènter Heisin an Fowk Siccar

LAND MANAGEMENT
for
THE CONSERVATION & CREATION
of
BIODIVERSITY
in
HEALTH SOCIAL CARE & PUBLIC SAFETY ESTATES

Acknowledgements

Health Estates Investment Group, Department of Health, Social Services and Pubic Safety would like to thank the following for their valuable contribution to this document:

Consulting Group

Matthew Hague, Lead Consultant, Hyder Consulting

Elaine Richmond, Hyder Consulting

Hannah Corcoran, Hyder Consulting

Elizabeth Coleman, Hyder Consuling

Steering Group

Sean Brown, Gransha Hospital, Western Health and Social Care Trust

Lorraine Holme, Department of Health, England

Christopher Lewis, Welsh Health Estates

Gordon Logan, Gransha Hospital, Western Health and Social Care Trust

Keith Miller, Health Estates Investment Group, Department Health, Social Services & Public Safety

Patricia Donnan, Health Estates Investment Group, Department of Health, Social Service and Public Safety (Project Manager)

Health Estates Investment Group
Sustainability & Specialist Engineering Branch
Annex 6
Castle Buildings
Stormont Estate
Belfast
BT4 3SQ
Northern Ireland
Tel: +44 28 90 520500

CONTENTS

1. Introduction

The Wildlife and Natural Environment (Northern Ireland) Bill 2010 makes it the duty of "*every public body, in exercising any functions, to further the conservation of biodiversity so far as is consistent with the proper exercise of those functions".*

The Northern Ireland Executive recognises the importance of taking action to protect and conserve our landscape, wildlife habitats and species and is fully committed to taking steps to protect and enhance biodiversity in Northern Ireland. The first Programme for Government included a commitment to publish a Biodiversity Strategy and the Northern Ireland Biodiversity Strategy sets out how the Executive plans to protect and enhance biodiversity in Northern Ireland over the period up to 2016.

The Department of Health, Social Services and Public Safety (DHSSPS) is commited to the objectives of Sustainable Development, of which Biodiversity is a key indicator, in the delivery of health, social care and public safety services. It is therefore essential that anyone involved with the management and development of the Health and Social Care & Public Safety (HSC&PS) estates has a working knowledge of their responsibilities with regard to biodiversity.

A key action to demonstrate our commitment is the commissioning of this biodiversity guidance for HSC&PS organisations. It is designed to assist in the management and development of the HSC&PS estates in an ecofriendly and sustainably sympathetic manner, contributing to the objectives of the Northern Ireland Biodiversity Strategy and to demonstrate compliance with the Biodiversity Duty.

The aims of this guidance document are as follows:

- To advise on the most appropriate and effective manner to both conserve for biodiversity and, where appropriate, create new habitats to enhance biodiversity throughout the HSC&PS estates;
- To give guidance on the appropriate methods of land management, taking into account the specific requirements of the health, socal care and public safety environment;
- To address the need for continuous improvement and integration of biodiversity into management plans to enhance site ecology;
- To give guidance on how best to integrate biodiversity conservation into new development projects; and
- To provide guidance on how to integrate biodiversity enhancement with existing policies concerning health and wellbeing as well as community enhancement.

It is anticipated that the guidance will be a key point of reference for biodiversity, land management and development related matters and it will therefore need to inform all decision making for future development and land management. It therefore contains a range of short, medium and long-term recommendations for management strategies that offer value for money, recognising that funding is limited and priority will always be given to projects that are directly related to improving health, social care and public safety provision. For this reason, the recommendations are, for the most part, designed to be implemented under existing budgets.

2. Objectives & Structure of the Guidelines

2.1. Objectives

These Guidelines are intended to assist estates managers within HSC&PS organisations to effectively and efficiently manage estates to be as biologically diverse as possible, while at the same time taking into account the particular requirements unique to HSC&PS providers. They can be summarised as follows:

- To increase awareness of biodiversity among all staff, but in particular, those responsible for day to day estates management, such as maintenance staff and managers;
- To provide estates managers with advice on how to devise management plans that are low maintenance, in order to minimise additional costs. The advice is set out in a series of Action Plans. These Action Plans link with relevant UK Biodiversity Action Plans for habitats and species;
- To encourage the use and dissemination of best practice in both the on-going management and future development of HSC&PS estates;
- To ensure that any new capital development projects achieve the maximum number of credits under the Building Research Establishment's Environmental Assessment Method (BREEAM). This ensures that new developments are sustainable and the environmental impacts of new developments are minimised; and
- To ensure that concerns that are specific to health and social care, for example, additional Health and Safety considerations for mental health service users, are accounted for.

When private contractors and other partners undertake any works, matters relating to ecology and biodiversity conservation should always be considered. This guidance provide a basis for ensuring that strategies to maximise biodiversity can be easily integrated into all estates management plans and contracts

Most HSC&PS organisations could cover the costs of the works described in this document within the estate budgets. It may also be possible to access funding outside HSC&PS service funding, such as for example, charitable funds and other funding sources. Costs may be balanced out over a site, for example, the cost of new signage may be offset by a reduction in the amount of time and money spent on grass mowing. For more ambitious projects, grants may be available from bodies such as, for example, the Forestry Commission, for the planting of woodlands.

2.2. Structure

This publication is intended to provide guidance and advice to the Health Care sector on land management and biodiversity enhancement within its estates. It is set out as follows:

- **Section One and Two** of the Guidelines provides an introduction to, and describes the aims and objectives of the document.
- **Section Three** gives the background and a brief introduction to biodiversity in the UK.

- **Section Four** outlines the business case for biodiversity as well as the existing local, national and international guidance, policy and legislation relating to biodiversity, and how these affect the work of the HSC&PS sectors.
- **Section Five** details how the Guidelines and Action Plans are to be implemented.
- A set of General Action Plans for land managers is presented in **Section Six**. These are intended to be the first source of information for anybody who is involved with land management or maintenance within the HSC&PS estates.
- A set of specific Habitat Action Plans is included in **Section Six** together with an Action Plan that focuses on climate change.
- **Section Seven** addresses the need to incorporate biodiversity into new builds within the HSC&PS estates, and describes how new projects can be implemented in a sustainable manner.
- Information, including contact details, about organisations and individuals that can assist the HSC&PS sectors in implementing the Guidelines is presented in **Section Eight**.
- **Section Nine** comprise a list of references and other useful information sources.
- A set of **Appendices** provide comprehensive details about relevant legislation and policy.
- The **Key Cards** contain relevant information about BREEAM Healthcare, a calendar for maintenance work and a calendar that can be used to plan ecological surveys.

Text boxes are presented throughout the document. These are colour-coded as follows:

Green: Aims and Objectives

Orange: How to/actions

Purple: Suggested timescales

Yellow: considerations/general information/species recommendations

Red: Legislation

There are other ways that environmental awareness can be raised amongst staff and HSCPS users. Examples of these are presented in boxes interspersed throughout the document

3. Background of Biodiversity

3.1. What is biodiversity?

The 1992 United Nations Convention on Biological Diversity (the ‘Rio Convention’), Article 2 defines 'biological diversity' as: *'the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems'* (European Environment Agency (EEA) (2007). In more simple terms, biodiversity is the variety of all living things on planet Earth. As part of this biodiversity, humanity can have the most impact, either positive or negative, in both a local and global context.

3.2. The value of biodiversity

Biodiversity has value at all scales. These are described in the table below:

Environmental functions	The range of functions provided by biodiversity and ecological systems includes: climate regulation; oxygen production and carbon cycling; nutrient cycling and decomposition; air, water and soil purification; flood control and the maintenance of the hydrological balance; soil formation and maintenance; erosion control and food production.
Economic value	A wide range of commodities are provided by biodiversity in sectors ranging from agriculture, recreation and tourism to pharmaceuticals and mining. Furthermore, biodiversity directly and indirectly contributes to the livelihood of many involved in these industries. It is increasingly recognised that biodiversity has a distinct economic value, and this has led to an acceptance that it is essential to incorporate sustainable features such as waste recycling and water and energy efficiency into new developments.
Human value	It has long been known that biodiversity enhances quality of life through its practical environmental functions and the economic benefits it brings. However, nature and biodiversity can offer something that is essential to the mental and physical health of people. Natural and wild landscapes are aesthetically pleasing, provide opportunities to ‘get away’ from human-dominated landscapes and also provide opportunities for recreational activities. Biodiversity can bring immediate relief from stress and a sense of well-being. There is a growing understanding that in a fast-paced modern world, biodiversity has huge benefits for people’s well-being, both psychological and physical.
Intrinsic value	Regardless of their value to people, it can be argued that all species and habitats have a place in the long history of evolution, and this is sufficient to warrant their preservation. The Convention on Biological Diversity describes the intrinsic value of biodiversity, and underlines people’s responsibility for other living things. Because human actions are the primary cause of extinctions, it is our responsibility to actively protect biodiversity.
Future potential	Biologists frequently state that more is unknown than is known about the natural world, and important ecosystem services and uses for plants and animals await discovery. These uses cannot be discovered, and the benefits to people cannot be realised, if they disappear before ever being discovered.

3.3. Biodiversity in the UK

The purpose of the Rio Convention was to find a methodology for stopping the global loss of biodiversity. The United Kingdom Biodiversity Action Plan (UKBAP) is the UK Government's

response to the Convention on Biological Diversity (CBD) signed in 1992. It describes the UK's biological resources and commits a detailed plan for the protection of these resources (species, habitats and ecosystems), and sets out a national strategy for the conservation of biodiversity in Britain (JNCC, 2007).

A large number of habitat types and species are listed within the UKBAP with specific targets for their conservation. Following a recent review (undertaken in 2007), the UKBAP now includes 1149 priority species and 65 priority habitats.

Species Action Plans (SAPs) have been produced for a number of these species. Those which are of potential relevance to the Health Care lands include: numerous bat species, great crested newts, common lizards, slow worms, small bird species including black redstarts and vascular plant species such as several Orchid species, Juniper and Early Gentian.

Of the Habitat Action Plans (HAPs) which have been produced, the HAPs for Hedgerows, Ponds, Reedbeds, Wet Woodland, Rivers and Wood-pasture and Parkland would be of relevance, other HAPS which may also be of interest include Upland Heathland, Upland Oakwood, Upland Calcareous Grassland and Birchwoods, Native Pine Woodlands, Rivers, Lowland Mixed Deciduous Woodland, Lowland Beech and Yew Woodland and Open Mosaic Habitats in Previously Developed Land. This would need to be reviewed on a site-specific basis.

Throughout the United Kingdom there are numerous sites of both international and national biodiversity value that have been designated as Special Areas of Conservation (SAC), Special Protection Areas (SPA) and Sites of Special Scientific Interest (SSSI) (known as Areas of Special Scientific Interest (ASSI) in Northern Ireland. These sites are protected under a range of UK law and European policy instruments. However, they occupy only a very small proportion of the total land area of the country. In fact, there are substantial areas of land which are of high biodiversity value but do not have any statutory level of protection.

3.4. Local Biodiversity

Local Biodiversity Action Plans (LBAPs) set out targets and objectives for the protection and enhancement of priority habitats and species which are important at a local level; they can include Regional, County and District level Plans. They are produced largely by Local Authorities, in partnership with other interested parties, including Wildlife Trusts, statutory nature conservation bodies and specialist interest groups. In addition, Local Development Plans identify local conservation needs and contribute towards incorporating issues relating to biodiversity into the planning process. Various business sectors have created their own Action Plans, for example, the Highways Agency, and Aggregate Industries UK. The Sustainable Development Commission project ‘Healthy Futures’ outlines the importance of biodiversity to the aims of the NHS in England, Wales and Scotland and the HSC in Northern Ireland. The SNIFFER document ‘Scoping Biodiversity Guidance for Public Bodies’ (2009) analyses where biodiversity guidance can be improved, or is missing, specifically for public bodies.

There are a range of priority habitats and species that are likely to be of relevance to health, social care and public safety, including urban parkland, rivers, watercourses and ponds, hedgerows, bats (mostly pipistrelle species), otters and house sparrows.

Sites which are considered to be of importance for nature conservation at a County or Local level are often referred to as Sites of Importance for Nature Conservation (SINC). They are designated by the local wildlife trust, or Local Authority. Whilst they are not afforded any statutory protection, they are often protected through the local planning process.

3.5. Biodiversity within the HSC&PS Estates

The extent of the HSC&PS estates cover large areas of land. For example, the Healthcare sector in England is responsible for almost 8,000ha of land. There are several hundred sites and these range in size from the very small, such as single buildings in the town centre, to much larger estates, such as hospitals with extensive areas of open space around the buildings. The Gransha Hospital site in Londonderry for example, is 150ha in size, of which approximately half constitutes buildings or amenity planting, with the remainder being managed as farmland or woodland.

Heavily modified or artificial habitats, particularly garden and park-like habitats, are important features within the HSC&PS estates. They tend to contain a great many non-native species; however these features nonetheless offer opportunities for management for biodiversity. Even artificial habitats and non-native species can be a major biodiversity resource, providing shelter and food sources for birds and other animals. Artificial water features such as ponds and even fountains can also encourage wildlife. This is particularly true in urban areas (where most HSC&PS properties are likely to be found). This resource has the potential for enhancement through wildlife-friendly management.

The HSC&PS land resource is comprised of three main types of land: green space, grey space and brown space.

Green space

Green space or 'green infrastructure' is land within the Estate that is currently vegetated. It can clearly have a value for biodiversity; however it can also play an important role in the functioning of the Estate, through flood protection, air quality regulation and pollution control, as well as providing amenity value.

Green space can range from heavily modified and artificial habitats, such as the highly managed gardens and flower beds, lawns and individual trees and shrubs that are found within the boundaries of most hospitals and other HSC&PS properties, to much larger areas under quite different management.

Grey space

Grey space can be defined as the built environment and includes buildings, roads and pavements and other man-made features. Historically, grey space has not been of high biodiversity value. However, grey space can be enhanced, particularly at the design stage, to include features such as green roofs and walls, and other measures to support wildlife. This does not directly replace lost habitats, but it does provide a degree of compensation and can provide new habitats for birds, foraging bats, invertebrates and plants. Grey space can be sensitively designed in other ways, for example through the use of permeable surfaces (gravel or honey-comb brick) instead of concrete or tarmacadam. This increases natural infiltration and reduces flooding caused by a rapid influx of water into the local drainage system. It can also provide additional opportunities for plant and animal communities to develop.

Brown space

Brown field spaces are vacant or unused sites that have the potential for redevelopment. They have been occupied in the past but are not currently managed. The biodiversity of such sites

can vary; however, they tend to comprise transient communities, with species capable of growing in disturbed and nutrient poor conditions. These unmanaged sites can often be rather diverse in flora, particularly pioneer and tall herb species that thrive in disturbed ground or in nutrient poor conditions. Over time, these communities may develop into grassland or scrub, due to natural ecological succession, if left alone and not directly managed or 'tidied up'. Brown field sites can provide refuges for wildlife such as birds and mammals, as well as invertebrates.

3.6. Loss of biodiversity

The UK is losing its biodiversity at an alarming rate. The main threats are as follows (Natural History Museum, 2010):

- **Habitat loss and fragmentation:** Clearance of native vegetation for development, as well as draining wetlands and flooding valleys to form reservoirs, destroys these habitats and all the organisms in them. This destruction can cause remaining habitats to become fragmented and too small to support some species, or fragments may be too far apart for organisms to move between.

- **Invasive species:** Introduced species can present particular problems on islands such as the UK, with a naturally limited range of native species. A number of habitats and species are severely affected by introduced species and this problem is predicted to get worse during the next century as a result of climate change, and an increase in global trade and tourism.

- **Pollution:** All sectors of the economy contribute pollutants to the air, land and water. These chemicals can directly affect biodiversity or lead to chemical imbalances in the environment that ultimately kill individuals, species and habitats.

- **Climate change:** The release of greenhouse gases has influenced the climate, resulting in an average temperature increase, sea level rise, seasonal changes and increased frequency of severe weather events.

- **Over exploitation:** Removal of species can unbalance ecosystems and other organisms within them. Exploitation of biodiversity occurs for example, for food, construction and industrial products.

Within the HSC&PS estates, biodiversity is likely to be predominantly at risk from habitat loss and fragmentation. This is a potential problem in sites that are proposed for development. Construction of new buildings can lead directly to the loss of habitat, as well as to fragmentation and isolation, which brings an increased risk of localised species extinction in the remaining habitat areas.

Other factors affecting biodiversity are specific to the habitat type. These are discussed in more detail in Section Six, the Habitat Action Plans.

3.7. Climate change impacts

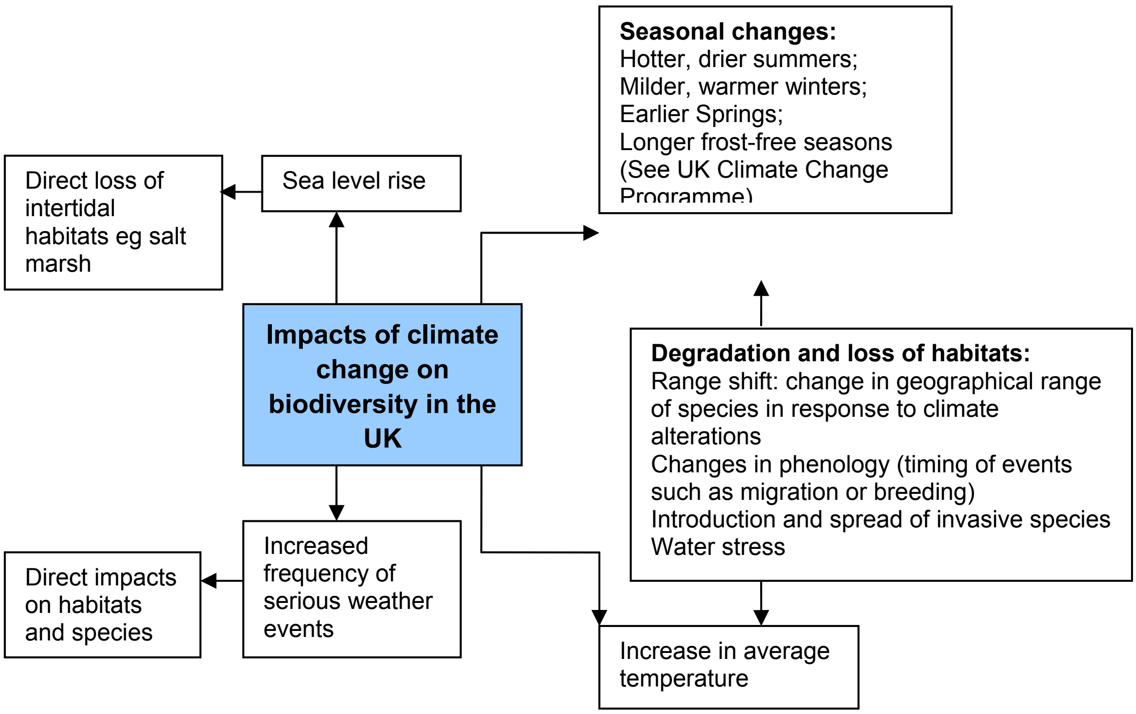
In producing these guidelines, climate change impacts which are apparent now, and those which are predicted to occur in the future, have been considered, and the advice tailored appropriately. The climate is affected by both natural factors, such as volcanic eruptions, and human factors. Humans have influenced the climate by releasing greenhouse gases such as carbon dioxide and methane, into the atmosphere. Greenhouse gases absorb heat energy that is radiated from the Earth's surface which in turn warms the atmosphere. In 2007, the

Intergovernmental Panel on Climate Change (IPCC), which is considered to be the most authoritative body on climate change, concluded that 'most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic (man-made) greenhouse gas concentrations' (IPCC, 2010). According to the current UK Government climate projections, temperatures have risen by about 0.74°C on average across the globe from 1906 to 2005, and average temperatures across the UK have increased by 0.7°C since 1659 (UK Climate Impacts Programme (UKCIP) (2010)).

Evidence suggests that the release of increased greenhouse gases into the atmosphere is having, and is predicted to have, a range or impacts on the climate of the UK. Average temperatures have already risen, and are predicted to rise further; summers are getting hotter and drier, winters milder and wetter and seasons are shifting; sea levels will rise and serious weather events such as storms will become more frequent. These impacts in turn affect species and habitats. Each species will respond differently depending on its tolerance to climatic conditions and its ability to disperse, alter its phenology and feeding patterns.

Experiments using climate models have shown that when greenhouse gas emissions are reduced the rate of rise of global temperatures also reduces. Individuals and organisations play an important role in mitigating the effects of climate change, by reducing our carbon footprint. Implementing the strategies set out in these Guidelines will contribute to the Health Service in the UK meeting its responsibilities to mitigate and adapt to climate change.

The impacts of climate change on biodiversity in the UK, and how these in turn impact our habitats and species, are illustrated in the diagram below:



4. The Business Case for Biodiversity

4.1. Legal Compliance

Gaining an understanding of current legislation relating to biodiversity, the biodiversity resource within and adjacent to HSC&PS assets, and how HSC&PS sector could impact upon them, will enable any impacts to be minimised, whilst ensuring legal compliance. Reporting on environmental risks and management of those risks is increasingly expected from investors, and having an understanding of the biodiversity resource and associated legislation will reduce the risk of liabilities being incurred. Key elements of the legislation are described in this section, with full details presented in Appendix I.

It is essential that anyone involved with land development of any sort, including renovations, as well as those responsible for more general land management and maintenance has a working knowledge of their responsibilities with regard to nature conservation. This will ensure that they avoid contravening the law and will make obtaining planning permission for new developments a more straightforward process.

All UK Public Bodies have a statutory duty to further the conservation of Biodiversity.

It is the duty of every public body, in exercising any functions, to further the conservation of biodiversity so far as is consistent with the proper exercise of those functions. The Natural Environment and Rural Communities (NERC) Act came into force in October 2006. Section 40 of the Act requires all public bodies to have regard to biodiversity conservation when carrying out their functions. This is commonly referred to as the 'biodiversity duty'. In Northern Ireland, the Wildlife and Natural Environment (Norhern Ireland) Bill 2010 makes it the duty of "every public body, in exercising any functions, to further the conservation of biodiversity so far as is consistent with the proper exercise of those functions".

The relevant Statutory Nature Conservation Organisation (SNCO) should be contacted about all issues that relate to biodiversity which in Northern Ireland is the Northern Ireland Environment Agency.

4.2. Sustainability and Corporate Social Responsibility

The European Commission defines Corporate Social Responsibility as the "voluntary social and environmental practices of business, linked to their core activities, which go beyond companies' existing legal obligations". In the Health Service this means that all activities are undertaken with a view to achieving a better quality of life. It includes integrating issues such as accountability, human rights, corporate governance codes, workplace ethics and stakeholder consultation and management into everyday business practices.

By incorporating biodiversity into the HSC&PS sector's social responsibility and management practices, the benefits can be identified and maximised. The granting of consents and planning permissions for new development or changes to existing sites can be facilitated if biodiversity issues are anticipated and addressed, and if public approval and/or acceptance are already obtained. Implementing the Guidelines and being able to demonstrate clear commitment to biodiversity whist maintaining good relationships with the local community is likely to minimise subsequent delays in obtaining consents and permissions.

HSC&PS services do not directly rely on biodiversity resources in order to carry out their duties. However, good social, environmental and ethical policies are essential for any organisation, public or private, in order to allow it to meet its corporate social responsibility targets. By integrating the concepts of biodiversity into daily management, the HSC&PS sectors and those working within them will be able to both manage biodiversity risks and identify biodiversity opportunities.

4.3. Stakeholder trust and public relations

Biodiversity can be used to improve relationships among staff, with patients, local stakeholders and the community alike. Biodiversity can be used as a driver for stakeholder involvement and engagement. The general public are more likely to relate and respond to, and understand more readily, wildlife issues, but claims of protecting and enhancing biodiversity need to be clearly demonstrated and substantiated. In some cases, the Habitat Action Plans may provide direct benefits to the community through stakeholder initiatives. Where possible, community relations can be improved through engagement and involvement directly with a site itself whether through the creation of a community conservation project or actively engaging with local schools through activities. Reporting the progress of the actions within the guidelines can result in increased reputation and public relations. Publicising the HSC&PS sector's commitment to biodiversity will help to create a sound environmental reputation.

4.4. The value of biodiversity and benefits at a local level

The benefits of incorporating measures to enhance biodiversity in the everyday running of a HSC&PS site are many. Biodiversity has a range of different, but equally important, values, including environmental functions, economic value, human value, intrinsic value and future potential. These values are described in detail in section 2.2.

Creating conservation areas within a site can attract species of interest, and provide amenity value for staff, patients and visitors alike. The therapeutic benefits of biodiversity can also be of great benefit to patients.

Demonstrable action on biodiversity can make an important contribution to the image and culture of the Health Service that will help to attract, motivate and retain high quality employees. Increasing awareness of staff about biodiversity may help to engender engagement and ownership. There will be the opportunity for employees at all levels to be involved in biodiversity initiatives, and this should be encouraged.

The Action Plans presented in this document allow for a certain level of community engagement with the Health Service, which can be mutually beneficial.

Walk to work week!

Walking to work not only reduces carbon emissions, but improves health and fitness too! Taking part in iniaiatives such as the Walk to Work Week could be encouraged, see www.walkingworks.org.uk for more details.

5. Implementing a Biodiversity Strategy

5.1. Action Plans

Action Plans are the key to the success in conserving and creating biodiversity. They comprise a range of generic and more specific options to be considered for land management at each site, ranging from cheap (and even money saving) options such as reduced mowing in certain areas, reduced fertilisation, organic gardening, bird boxes, to more aspirational objectives, such as planting of areas of native woodland or the development of water features, with a range of options in between.

Climate change, budgetary concerns, long-term maintenance and health and safety issues are addressed. Furthermore, concerns that are specific to the Health Service, for example, concerns relating for facilities accessed by mental health service users, where certain unique constraints may apply, are taken into account.

There are three types of Action Plan: **General Action Plans, Habitat Action Plans** and a **Climate Change Action Plan**. Species Action Plans have not been included, rather the other Action Plans refer to species where appropriate. Each Action Plan is formatted in such a way that it can be used as a stand-alone document that can be easily extracted from the overall document. The Action Plans are presented in Sections 5, 6 and 7 of the Guidelines.

The Action Plans contain management strategies and suggested timescales (short-, medium- and long-term) for each of the actions. It is envisaged that a nominated person within each HSC&PS organisation would be responsible for ensuring that these strategies are implemented.

- Short-term: to be implemented within two years;
- Medium-term: to be implemented within five years; and
- Long-term: to be implemented within ten years.

The Action Plans are supplemented by a set of Key Cards**,** presented in Appendices II and III. These Key Cards provide more detailed information and advice on the implementation of the Action Plans. The Key Cards will not necessarily be applicable for every site, but by undertaking site-specific evaluations it will be possible to identify which of the recommendations would be the most appropriate to a particular site.

5.2. Biodiversity Audit

In order to identify any opportunities for enhancement for a particular site, in the first instance, it would be appropriate to undertake a biodiversity audit. This would aim to identify species and habitats present allowing recommendations for enhancement to be made. Details of how to undertake a biodiversity audit are presented below and in Action Plan 3: Ecological Surveys.

Following the audit, it is important to assess the value of the habitats present within each of site, in terms of designated sites, LBAP priority habitats and their potential to support protected and notable species, wildlife corridors and links to the wider environment. This will help to identify where contributions to the relevant LBAP targets can be made by the site-specific maintenance and management plans.

5.3. Biodiversity Responsibility

As part of the implementation of a Biodiversity Strategy, the individual responsible for land management in each HSC&PS organisation should ensure that the actions identified in the General and Habitat Action Plans are undertaken, and that appropriate monitoring is undertaken and reported. It may also be appropriate to identify a responsible person at each HSC&PS site, to encourage implementation at a local level.

5.4. Desk study

A detailed desk study should be undertaken to identify any records of species of conservation concern, any statutory designated sites or non-statutory designated sites. This would usually involve contacting local biodiversity records centres, Wildlife Trusts and other specialist interest groups to identify known records up to 2km from the site boundary. In addition, a web-based review should be undertaken to search for statutory designated sites of nature conservation value within 1km of the site, and the National Biodiversity Network (NBN) website (www.nbn.org.uk) to search for records of protected species within and adjacent to the site.

A review of the relevant Local Biodiversity Action Plan (LBAP) should be undertaken as this will list any species and habitat considered to be of priority in the County or District. In the event that the desk study reveals that BAP species or habitats suitable for such species are identified within close proximity to the site, enhancement measures could be designed to be of specific value to such species. The enhancements undertaken at any Health Care site should also aim to contribute towards LBAP targets.

5.5. Delivery, monitoring and reporting

The person within each HSC&PS organisation with responsibility for implementing the Biodiversity Strategy will be required to ensure that the actions undertaken are recorded.

A recording system such as BARS (Biodiversity Action Reporting System) could be used to aid with the monitoring of the success or otherwise of the works carried out. BARS is the UK's Biodiversity Action Reporting System which includes national, local and company Biodiversity Action Plans and both Biodiversity Strategies and Action Plans for England, Wales, Scotland and Northern Ireland.

This information should be fed back into the Action Plan to ensure that any modifications required are identified. Monitoring is required, not only to ensure that the appropriate actions are being undertaken, but also that they are having the desired effect in terms of increasing biodiversity. This may involve undertaking a certain level of ecological survey throughout the duration of the Action Plan. If the Guidelines are not being correctly implemented, or changes in management is not having the desired effect, then the actions should be modified accordingly. This is particularly important to ensure that the HSC&PS organisations meet their responsibilities under legislation, including, in particular, biodiversity duty.

It will be important to ensure that the success (or otherwise) of the implementation of the Biodiversity Strategy is fed back to staff and service users alike. There are public relationship benefits to be obtained by increasing awareness of the good work that is being undertaken by HSC&PS organisations with regard to biodiversity.

6. Action Plans

6.1. Structure

There are three **General Action Plans** that can be applied to all sites under the following headings:

- General Action Plan 1: Maintenance
- General Action Plan 2: Education and awareness
- General Action Plan 3: Ecological surveys

There are five **Habitat Action Plans**, as follows:

- Habitat Action Plan I: Urban habitats
- Habitat Action Plan II: Woodlands (including scrub, hedgerows and trees)
- Habitat Action Plan III: Grasslands
- Habitat Action Plan IV: Wetland habitats, watercourses and ponds
- Habitat Action Plan V: Invasive Species

An additional Action Plan is presented in Section Seven.

- Climate Change Action Plan : Mitigating the impacts of climate change

Appendix IV contains a pruning schedule and a maintenance calendar and Appendix V contains a survey year calendar. These appendices should be referred to in tandem with the Action Plans and Key Cards.

Plant a tree day

Holding an annual tree planting day is a good way to engage employees and patients and raise awareness of climate change and biodiversity.

6.2. General Action Plans

This section contains the 3 general actions plans as follows:

General Action Plan 1: Maintenance

General Action Plan 2: Education and awareness

General Action Plan 3: Ecological surveys

Cut your carbon emissions day!

Encouraging staff to, for example, walk to work, switch off computer monitors when not in use, turn lights off etc, can help reduce energy use and raise awareness of climate

General Action Plan 1: Maintenance

Land management and maintenance forms a significant part of the annual budget of the HSC&PS sectors. Frequently, a relatively simple change in management can reduce maintenance costs while at the same time significantly increase the biodiversity value of a site. For example, an area of amenity grassland which is currently subject to a regular mowing regime may be better managed as a wildflower meadow which is cut just once or twice a year. Such a change in management practices may result in significant savings in time and money. These resources could then be spent on other biodiversity management actions. The Habitat Action Plans (Section Seven) and the Key Cards (Appendices II and III) provide detailed guidance and advice on site maintenance for a range of habitats.

All contracts between HSC&PS organisations and private companies or others need to have regard to biodiversity conservation. This is referred to as 'biodiversity duty' and is a legal requirement (see Section 3 for further information about biodiversity duty).

A maintenance calendar and pruning schedule are included as Appendix V.

Objective:

To ensure that all day to day maintenance operations undertaken on HSCPS estates are carried out in a way that provides the maximum benefit to biodiversity while at the same time meeting the specific needs of the health, social care and public safety services.

Proposed actions:

At each site, review all existing maintenance plans.

Carry out:

- Weeding rather than using fertilisers, weedkillers and pesticides;
- Fit tree guards to protect young trees rom grazing damage;
- Use diverse, native planting mixes, from local sources;
- Erect public notice boards to explain site management;
- Remove invasive species; and
- Repair fences to prevent uncontrolled grazing and poaching of ground.

Avoid:

- Habitat loss and fragmentation;
- Removing trees and shrubs during the bird nesting season, which runs from the end of February to mid-August;
- Leaving grass clippings in situ as this will increase soil nutrient levels and reduce species diversity;
- Removing deadwood from the site unless there are over-riding health and safety reasons; and
- Undertaking an intensive mowing regime across the entire site.

Suggested timescales:

- **Short-term:** To review the existing maintenance regime at each site and to make recommendations for future maintenance work;
- **Medium-term:** To implement the new recommendations across a suitable proportion of the Health Care sites within each Trust; and
- **Long-term:** To continue to implement the new recommendations across the remainder of Health Care sites.

General Action Plan 2: Education and awareness

One of the most important elements that will affect the success or otherwise of these guidelines will be how the actions are communicated to HSC and PS Staff, particularly the land managers, caretakers and others who have a direct role in the day to day running of the estate.

Objective:

To support the overall implementation of the other Action Plans presented in this document and to raise awareness of biodiversity across HSC and PS organisations as a whole.

Proposed actions:

- To publicise this guidance document within HSCPS organisations and beyond;
- To identify suitable 'Biodiversity Champions' for each HSCPS organisation. This person would be tasked with publicising the guidance and ensuring that their recommendations are implemented across their organisation.
- To identify a Biodiversity co-ordinator at each HSCPS site. This person would be tasked with overseeing the implementation of the orgainsations Biodiversity Strategy at a local level;
- To develop a programme of education (for service users as well as staff) about matters relating to biodiversity, in particular, issues directly affecting land managers such as the implications of the bird breeding season for management operations and the recognising and dealing with invasive or alien plant species;
- To ensure that land managers are familiar with available guidance, policy and legislation;
- To organise training seminars for land managers where funding is available; and
- To liaise with local biodiversity officers and other relevant parties to ensure that land managers are aware of all statutory and non-statutory ecological designations.

Suggested timescales:

- **Short-term:** To publicise the guidance within HSCPS organisations and to assign a Biodiversity Champion for each site;
- **Medium-term:** To identify suitable people within the HSCPS workforce to be trained in implementing the orgainsations Biodiversity Strategy at each site; and
- **Long-term:** To undertake and complete training for relevant staff.

General Action Plan 3: Ecological surveys

There is a vast area of the HSC&PS estates about which very little biodiversity information has been gathered. This lack of information does not imply a lack of biodiversity interest, it is simply the case that there are habitats and species that are present but have not yet been recorded. Many sites therefore would benefit from a biodiversity audit. This would include both desk studies and systematic, targeted surveys.

These surveys should be undertaken as part of the actions arising from the Habitat Action Plans and Key Card or prior to any development taking place within the HSC&PS estates. Ecological surveys will often be required as part of new building and extension projects.

Professional ecologists may undertake surveys prior to development, however, funding is not likely to be available as part of the everyday land management programme. It may be possible to fund an annual ecological survey programme, perhaps through cost savings made as a result of the land management actions outlined in the General and Habitat Action Plans. It is suggested that such activities may be undertaken by school groups, wildlife groups and others.

It is important that habitat and species surveys are carried out at the appropriate time of year, as shown in the survey calendar presented in Appendix VI.

Objectives:

To increase the existing knowledge of the biodiversity resource within the HSCPS estates. This will allow specific objectives to be identified for each site, in order to identify appropriate changes in land management and other opportunities to enhance biodiversity.

Proposed actions

- Undertake a biodiversity audit of each site. This will include a desk study and a programme of surveys. Such surveys should conform to best practice standards and ecological advice;
- All habitats that are identified as important following the surveys should be notified to the personnel responsible for land management at that site;
- Ensure that all survey records are kept in a clearly defined location so that they can be accessed by land managers and those responsible for undertaking development projects; and
- Survey results relating to UKBAP species and habitats should be collated and made available to local biodiversity officers and other relevant parties.

Suggested timescales

- **Short-term:** identify which sites require a biodiversity audit and nominate suitable personnel to undertake the work;
- **Medium-term:** undertake a biodiversity audit at a suitable proportion of sites; and
- **Long-term:** undertake a biodiversity audit at the remaining sites and implement the recommendations.

6.3. Habitat Action Plans

This section contains the 5 Habitat Action Plans as follows:

Habitat Action Plan I: Urban habitats

Habitat Action Plan II: Woodlands (including scrub, hedgerows and trees)

Habitat Action Plan III: Grasslands

Habitat Action Plan IV: Wetland habitats, watercourses and ponds

Habitat Action Plan V: Invasive Species

Biodiversity day

Holding an annual biodiversity day is a good way to engage employees and patients,highlight the diversity of habitats within the Health Estate and identify ways in which areas can be improved.

Habitat Action Plan I: Urban habitats

A variety of building types and ages, surrounded by various arrangements of hard landscaping exist within the HSC&PS estates. These present potential opportunities for biodiversity enhancement in the form of gardens, courtyards and balconies which can be greened, and locations where ponds, water features, bat and bird boxes can be installed. Frequently, visual enhancement of urban areas can lead to community benefits, which can also lead to overall improvements in health and well-being throughout the community.

Threats to the habitat type

The most common threats to this habitat type within the HSC&PS estates are outlined in the table below.

Threat	Description
Loss and fragmentation as a result of development	Clearance of vegetation, particularly linear features within urban areas such as tree lines as well as brown field or derelict sites that are cleared for development. This destruction can cause remaining habitats to become fragmented and too small to support some species, or fragments may be too far apart for organisms to move between.
Inappropriate planting and unsuccessful management	Urban habitats often include areas of hard standing and potted plants, troughs and hanging baskets. Inappropriate plant species can be used which may not withstand the conditions in which they have been positioned including areas which are either too exposed or heavily shaded. Plant species may also be used which are non-native or have little value for invertebrates.
Damage during development or maintenance works	Any maintenance works undertaken such as repairs to paths, or minor works on buildings for example can lead to damage to trees and shrubs. Although it may be possible to avoid damage to larger trees, younger trees and shrubs can be easily lost. Trees can be impacted upon indirectly by development and maintenance works. For example, through the inappropriate storage of materials within the 'root-protection area' (the area around the tree into which the roots extend) the long-term viability of the tree can be severely impaired due to soil compaction.

Detailed information on specific enhancement options is provided in Appendix II, Key Card 1.

Proposed actions:

- Undertake a biodiversity audit of each site. This will include a desk study and a programme of surveys. Such surveys should conform to best practice standards and ecological advice. Particular features to focus on include courtyards, balconies, terraces, gardens and ponds, as well as features that may be used by roosting bats or nesting birds;
- All habitats that are identified as important following the surveys should be notified to the personnel responsible for land management at that site;
- Identify all locations where invasive species are present on each site; and
- Protect valuable habitats and avoid fragmentation of existing areas where development is not avoidable.

Suggested timescales

Short-term:

- Identify all areas of valuable urban habitats on the HSC&PS estates, particularly at smaller sites, through a biodiversity audit;
- Design a management plan that will enhance these spaces.

Medium-term:

- Identify areas that have the potential to be managed in a way that encourages biodiversity;
- Implement the new management plan across a suitable proportion of the HSCPS estates.

Long-term:

- To implement the new management plan across the remainder of the HSCPS estates.

Habitat Action Plan II: Woodlands (including scrub, hedgerows and trees)

Woodlands vary greatly in size, structure, age, origin, and species composition. They are important habitats for a wide range of species, not only for the trees themselves, but also the other communities that are present, such as the ground flora and shrub layer, mammals and birds, invertebrates, fungi and lower plants. The survival of lichens that grow very slowly on old trees, invertebrates that rely on decaying wood, and birds and bats that rely on crevices and hollows within trees, are directly related to the age and structure of the woodland habitat. Woodlands and individual trees are also important landscape and amenity features.

Semi-natural woodlands largely comprise locally-native tree and shrub species. Often the relative abundance of these species within a site reflects local variations in soil type, drainage and topography. The majority of the semi-natural woodlands in the UK have been subject to management and this activity has influenced their structure and composition. In contrast, plantations may or may not comprise native species, but their species composition rarely reflects soil type, topography and drainage. Consequently, they are more uniform in both composition and structure. Woodlands can also be categorised as broad-leaved, coniferous or a mixture of the two (called 'mixed'), depending on the species present.

Woodland communities of nature conservation value are those that support a diverse assemblage of species. Semi-natural woodland is generally considered to be of higher nature conservation value than planted woodland, unless the planted woodland occurs on an ancient woodland site. Ancient woodlands and veteran trees are of particular value, as they tend to support a more varied flora and fauna than more recent woodland or younger trees.

Key Card 2 in Appendix II details ways in which existing woodland can be enhanced and new areas of woodland rich in biodiversity can be created.

Threats to the habitat type

The most common threats to this habitat type within the HSC&PS estates are outlined in the table below.

Threat	Description
Loss and fragmentation as a result of development	Clearance of native vegetation for development, as well as draining wetlands and flooding valleys to form reservoirs, destroys these habitats and all the organisms in them. This destruction can cause remaining habitats to become fragmented and too small to support some species, or fragments may be too far apart for organisms to move between.
Damage during development or maintenance works	Maintenance works undertaken adjacent to areas of woodland (such as repairs to paths, or minor works on buildings for example) can lead to damage to trees and shrubs. Although it may be possible to avoid damage to larger trees, younger trees and shrubs can be easily lost. Trees can be impacted upon indirectly by development and maintenance works. For example, through the inappropriate storage of materials within the 'root-protection area' (the area around the tree into which the roots extend) the long-term viability of the tree can be severely impaired due to soil compaction.

Threat	Description
Spread of invasive species	Plants that threaten the nature conservation value of woodland habitats usually colonise areas of bare or recently disturbed soil. Once established, these plants may spread from these areas into adjacent areas of woodland. Non-native invasive species of woodlands include Japanese Knotweed (*Fallopia japonica*), Rhododendron (*Rhododendron ponticum*), Snowberry (*Symphoricarpos albus*), Shallon *(Gaultheria shallon)* and Indian Balsam (*Impatiens glanulifera).* The latter is usually restricted to wet woodlands and those woodlands close to watercourses. These species are able to spread beneath the canopy of woodlands creating dense shade and, over a long period of time, potentially reduce the species diversity of the ground flora and shrub layer.
Uncontrolled grazing and poaching	Uncontrolled grazing by rabbits or deer and stripping of bark by grey squirrels can severely damage trees. It can affect woodland structure and species composition by preventing new tree and shrub growth.
Removal of dead wood	There may be an emphasis on removal of standing dead trees or fallen deadwood. Whilst it is clearly essential that health and safety is the first priority, in many cases deadwood is removed simply to 'tidy-up' an area. This can greatly reduce the wildlife value of the habitat.
Diseases	Sudden oak death and other fungal air borne or water borne diseases, have the potential to cause severe damage to woodlands. This may not be a significant problem currently; however, climate change trends are likely to result in warmer and damper conditions. This may lead to the more rapid spread of disease in the future.
Inappropriate planting	Inappropriate planting, particularly of non-native tree and shrub species, can lead to a loss of native species and an impact on local biodiversity.

Proposed actions:

- Avoid clearance of native vegetation and the undertaking of activities that will fragment areas;
- Ensure that valuable areas of woodland habitat are clearly identified;
- Identify all locations where invasive species are present on each site;
- Establish locations where log piles can be constructed;
- Identify any trees which appear to be diseased; and
- Use native tree and shrub species in woodland and landscape planting mixes.

Suggested timescales

Short-term:

- Identify areas on the HSC&PS estates that comprise native and/or valuable habitats. (Where these areas have been identified future development or refurbishment works should give recognition at an early stage and avoidance should be possible.);
- Install information boards identifying valuable areas and detailing species present; consider fencing areas to avoid degradation;
- Create at least one log pile as appropriate in each area considered to comprise valuable woodland/landscape planting.

Medium-term:

- Identify an appropriate contractor and implement control measures which will continue to be undertaken over a two-three year duration, at a suitable proportion of the HSCPS sites.

Long-term:

- Appoint an arboriculturalist to undertake annual visits of a suitable proportion of sites to monitor the condition of trees and advise on any necessary management/removal;
- Undertake regular maintenance and management of woodland and landscape planting on the site for the duration of site operation.

Habitat Action Plan III: Grasslands

Grassland communities of nature conservation value are those that support a diverse assemblage of species, including non-grass species. Grasslands can be defined as improved, semi-improved or unimproved, depending on the level of agricultural 'improvement' from their semi-natural state. Improvement can be through the application of fertilisers and herbicides, drainage, re-seeding or intensive grazing.

Threats to the habitat type

The most common threats to this habitat type within the HSC&PS estates are outlined in the table below.

Threat	Description
Loss and fragmentation as a result of development	Areas of grassland (ranging in quality from species poor amenity grassland to semi-natural species rich grassland) can easily be lost to development. Frequently such habitats are perceived as having low ecological value, whereas frequently this is not the case.
Changes in soil nutrient levels	Caused by, for example, farming practices on adjacent land, the leaving of clippings in-situ after mowing.
Inappropriate mowing	Grassland species must be allowed the time to flower and set seed. Therefore, mowing either too frequently or too rarely will lead to a decrease in species diversity and a change in the habitat structure.
Inappropriate planting	Particularly of low diversity seed mixes of non-local origin

Proposed actions:

- Protect valuable areas of grassland and avoid fragmentation of existing areas where development is not avoidable;
- Maintain soil nutrient levels;
- Manage areas of existing grassland appropriately; and
- Create new areas of valuable species rich grassland.

Suggested timescales

Short-term:

- Identify all existing areas of valuable grassland habitats already present on the HSC&PS estates;
- Identify areas of amenity grassland which could be re-seeded and managed as species rich grassland/ a wild flower meadow;
- Protect grassland areas which are considered to be of value through the provision of fencing;
- Design a mowing regime to ensure appropriate management of valuable grassland areas.

Medium-term:

- Re-seed a suitable proportion of amenity grassland areas identified as appropriate to become species rich.

Long-term:

- Implement the newly designed mowing regime at all sites, removing all arising to ensure no changes in soil nutrient levels for the duration of the operation period of the site.

Key Card 3 in Appendix II details ways in which existing grassland can be enhanced and new areas of species rich grassland can be created.

Habitat Action Plan IV: Wetland habitats, watercourses and ponds

These include linear features such as rivers, streams, canals, and drainage ditches as well as ponds and lakes, and will be limited to those features that are present on the HSC&PS estates.
Incorporating wetland habitats can greatly enhance the biodiversity value of a site. In most cases, it is unlikely that major new water features will be provided, however existing habitats (ponds, wetlands watercourses) can be augmented by newly created features.

Where present, watercourses should be retained in as natural a state as possible; the banks should be vegetated and such vegetation should range from emerging aquatic plants to overhanging bushes. These banks may be incorporated into flood defence features where necessary. Culverts and stream diversions should only be used where absolutely necessary.

Where ponds are created, they should replicate natural features as far as possible. Rather than having steep or even vertical sides, ponds should slope gently towards the deepest point. This will provide a gradient for different aquatic species (plants and animals) to become established. In this way, different habitats can be created even in a relatively small pond, ranging from marshy conditions near the edge to submerged and floating species in the deeper parts. If the pond is large enough, islands can be developed within it. These features can be of great benefit to wildlife, as they tend to be inaccessible by foxes, dogs and other disturbances to wildlife.

Ponds need careful management to ensure they remain in good condition in the long term. However, this management need not be labour intensive, particularly if the pond is well designed in the beginning. Such ponds thrive with low levels of nutrient input and the planting of fringe vegetation as a buffer zone will help to prevent run-off from entering the pond. This is important if the pond is located within a highly managed development, with fertilised amenity grassland close by.

The likelihood of successful implementation of these recommendations will be enhanced through engagement with local authorities and the Environment Agency, particularly in areas prone to flooding.

Key Card 4 in Appendix II details ways in which existing wetlands, watercourses and ponds can be enhanced and new areas created.

Threats to the habitat type

The most common threats to this habitat type and value within the HSC&PS estates are outlined in the table below.

Threats	Description
Invasion of non-native plant species	Aquatic invasive plant species such as Parrot's-feather, Australian Swamp Stonecrop and Canadian Pondweed can become firmly established and in ponds and lakes and can reduce aquatic diversity.
Lack of management and establishment of wet woodland	If wetlands, ponds, lakes and canals are not managed appropriately Bulrush can begin to invade leading to the establishment of wet woodland and the loss of aquatic habitats.

Threats	Description
Infilling of ponds	Waterbodies can be lost under the footprint of a development.
Hard engineering measures and canalisation of watercourses	Watercourses can often be subject to hard engineering methods to prevent issues such as erosion. The creation of concrete lined channels often results in the absence of marginal vegetation and limits its value to local wildlife and is not particularly biologically diverse.
Reduction of water quality	Urban debris and litter can often accumulate where water bodies are within close proximity to the general public, therefore reducing water quality.

Proposed actions:

- Retain any features in as natural a state as possible;
- Ensure that any features comprise a range of vegetation including aquatic, emergent and marginal and appropriate surrounding vegetation;
- Retain and enhance green corridors along watercourses and canals; and
- Undertake regular management activities to ensure ponds remain in a good condition.

Suggested timescales

Short-term:

- Identify key wetland habitats within HSCPS estates;
- Design a management plan to ensure that the relevant features remain in good condition;
- On a monthly basis remove litter and urban debris.

Medium-term:

- Increase the extent of marginal vegetation and fill gaps along the riparian zone and edges of ponds and lakes where appropriate using coir-fibre rolls;
- Where suitable features exist install bat boxes along river banks and within close proximity to ponds, lakes and canals;
- Implement new management plan across a suitable proportion of sites as appropriate.

Long-term:

- Enhance and appropriately manage green and woodland corridors on sites where applicable. Enhancement should include the use of native plant species and appropriate management techniques (see woodland management);
- Continue to implement management plan recommendations;
- Implement new management plan across the remainderof sites as appropriate.

Habitat Action Plan V: Invasive species

Biodiversity globally is under considerable threat from invasive species. Invasive species affect the nature conservation value of all habitat types. Common invasive terrestrial plants are Rhododendron (*Rhododendron ponticum*), Giant Hogweed (*Heracleum mantegazzianum*), Japanese Knotweed (*Fallopia japonica*) and Himalayan Balsam (*Impatiens glandulifera*). Invasive ornamental aquatic plant species cited as potentially high impact species include Stonecrop, (*Crassula helmsii*), Nuttall's Pondweed (*Elodea nuttallii*), Water Fern (*Azolla filiculoides*), Floating Pennywort (*Hydrocotyle ranunculoides*), Parrot's Feather (*Myriophyllum aquaticum*) and African Curly Leaved Waterweed (*Lagarosiphon major*).

With invasive species, prevention is much more easily and cheaply achieved than eradication. Some species, once established, can be almost impossible to eradicate. Control and eradication procedures can be expensive and some species such as giant hogweed present public health issues. It is therefore imperative to avoid the use of invasive species in all new planting schemes.

Imported and reused topsoil may contain even small quantities (seeds or root fragments) of invasive plants. Japanese Knotweed for example can establish from even a stray root even 1cm in length. The source of soil material should therefore always be checked before approval.

Waterways and other linear features, especially those that are disturbed provide the perfect conduit for the spread of invasive plants. A great deal of care should be taken when working along the edges of waterways, to prevent such plants from spreading downstream.

For several species it is an offence to plant or cause them to spread in the wild under the Wildlife and Countryside Act 1981 and waste containing these species may come under the control of the Environmental Protection Act 1990.

Key Card 5 in Appendix II lists some of the most common invasive species and describes how to deal with them if and when they are encountered.

Threat	Description
Establishment of invasive species	They out-compete native species, forming monocultures and causing less aggressive plants to die off. A reduction in plant diversity in turn has an impact on fauna. In water bodies, invasive plants can spread over the surface of the water, reducing light and oxygen levels and damaging other plants and animals. Invasive species can become established through deliberate release or planting, and, once established, invasive species can become very difficult to control.

Proposed actions

- Prevent the establishment of invasive species;
- Control and where possible eradicate invasive species from the HSCPS estates.

Suggested timescales

Short-term:

- Identify on all HSCPS estates lands where invasive species are present;
- Identify an appropriate contractor who would be able to begin treatment of any known invasive species.

Medium-term:

- Appoint a contractor and implement control measures and treatment;
- Where soils are being brought into a new development site ensure that appropriate testing is undertaken to confirm absence of any invasive species;
- Along watercourses undertake regular checks to ensure that invasive plant species are not beginning to establish.

Long-term:

- Continue to ensure that all necessary precautions are undertaken so that invasive species are not introduced or become established on the HSCPS estates;
- Continue with required eradication measures where necessary.

6.4. Climate Change Action Plan: Mitigating the impacts of climate change

As a significant land holder and developer, the HSC&PS services have a responsibility to reduce the impact of climate change as much as possible.

Climate change can be addressed by reducing the greenhouse gas emissions to the atmosphere. However further climate changes are inevitable, and it is essential that these impacts that are predicted or are already being felt, are planned for.

Adapting to climate change

To plan for climate change impacts that are predicted/already being felt the following measures can be taken:

- Decrease areas of hard standing allowing water to infiltrate into the ground rather than flowing over a hard, non porous surface resulting in flooding;

- Install green roofs which absorb water and release it slowly, preventing high water flows which contribute to flooding. (See, Key Card 7 for more details);

- Sustainable Urban Drainage Systems (SUDS) are a way of engineering new developments to replicate the natural environment. They remove the need for engineered below ground structures and allowing natural processes to occur. (See Key Card 6 for more details);

- Install water saving devices such as low flow taps, water butts and grey water recycling;

- Green corridors: intact, well connected ecosystems are believed to be more resilient to climate change, allowing species to migrate to more suitable habitat more easily; and

- Plant trees: vegetation absorbs carbon dioxide, so planting trees will help reduce the amount of this greenhouse gas in the atmosphere and can also be used to help create green corridors.

Mitigating climate change

There is a wide range of measures that can betaken in order to reduce carbon emissions. These include the following:

- **Sustainable building design** encompasses building orientation, construction materials, triple glazed windows, and a whole host of other measures. Sustainable building design should be considered at project conception to ensure that all options are adequately considered and costed at the outset;

- **Reduce energy use**: energy use can be easily reduced, through, for example installing energy saving light bulbs and appliances, switching lights off wherever possible, avoiding keeping appliances on standby; and

- **Installing renewable energy technologies** such as photovoltaics, solar hot water panels, ground source heat pumps, wind turbines. Often the initial cost of these

technologies is expensive, however the savings in energy use in the long run make the technology worthwhile.

Objective:

To reduce greenhouse gas emissions throughout the HSCPS sectors and to plan for climate change impacts that are predicted/already being felt.

Proposed actions

- Undertake energy audits and incorporate the recommendations arising into specific site carbon management plans;
- Reduce water usage and water wastage where possible;
- For all new building and renovation projects: incorporate energy saving measures into the project from the start; and
- For both new and existing developments, identify opportunities to incorporate Sustainable Drainage Systems into the site.

Suggested timescales

Short-term:

- Undertake energy audits at a suitable proportion of the HSCPS sites, as appropriate;
- Review and assess water usage at a suitable proportion of HSCPS sites.

Medium-term:

- Implement the recommendations from the energy audit at a suitable proportion of sites;
- Install water saving devices as recommended;
- For all new development and refurbishment works ensure that plans include dedicated measures for dealing with climate change and that these plans are carried out. E.g. The planting of vegetation to create ecological healthy areas

Long-term:

- Implement the recommendations from the energy audit at the remainder of sites;
- Ensure that all development and refurbishment projects undertaken achieve an Excellent or Very Good rating under BREEAM Healthcare.

7. Incorporating biodiversity into new builds and refurbishments

Where new developments or expansion works to existing sites are proposed, it would usually be appropriate to complete an Ecological Appraisal, a BREEAM Healthcare assessment or, if necessary, a formal Environmental Impact Assessment to inform the planning application (this will depend upon the size and nature of the development). All new development will involve changes to the existing environment. The impact (positive or negative) of any change will depend on how much existing habitat is lost, what it will be replaced with, how the newly created habitat will be managed and how it will interact with the surrounding habitats.

In order to inform the impact assessment and to achieve a sustainable design it is recommended that a basic habitat assessment (comprising a desk review of existing ecological information, consultation with relevant bodies and a general habitat survey) is undertaken early in the development process. This will allow the value of the site to be assessed, and should inform the overall design by identifying constraints and other factors that need to be considered, as well as identifying opportunities for enhancement.

7.1. Pre-development assessment (biodiversity audit)

7.1.1. Background information review

The collection of adequate ecological information is essential in informing the decision as to the viability of the project, and identifying any likely impacts on biodiversity. If it is agreed that the project is feasible the information gathered can be used to aid the detailed design, so that existing valuable habitats and other green space can be retained and additional features can be created in order to enhance the biodiversity of the site and to ensure that the development is sustainable.

An assessment of the biodiversity value and potential of the proposed site should be undertaken as early as possible in the development process. As part of this assessment a review of existing information should be undertaken, this can involve contacting local biodiversity record centres, specialist interest groups, as well as undertaking a web-based search.

Important information to be gathered includes:

- Habitats and species protected or proposed for protection under statutory designations. These include Special Areas of Conservation (SAC), Special Protection Areas (SPA), Ramsar sites (designated for wetland and wildfowl conservation), Sites of Special Scientific Interest (SSSI) (or Areas of Special Scientific Interest (ASSI) in Northern Ireland), and Nature Reserves (National, Local and Marine). All such sites within 1km of the site should be noted;

- Non-statutory sites such as Sites of Nature Conservation Importance (SNCI) and trees protected under Tree Protection Orders (TPO);

- Habitats that are not designated, but are nevertheless known to be of high biodiversity value (UKBAP and Local priority habitats);

- Watercourses, including rivers, streams, lakes, ponds and drainage ditches;

- Records of rare or protected species; and

- Objectives set out in Development Plans, Local Area Plans, Local Biodiversity Action Plans.

Contact details for statutory and non-statutory consultees, including non-governmental organisations and other sources of information are presented in Section Ten of these Guidelines.

7.1.2. Habitat assessment

A site survey by a suitably qualified ecologist may be required in order to properly evaluate the habitats and species present. This survey will usually involve the production of a map showing the key habitats and features on the site. This general habitat survey may need to be followed up with separate, more specialised surveys, for example surveys to confirm the presence or absence of roosting bats or for rare and protected plant species.

7.2. Protecting existing features

The footprint of any new development, no matter how small, should be designed to avoid any direct impacts on areas of value for biodiversity. Areas of semi-natural habitat should be retained if possible, with development focussed on low value habitats such as existing brown field sites (although it is noted that with time, they can develop into important biodiversity resources in their own right) or improved grassland or arable land. It may be possible to reduce the overall footprint of a development, while providing the required level of floor space, by for example, increasing the height of buildings and by locating car parking facilities and other services in basements.

Trees, tree lines, hedgerows, areas of scrub and streams are key features to be retained if possible. Such features are essential for ecological connectivity, and provide a direct link for small mammals, birds and other animals between the development site and the

wider countryside. They also help to 'soften' the appearance of a new development in the local landscape. When new construction is taking place on the site it will be important to ensure that all contractors establish adequate tree protection zones around all specimen trees according to British Standard BS 5837 2005 – Trees in Relation to Construction.

Building on floodplains has caused tremendous problems in the past and should be avoided. However, if this is not possible these features must be incorporated into the design for flood protection and water management. If well designed, this strategy can increase biodiversity whilst at the same time, increasing the amenity value of the site.

It is unlikely that any new development proposed for The HSC&PS estates land will impact directly on any designated sites. However, developments have the potential for indirect impacts on such areas. Designated wetland sites (including rivers, lakes, marshes, bogs and other wetland areas) in particular can be affected by development, either as a result of contamination (including both surface water and ground water), water abstraction (this can result in the lowering of groundwater tables) and even alteration to groundwater flow patterns.

Existing ecological areas do not have to be simply isolated from the development and left untouched. If sensitively planned, such areas can be used for recreation, landscaping, and even sustainable drainage as well as for the protection of biodiversity.

7.3. Sustainable Drainage Systems

Traditionally, development has relied on connection to the sewer network in order to remove both foul and surface water from a site for treatment elsewhere. In recent years, it has become increasingly clear that this is not a sustainable solution for surface water management. As urbanisation has progressed the loss of flood plains and wetlands has resulted in an increase in flooding and pollution events. Looking to the future, there is increasing evidence to suggest that with climate change, high intensity storm events are likely to become more frequent. This means that it is imperative to incorporate solutions to these potential problems into new development now. The advent of the EU Water Framework Directive has meant that a new approach to how human activities affect the water cycle has been required.

There are alternatives to the simple 'collect and convey' system of surface water management. Sustainable drainage systems (SuDS) are a way of engineering new developments to replicate the natural environment. These techniques are fast becoming the accepted best practice. They take into account not just the volume of surface water but also the quality. The most useful way to manage surface water is to allow rainfall to infiltrate naturally where it falls. This method of controlling water at source allows a more gradual release of water to the environment and prevents flooding by attenuating peak water flows, slowing run-off rates and reducing run-off volumes. Allowing surface water to evaporate or to infiltrate into the ground dramatically reduces the pressure on the drainage network.

More details of SuDS are provided in Appendix III in Key Card 6.

7.4. Sustainable building design

Directly linked to sustainable drainage, is the concept of the living (green) roof and the brown roof. In many situations where a new development is proposed, development space may be at a premium. Using a living roof allows land-take to be minimised by taking some of the elements of SuDS from off the ground and placing them on the roof.

Living roofs are well suited to the the HSC&PS estates environment and one such example can be seen at St. Vincent's Hospital in Dublin, where a living roof has been incorporated into a major new development and has proven to be very successful.

Living roofs can store and provide preliminary treatment of the water falling on the roof. They can slow down the flow of water reaching overloaded sewerage systems and permit reductions in the infrastructure required to drain the area. This can in turn provide huge savings to developers in terms of the investment required by water companies and drainage authorities. The living roof not only slows down the flow of water reaching the sewerage system, it can assist in reducing the volume of water as rain water is held for a time within the matrix of the roof and this allows evapo-transpiration of large volumes of water back into the atmosphere.

A well designed living roof will have a wide range of benefits, not only in assisting sustainable drainage, but also in providing new habitat for a wide range of plant and animal species, including invertebrates and birds. They can also be designed to utilise waste 'grey' water that would otherwise be sent directly to the foul drainage network and add to the thermal insulation properties of the roof.

It is not just the roofs of buildings that can be designed to incorporate green features. Living walls can also be designed for many buildings, either through the use of false walls attached to the external surface of the building, or by allowing appropriate plant types to grow directly up the sides of the buildings.

Good design, together with sensitive landscaping will allow the biodiversity potential of a new development to be maximised. The following key points should be considered during the planning of any work (more information is provided in the relevant Key Cards):

- Review options for inclusion of green roofs, brown roofs and living walls.
- Reduce hard standing and use permeable ground cover to allow percolation and reduce run-off;
- Planting and landscape design should take into account local conditions (microclimate). For example areas that are shaded and damp will require very different plants to sunny, open areas;
- Features such as bat and bird boxes, ledges and crevices are relatively easy to include during construction. On the HSC&PS estates sites the location of such features requires thoughtful planning. The advice of an ecologist should be sought; and
- Providing underground car parking reduces hard-stand area and maximises green area above ground.

7.5. BREEAM Healthcare

The BREEAM Healthcare Assessor Manual BES 5053 Issue 3.0 (BREEAM 2008) can be used to assess the following types of The HSC&PS estates developments at both the Design and Post Construction stages of their lifecycle:

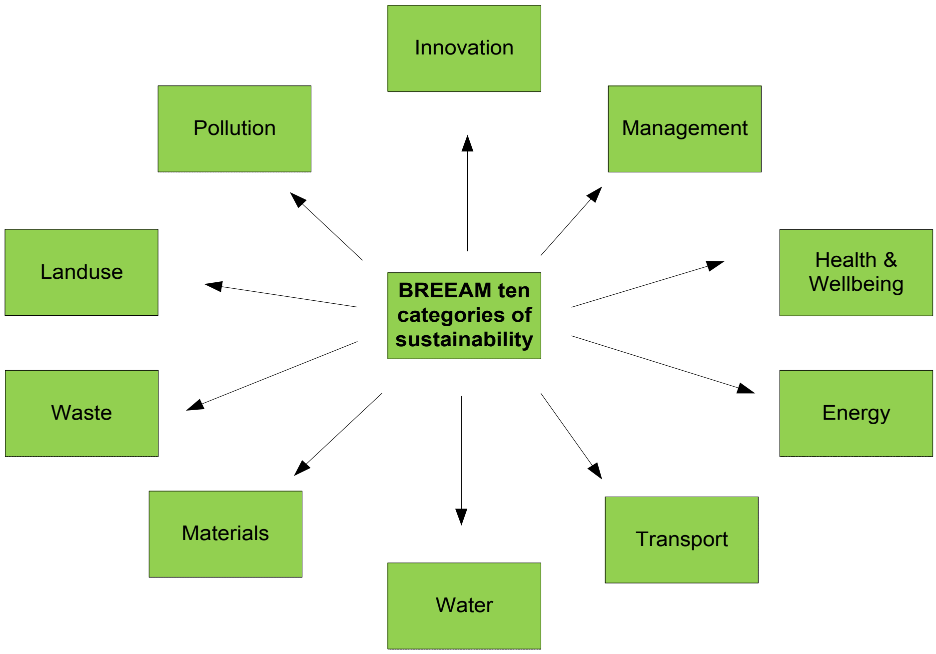
- Teaching/specialist hospitals;
- General acute hospitals;
- Community and mental health hospitals;
- GP surgeries;
- Health centres and clinics.

As of 30th October 2008, all new HSC buildings must seek to achieve an BREEAM Excellent rating (PEL(08)12 refers).

In addition, all refurbishments which account for 10% or more of the total floor area of the building assessed are required to commit to achieving a Very Good rating. If the refurbishment part accounts for less than 10% of the total floor area of the building assessed, the requirement is to achieve Excellent.

BREEAM assessments are required where the capital cost exceeds certain thresholds. In Northern Ireland for example this figure is >£1M. Where the capital cost falls below the relevant threshold, a Pre-Assessment should still be undertaken (at the OBC stage) to determine whether a BREEAM assessment is viable. BREEAM assessments are not required for listed buildings.

Within BREEAM Healthcare, the ten categories of sustainability are:



Each category is detailed in the BREEAM Healthcare technical manual and consists of a number of issues. Each issue seeks to mitigate the impact of a new or refurbished building on the environment by defining a performance target and assessment criteria that must be met to confirm the target has been achieved. Where a performance target has been achieved the number of available BREEAM credits can be awarded.

Of particular relevance to this Guidance document is the Land Use and Ecology category. Within this category, the following issues are addressed (the majority of BREEAM issues are tradable, meaning that a design team/client can pick which to comply with in order to build their BREEAM performance score):

- LE1: Reuse of Land;
- LE2: Contaminated Land;
- LE3: Ecological Value of Site and Protection of Ecological Features;
- LE4: Mitigating Ecological Impact;
- LE5: Enhancing Site Ecology;
- LE6: Long Term Impact on Biodiversity.

Guidance is provided in Appendix I of this document on the general principles behind each Land Use and Ecology category, and ways in which the maximum credits, and consequently the most positive impact on biodiversity, can be achieved. Please note however that it is important to refer to the BREEAM Healthcare 2008 Assessor Manual, which is the technical guidance document for carrying out BREEAM assessments.

8. Partnerships

8.1. Approach

Delivery of the actions outlined in the Guidelines will primarily be the responsibility of Health Service land managers and maintenance staff. However,given the limited funds which are likely to be available to enhance biodiversity, forming strategic partnerships will be critical to ensuring the successful implementation of the actions identified in this document.

With the input of volunteers and individuals and organisations with specialist wildlife expertise, effective implementation of the objectives will be easier to achieve. In the first instance, opportunities for engaging the local wildlife trust should be reviewed as they often play a key part in the LBAP process and will often be aware of local volunteer or 'friends of' groups. It may be possible to encourage staff and patients to form a conservation volunteer group to help with undertaking biodiversity enhancement measures and subsequent monitoring of the success, within a site. The person responsible for the implementation of the Guidelines for the site would take the lead and would be in a position to review which people and organisations in the local area would be appropriate to assist with delivery of the objectives. Section 10.2 contains details of key organisations that would be able to provide advice, funding and practical help.

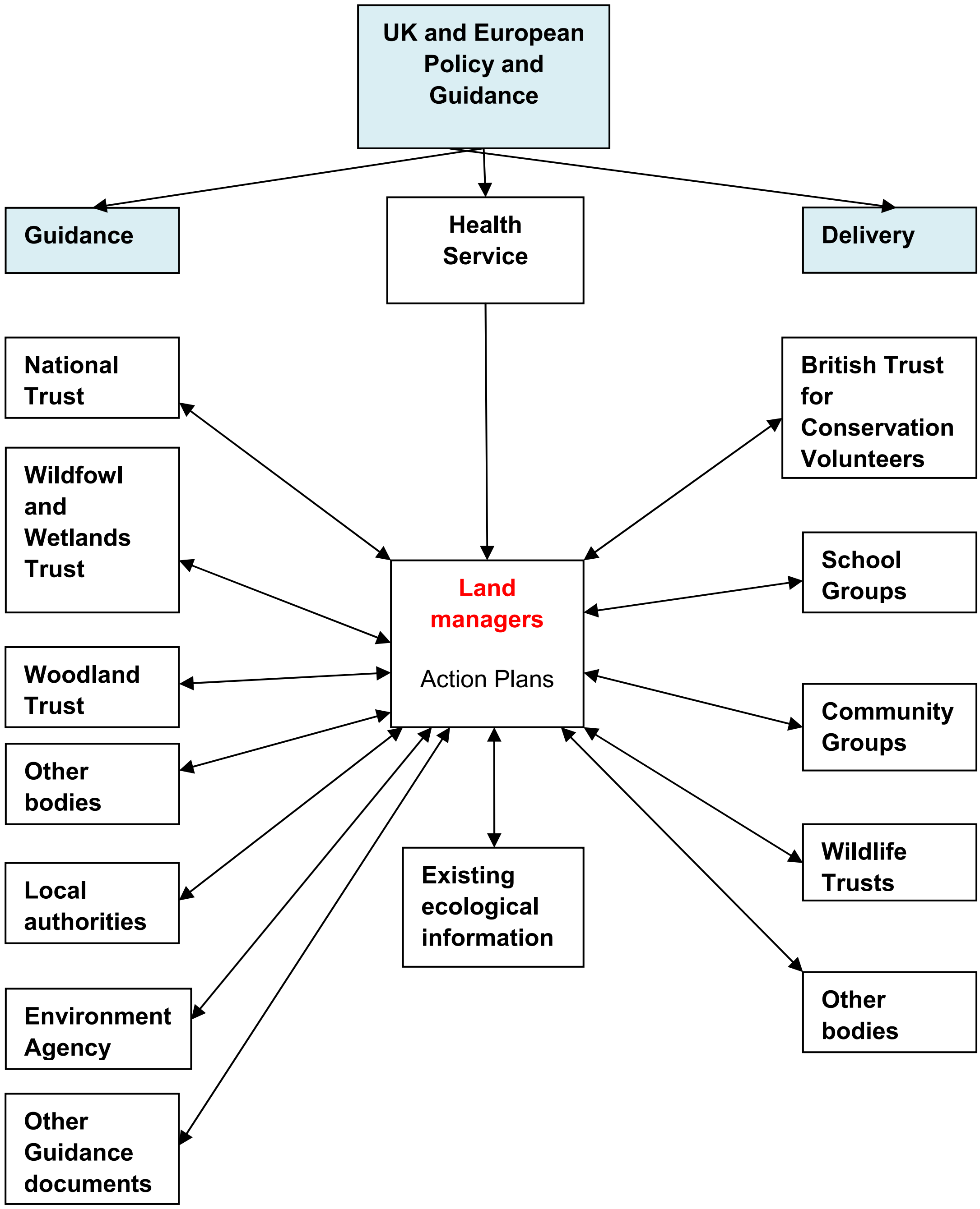
The involvement of stakeholders, including employees, patients, the local community and local biodiversity partnerships is important to consider. Internal support for the process is essential, and identifying a sound business case (see Section Four) will help in achieving this.

The Big Garden Birdwatch!

Initiatives such as the Big garden Birdwatch, organised by the RSPB, help provide this charity with important data, as well as stimulating an interest in wildlife. This will be particularly successful at sites where bird feeders have been installed.

8.2. Key organisations

The chart below illustrates the key organisations involved in the delivery of this Biodiversity Guidance Document.



8.3. Conservation groups and contact details

The table below provides more detail of the roles that the organisations listed above would play, as well as providing contact details.

Organisation	Role (Delivery or Advice)	Organisation Description	Contact Details
RSPB	Advice: Provide advice on the management of sites which are of particular interest or value to birds.	The RSPB is a charity funded organisation whose work is based on the responsibility to protect birds and the environment. The RSPB are involved in conservation, policy making, reserve management, scientific research and provide an advisory role to farming industry regarding land management.	The Lodge Potton Road Sandy Bedfordshire SG19 2DL Telephone: 01767 680551
National Trust	Delivery: Provide advice on the management and conservation of sites which are of particular interest or value to cultural heritage and the environment. Could also potentially provide a group of volunteers to aid with site management/enhancement.	The National Trust is a charity and is completely independent of the Government. Who rely for income on membership fees, donations and legacies, and revenue raised from our commercial operations. The National Trust protects over 350 historic houses, gardens and ancient monuments. They also look after forests, woods, fens, beaches, farmland, downs, moorland, islands, archaeological remains, castles, nature reserves and villages.	The National Trust Heelis Kemble Drive Swindon SN2 2NA Telephone: 01793 817400 The National Trust 32 Queen Anne's Gate London SW1H 9AB Telephone: 01793 817400
Wildfowl and Wetlands Trust	Advice and Delivery: Provide advice on the management, conservation and enhancement of sites which are of particular interest or value to local wildlife, biodiversity and more specifically wetland birds. Could also potentially provide a group of volunteers to aid with site management/enhancement.	The Wildfowl & Wetlands Trust (WWT) is a leading UK conservation organisation saving wetlands for wildlife and people across the world. Founded in 1946, the WWT has over 60 years experience of wetland conservation. WWT is committed to the protection of wetlands and all that depend on them for survival.	Wildfowl & Wetlands Trust Slimbridge, Gloucestershire GL2 7BT Telephone: 01453 891900 enquiries@wwt.org.uk

Woodland Trust	Advice and Delivery: Provide advice on the management, conservation and enhancement of sites with particular focus on woodlands.	The Woodland Trust was established in 1972 and is the UK's leading woodland conservation charity. Over the last 30 years or so, the Trust has acquired more than 1,000 woodland sites covering over 20,000 hectares (50,000 acres). The Trust manages a large number of sites around the UK and offers management advice as well as information regarding the most appropriate species to use if creating new areas of woodland and landscape planting.	Email: corporatepartnerships@woodlandtrust.org.uk Telephone: 01476 581112
Conservation Volunteers Northern Ireland	Delivery: through the provision of volunteers to aid with implementation of management plans and on site activities.	Conservation Volunteers Northern Ireland is a charity organisation which was set up in 1959 with a history of environmental conservation volunteering throughout the UK. Conservation Volunteers Northern Ireland provides learning and training opportunities in areas such as building dry stone walls, creating ponds or a wildlife garden and provides links between local communities and the environment encouraging local based land management schemes.	Conservation Volunteers Northern Ireland Beech House 159 Ravenhill Road BELFAST BT6 0BP Telephone: 028 9064 5169 Fax: 028 9064 4409 Email: CVNI@btcv.org.uk
School Groups	Delivery: school groups to get involved with local sites and contribute to the implementation of enhancement and conservation measures.	Local schools can get involved with site conservation through the provision of schemes such as tree planting and mini-beast workshops.	Contact details dependent on site locations.

ALGE (Association of Local Government Ecologists)	Advice: regarding planning policies and requirements	The Association of Local Government Ecologists represents professional ecologists working in local government throughout the UK. In partnership with others, ALGE supports and develops the nature conservation work of local authorities. The association promotes and develops good principles and practice of nature conservation in local government, provides a forum for the exchange of information and ideas on nature conservation, provides regular advice on nature conservation to the local authority associations, provides advice to, and liaises with, other bodies working on related matters.	Andrew Jones Greater London Authority City Hall The Queen's Walk London SE1 2AA Tel. (0)20 7983 4305
Wildlife Trusts	Advice and Delivery: Provide advice on the management, conservation and enhancement of sites which are of particular interest or value to local wildlife and biodiversity. Could also potentially provide a group of volunteers to aid with site management/enhancement.	The Wildlife Trust is a voluntary organisation dedicated to conserving the full range of the UK's habitats and species, whether they be in the countryside, in cities or at sea. There are 47 local Wildlife Trusts across the whole of the UK, the Isle of Man and Alderney. The WT manages 2,256 nature reserves covering more than 90,000 hectares and provides conservation management advice and has a strong involvement with volunteers and schools.	The Kiln Waterside Mather Road Newark Nottinghamshire NG24 1WT Telephone: 01636 677711

9. References and bibliography

European Environment Agency (EEA) (2007): *Halting the loss of biodiversity by 2010: proposal for a first set of indicators to monitor progress in Europe.* EEA, Copenhagen.

UK Climate Impacts Programme (UKCIP) (2010): *UKCIP* [Online] Available at http://www.ukcip.org.uk/index.php Joint Nature Conservation Committee (2004 and ongoing): *UK Biodiversity Action Plan* [Online] Available at: http://www.ukbap.org.uk

SNIFFER (2009): *UKCC12 Scoping Biodiversity Guidance for Public Bodies Preliminary Gaps Analysis.* SNIFFER, Edinburgh.

Natural History Museum (2010): *What threatens our biodiversity?* [Online] Available at http://www.nhm.ac.uk/nature-online/biodiversity/what-is-threatening-biodiversity/index.html

Intergovernmental Panel on Climate Change (2010): *IPCC* [Online] Available at http://www.ipcc.ch/index.htm

Greater London Authority (May 2004): *Building Green, a guide to using plants on roofs, walls and pavements.* Greater London Authority.

Bat Conservation Trust (October 2009): *Encouraging bats, a guide for bat-friendly gardening and living.* Bat Conservation Trust, London.

Environment Agency (undated): *Managing Japanese knotweed on development sites, the Knotweed code of practice*. Environment Agency, Bristol.

Plantlife (2010): *Removing invasive plants from your land* [Online] Available at http://www.plantlife.org.uk/uk/plantlife-campaigning-change-invasive-removal.htm

Non native species secretariat (undated): *Non native species information portal [*Online] Available at https://secure.fera.defra.gov.uk/nonnativespecies/index.cfm?sectionid=10

Construction Industry Research and Information Association (CIRIA) (2010): *Sustainable Drainage Systems: Promoting good practice – a CIRIA initiative* [Online] Available at http://www.ciria.com/suds

Brownroofs.co.uk (undated): [Online] Available at http://www.brownroofs.co.uk/index.php

BREEAM (2008): *BES 5053: Issue 3.0. BREEAM Healthcare 2008 Assessor Manual*. BREEAM, Hertfordshire.

Appendix I: Legislation and Policy

Existing legislation and guidance

It is essential that anyone involved with land development of any sort, including renovations, as well as those responsible for more general land management and maintenance has a working knowledge of their responsibilities with regard to nature conservation. This will ensure that they avoid contravening the law and will make obtaining planning permission for new developments a more straightforward process.

The Habitats Directive (92/43/EEC) on the Conservation of Natural Habitats and of Wild Fauna and Flora exists to promote the maintenance of biodiversity in Europe. The Directive provides for the creation of a network of protected areas across the continent, and the annexes to the Directive list habitats and species of importance in a Europe-wide context. This directive was enacted in the UK by the Conservation (Natural Habitats &c.) Regulations.

The Conservation (Natural Habitats &c.) (Amendments) Regulations 2007, more commonly termed the 'Habitats Regulations', constitute the UK government's implementation of the Habitats Directive. The Regulations provide for the designation of both Special Protection Areas (SPAs) (first established under the Birds Directive, 1979) and Special Areas for Conservation (SACs) as part of the Natura 2000 network of protected areas across the European Union.

For European Protected Species (EPS), such as great crested newts, dormice, all species of bats and otters, the 2007 amendments of the Habitat Regulations gives protection from deliberate capture, killing or significant disturbance (such that it affects the ability of the species to survive, breed, nurture their young or the local distribution or abundance of the species). It is also an absolute offence to destroy or damage the resting site or breeding site of an EPS.

The Wildlife and Countryside Act (1981), as amended and strengthened by the Countryside and Rights of Way Act (2000) and other amendments, is the principle mechanism for the legislative protection of wildlife in Great Britain. The Act established a statutory framework for the protection of wildlife, in particular providing for the designation of SSSIs, which are selected as the best national examples of habitat types, sites with notable species and sites of geological importance.

Schedules 1-4 of the Wildlife and Countryside Act (and amendments) relate to the protection of wild birds. Section 9 of the Act details protection of animals listed on Schedule 5. Changes to the Habitats Regulations have also resulted in amendments to the Wildlife and Countryside Act with regard to the protection of EPS, which have removed certain offences listed in Section 9. Partial protection under Section 9 is given to certain other species, including all common species of reptile. Water voles have recently been afforded 'full' protection under this Act.

The Wildlife (Northern Ireland Order) 1985 applies only in Northern Ireland and is the equivalent to the WCA. Under article 14, it protects plant species under Part 1 of Schedule 8 from being intentionally uprooted, picked or destroyed. It is an offence to sell, possess or transport any live or dead plant, or anything derived from a plant that is listed in Part I or Part II of Schedule 8. Article 14 also deals with the control of introduced species such as Giant Hogweed and Japanese Knotweed.

The Environment (Northern Ireland) Order 2002 deals with the declaration, denotification and protection of Areas of Special Scientific Interest (ASSIs) by reason of any of its flora, fauna or geological or physiographical features. It identifies the responsibilities of land owners and public bodies with respect to these areas. Public bodies have duty to take reasonable steps to further the conservation and enhancement of the features by which the ASSI was designated. In addition, this legislation makes provision for the regulation and control of pollution and waste disposal.

The Countryside and Rights of Way (CRoW) Act 2000 gives greater protection to SSSIs and strengthens wildlife enforcement legislation by the introduction of the offence of 'reckless disturbance'. The Act also

requires Government Departments to have regard to biodiversity and conservation; in particular, habitats and species of principal importance are listed under Section 74 of the Act, for which conservation steps should be taken or promoted. The requirement to prepare such lists of habitats and species has been extended by Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006. This Act also places a duty upon public bodies to consider enhancement of biodiversity within all of their actions.

Badgers are extensively protected by the Protection of Badgers Act 1992, which consolidates the legislation specific to badgers. The Act makes it an offence to wilfully take, kill, injure or ill-treat a badger; to obstruct, destroy, or damage in any part, a badger's sett; or to disturb badgers within a sett.

The Hedgerows Regulations 1997 have been designed to protect 'important' hedgerows for which replanting is no substitute. The 'importance' of a hedgerow depends upon a number of archaeological, wildlife and landscape criteria.

Relevant guidance documents

- **Health Estates Sustainable Development Design Brief Volumes 1 & 2 :** This is a guide to sustainable development in practice which identifies opportunities and targets for the integration of sustainable development principles and practices;
- **Government Construction Clients Group Sustainability Action Plan:** This Action Plan identifies various themes aimed at achieving sustainable construction;
- **SNIFFER Scoping Biodiversity Guidance for Public Bodies (2009):** This document provides a gap analysis of where biodiversity guidance can be improved, or is missing, specifically for public bodies. It identified the need to collate existing biodiversity guidance in relation to public bodies;
- **DEFRA: Guidance for Public Authorities on Implementing the Biodiversity Duty:** This document provides guidance to Public Authorities on implementing their biodiversity duty;
- **Department of Health: Sustainable Development: Environmental Strategy for the National Health Service:** This strategy explains how the NHS can achieve significant benefits, including cost savings and improving quality, by adopting an approach based on the sound principles of sustainable development, focusing on environmental issues, economic considerations and social impacts;
- **NHS Corporate Citizen Handbook:** This is a tool to help individuals think about how they and their organisation can contribute to sustainable development;
- **Sustainable Development Commission: Healthy Futures:** This guidance outlines the importance of biodiversity to the aims of the NHS and DHSSPS. The guidance coins the phrase "The Natural Health Service" – biodiversity and green spaces are "essential to the healthy society" and "can help prevent ill-health". This approach allows the promotion of biodiversity within the HSC&PS estates land but in a manner consistent with the function and objectives of the Department. This guidance provides the basis for an integrated approach to biodiversity; satisfying the requirements of the Natural Environment and Rural Communities Act and other legislation and providing functional green spaces within the HSC&PS estates land;
- **BREEAM Healthcare:** BREEAM (Building Research Establishment's Environmental Assessment Method) is the world's leading and most widely used environmental assessment method for healthcare buildings;
- **Health Estates Agency: Composite Biodiversity Report:** This report details the findings of a biodiversity study of six hospital sites in Northern Ireland and provides recommendations for enhancing biodiversity at each site. It has been used to provide information with regards the existing situation of The HSC&PS estates land;
- **DHSSPS Control Assurance Standards;** These Standards have been developed by the Department to support the embedding of organisation-wide risk management in DHSSPS bodies.

By implementing these standards, all tasks and processes are managed to minimise any negative impacts; Healthcare Standards for Wales

- **Northern Ireland Biodiversity Strategy 2002:** This document provides a strategy detailing how the government plans to protect and enhance biodiversity in Northern Ireland over the period up to 2016. It identifies forty habitats as priorities for conservation action in Northern Ireland;
- **DHSSPS Biodiversity Implementation Plan (December 2007 – December 2008):** This document extracts issues raised in the Northern Ireland Biodiversity Strategy, with a focus on how DHSSPS can implement the Strategy;
- **Northern Ireland Environment Agency Biodiversity Implementation Plan (April 2009 to March 2012):** This document takes issues identified in the Northern Ireland Biodiversity Strategy and outlines how they can be resolved;
- **Northern Ireland Environment Agency:** 'Our Environment, Our Heritage, Our Future' State of the Environment Report for Northern Ireland. March 2008: This report provides baseline data and information, which will be updated and extended in the future. It also provides part of the evidence base to inform the development of policies and to underpin the delivery of sustainable development objectives across Government.

International legislation

The Convention on Biological Diversity (CBD)
At the 1992 Earth Summit in Rio de Janeiro, world leaders agreed on a comprehensive strategy for sustainable development. The Convention on Biological Diversity sets out commitments for maintaining the world's ecological underpinnings as we go about the business of economic development. The Convention establishes three main goals: the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits from the use of genetic resources.

The Convention is legally binding; countries that join it are obliged to implement its provisions. The UK is required to develop national biodiversity strategies and action plans, and to integrate these into broader national plans for environment and development.

Sites of Excellence for Conservation and Sustainable Development, commonly referred to as Biosphere Reserves

The ''Biosphere Conference'' organized by UNESCO in 1968 was the first intergovernmental conference to seek to reconcile the conservation and use of natural resources. Resulting from this conference was the launch of the ''Man and the Biosphere Programme (MAB)'' by UNESCO in 1970. One of the MAB programmes is the establishment of a coordinated world network of new protected areas, to be designated ''Biosphere Reserves''. In the UK there are eight designated Biosphere Reserves. Each reserve is intended to fulfil three basic functions, which are complementary and mutually reinforcing:

- Conservation to contribute to the conservation of landscapes, ecosystems, species and genetic variation;
- Development to foster economic and human development which is culturally and ecologically sustainable; and
- Logistics to provide support for research, monitoring, education and information exchange related to local, national and global issues of conservation and development.

For UK biosphere reserves, statutory protection is given to a core area. The designation of a biosphere reserve does not afford any extra protection but does give the site international recognition.

The Convention on Wetlands of International Importance, especially as Waterfowl Habitat, commonly referred to as the Ramsar Convention.

The Convention, signed in Ramsar, Iran, in 1971, is an inter-governmental treaty, which provides the framework for national action and international cooperation for the conservation and wise use of

wetlands and their resources. The UK ratified the Convention in 1976, and has underpinned the designation of its Ramsar sites through prior notification of these areas as SSSIs (or ASSIs in Northern Ireland). Accordingly, these receive statutory protection under the Wildlife & Countryside Act (WCA) 1981, and the Nature Conservation and Amenity Lands (Northern Ireland) Order 1985. In England and Wales, further protection is provided by the Countryside and Rights of Way (CRoW) Act 2000.

European policy of relevance to habitats, plants and fungi

The Habitats and Species Directive 92/43/EEC, Conservation (Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora.) Regulations (1994) and Special Areas of Conservation (SACs)

These are identified under Annex 1 of the EC Habitats Directive 1992. The Conservation (Natural Habitats & c) Regulations (1994) implement the requirement of the EC Habitat Directive, with the exception of Northern Ireland where the Directive is implemented under Statutory Rules (NI) 380, 1995. The Habitats Directive requires States to ensure the “favourable conservation status” of internationally significant habitats. This Directive aims to promote the maintenance of biodiversity, taking into account economic, social, cultural and regional requirements, and thus contributes towards sustainable development. It also led to the establishment of European Network (Natura 2000) of Special Areas of Conservation (SACs) and Special Protected Areas (see below). These sites will be designated in order to conserve the habitats and species identified in the Habitats Directive.

The Life in UK Rivers (Conserving Natura 2000 Rivers) project was established to meet the challenges of conserving complex aquatic environments and to assist with the implementation of the Habitats Directive for river SACs. Information is available from the Life in Rivers website and includes a review of monitoring/conservation techniques related to siltation in rivers and the managing of diffuse pollution; the latter is specifically related to land management and farming practices. These documents also include river conservation strategies.

Special Protection Areas (SPAs)
These sites are classified under the EC Birds Directive 1979 (Council Directive 79/409/EEC on the conservation of wild birds). The Directive provides a framework for the conservation and management of, and human interactions with, wild birds in Europe. It sets broad objectives for a wide range of activities, although the precise legal mechanisms for their achievement are at the discretion of each Member State. It is UK policy that areas classified as SPAs are first notified as Sites of Special Scientific Interest (SSSI) (or as Areas of Special Scientific Interest (ASSIs) in Northern Ireland), as this provides the legal under-pinning for SPAs in domestic legislation. SACs, together with SPAs, form a network of protected areas known as Natura 2000.

The Bern Convention (1979) The Convention on the Conservation of European Wildlife and Natural Habitats
The aims of this Convention are to conserve wild flora and fauna and their natural habitats, particularly those species and habitats that require the co-operation of several States. It also emphasises the protection of endangered and vulnerable species and their habitats, especially those specified in Appendices I and II. Although the UK are signatories to the Bern Convention, it has no specific interpretation in UK law, but the protection measures appropriate to this convention are included in the Wildlife and Countryside Act (1981) (as amended) and in national planning policy.

The EU Water Framework Directive (WFD)
The WFD is probably the most significant legislative instrument concerning the water environment to be introduced on an international basis for many years. It takes a broad view of water management and has, as its key objectives, the prevention of any further deterioration of water bodies and the protection and enhancement of the status of aquatic ecosystems. It aims to promote sustainable water consumption and contribute to mitigating the impacts of floods and droughts.

The Environment Agency (EA) has been named as the Competent Authority for England and Wales. The EA is responsible for characterising river basin districts, identifying bodies of water used for the abstraction of drinking water, preparing, reviewing and keeping up-to-date register of protected areas for each river basin district, establishing programmes to monitor water status, preparing and submitting to the ‘appropriate authority’ (i.e. Secretary of State and/or National Assembly for Wales) environmental objectives and management plans.

DEFRA and the Welsh Assembly Government have undertaken consultation exercises, and a timetable for full implementation is set out on the EA website. SEPA (Scottish Environment Protection Agency) have also undertaken a consultation exercise on how the Scottish Executive plans to transpose the Directive regulatory requirements into Scottish Law.

UK legislation & Policy

The Wildlife and Countryside Act 1981 (WCA) (as amended).
This is the main legislation for protection of wildlife in the UK (apart from Northern Ireland) and fulfils many of the obligations set out in the Bern Convention, EC Birds Directive and EC Habitats Directive. Protected species of plants and fungi are listed under Schedule 8 and it is an offence to intentionally pick, uproot, destroy or sell these species under Schedule 13 or to uproot any wild plant or fungi without the permission of the landowner. Schedule 14 lists pest species which it is an offence to plant/grow.

Sites of Special Scientific Interest (SSSI)
SSSI's are designated and protected under the WCA (as amended by the Countryside and Rights of Way Act (CRoW Act) 2000) (see below); sites are selected as the best national example of habitat types by reason of their flora, fauna or geological/physiographical features. Such notification ensures compulsory consultation with the statutory nature conservation agencies over management operations and development proposals. Many SSSIs are also National Nature Reserves (NNRs) or Local Nature Reserves (LNRs).

The Countryside and Rights of Way Act 2000 (CRoW)
The CRoW Act (2000) requires Government Departments within England and Wales to have regard to biodiversity and conservation; habitats and species of principal importance are listed under Section 74 of the Act, for which conservation steps should be taken or promoted. Habitat and Species Action Plans under the UK Biodiversity Action Plan are already in place or under preparation for all listed habitats and species. 'Working with the Grain of Nature - A biodiversity strategy for England' (2002), sets out the means by which the Government will comply with its duty under Section 74 to take or promote the taking by others, of steps to further the conservation of the listed habitats and species, including through the continued implementation of the Action Plans.

The Act also increases the protection for SSSIs. Schedule 9 amends SSSI notification and provides increased powers for protection and management. Conservation agencies have been given extended powers for entering into management agreements and the Act also places a duty on public bodies to further the conservation and enhancement of SSSIs. A new offence has been introduced whereby third parties can be convicted for damaging SSSIs alongside increased penalties on convictions where provisions have been breached.

Schedule 12 of the Act amends the Wildlife and Countryside Act 1981, strengthening the legal protection for threatened species. The provisions make certain offences 'arrestable', create a new offence of reckless disturbance, confer greater powers to police and wildlife inspectors for entering premises and obtaining wildlife tissue samples for DNA analysis, and enables heavier penalties on conviction of wildlife offences.

Nature Conservation (Scotland) Act 2004
The Nature Conservation (Scotland) Act 2004, only applying to Scotland, received royal assent in June 2004 and came into force in July of that year. The Act places duties on public bodies relating to the conservation of biodiversity, increases protection for Sites of Special Scientific Interest; provides for Land Management Orders, Conservation Orders and strengthens wildlife enforcement legislation. The Nature Conservation (Scotland) Act supersedes provisions made in the WCA, providing enhanced protection for SSSIs, and allows Scottish ministers to make Conservation Orders to ensure the conservation, enhancement or restoration of a natural feature. The Act also strengthens legal protection for threatened species.

The Wildlife (Northern Ireland Order) 1985
The Wildlife (Northern Ireland Order) 1985 applies only in Northern Ireland and is the equivalent to the WCA. Under article 14, it protects plant species under Part 1 of Schedule 8 from being intentionally uprooted, picked or destroyed. It is an offence to sell, possess or transport any live or dead plant, or anything derived from a plant that is listed in Part I or Part II of Schedule 8. Article 14 also deals with the control of introduced species such as Giant Hogweed and Japanese Knotweed.

The Wildlife and Natural Environment Bill
This Bill makes provision about biodiversity; to amend the Wildlife (Northern Ireland) Order 1985 and Part 4 of the Environment (Northern Ireland) Order 2002. In particular it includes the duty to conserve biodiversity. It is the duty of every public body, in exercising any functions, to further the conservation of biodiversity so far as is consistent with the proper exercise of those functions. This is known as the 'biodiversity duty'.

The Environment (Northern Ireland) Order 2002
The Environment (Northern Ireland) Order 2002 deals with the declaration, denotification and protection of Areas of Special Scientific Interest (ASSIs) by reason of any of its flora, fauna or geological or physiographical features. It identifies the responsibilities of land owners and public bodies with respect to these areas. Public bodies have duty to take reasonable steps to further the conservation and enhancement of the features by which the ASSI was designated. In addition, this legislation makes provision for the regulation and control of pollution and waste disposal.

National Nature Reserves (NNR)
NNRs are areas of national importance for wildlife that are among the best examples of a particular habitat. They are usually designated for their broader ecological value rather than the presence of any rare species. The NNR network represents almost every kind of vegetation type in England. They also have a public role, with the majority of reserves allowing some permitted access. In many cases, they are owned and managed by the statutory authority (English Nature, Countryside Council for Wales and Scottish Natural Heritage).

Sites of Nature Conservation Importance (SNCIs)
These are designated by Local Authorities or local Wildlife Trusts to protect locally important sites; the importance of these sites is identified in Planning Policy Statement 9: Biodiversity and Geological Conservation, PPS9 (which replaces Planning Policy Guidance note: Nature Conservation (1994), known as PPG9). Through policies in plans, Local Authorities should identify, conserve and enhance habitats of principal importance for conservation of biodiversity in England. These habitats are based on the habitats of importance identified in Section 74 of the CRoW Act.

The Hedgerow Regulations 1997
These regulations introduced new arrangements to protect important hedgerows in England and Wales. As a result, since 1 June 1997, it has been against the law to remove most countryside hedgerows (or parts of them) without first notifying the local planning authority. The council then has the opportunity to go and inspect the hedge to see if it meets the criteria for important hedges in the Regulations. If the hedge meets the criteria in the Regulations the landowner is then legally obliged to retain the hedge. The Regulations include historical, ecological and archaeological criteria. However, they do not include hedgerows which are 'within or marking the boundary of the curtilage of a dwelling-house'. This means that if a hedge marks the edge of a garden which is attached to a house, the hedge is not covered by the regulations.

The Weeds Act 1959
This Act identifies that land owners are responsible for ensuring that noxious or invasive plant species are not able to spread onto neighbouring land. Those plants species that have been identified as being noxious or invasive include Common Ragwort (*Senecio jacobaea*), Broad-leaved Dock (*Rumex obtusifolius*), Curled Dock (*Rumex crispus*), Creeping Thistle (*Cirsium arvense*), and Spear Thistle (*Cirsium vulgare*).

The Forestry Act 1967 (as amended)
This requires that a felling licence be issued from the Forestry Commission to fell growing trees (but not lopping/topping) unless the felling is covered by planning permission or equivalent.

Town and Country Planning Act 1990 for England and Wales.
Under Part VIII of this Act, Tree Protection Orders (TPOs) can be issued in order to prohibit the cutting down, uprooting, topping, lopping, wilful damage or destruction of trees without the consent of the local planning authority (LPA). This legislation covers single trees and groups of trees. The purpose of this order is to preserve trees for reasons of amenity and to enhance the appearance of the environment.

Town and Country Planning (Scotland) Act 1997.
Under Part VII of this Act, TPOs can be issued to protect trees in Scotland.

The Planning (Trees) Regulations (Northern Ireland) 2003.
Under Part II of these Regulations, LPAs are able to issue (TPOs) in respect of trees or woodlands in Northern Ireland.

The Water Resources Act 1991
This Act contains provisions that prevent water pollution. Under Section 85 of the Act it is an offence to cause, or knowingly permit, a discharge of noxious or polluting matter/water into any controlled waters without proper authority. This includes groundwater and all coastal or inland waters, such as lakes, ponds, rivers, streams, canals and ditches (as well as temporarily dry watercourses). Under Section 161 of the Act, the EA can do work to prevent or clear up pollution and then recover the cost from the person responsible.

The Groundwater Regulations 1998
These regulations aim to prevent entry of certain substances into groundwater, as well as prevent its pollution (the listed substances are those included under the Groundwater Directive).

National planning guidance

In England Planning Policy Statement 9: Biodiversity and Geological Conservation provides advice to Local Planning Authorities to ensure that they devise planning policies that protect sites of statutory nature conservation value and develop policies against which proposals affecting sites of regional biodiversity can be judged. This policy statement also identifies ancient woodland, veteran trees and ‘networks of natural habitats’ as important habitats that should be conserved.

In Scotland National Planning Policy Guideline (NPPG) 14 gives guidance on how the Government’s policies for conservation and enhancement of Scotland’s natural heritage (plants, animals, geology, and areas of natural interest and beauty) should be reflected in land use planning.

In Wales, Technical Advice Note (TAN) 5 Nature Conservation and Planning (Revised, 2009) advises planning with respect to nature conservation.

Equivalent guidance for planning in Northern Ireland is given in Planning Policy Statement (PPS) 2 Planning and Nature Conservation (1997).

Biodiversity Action Plans

UKBAP
The UKBAP is the UK Government’s response to the Convention on Biological Diversity, signed in 1992, which describes the UK’s biological resources and commits a detailed plan for the protection of these resources. It includes separate habitat action plans for a number of Priority Habitats, and also included plans for Broad Habitat types and Priority Species. These habitats are also identified as habitats of principal importance under Section 74 of the CRoW Act (2000).

Local BAPs
LBAPs work on the basis of partnership, to identify local priorities and to determine the contribution they can make to the delivery of the national Species and Habitat Action Plan targets. Often, but not always, LBAPs conform to county boundaries. Many of the habitats listed in the UKBAP are also listed on LBAPs.

Other guidance

Red data books are lists of species whose continued existence is threatened; each red data book usually deals with a specific group of taxa, for instance insects, birds or vascular plants, and outlines the extent of threat to a particular species. The vascular plant red data book for Great Britain for example, was produced as part of the JNCC Species Status Assessment project to assess the status of the vascular plants throughout Great Britain. It includes species which are Critically Endangered, Endangered, Vulnerable, Extinct and Extinct in the wild; non-Red List species in the revised IUCN categories; species and subspecies endemic to Britain; species included in Schedule 8 of the Wildlife and Countryside Act; species included in Annexes IIb and IVb of the European Community Habitats and Species Directive; other species threatened internationally, or for which Britain has a special responsibility.

BREEAM

The Building Research Establishment's Environmental Assessment Method (BREEAM) is the world's leading and most widely used environmental assessment method for buildings, with over 115,000 buildings certified and nearly 700,000 registered. It sets the standard for best practice in sustainable design and has become the de facto measure used to describe a building's environmental performance. Credits are awarded in ten categories according to performance. These credits are then added together to produce a single overall score on a scale of Pass, Good, Very Good, Excellent and Outstanding. The operation of BREEAM is overseen by an independent Sustainability Board, representing a wide cross-section of construction industry stakeholders.

Aims of BREEAM:

- To mitigate the impacts of buildings on the environment;
- To enable buildings to be recognised according to their environmental benefits;
- To provide a credible, environmental label for buildings;
- To stimulate demand for sustainable buildings.

Objectives of BREEAM:

- To provide market recognition to low environmental impact buildings;
- To ensure best environmental practice is incorporated in buildings;
- To set criteria and standards surpassing those required by regulations and challenge the market to provide innovative solutions that minimise the environmental impact of buildings;
- To raise the awareness of owners, occupants, designers and operators of the benefits of buildings with a reduced impact on the environment;
- To allow organisations to demonstrate progress towards corporate environmental objectives.

The BREEAM rating is determined using the BREEAM Assessor's Spreadsheet Tool and associated calculators. An indication of performance against the BREEAM standard can also be determined using a BREEAM Pre-Assessment Estimator.

An assessor should be involved in a project as early as possible. As the majority of BREEAM schemes include a design stage assessment it is important to implement details into the design in the first instance. By doing this it will be easier to obtain a higher rating and a more cost effective result.

Each category is detailed in the BREEAM Healthcare technical manual and consists of a number of issues. Each issue seeks to mitigate the impact of a new or refurbished building on the environment by defining a performance target and assessment criteria that must be met to confirm the target has been achieved. Where a performance target has been achieved the number of available BREEAM credits can be awarded.

Of particular relevance to this Guidance document is the Land Use and Ecology category. Within this category, the following issues are addressed (the majority of BREEAM issues are tradable, meaning that a design team/client can pick which to comply with in order to build their BREEAM performance score):

- LE1: Reuse of Land;

- LE2: Contaminated Land;
- LE3: Ecological Value of Site and Protection of Ecological Features;
- LE4: Mitigating Ecological Impact;
- LE5: Enhancing Site Ecology;
- LE6: Long Term Impact on Biodiversity.

Guidance is provided below on the general principles behind each Land Use and Ecology category, and ways in which the maximum credits, and consequently the most positive impact on biodiversity, can be achieved. Please note however that it is important to refer to the BREEAM Healthcare 2008 Assessor Manual, which is the technical guidance document for carrying out BREEAM assessments.

LE1: Reuse of Land	The aim of this credit is to encourage the reuse of land that has previously been developed, and discourage the use of previously undeveloped land for building. In order to achieve this credit, at least 75% of the proposed development's footprint must be on an area of land which has previously been developed for use by industrial, commercial or domestic purposes in the last 50 years.
LE2: Contaminated Land	The aim of this credit is to encourage remediation and then development of contaminated land. The land must be 'significantly contaminated' in order to achieve this credit.
LE3: Ecological Value of Site and Protection of Ecological Features	The aim of this credit is to encourage development on land that already has limited value to wildlife and to protect existing ecological features from substantial damage during site preparation and completion of construction works. Whilst not absolutely necessary, it is always recommend that a suitably qualified ecologist is employed to undertake a site visit and write an ecological assessment report, prior to any works taking place on site. The results of the initial survey, and any subsequent surveys required will feed into the BREEAM assessment.
LE4: Mitigating Ecological Impact	The aim of this credit is to minimise the impact of a building development on the existing site ecology. It involves measuring the ecological value of the site before development compared to post development, to determine the change in ecological value. BREEAM calculates the change in ecological value by comparing the diversity (number and area) of plant species on the site pre and post construction. This credit should be achieved through collaboration between the ecologist and the landscape architects for the scheme, and should be seen as an opportunity to specify native and/or wildlife friendly flora that reflects the local landscape and benefits local fauna. It is also an opportunity to specify the creation of, for example, suitable BAP habitats.
LE5: Enhancing Site Ecology	The aim of this credit is to recognise and encourage actions taken to maintain and enhance the ecological value of the site as a result of development. This credit can be achieved where recommendations made by a suitably qualified ecologist are or will be implemented. Recommendations will be site specific, but may include the following: • Planting flora which produces flowers, fruits, nuts and seeds which are of value to wildlife, in particular invertebrates and foraging birds; • Creating and maintaining habitats such as a pond, coppice woodland or meadow grass areas; • Installing a living roof; • Installing log piles to benefit invertebrates;

	• Installing bat and bird boxes; • Implementing good horticultural practice such as the use of peat-free composts, mulches and soil conditions, to minimize off site ecological impacts.
LE6: long term impact on biodiversity	The aim of this credit is to minimise the long term impact of the development on the biodiversity of the site and surrounding area. Gaining these credits involves complying with all of the mandatory criteria and at least four of the additional criteria, as described below: **Mandatory criteria** 1. A suitably qualified ecologist has been appointed prior to commencement of activities on site; 2. The suitably qualified ecologist confirms that all relevant UK and EU legislation relating to protection and enhancement of ecology has been complied with during the design and construction process; 3. A landscape and habitat management plan, appropriate to the site, is produced covering at least the first five years after project completion. This is to be handed over to the building occupants and includes: management of any protected features on site; management of any new, existing or enhanced habitats; a reference to the current or future site level or local Biodiversity Action Plan.

Appendix II: Habitat Action Plans: Key Cards

Key Card 1: Urban habitats – courtyards, gardens and terraces

Key Card 2: Woodland

Key Card 3: Grassland

Key Card 4: Watercourses, ponds and other water features

Key Card 5: Invasive species

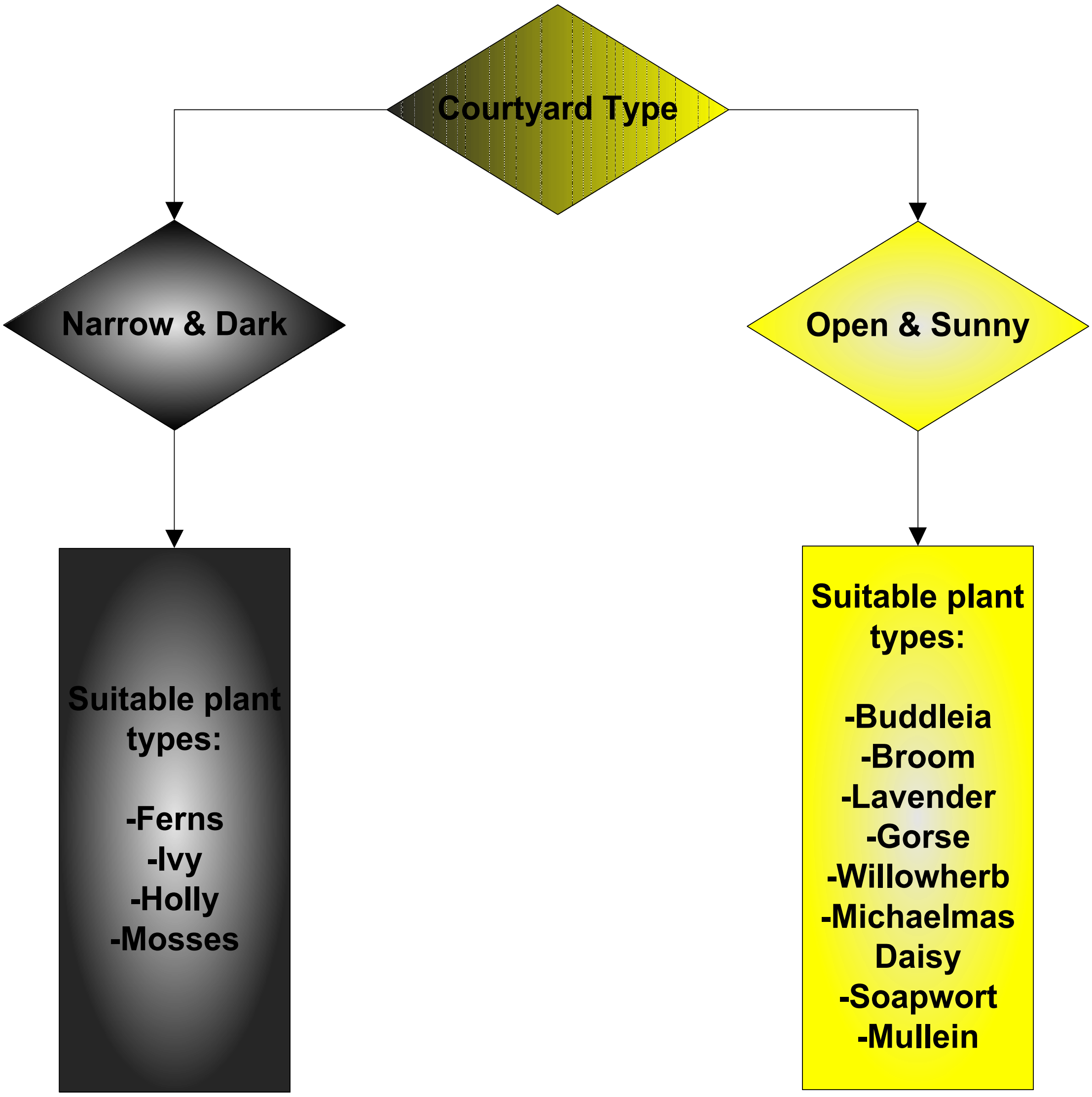
Key Card 1: Urban habitats- courtyards, gardens and terraces

Courtyards (Greater London Authority, 2004)

Courtyards can be defined as an open area surrounded by walls or buildings. Courtyards can provide green space for relaxation, be cultivated as wildlife habitats, or simply organized as attractive green areas to offer pleasing views from a window.

If a courtyard is to be 'greened,' four factors, which dictate the microclimate of a courtyard, should be considered. These are light, wind, temperature and moisture.

Plants should be chosen to suit the type of courtyard under consideration, as illustrated in the diagram below:



Many of the above species will offer cover and breeding places for certain invertebrates as well as food for some birds such as finches. More open but sheltered courtyards are particularly suitable for colourful plants which thrive in full sun. These will function as bee and butterfly gardens, supplying a rich source of nectar from spring to autumn.

In turn, planting a courtyard can have considerable effect on its microclimate. Plants can help to lower the air temperature of hot spaces by providing shade and ensuring surfaces heat up less. A covering of soil and plants also helps to absorb rainwater, thus ensuring that the surface of the courtyard does not contribute to storm-water runoff problems.

Balconies and terraces (Greater London Authority, 2004)

Balconies and small terraces can be used to grow plants in small containers, offering an opportunity for wildlife. Even small containers of plants attract insects which in turn attract birds. Seeds and berries also attract birds and squirrels. Small trees can be planted in containers and pots, and window boxes and hanging baskets used for planting colourful shrubs and wildflowers.

Installing a balcony garden can have other benefits too. Plants provide screening and hide unattractive buildings or building features. They also benefit people, giving particular pleasure to those without gardens or those without access to green spaces. Looking after a balcony garden could benefit some patients. Since balcony gardens do not require strenuous digging, weeding or mowing, it may be possible for some patients to tend their balcony or terrace garden, which in turn may provide health benefits to the individual. However, it is recommended that the health of the gardens is overseen by maintenance staff.

Conditions in containers and pots are sometimes extreme, with containers in south-facing positions heating up to very high temperatures in summer and losing water rapidly. In winter, roots in smaller containers have little resistance to frost and nutrient availability can be a problem where containers hold only small amounts of soil. However, many wildflowers are suited to growing in harsh conditions. Plants which provide visual interest, as well as seeds, pollen and nectar for insects and birds should be chosen.

Suitable balcony/terrace species

Suitable species are as follows, but remember to consider soil type, location, and size of container:

- Native spring bulbs such as wild daffodil, snowdrop and bluebell.
- Cornfield annuals such as poppies, chamomile and corn marigold for bright colours
- Meadow flowers such as ox-eye daisy, toadflax and harebell.
- Alpines, rockery plants, and those found on cliffs, such as thrift, wild thyme, stonecrops and saxifrages will thrive in minimal amounts of soil.

Managing the area

The artificial growing conditions of containers mean that they require frequent watering, and therefore ease of access and water supply is vital. It is also essential to ensure adequate drainage and shelter from strong sun and winds.

Birds

A variety of birds can be attracted to nest on or close to buildings. This not only benefits wildlife, but also provides enjoyment for human inhabitants. Wildlife requires two fundamental things: somewhere safe to breed and shelter and somewhere to forage throughout the year.

Some of the ideas discussed in this document for enhancing the biodiversity value of buildings will automatically benefit birds by providing a food source, either in the form of berries or invertebrates, and providing cover. Providing bird feeders and bird tables and providing nesting sites will further encourage birds.

Bird boxes can be attached to the outside of buildings or on mature trees close to buildings. Regular residents include blue, great and coal tits, nuthatches, house and tree sparrows, starlings, spotted and pied flycatchers, robins, house martins, kestrels and tawny owls. Much depends on the type of box, where it is located, and on its surroundings.

Tips for putting up bird boxes:

- If there is no natural shelter, it is best to mount a box facing somewhere between south-east and north, to avoid strong direct sunlight and the heaviest rain.
- Make sure that the birds have a clear flight path to the nest without any clutter directly in front of the entrance.
- Tilt the box forward slightly so that any driving rain will hit the roof and bounce clear.
- House sparrows and starlings will readily use nestboxes placed high up under the eaves. Since these birds nest in loose colonies, two or three can be sited spaced out on the same side of the house.
- Open fronted boxes may attract robins, wrens pied wagtails, spotted flycatchers and blackbirds. Those for robins and wrens need to be low down, below 2m, well hidden in vegetation. Those for spotted flycatchers need to be 2-4m high, sheltered by vegetation but with a clear outlook.
- Nestboxes are best put up during the autumn. Many birds will enter nestboxes during the autumn and winter, looking for a suitable place to roost or perhaps to feed.

Bats (Bat Conservation Trust, 2009)

Bats need summer roosting sites and places to hibernate. Bat boxes are artificial roosts designed to encourage bats into areas that lack natural roosting sites (e.g holes in trees). Bat boxes are usually made of wood or woodcrete (a mixture of wood chips and concrete). Boxes can be attached to buildings or trees, and various designs are available. Because species have different requirements, you are more likely to attract bats to your boxes if you put up a few of each type.

Tips for putting up bat boxes:

- Locate boxes where bats are known to feed. Close to ponds, rivers or parks are good places.
- Locate boxes close to a hedge or tree line, as sone species of bat use these to navigate and are reluctant to cross open spaces to get to and from roosts.
- Ensure that the approach to the box is clear of obstacles such as tree branches.
- Place boxes as high as possible, at least 4 – 5m above ground level.
- Ideally, between two and four boxes should be clustered, facing in different directions betseen south-east and south-west in order to allow bats to select a range of roosting temperatures (as illustrated in the picture above).

Remember….All British bats feed on insects and the planting of insect attracting flora will increase the value of the area for foraging bats. A mixture of flowering plants, trees and shrubs to encourage a diversity of insects, which in turn may attract different bat species, should be used. Many of the recommendations made above will benefit bats.

Compost heaps and log piles

Kitchen and garden waste can be composted to produce compost which can be used to feed and condition the soil. In addition, compost heaps provide an ideal habitat for many insects that break down the green waste, and these insects may in turn provide a food source for birds and other wildlife. A further environmental benefit is a reduction in the amount of waste that ends up in landfill. Materials such as fruit and vegetable trimmings, annual weeds and lawn clippings can all be composted. The compost heap should be turned every couple of weeks.

Log piles are a valuable habitat for invertebrates and can easily be created with wood from felled trees. These should be located in sheltered locations, receiving sun for part but not all of the day to prevent them from drying out. Areas on the fringes of scrub and woodland are especially suitable. The log piles should remain undisturbed to allow colonisation by invertebrates and fungi.

If any hardwood, particularly oak or chestnut, is available, this may be buried (but allowing the end of the logs to be exposed) adjacent to the log piles to attract stag beetles. This species requires buried dead hardwood for its larval stage.

Key Card 2: Woodland

One of the simplest ways of incorporating biodiversity into a development is to plant trees. Apart from their direct biodiversity value trees perform a range of ecological functions; they act as major carbon sinks, they clean air and produce oxygen, they can protect development from wind and reduce noise pollution. Trees are also a key landscaping feature in any development.

It is important that trees are of native origin and reflect the variety of trees present in the local landscape. Non-native species can be used, if the setting is appropriate; however priority should always be given to native planting. Invasive species should be avoided (see Key Card 5). Thought should be given to the long term situation, for example it is not advisable to plant trees that will grow very large, if their size cannot be accommodated by the site in the long term. The trees chosen should also be suited to the local soil and climatic conditions.

Although individual trees may be relatively easy to incorporate into a new development, small pockets of woodland may require more planning. Trees of different ages and sizes can be planted but in order for such a scheme to be successful a shrubby under-storey should also be created; this will provide a more complex structure to the woodland. Over time, with appropriate management, a species rich woodland, complete with several layers of vegetation (ground flora, small shrubs and mature trees) can develop. Such planting should be relatively low maintenance, with debris allowed to remain within the woodland.

Many development projects are suited to the planting of native hedgerows and tree lines, and this should always be considered as an alternative to planting species of low ecological value such as Leyland Cypress. Shrubs can provide structural diversity within the development and can form a link between different habitats that can facilitate the movement of invertebrates, birds and mammals.

The key objectives for managing woodland habitats for biodiversity are as follows:

- Where possible and appropriate, create new areas of woodland within new developments;
- Where possible, avoid further loss of woodland habitat within Health Care land;
- Where loss of woodland habitat is unavoidable – mitigate this loss by appropriate planting;
- Maintain and enhance the existing woodland habitats, trees and shrubs, while ensuring that this does not conflict with health and safety requirements through:
- Improving the internal and edge structure of woodlands;
- Reducing the presence of invasive species;
- Reducing over grazing of herb layer by livestock;

- *Controlling grey squirrel where red squirrel are present;*
- *Increasing nesting and roosting sites for birds and bats*
- *Target new planting to create wildlife corridors between existing woodlands and other woody habitats.*

Creating new areas of woodland

It may be appropriate in some instances to create new areas of woodland.

For example:

- Within a new development as part of the landscape proposals;
- To mitigate the loss of an area of woodland as a result of development;
- As a buffer for retained habitats, such as adjacent areas of woodland;
- As a wildlife corridor, linking existing pockets of woodland.

Before creating new areas of woodland, it is important to:

- Evaluate the local context of the site in terms of the types of semi-natural woodland in the area and the presence of old hedgerows. These can provide a model for the habitat creation that is proposed, including an inventory of tree and shrub species and characteristic ground flora.
- The history of the site and soil type are also important considerations.

The following text box provides general guidance on creating woodland habitat, but more detailed, site specific guidance should be sought.

Once a suitable site has been chosen and analysed, it will likely be necessary to carry out the following steps:

Step 1: Modification of soil: The creation of suitable soil conditions is a critical factor in establishing new woodland. The establishment of trees to produce a canopy will be more rapid in fertile soils but there will be the need for control of weeds. Consideration should be given to inversion of the soil so that the nutrient rich topsoil is located at the depth of the tree and shrub roots. The soil type will be a substantial consideration when determining the type of woodland and species of tree which are best planted.

Step 2: Choosing seeds/plants or natural colonisation? If planting is required adjacent or near to good quality existing woodland and scrub, and if rapid establishment is not necessary, then natural colonisation should be considered since it is more cost effective than planting. The adjacent woodland and scrub will provide a natural seed source for the selected area. Natural colonisation also conserves local genotypes and creates a more diverse community of varied structure and age. In addition, bird perches could be installed to encourage birds to deposit seeds into the area.

If natural colonisation is not possible, then planting will be necessary. The species used for new plantings, where possible, should be of local provenance, i.e. locally native species and genotypes sourced from local seed zones. Species of local provenance are more likely to be suitable for the environmental conditions of the area, should display a good growth rate and will help ensure the survival of local genotypes. Use of the right combination of native plant species will create a framework which will promote the colonisation of a site by a diverse range of invertebrates adapted to plant species found within the local area.

Step 3: Site preparation and planting (if required): Generally, the following techniques should be employed:

- random spacing between plantings to create variation in density from scattered groups to more dense clumps; For the majority of woodland communities a ratio of 40:60 of trees to shrubs should be used. If a scrub community is required, no tree species should be included in the mix;
- avoid planting in lines;
- random species selection (large blocks of same species planting should not be used), especially intermixing lower-growing shrub species with tree species;
- where blocks of planting are to be created they should vary in size and shape and have scalloped edges;
- where larger blocks (greater than 1ha in area and/or wider than 50 metres) are planted open areas such as glades and rides should be created; and
- to increase diversity further, plantings of different ages could be used. This has an instant visual effect but smaller specimens will often have a faster growth rate, eventually 'over-taking' older stock specimens. The majority of planting will usually comprise of small bare-rooted transplants, 40 to 80 cm tall. However, trees and shrubs of different ages can be obtained, at a greater cost, including feathers and container grown plants.

Step 4: Establishing woodland ground flora

- If soil fertility is high, the establishment of woodland ground flora will be difficult due to competition from vigorous species. Either soil fertility must be reduced by or the introduction of woodland ground flora has to be delayed until a closed canopy has been produced. A closed canopy should suppress weed and grass species and allow the leaching of some nutrients.

Aftercare of newly created woodlands

Protection of the new plantings is essential to ensure their survival, which is often achieved by protecting each plant individually. This is often done using tree guards. The disadvantage of these is that they are expensive and can have a negative visual impact. Rabbit fencing may be used without tree guards to limit damage to newly planted trees, though heavy damage to young trees by field voles may necessitate the use of tree guards. Note that deer can present a problem for young trees and shrubs through browsing. If deer browsing is likely, suitable tree shelters or fencing will be required.

Woodland Management

Without management, woodlands, including hedgerows, can become dense and overgrown, with a resultant loss of ground flora. Well managed woodlands will need less management in the long-term, but some level of management will always be needed to ensure that the trees and shrubs grow well, and that the woodland habitat supports features of value to wildlife. Many of the principles of managing woodlands are common to all woodland types; however, it is important that the suite of management techniques applied in a given situation is designed on a site-specific basis.

There are several options for effectively managing woodlands for biodiversity. In all cases it is important to avoid the removal of any trees and shrubs during the bird nesting season (between the end of February and the end of August).These options range from simple, low cost options to more complex programmes of work. The boxes below illustrate these.

More long term management options include:

Low cost

Cease application of fertiliser: Fertilisers should not generally be added to new or existing woodland areas, as this will reduce species diversity and encourage the growth of undesirable weed species. In certain cases, for example where a tree is under stress due to root compaction by trampling, a mulch of compost or leaf litter may be applied; this can be particularly beneficial for older trees. Similarly, when planting trees and shrubs in nutrient-poor soil, it may be appropriate to add a slow release fertiliser (preferably peat-free and organic) in the planting pit to benefit these plants in the first years of growth

Disposal of brash and the management dead wood: The presence of decaying wood is critical to the healthy functioning of woodland habitats. Log piles provide potential habitat for fungi and invertebrates, and refuges for reptiles and amphibians. Deadwood, both standing and fallen, should be left *in situ* within normal health and safety constraints. Frequently, standing deadwood can be made safe by the removal of branches and a reduction in height. If brash needs to be chipped the resultant material can be used as a mulch; however, if used in this way it must be spread in such a way to avoid smothering any valuable ground flora species

Carefully consider the amenity value of the woodland: Many of the woodlands in Health Care land will be used by the public either for their amenity value or because they are located on an access route. Care should be taken when considering the route of any path through a wood and the location of any amenity features such as seating or bins. It may be appropriate to instigate measures to discourage the use of certain paths to reduce the need for remedial works and the cost of path maintenance. The creation of a formal path network will often reduce the number of unofficial paths that appear in a woodland;

Grazing: Ares of wood pasture where grazing would be appropriate, and areas where grazing needs to be controlled, should be identified. Where grazing is having a detrimental effect, measures to control it should be implemented. This would involve repairing any damaged fencing to prevent livestock from accessing certain woodlands and over grazing the native herb and shrub layer. Areas of new plantings should be fenced off to prevent grazing by livestock. Grazing can have benefits for the woodland under-storey and ground flora. Sympathetic mowing regimes can also achieve similar results to grazing;

Control of invasive species: Invasive woodland species, in particular Rhododendron, Cherry Laurel and Sycamore have been identified as a problem throughout Health Care lands. These species should be removed as soon as they are identified in order to prevent them from becoming established. In areas where they are already established a phased programme for their removal should be implemented;

Replacement planting and planting of new areas: Where required, for example following the removal of invasive species, gaps should be filled with native species during the next planting season; where isolated blocks of woodland exist, it is recommended that woodland wildlife corridors are established to link them.

Other, more labour and cost intensive options include the following:

Thinning: Thinning is the process of selectively removing trees and shrubs to enable the retained plants to develop a healthy structure. It may be appropriate to selectively thin areas of established woodland, to facilitate the growth of trees and shrubs and encourage the development of ground flora;	
Coppicing: Coppicing is the practise of cutting trees on a rotational basis, allowing regeneration from cut stumps by natural growth. This method of management can create a varied habitat structure. It is labour intensive, however it produces cut material that can be used as a source of fuel;	
Pollarding: This ancient technique will prolong the life of the tree and create niches for a range of fauna. It involves cutting the top of a tree, with new shoots growing from the cut area or just below. Once again this technique is labour intensive, but does generate material that can be used as fuel;	
Hedge laying: This traditional hedgerow management technique is used to rejuvenate an ageing hedgerow and improve its structural strength. In all instances, it should be undertaken by a skilled hedge-layer and can be a costly exercise. However it provides long-term benefits for wildlife.	
Fauna: Bird nest-boxes and bat boxes should be installed throughout woodland blocks, where appropriate. Where red squirrel are present, grey squirrel should be controlled by humane methods, additional conifers should be planted (such as Norway Spruce, hybrid Larch, Douglas Fir and Scots Pine as they provide seeds of high calorific value). Also, red squirrel feeders may be placed in suitable locations.	

Key Card 3: Grassland

Grassland specific habitat objectives and management plans

Species-rich grassland can be used instead of a monoculture of perennial ryegrass in many developments, at least in part. Topsoil low in nutrients should be used as a planting medium, however if this is unavailable it may be possible to use the existing subsoil instead. Such areas should not be fertilised as nutrient rich soil will not support a wide diversity of species. Wildflower gardens can be created by using a specially prepared wildflower seed mix.

The key to creating diverse grasslands is good management. If certain areas remain uncut until late summer this will allow flowers to produce seed. Areas of long grass, with a variety of species will allow insects, small mammals and even birds to thrive. If necessary, paths can be mown through and along the edges of such grasslands. This will facilitate access to the habitat for pedestrians and will also ensure that the habitat looks cared for and well maintained.

The box below identifies the key management objectives for grassland habitats:

The key objectives for managing grasslands for biodiversity are as follows:

- Where possible, to avoid further loss of valuable grassland habitat within Health Care land;
- Where such habitat loss is unavoidable – this habitat loss should be compensated for by planting new areas of species rich grassland;
- To return areas of species poor or improved grassland to species rich grassland of greater conservation value;
- To maintain existing areas of species rich grassland at their current high biodiversity level
- Maximise species diversity within grasslands through implementing a management regime suited to each particular grassland, and removing invasive species where possible.

Proposed management

There will understandably be numerous areas within The HSC&PS estates land where neat, closely mown, species poor amenity grassland is desired and indeed highly appropriate. However, there are likely to be areas where an alternative management strategy can be employed, and species poor grassland can be returned to species rich grassland, of higher biodiversity value. These areas should be identified. The box below describes inexpensive ways in which the biodiversity value of these areas can be improved. It may be appropriate in certain situations to put in place a management regime that, over time, allows an area of improved grassland to become species rich. Important characteristics to consider in site selection include the

slope gradient (this is important for the feasibility of future management), aspect, soil type and previous land use.

Returning existing areas of species poor grassland to species rich grassland

Soil modification: Suitable soil conditions are essential for establishing species rich grasslands, which occur on soils with a low availability of nutrients, particularly phosphates and nitrates. The most cost effective techniques to reduce soil fertility include topsoil stripping to expose nutrient poor sub-soil and inverting soil to bring nutrient poor soil to the surface and bury nutrient rich soil. The suitability of such techniques needs to be assessed on a case by case basis;

Seeding: The seeding of a prepared area of soil can take place either through natural colonisation or planting. Natural colonisation is the most cost effective method, but is only appropriate if there is a suitable seed bank or diverse grassland area nearby. If planting is the chosen option, a seed mix that is collected from local sources is most appropriate. Commercially produced seed mixes can be used if necessary, but must be sourced locally, and from a reputable supplier;

Immediate aftercare: If grassland is not managed it will degenerate within a few years to a rough, grass-dominated species-poor sward. Cutting and/or grazing are the most appropriate management techniques that should be applied. Seeded areas will need to be cut on a regular basis (up to four times) in the first year of establishment to encourage the development of a diverse sward, thereafter these areas should be cut less frequently, usually only once or twice a year. In the majority of cases it will be essential to remove the grass cuttings to prevent then from smothering small seedlings and maintain low nutrient levels

Species rich grasslands are not expensive to manage, and should be a cost effective option in the long term, with reduced mowing intensity and no fertilisers or pesticides required. The box below outlines a long term management regime.

Long term management:

Grazing or cutting will need to be implemented in order to prevent the grassland succeeding into scrub and to maintain optimum levels of diversity.

Grazing: This is usually the best means of managing grassland for biodiversity. Grazing with cattle, sheep or ponies can reduce the dominance of certain plant species and improve the structural diversity of the habitat. Grazing levels need to be carefully controlled to ensure that plant species diversity is maintained and the value to fauna enhanced;

Cutting: This tends not to create the same structural or species diversity as grazing, however, adopting a range of cutting regimes within Health Care land grassland will improve the structural diversity of the habitat. Cuttings should be removed to further reduce soil fertility and this will also prevent cuttings smothering small delicate plants. In situations where it is not possible to remove the cuttings, the impacts of smothering can be minimised by making the cuttings very short, fine and evenly distributed. The effect of cutting on the fauna of the grassland should be taken into consideration, particularly on nesting birds and invertebrates;

Long term management:

Scrub management: Scrub can have a high conservation value, both as a habitat in its own right or as part of a mosaic with other habitats. However, scrub encroachment can result in a loss of grassland of nature conservation value. For neglected or poorly managed grasslands scrub control (most commonly Gorse/Whin (*Ulex europaeus*), Bramble (*Rubus fruticosus*), Blackthorn (*Prunus spinosa*) and hawthorn (*Crataegus monogyna*) may be necessary and on-going scrub management may be required to maintain both species and structural diversity. Measures to control scrub are usually a combination of cutting and herbicide treatment. Cuttings should be removed to avoid smothering areas of grassland and to maintain low nutrient levels. To minimise disturbance to fauna, these measures should be carried out in winter months;

Management for fauna: Where a particular species of interest associated with grassland habitats has been identified, then specific management may be necessary, for example, a grassland may be of value to invertebrates, reptiles or birds;

A mosaic of grassland habitats: Creating a mosaic of grassland habitats and vegetation structure will provide a range of opportunities for a variety of animal and plant species. This could include, for example, establishing patches of scrub habitat surrounded by tall grassland that is cut on an irregular basis (once in the late summer every two or three years) or the integration of grassland with scrub and woodland habitats.

Key Card 4: Watercourses, ponds and other water features

Ponds can quickly attract wildlife such as amphibians, insects, birds and mammals, to an area. They also provide a feature of interest to people. Even if space is limited and there is no room for a pond, a small water feature can greatly increase the diversity of animals that will visit the area.

These include linear features such as rivers, streams, canals, and drainage ditches as well as ponds and lakes, and will be limited to those features that are present on The HSC&PS estates lands.

Watercourses, where present, should be:

- Retained in as natural a state as possible.
- Support vegetated banks.
- Should support a diverse structure, including emerging aquatic plants to overhanging vegetation.
- Culverts and stream diversions should only be used where absolutely necessary.

Incorporating wetland habitats can greatly enhance the biodiversity value of a site. In most cases, it is unlikely that major new water features will be provided, however existing habitats (ponds, wetlands watercourses) can be augmented by newly created features.

Where ponds are created, they should replicate natural features as far as possible. Rather than having steep or even vertical sides, ponds should slope gently towards the deepest point. This will provide a gradient for different aquatic species (plants and animals) to become established. In this way, different habitats can be created even in a relatively small pond, ranging from marshy conditions near the edge to submerged and floating species in the deeper parts. If the pond is large enough, islands can be developed within it. These features can be of great benefit to wildlife, as they tend to be inaccessible by foxes, dogs and other disturbances to wildlife.

Ponds need careful management to ensure they remain in good condition in the long term. However, this management need not be labour intensive, particularly if the pond is well designed in the beginning. Such ponds thrive with low levels of nutrient input and the planting of fringe vegetation as a buffer zone will help to prevent run-off from entering the pond. This is important if the pond is located within a highly managed development, with fertilised amenity grassland close by.

Suitable aquatic plant species to enhance an existing or newly created waterbody: Hornwort, Spiked-water Milfoil, Curled Pondweed, Water Violet, Water-starwort, Fringed Water Lily, Water Crowfoot, Bogbean, Yellow Flag Iris, Purple Loosestrife, Marsh Marigold, Hard Rush, Soft Rush, Pendulous Sedge, Lesser Spearwort, Water Forget-me Not, Water Mint, Water Plantain, Watercress.

Suitable plant species to improve the river corridor/riparian zone: Greater bird's foot trefoil, Bugle, Red Campion, Cuckooflower, Hemp Agrimony, Meadowsweet, Primrose, Ragged Robin, Meadow Vetchling, Water Avens, Marsh Moundwort, Hawthorn, Oak, Hazel, Bramble.

Wetland habitats comprising a diver range of marginal plant species can be created by the use of reedbed planting, reed fringes, coir fibre-rolls and mattresses which can all be installed within the riparian zone to create a sustainable wetland habitat. Such habitat enhancement measures can also be applied to canal fringes and lake and pond margins which often do not require extensive management. The creation of wetland habitat is often done through the use of coir fibre-rolls or and similar materials which are already sown with seed or small plugs which are ready to be put in position and allowed to established. Coir rolls and mattresses and pallets need to be secured along the margins of the water feature but can then be left to establish and often require very little management.

Floating reed islands can also be installed in lakes and ponds to provide further habitat for waterfowl and can also often provide refuges for fish. Such a measure would be suitable for use at Ravenhead within the two large ponds present within the site. Floating islands are not designed for use in rivers. Suitable plant species such as Yellow Flag Iris, Water Mint, Bogbean, Branched Bur-reed, Marsh Marigold, Water Plantains, Soft Rush and Watercress can also be used when creating a wetland.

Key Card 5: Invasive Species

Japanese Knotweed (*Fallopia japonica*) (Environment Agency, undated and Plantlife, 2010).

Japanese Knotweed was originally introduced to the UK as an ornamental plant but has spread extensively in the wild. It grows rapidly and forms dense clumps which crowd out and prevent the growth of native plants.
It has a rhizome root system, from which new plants can grow, which can extend several metres away from the original plant. New plants can also from fragments of its stem or root as small as 0.8 grams.
In addition to harming our native wildlife, Japanese Knotweed can also damage structures as the plant is strong enough to penetrate foundations and walls.

Identification:

- Japanese Knotweed forms dense clumps and grows up to 3m tall;
- The stem is hollow with distinct nodes like bamboo and breaks easily. In Spring it is fleshy and red tinged and in Summer it is green with purple speckles;
- Leaves in Spring are pinky red. In summer they are large oval or heart shaped and bright green in colour;
- Flowers are cream coloured in drooping clusters at the end of August;
- The plant dies before November leaving behind upright brown, hollow woody stalks.

It is an offence to plant or cause Japanese knotweed to spread in the wild under the Wildlife and Countryside Act 1981 and all waste containing Japanese knotweed comes under the control of the Environmental Protection Act 1990.

What to do if you suspect Japanese Knotweed on your site:

- Immediately stop work within 7m of the suspect plant and arrange for it to be properly identified;
- If Japanese Knotweed is confirmed, employ a specialist contractor to advise on its eradication. There are various ways of eradicating Japanese Knotweed, from chemical treatment to digging up the affected area and transporting to landfill. These range considerably in terms of cost and timescales involved, and a specialist contractor will be able to advise on the most effective way forward for the specific site.
- Contact the Environment Agency for further advice.

Indian Balsam (*Impatiens glandulifera*)

Images taken from the Environment Agency website and text adapted from Plantlife (2010) and the non native species secretariat (undated).

Indian Balsam is native to the west and central Himalayas and was introduced as a garden plant in the early 19th century. This tall, attractive annual plant is now widespread in the UK, especially along rivers. It grows up to 2.5m tall and the stem is pink-red, hollow, and brittle. The leaves are dark green with a reddish mid-rib and are spear shaped with serrated edges. They occur in two's or three's from the same point on the stem. The flowers are pink-purple on long stalks and appear from June to October and the seed pods, which are brown / black are produced from August to October. The plant spreads extremely effectively by seeds, which are easily carried by wind or water. Indian Balsam grows in dense stands along river banks, where it out-competes native species and impedes flow, increasing the likelihood of flooding. However, it dies back significantly over winter and can leave river banks bare and prone to erosion.

The plant produces lots of nectar and is attractive to pollinating insects including bees, and there is concern that this leads to decreased pollination of native plants.

Dealing with Indian Balsam:

Plantlife International recommends that the plant should be dealt with before it sets seed. The plant should be pulled out of the ground and disposed of by burning appropriately or composting (As long as no seeds are present). Doing this regularly will result in the plant being unable to set seed and it will eventually die out. An alternative option is regularly strimming large areas, ensuring that it is doing often enough to prevent flowering.

Giant Hogweed (Heracleum mantegazzianum)

Images taken from the Environment Agency website and text adapted from Plantlife (2010) and the non native species secretariat (undated).

Giant Hogweed was introduced as an ornamental plant approximately 150 years ago and it is now widespread throughout the UK. It can grow up to 5m tall and the stem develops dark red/purple spots or blotches during the summer. The stem is hollow and ribbed with sparse spiky hairs. The leaves are dark green with deeply cut lobes and form a rosette that can be up to 1m across.

This perennial plant only flowers in its 4th year of growth. The flowers are white, umbrella like and appear from June. Beige seedpods are produced from August to October and they disperse thousands of seeds, allowing the species to spread rapidly and widely. The seeds remain viable on or in the ground for up to 15 years.

Giant Hogweed thrives in any habitat but particularly where the soil has been disturbed such as riverbanks, derelict land or railway embankments.

Giant Hogweed is a problem because:

- It contains large amounts of poisonous sap, which, on contract with the skin and in the presence of sunlight, causes irritation, swelling and blisters.
- As it spreads it out-competes native plants.
- The loss of other vegetation may lead to excessive erosion of soil as the giant hogweed dies back in winter.
- Where it grows along river banks, it can impede the flow of water, causing flooding.

It is an offence to plant or cause Giant Hogweed to spread in the wild under the Wildlife and Countryside Act 1981 and all waste containing Giant Hogweed comes under the control of the Environmental Protection Act 1990.

What to do if you suspect Giant Hogweed on your site:

- Immediately stop work within 7m of the suspect plant and arrange for it to be properly identified;
- If Japanese Knotweed is confirmed, employ a specialist contractor to advise on its eradication. There are various ways of eradicating Japanese Knotweed, from chemical treatment to digging up the affected area and transporting to landfill. These range considerably in terms of cost and timescales involved, and a specialist contractor will be able to advise on the most effective way forward for the specific site.
- It may also be appropriate to contact the Environment Agency.

Appendix III: Green Infrastructure: Key Cards

Key Card 6: Sustainable drainage systems

Key Card 7: Green and brown roofs (living roofs)

Key Card 8: Living walls

Key Card 6: Sustainable drainage systems (SuDS)

Information provided by www.ciria.org (CIRIA, 2010).

Sustainable drainage systems are a way of engineering new developments to replicate the natural environment. SuDS take into account not just the volume of surface water but also the quality. The most useful way to manage surface water is to allow rainfall to infiltrate naturally where it falls. This allows a more gradual release of water to the environment and prevents flooding by attenuating peak water flows, slowing run-off rates and reducing run-off volumes.

SuDS can combine water management on-site with habitat creation. The benefit is two-fold: surface water is quickly and effectively dealt with, and local biodiversity is enhanced. Such surface water drainage methods that satisfy quality and amenity, as well as quantity, requirements are more environmentally sustainable than traditional drainage systems.

SuDS techniques have the following benefits:

- Reduce flooding caused by development by managing run-off flow rates;
- Improve run-off quality;
- Provide wildlife habitat; and can assist in natural groundwater recharge.
- Long-term cost savings, as the need to supplement or replace the existing drainage or sewerage system is avoided.

The following methods are often used for control of surface water runoff:

1. **Prevention:** Runoff increases in proportion to the impervious area of the site, so by minimizing impervious areas, runoff can be reduced. Using gravel instead of tarmac is a way of reducing impervious areas;
2. **Filter strips and swales:** These are vegetated areas that drain water evenly off impermeable areas. Swales are shallow channels whilst filter strips are gently sloping areas of ground. These features mimic natural drainage systems, slowing and filtering the flow. This filtering process removes also removes pollutants. Filter strips and swales can be vegetated with locally native grass and wild flower species, providing biodiversity and amenity value;
3. **Filter drains and permeable surfaces:** These are features that have a volume of permeable material below ground to store surface water. Runoff flows to this storage area via a permeable surface such as an area of grass, gravel or permeable paving block;
4. **Soakways and infiltration basins:** These features drain water directly into the ground and work by increasing the natural capacity of the ground to store and drain water. They can be used as public open space or planted with suitable vegetation, enhancing their biodiversity value.
5. **Basins, ponds, reed beds and wetlands:** These features store water at the ground surface, either as temporary flooding of dry basins and flood plains, or permanent pon. They can be designed to manage water quantity and quality and offer an opportunity for wetland habitat creation and biodiversity enhancement.
6. **Green roofs:** Intentionally vegetating a roof is a way of reducing run-off from roofs, contributing to drainage and flood alleviation schemes. In addition, the rate of release following heavy rainfall is

slowed, reducing the problems associated with storm surges. This can make a significant contribution to attenuation of surface water flows over the site..

The type of SuDS techniques that are suitable will depend on the location of the site and the development, and some of the SuDS measures described above have more biodiversity benefits than others. Within the HSC&PS estates sector, SuDS techniques should be considered early in a new development. Consideration should also be given to installing green roofs within existing developments.

Aims:

- *Consider SuDS in all new developments;*
- *Consider SuDS in existing developments when the drainage or sewerage system needs upgrading;*
- *Consider installing green roofs in existing developments.*

Key Card 7: Green & brown roofs (living roofs)

Green roofs

(Greater London Authority, 2004)

The term green roof refers to roofs that are intentionally vegetated. Green roofs have a number of benefits as follows:

- They reduce run-off from roofs, contributing to urban drainage and flood alleviation schemes. In addition, the rate of release following heavy rainfall is slowed, reducing the problems associated with storm surges. This can make a significant contribution to attenuation of surface water flows over the site.
- They insulate buildings thus reducing the need for air conditioning and central heating and as a result reduce CO_2 emissions.
- They contribute to biodiversity and address local biodiversity action plans.
- They contribute to a greener urban environment and quality of life for communities in high density developments.
- A roof life is at least doubled with the addition of a green roof, thereby reducing resource use in roof replacement and repair.
- Within the Health Sector, green roofs can provide a therapeutic benefit to patients, utilising gardening as a tool to enhance the healing process.

Green roofs can either be retrofitted to an existing building or designed into a newly constructed building. If dealing with a new development, green roofs should be considered as early in the design stages as possible in order to get the best out of the feature. The installation of a green roof is often the most cost effective and straightforward either early in the design stage (if dealing with a new build) or when an existing roof needs repair or replacement.

Aims:

- *Consider the suitability of a green roof on each roof that requires repair or replacement*
- *Consider green roofs on all new builds early in the design stage*

Large buildings are not the only type of buildings that can be retrofitted with a green roof. There are many opportunities to create green roofs on all manner of structures including porches, balconies, sheds, outhouses, garages and extensions. Flat roofs are the most suitable for 'greening,' however, it is also possible to green moderately sloping roofs.

There are two basic types of green roof: intensive and extensive. These vary in the amount and type of maintenance required, the soil depth and the type of plants grown. The appropriate type depends on the type of roof available.

Extensive green roofs:
These are the most light weight and easily maintained green roofs. They are made using shallow soils (typically 0 - 10cm deep), and therefore have a lower weight which tends to be the most suitable choice for structures such as sheds, garages and small extensions. The shallow soils used dry out quickly and so the plants used on these types of roofs need to be drought tolerant and hardy. They are best seeded with simple sedum or moss communities, or short wildflower meadows. Extensive green roofs are designed to be self maintaining and therefore only require the equivalent upkeep of a conventional roof, provided that the building owner is satisfied with the natural habitat that develops.

Intensive green roofs:
Intensive green roofs have a thicker layer of soil (typically 10 – 20cm deep). Consequently, a variety of plants, shrubs and trees can be grown. They require more intensive management than extensive green roofs and require a stronger structure to support them. They can be seeded with mixtures of low or medium perennials, grasses, bulbs and annuals suited to dry habitats. Wildflower meadows and hardy shrubs and trees may also be incorporated.

Check:	**Consider:**	**Recommendations:**
1) If new build	• Consider green roof early in the design stage	Get expert advice from experienced engineers and architects.
2) If retrofitting, is the structure suitable for a green roof?	• Is the existing waterproof sound? • Is the building structure sound and can it take the load? • Is the roof flat or with only a slight gradient?	Get expert advice from structural engineers or architects on these matters.
3) What type of green roof is most appropriate? Extensive or intensive?	• Weight that the roof can take • Maintenance • Cost	The type of roof appropriate may be dictated by the load the structure can take since extensive green roofs are considerably heavier than extensive ones. They are also more costly and require more intensive management.
4) What species should be planted?	• The site location and surrounding habitat types and dominant plant species • Is it desirable to encourage a particular species or species group, such as invertebrates or black redstarts? (see box below)	Ideally the green roof should be designed to suit the surrounding landscape and habitat types, and/or encourage a specific species/species group. Look into green initiatives in the surrounding area that the design of the green roof may be able to contribute to. When buying seeds, use a native seed mix or plug plants, preferably from a recognized and reputable supplier. A cheaper alternative is to collect your own seeds from a local meadow, wasteland or dry grassland site.

It may sometimes be appropriate to design a green roof specifically for a certain species or species group that it is desirable to encourage in that location. Green roofs are especially good for invertebrates and birds.

The box below lists plants that are good for invertebrates, although bear in mind that the geographical location of the roof should be considered when choosing species.

Species

Kidney Vetch
Horseshoe Vetch
Bird's-foot-trefoils
Salad Burnet
Toadflax
Native grasses
Cabbages and wild crucifers

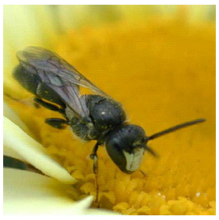
Good for a range of invertebrates. Cabbages and wild crucifers are the food plant of the Small White butterfly, as shown in the picture below.

Clovers

Attract bumblebees including (*Bombus sylvarum)* and (*Bombus humilis)* both of which are in decline. (Picture below illustrates *Bombus sylvarum*, taken from www.landrestorationtrust.org.uk)

Wild mignonette
Weld

Attract tiny white-faced bees (*Hylaeus* species) (as illustrated in the picture below, taken from www.insectpix.net)



Ox-eye daisy
various hawkbits
Common cat's-ear

Important nectar and pollen sources for bees, wasps, hoverflies and butterflies. (Picture below illustrates the hoverfly *Melangyna umbellatarum*, taken from www.microscopoy-uk.org.uk)

Brown Roofs

(Brownroofs.co.uk)

Brown roofs are sometimes used as a way to mitigate the loss of brownfield sites. Brownfield sites are areas that were previously in industrial use, but have since been recolonised by a range of species that thrive on disturbed open ground, such as species of plants and insects such as butterflies, moths, beetles and bees. These brownfield sites are increasingly in demand for redevelopment.

Construction techniques for brown roofs are typically similar to those used to create green roofs, the main difference being the choice of growing medium. Brown roofs use a layer of locally sourced material such as rubble, gravel or spoil, and these materials can usually be recycled from development or other building works on site. Using a mixture of different materials is a good idea, and creating areas of varying depths of substrate will create a more varied structure to the roof. If possible, the material should be allowed to colonise naturally. Often, the material will already have an existing seed bank, which will speed colonisation.

Often brown roofs are a cheaper option to green roofs, and should be considered as an alternative when budgets are tight.

Key Card 8: Living walls

(Greater London Authority, 2004)

Buildings provide an enormous amount of wall space, much of which is suitable for growing plants.

Green walls have the following advantages:

- Provide effective nesting habitat for a variety of birds including nrobin, wren and blackbird;
- Visual enhancement;
- Provide natural scents;
- Assist in cooling buildings in summer and insulating them in winter;
- The leaves of climbing plants on walls provide a large surface area which is capable of filtering out dust and other pollutants;
- Large areas of vegetation reduce noise levels;
- A more pleasant climate is created through the processes of transpiration and evaporation, which add more water into the air.

The most commonly used species for wall-greening are ivy, Russian-vine and Virginia-creeper. These will climb directly onto wall faces, especially those of brick and stone where the porous surface allows them to attach more easily, but the installation of trellises and wires can aid their growth. A number of varieties have colourful foliage that will change with the seasons.

Consideration should be given to the aspect of the wall to be greened, as shown in diagram on below:

For climbing plants the ground should be prepared as for any tree or shrub by creating a pit and adding in some well rotted compost to the top 30cm. The plant should be positioned at least 40cm away from the wall. Where a support is used, a regular maintenance check is required to ensure that the structure is still firmly attached to the wall.

Managing the area

Climbers may need pruning at intervals to prevent them from interfering with services such as guttering and finding their way into the building via small spaces. However, this is unlikely to be a frequent occurrence, at least until a wall is fully clad. A fully clad ivy wall may need to be pruned every two to three years.

The amount of water required depends mostly on the species used and the aspect of the wall. Plants growing on a south facing wall require far more water than those on a north or west facing wall.

North:

Evergreens, particularly ivy, are the most appropriate climbing species for north facing walls which receive little direct sunlight and therefore stand to benefit most from the insulation effect of plants. Thick growth on some form of structure positioned away from the wall offers valuable insulation. North facing walls are best for supporting native herbs and wider ranges of plants. This is due to the higher moisture regime.

West:

Evergreens will protect the building from rain but in drier parts of the country which receive more sunshine suggestions for a south wall may be more appropriate.

East:

If the wall receives a fair amount of sun then it should be treated as a south wall, if not it is best to use evergreens.

South:

On the south side of a building deciduous plants are the most suitable; in the summer their dense foliage shields the building from sunlight and evapotranspiration creates a cooling effect. In winter leaves are shed, allowing sunlight to reach the surface of the wall so helping to warm the interior of the building. Some of the species suitable in this situation are climbing roses, trumpet vine, jasmine, climbing bittersweet, trumpet bindweed, clematis, Dutchman's pipe, wisteria and Russian vine.

Appendix IV: Maintenance calendar

Periodic General Maintenance Operations:

Vegetation Type	Years and Optimal Time Frame for General Maintenance to be Carried Out						
	2-5	**6-9**	**10-12**	**13-15**	**16-20**	**21-25**	**26-30**
Trees: Tree works generally, to be undertaken as required rather than to a rigid programme: To be carried out by an arboriculturalist or qualified and experienced tree surgeon. Carry out to BS 3998 and HSE Forestry and Arboriculture safety leaflets. Leave trees with a well balanced shape and natural appearance. Chain saw operatives must hold a certificate of competence. When cutting tree roots use hand tools only when excavating. Do not cut roots within an area which is the larger of the branch spread of the tree or an area with a radius of half the tree's height, measured from the trunk. Outside protected areas avoid cutting roots over 50mm in diameter when cutting make clean smooth cuts with a hand saw. Minimise wounds. Avoid ragged edges. When backfilling cover cut roots with original topsoil.	Oct-Feb	Oct-Feb	Oct-Feb	Oct-Feb	Oct-Feb	Oct-Feb	Oct-Feb
Arboriculturalist to undertake annual condition inspection to identify defective, diseased, unsafe or weak parts of trees and carry out tree surgery as required. Additional inspections will be undertaken following a storm. Prevent wound bleeding and disease transmission in accordance with BS 3998. Using chain or hand saws keep wounds as small as possible, position and create cuts in accordance with good horticultural practice. Cut back to sound wood leaving a smooth surface, angled to shed the water and avoiding bark tears.	Oct-Feb	Oct-Feb *	Oct-Feb *	Oct-Feb *	Oct-Feb *	Oct-Feb *	Oct-Feb *
Remove poor quality trees once new interplanted trees are well established. Precise timing to remain flexible and be governed by condition of trees, arboricultural advice and healthcare lands and local authority approval. Remove stumps.			Oct-Feb *				

Vegetation Type	Years and Optimal Time Frame for General Maintenance to be Carried Out						
	2-5	6-9	10-12	13-15	16-20	21-25	26-30
Replace trees which have to be removed for health and safety, disease or structural reasons with appropriate species as agreed beforehand with the local authority.	* Oct-Feb	* Oct-Feb	* Oct-Feb	* Oct-Feb	* Oct-Feb	* Oct-Feb	Oct-Feb
Thin out congested trees to achieve sound branch structures and natural shapes and avoid heavy shade. Precise timing needs to be judged on site and will be a response to the quality of the tree, its growth rate, shade created, shape, proximity to the buildings etc. Advice to be obtained from an arboriculturalist.					Oct-Feb	Oct-Feb	
Tree stakes and ties: check conditions of stakes, canes and ties during each maintenance visit. --- Replace broken or missing items. Adjust ties if necessary to prevent rubbing of bark or strangulation. Tear off any suckers or cut back damaged bark and treat wound with fungicidal sealant. Remove stakes if and when they are no longer required. If stakes and ties have not been adjusted and trees show signs of strangulation (creating a weak point vulnerable to snapping in strong winds) trees are to be replaced.	Jan-Dec*						
Structure Planting:							
Selective thinning of new trees, sacrificing short-lived, rather than climax (oak and ash) species. Trees to be thinned, so that their canopies do not touch. Anticipated densities: 5m after years 6/9 and 8m at year 15, 8-10m at year 25. Poor shaped, damaged or inferior specimens to be removed first. - Cut stumps to be treated to stop regeneration. Some arisings to be used to supplement hibernacula. Carry out outside bird nesting season. Arisings to be chipped and composted on site.		Oct-Feb *		Oct-Feb *		Oct-Feb *	
Coppice scrub to 300mm in height, over a period of three winters, removing one third each year and ensuring screen to neighbouring residential properties is maintained. The objective is to rejuvenate growth and prevent legginess. Carry out outside bird nesting season. Arisings to be chipped and composted on site.	Oct-Feb *	Oct-Feb *	Oct-Feb *	Oct-Feb *	Oct-Feb *	Oct-Feb *	Oct-Feb *

Vegetation Type	Years and Optimal Time Frame for General Maintenance to be Carried Out						
	2-5	6-9	10-12	13-15	16-20	21-25	26-30
Edge species to be retained to form natural woodland edges and maintain a screen. Coppice on a three year cycle. Carry out outside bird nesting season. Arisings to be chipped and composted on site.	Oct-Feb *	Oct-Feb *	Oct-Feb *	Oct-Feb *	Oct-Feb *	Oct-Feb *	Oct-Feb *
Fell trees or remove limbs, which are structurally unstable following arboricultural report. This may arise due to squirrel damage, storm damage or installation of services close to trees. Carry out outside bird nesting season.	Oct-Feb *	Oct-Feb *	Oct-Feb *	Oct-Feb *	Oct-Feb *	Oct-Feb *	Oct-Feb *
Ornamental and Semi-ornamental Planting:							
Pruning to encourage bushy basal growth. Carry out on rotation in accordance with the schedule overleaf. Pruning frequency and intensity depends on species. Frequent limited pruning is easier to accommodate within a maintenance programme, more visually acceptable and it is easier to deal with the arisings. Pruning is likely to commence 5-6 years after planting and is essential to rejuvenate plants, assist longevity and promote good flowering.		Oct-Feb *	Oct-Feb *	Oct-Feb *	Oct-Feb *	Oct-Feb *	Oct-Feb *
Replace shrub planting when plants have outlived their aesthetic lifespan. This can be 7-10 years, but longer if pruned correctly each year. Plants requiring replacement at 7-10 year intervals include: Ceanothus, Hebe, Lavandula, Potentilla, Rosa Kent, Flower Carpet, Surrey and rugosa varieties and Santolina. Removed planting to be added to log piles and hibernacula throughout the site if woody in nature. To be added to compost heaps if herbaceous		Mar*	Mar *	Mar *	Mar *	Mar *	Mar *
Thin perennials when overcrowding is evident. Surplus plants to be used to fill gaps elsewhere. Frequency and techniques depends upon species. Those that need thinning or periodic rejuvenation include: Bergenia (becomes leggy), Hedera (becomes leggy), Sedum (stems fall over when congested), Rubus (becomes leggy) and Waldsteinia (becomes leggy). Herbaceous waste to be added to compost heaps		Sept or Mar *	Sept or Mar *	Sept or Mar *	Sept or Mar *	Sept or Mar *	Sept or Mar *

Vegetation Type	Years and Optimal Time Frame for General Maintenance to be Carried Out						
	2-5	6-9	10-12	13-15	16-20	21-25	26-30
Wildflower and Swale Grassland:							
Cutting summer flowering wildflower meadows and swale grassland: Cut twice a year early August and March to no lower than 150 mm. Where arisings are dry remove all cut vegetation to on-site composter. Where they are wet remove arisings to a separate compost heap, whose sole purpose is for biodiversity. Remove litter and rubbish prior to cutting and remove fallen leaves in autumn to a separate compost heap, whose sole purpose is for biodiversity.	Aug and Oct	Aug and Oct	Aug and Oct	Aug and Oct	Aug and Oct	Aug and Oct	Aug and Oct
Remove pernicious weeds from Wildflower/Swale Grassland as follows: Spot treat docks, common nettle and thistle with Round-up in May;	May	May	May	May	May	May	May
Brown Roof:							
Cutting of wildflowers on roof gardens: Cut twice a year in early August and October ensuring that growing tips of geranium are not removed. Where arisings are dry remove all cut vegetation to an on-site composter and remove any fallen leaves. If wet remove to a separate compost heap, whose sole purpose is for biodiversity; Summer watering will be required in times of dry weather.	Aug and Oct	Aug and Oct	Aug and Oct	Aug and Oct	Aug and Oct	Aug and Oct	Aug and Oct
Wetland Habitats:							
Thin out marginals and aquatic plants every 5-7 years to original planting centres. Bottom of pond to be disturbed as little as possible. Leave arisings on side for 24 hours, then remove to compost heaps.	Oct-Nov*		Oct-Nov *	Oct-Nov *	Oct-Nov *	Oct-Nov *	Oct-Nov *
Decomposing leaf litter will help reduce the amount of oxygen in the water, which in turn can cause eutrophication. The result can be reduced biodiversity, increase in algae blooms, stagnant water and other toxicity effects. This will be most likely to occur if the attenuation ponds retain small amounts of water only. When this takes place, clear out the ponds and remove silt from the bottom. Remove	Oct	Oct	Oct *	Oct	Oct *	Oct	Oct *

Vegetation Type	Years and Optimal Time Frame for General Maintenance to be Carried Out						
	2-5	6-9	10-12	13-15	16-20	21-25	26-30
fallen leaves annually in October through netting. Leave arising on the side for 24 hours, then remove to compost heaps.							
Other Wildlife - Bat and Bird Boxes:							
Bat boxes to be inspected and cleaned during winter. This will be carried out by licensed bat worker.	*Nov-Feb	Nov-Feb *	Nov-Feb *	Nov-Feb *	Nov-Feb *	Nov-Feb *	Nov-Feb *
Broken bat and bird boxes to be repaired/replaced.	Nov-Feb *	Nov-Feb *	Nov-Feb *	Nov-Feb *	Nov-Feb *	Nov-Feb *	Nov-Feb *
Bird boxes to be cleaned out during the winter months.	Nov-Feb *	Nov-Feb *	Nov-Feb *	Nov-Feb *	Nov-Feb *	Nov-Feb *	Nov-Feb *

Any felled timber will be added to log piles and hibernacula throughout the site.

PRUNING SCHEDULE		
Code	**Species**	**Annual or Periodic Pruning**
	SHRUBS:	
Ae	Aralia elata	None normally required.
Aev	Aralia elata variegata	
Aev1	Aralia elata variegata	
Ajl	Aucuba japonica ‘Longifolia’ or ‘Salicifolia’	If plants become large prune in May.
Bmp	Berberis media ‘Parkjeweel’	No regular pruning required. Plants respond poorly to heavy pruning. If required, cut back a few stems each year.
Bsun	Brachyglottis ‘Sunshine’	Trim annually after flowering to maintain shape.
Bud	Buddleia davidii ‘Empire Blue’	Prune hard annually in March to within 100mm of the old wood.
Bl	Buddleia x ‘Lochinch’	
Cas	Cornus alba ‘Sibirica’	To maintain coloured stems cut ⅓ of stems to 200mm above the ground on a 3 year rotation in March. Do not prune if stem die back (anthracnose) is evident.
Cbm	Ceanothus ‘Blue Mound’	If required prune just after flowering to within 30mm of the previous season’s growth.
Ct	Choisya ternata	No regular pruning. If plants become large, prune after flowering.
Ca	Corylus avellana	Rejuvenate native planting if it becomes leggy. Prune hard in March.
Cs	Cornus sanguinea	
Csf	Cornus stolonifera ‘Flaviramea’	To maintain coloured stems cut ⅓ of stems to 200mm above the ground on a 3 year rotation in March. Do not prune if stem die back (anthracnose) is evident.
Csk	Cornus stolonifera ‘Kelseyi’	None normally required.
Dmr	Deutzia ‘Mont Rose’	If required prune hard late summer to rejuvenate
Ee	Elaeagnus ebbingei	None normally required. If plants become large, prune back hard in April.
Eec	Euonymus ‘Emerald Cushion’	No regular pruning needed. Trim in Spring if required.
Efg	Euonymus fortunei ‘Emerald Gaiety’	
Efk	Euonymus fortunei ‘Kewensis’	
Fjap	Fatsia japonica	If plants become large, prune in April and water well for 1 month thereafter to overcome shock to the plants. Remove seed heads annually in March.

PRUNING SCHEDULE		
Code	**Species**	**Annual or Periodic Pruning**
Ftt	Fushcia Tom Thumb	Fuchsias will be knocked back in winter. Prune to a strong bud in Spring or cut back to 100mm from the ground. Carry out annually.
Hag	Hebe 'Autumn Glory'	None usually required. If larger growing species need pruning or become leggy, cut back a few branches in Spring. Allow regrowth to occur and cut back remaining old growth the following year. Hebes do not respond very well to heavy pruning and replacement is a better option aesthetically.
Hg	Hebe 'Great Orme'	
Hgg	Hebe 'Green Globe'	
Hem	Hebe 'Marjorie'	
Hmw	Hebe 'Mrs Winder'	
Hnic	Hebe 'Nicola's Blush'	
Hwg	Hebe brachysiphon 'White Gem'	
Hr	Hebe rakaiensis	
Hre	Hebe 'Red Edge'	
Hhh	Hedera helix 'Hibernica'	Trim back to kerb lines three times a year, or trim to within 200-300mm of the ground once a year if overhanging planters or retaining walls.
Hvil	Hydrangea villosa	Dead head in March to protect from frost. Cut back old, diseased, dead or unwanted branches to a strong bud in March if plants become large.
Hyap	Hydrangea 'Ami Pasquier'	
Hydm	Hydrangea 'Benelux Rose' (or other pink)	
Hym	Hydrangea 'Madame Emile Mouilliere'	
Hymv	Hydrangea paniculata 'Pink Diamond'	
Hc	Hypericum calycinum	None normally required. If leaves become rusty strim back to 100mm above ground level and remove arisings.
Lf	Leycesteria formosa	No regular pruning. Dense shrubs can be thinned by cutting out half the stems at ground level in Spring.
Lk	Leptospermum 'Kiwi'	None normally required.
Lah	Lavandula angustifolia 'Hidcote'	Dead head after flowering AND prune in mid Spring to promote bushy growth. Pruning required annually to extend aesthetic lifespan.
Lam	Lavandula angustifolia 'Munstead'	
Lple	Lonicera pileata 'Loughgall Evergreen'	No regular pruning. Tim in April if required.
Lv	Ligustrum vulgare	Rejuvenate if plants become leggy. Prune heavily in March.
Mac	Mahonia 'Charity'	When plants become leggy rejuvenate by cutting back stems to different heights. Hard pruning to 500-1000 mm is fine. Carry out after flowering.
Mjas	Mahonia japonica	
Pmh	Philadelphus 'Manteau d'Hermine'	None normally required. If plants get big, trim after flowering.

PRUNING SCHEDULE		
Code	**Species**	**Annual or Periodic Pruning**
Pm	Philadelphus microphyllus	
Ptm	Phormium cookianum 'Maori Sunrise'	None normally required. Remove any dead leaves in Spring.
Pitt	Pittosporum 'Tom Thumb'	None normally required.
Pfe	Potentilla fruticosa 'Elizabeth'	Can become straggly after 4-6 years. Prune to the ground in March to rejuvenate and promote good flowering.
Pdlg	Prunus laurocerasus 'Dart's Low 'n' Green'	None normally required. If plants get large trim in April.
Pz	Prunus laurocerasus 'Zabeliana'	
Rflc	Rosa 'Flower Carpet'	None normally required.
Rk	Rosa 'Kent'	
Rra	Rosa rugosa 'Alba'	Tend to become leggy after 4-6 years. Cut back ⅓ plants to 150mm on a 3 year rotation in early March.
Rbdc	Rosa rugosa 'Blanc Double de Coubert'	
Rfd	Rosa rugosa 'Frau Dagmar Hastrup'	
Rrr	Rosa rugosa 'Rubra'	
Rsu	Rosa 'Surrey'	None normally required.
Rbb	Rosmarinus officinalis 'Benenden Blue'	
Scap	Salix caprea	Rejuvenate if plants become leggy or too big. Prune very hard in March.
Sch	Symphoricarpus chenaultii 'Hancock'	Cut back with hedge trimmers every 3 years to 500mm above the ground.
Sja	Skimmia japonica	None normally required. If plants become large cut back in February.
Sjrub	Skimmia japonica 'Rubella'	
Snsno	Spiraea nipponica 'Snowmound'	None normally required.
Sjlp	Spraea japonica 'Little Princess'	
Svlq	Santolina chamaecyparissus 'Lemon Queen'	Will become straggly unless cut back by ½ annually in March. Lightly trim after flowering.
Skc	Skimmia x 'Kew Green'	None normally required. If plants become large cut back in February.
Sjru	Skimmia japonica 'Rubella'	
Saw	Spiraea japonica 'Anthony Waterer'	None regularly required. Trim if necessary after flowering.
Sj	Spiraea japonica 'Darts Red'	
Sj	Spiraea japonica 'Little Princess'	None normally required.
Snsn	Spiraea nipponica 'Snowmound'	

PRUNING SCHEDULE		
Code	**Species**	**Annual or Periodic Pruning**
Stl	Stachys lanata	Spreading plants can be controlled by cutting off unwanted stems.
Sy	Syringa microphylla ‘Superba’	Rip out unwanted suckers. Cutting off encourages further growth. This is a low growing species. Rejuvenate by cutting back to 500mm in October if required.
Var	Viburnum ‘Anne Russell’	
Vd	Viburnum davidii	None normally required. If plants become large, cut back old branches hard in April.
Vo	Viburnum opulus	Rejuvenate big or leggy plants by cutting hard back in March.
Voc	Viburnum opulus ‘Compactum’	None usually required. Trim in March if it becomes too tall.
Vt	Viburnum tinus ‘Eve Price’	Rejuvenate big or leggy plants by cutting hard back in March.
Vm	Vinca minor	No pruning.
%	**NATIVE SHRUB MIX**	
10%	Cornus sanguinea	Refer to specification.
20%	Corylus avellana	
40%	Crataegus monogyna	
5%	Ilex aquifolium	
10%	Prunus spinosa	
5%	Rosa canina	
10%	Viburnum opulus	
	PERENNIALS/HERBACEOUS:	**Annual pruning**
Ahha	Anemone huphensis ‘Hadspen Abundance’	Cut down dead flower stems and leaves annually in Autumn.
Ahhj	Anemone x hybrida ‘Honorine Jobert’	
	Aster novae-angliae 'Andenken an Alma Pötschke'	Leave seed heads until March
As	Asplenium scolopendrium	Remove dead leaves in March.
Bbs	Bergenia ‘Bressingham Salmon’	Dead head after flowering.
Bbw	Bergenia ‘Bressingham White’	
Bs	Bergenia ‘Sunningdale’	
Bc	Bergenia cordifolia ‘Purpurea’	
Bxs	Bergenia x schmidtii	
	Cynara cardunculus	Leave seed heads until March
Dfm	Dryopteris filix-mas	Remove dead leaves in March.

PRUNING SCHEDULE		
Code	**Species**	**Annual or Periodic Pruning**
	Dianthus gratianopolitanus	Replace plants after 5 years
Ep	Echinacea purpurea ;White Swan'	Cut down in Autumn.
Ep1	Epimedium perralderianum	Remove dead leaves by cutting back in March.
Exv	Epimedium x versicolor	
Gcb	Geranium x cantabrigiense 'Biokovo'	None normally required.
Gixo	Geranium x oxonianum	Remove dead foliage to within 150mm of the soil surface. Take care not to remove growth points.
Gewp	Geranium endressi 'Wargrave Pink'	Evergreen plant. No regular pruning.
Gb	Geranium 'Brookside'	Remove dead foliage to within 150mm of the soil surface. Take care not to remove growth points.
Ghi	Geranium himalayense	
Gm	Geranium macrorrhizum 'Walter Ingwersen'	Evergreen plant. No regular pruning.
Gma	Geranium macrorrhizum 'Album'	
Gn	Geranium Nimbus	Remove dead foliage to within 150mm of the soil surface. Take care not to remove growth points
Hc	Helleborus corsicus	Cut off dead flower stem and remove dead leaves after flowering.
Hf	Helleborus foetidus	
Ho	Helleborus orientalis	Cut off dead flower stems after flowering.
If	Iris foetidissima	Cut off flower stems in March.
	Hesperis matronalis	Cut off flower stems in October (seed pods are a butterfly food plant)
Pt	Pachysandra terminalis	No pruning.
Padl	Persicaria affinis 'Donald Lowndes'	Strim to remove flower stems. Take care not to remove growth points.
	Phlox maculata 'Omega'	Cut off dead stems in November
Pv	Polypodium vulgare	Remove dead leaves in March.
Ps	Polystichum setiferum	
Rpgc	Rubus pentalobus 'Green Carpet'	If it spreads beyond its planting area or overwhelms neighbouring species, dig out surplus plants.
Ssp	Sedum spectabile 'Brilliant'	Remove dead stems in late winter at ground level.
Stma	Sedum telephium maximum 'Atropurpureum'	
	Silene nutans	Cut off dead stems in November
Si	Symphytum ibiricum	Usually none required.

PRUNING SCHEDULE		
Code	**Species**	**Annual or Periodic Pruning**
Tc	Tiarella cordifolia	Cut back dead leaves and flower stems
Wt	Waldsteinia ternata	If it spreads beyond its planting area or overwhelms neighbouring species, dig out surplus plants.
	HEDGES:	**Refer to Specification for pruning**
Fsylv	Fagus sylvatica	
Iaq	Ilex aquifolium	
Llpl(h)	Lonicera 'Loughgall Evergreen'	
Lo	Ligustrum ovalifolium	
%	**NATIVE HEDGE MIX**	**Refer to Specification for pruning**
10%	Cornus sanguinea	
20%	Corylus avellana	
30%	Crataegus monogyna	
5%	Ilex aquifolium	
10%	Prunus spinosa	
5%	Rosa canina	
10%	Viburnum opulus	
5%	Rhamnus cathartica	
5%	Ulmus procera	
	WILDFLOWER GRASSLAND SEED MX	
	Agrostis capillaris	Cut wildflower grassland areas to 150 mm in March. Avoiding an autumn cut will provide more shelter for reptiles over the winter.
	Cynosurus cristatus	
	Pleum bertolonii	
	Festuca rubra	
	Dactylis glomerata	
	Deschapsia cespitosa	
	WILDFLOWER GRASSLAND PLUG PLANTING	
	Achillea millefollium	Cut wildflower grassland areas to 150 mm in March. Avoiding an autumn cut will provide more shelter for reptiles over the winter.
	Centaurea nigra	
	Lotus corniculatus	
	Silaum silaus	
	Ranunculus acris	

PRUNING SCHEDULE		
Code	**Species**	**Annual or Periodic Pruning**
	Runex acetosa	
	Trifolium pratense	
	Geranium pratense	
	Knautia arvensis	
	Filipendula ulmaria	
	SWALE GRASS SEED MIX	
	Agrostis stolonifera	Cut to 150 mm in March
	Festuca rubra	
	Alopecurus pratensis	
	Deschampsia cespitosa	
	Cynosurus cristatus	
	Anthoxanthum odoratum	
	SWALE PLUG PLANTING	
	Phalaris arundinacea	Cut to 150 mm in March
	Cardamine pratensis	
	Potentilla anserina	
	Lotus pedunculatus	
	Juncus effusus	
	Eupatorium cannabinum	
	Valeriana officinalis	
	MARGINALS, FLOATING AND SUBMERGED PLANTS	
	Ponds with permanent water	
Apa	Alisma plantago-aquatica	Cut down in October
Bu	Butomus umbellatus	
Cp	Caltha palustris	
Ip	Iris pseudacorus	
	Potamogeton natans	
Ssag	Sagittaria sagittifolia	
Vbe	Veronica beccabunga	

PRUNING SCHEDULE		
Code	**Species**	**Annual or Periodic Pruning**
	Lythrum salicaria	
	Ceratophyllum demersum	
	Potamogeton crispus	
	Myriophyllum spicatum	
	CLIMBERS:	
Ad	Actinidia deliciosa	If pruning is needed thin out and cut back in winter.
Cmb	Clematis 'Marie Boisselot'	Lighting prune in late winter.
Cnm	Clematis 'Nelly Moser'	
Les	Lonicera etrusca 'Superba'	Thin and cut back after flowering to remove straggly or over vigorous growth.
Lpb	Lonicera periclymenum 'Belgica'	
	GRASSES & BAMBOOS:	
Cpe	Carex pendula	Remove seed heads in summer to prevent seedlings spreading everywhere.
	Cortaderia selloana	Leave until March before cutting back growth to avoid disturbing hibernating hedgehogs.
Pn	Phyllostachys nigra	If clumps become too thick, cut down 30% of canes at ground level. Ensure bamboo stays within its root protection barrier.
Sar	Stipa arundinacea	Cut back in February to allow new growth to emerge.
Stn	Stipa tenuissima	Cut back in February to allow new growth to emerge.
	BULBS:	
Au	Allium ursimum	Remove old flowers to limit seeding.
	BROWN ROOFS	
	Mix A: Extensive roof (mainly sedum) with 90mm growing medium, a filter layer, drainage layer, moisture mat, waterproof membrane and insulation over the roof slab.	No
	Echium vulgare	
	Linaria vulgaris	
	Rumex acetosella	
	Lotus corniculatus	
	Campanula rotundifolia	
	Dianthus deltoids (pink)	

PRUNING SCHEDULE		
Code	**Species**	**Annual or Periodic Pruning**
	Saxifraga paniculata	
	Sedum album	
	Sedum ewersii	
	Sedum floriferum ‘Weihenstephaner Gold’	
	Sedum reflexum	
	Sedum spurium (red)	
	Sedum spurium (white)	
	Sedum spurium (pink)	
	Thymus serphyllum (thyme)	
	MIX B: Extensive roof (mainly sedum) - growing and drainage medium as above.	No pruning required.
	Echium vulgare	
	Linaria vulgaris	
	Rumex acetosella	
	Lotus corniculatus	
	Campanula rotundifolia	
	Saxifraga paniculata	
	Sedum hispanicum ‘Minus’	
	Sedum hybridum ‘Immergrunchen’	
	Sedum kamtschaticum	
	Sedum spurium (white)	
	Sedum spurium (red)	
	Teucrium scorodania (native woodsage)	
	MIX C: Intensive roof (perennials) 300mm topsoil with drainage layers as above.	
	Epimedium perralderanium	Cut to 100mm in March
	Pachysandra terminalis	No pruning.
	Polypodium vulgare (Common Polypody Fern)	Remove dead foliage in March.
	MIX D: Semi-intensive roof (perennials mainly) with 150-250mm growing medium and drainage.	No pruning required.

PRUNING SCHEDULE		
Code	**Species**	**Annual or Periodic Pruning**
	Carex ornithopoda	
	Saxifraga paniculata	
	Sedum hybridum ‘Immergrunchen’	
	Sedum spurium (white)	
	MIX E: Intensive roof (perennials and native wildflowers). 150-250mm growing medium and drainage.	**Refer to Specification for wildflower maintenance.**
	Achillea millefolium (N)	
	Ajuga genevensis	
	Aquilegia vulgaris(N)	
	Campanula glomerata (N)	
	Campanula trachelium (N)	
	Centaurea scabiosa(N)	
	Galium verum(N)	
	Gallium mollugo (N)	
	Geranium sylvaticum(N)	
	Geranium magnificum	
	Geranium macrorrhizum	
	Geum urbanum(N)	
	Gypsophila repens	
	Lychnis coronaria	
	Origanum vulgare(N)	
	Papaver orientale	
	Persicaria bistorta(N)	
	Primula veris (N)	
	Salvia nemrosa	
	Salvia pratense(N)	
	Silene dioica (N)	
	Stellaria holostea (N)	
	Teucrium scorodonia (N)	

PRUNING SCHEDULE		
Code	**Species**	**Annual or Periodic Pruning**
	MIX F: Intensive roof (ornamental grasses and perennials) with 250-300mm growing medium and drainage.	
	Calamagrostis x acutifolia ‘Karl Foerster’ (feather reedgrass)	Cut back to ground level in February to allow new growth to emerge.
	Euphorbia palustris	Cut back in October to 150mm in height.
	Geranium macrorrhizum	No pruning needed.
	Geranium sylvaticum	Cut back in October to 150mm in height taking care not to remove the growing points.
	Pennisetum alopecuroides (fountain grass)	Cut back seed heads and stems to ground level in February to allow new growth to emerge.
	Pennisetum orientale	
	Stipa tenuissima (feather grass)	

Appendix V: The Survey Year Calendar




The Survey Year

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Comments and caveats
Woodland													May need to be modified depending upon the flowering times of any particular target plant species.
Grassland													May need to be modified depending upon the flowering times of any particular target plant species.
Heathland													May need to be modified depending upon the flowering times of any particular target plant species.
River Corridors													Surveys generally appropriate during summer months but vegetation in lowland rivers can be too dense later in the summer.
Terrestrial invertebrates													Surveys on three separate occasions required (one each in early, mid- and late summer) to take account of seasonal variations in emergence. Species-specific surveys will need to be carried out at the optimum time for the particular taxa (e.g. surveys for marsh fritillary larval food webs are carried out in September/October)
Aquatic invertebrates													Surveys on at least two separate occasions required, one in spring the other in autumn. An extra survey in summer may also be required to assess the conservation status of potentially valuable ponds/lakes
White-clawed crayfish													Surveys inappropriate during early summer for welfare reasons (females carrying/releasing offspring)
Fish													A general guide, but depends on life cycle/migration of species




The Survey Year

Great crested newts	Surveys outside the period mid-March to mid-June for presence/assumed absence only
Reptiles	Depends on weather conditions and time of day
Breeding birds	Minimum five surveys required throughout optimum period specified
Over-wintering birds	Minimum monthly surveys required throughout peak period specified, surveys into October and March needed for passage-migrants
Water voles	Avoid periods of high flows
Dormouse surveys (nut search)	Surveys of characteristically-chewed hazel nuts
Dormouse surveys (nest boxes/tubes)	Surveys using nest boxes or tubes. Installation of boxes/tubes in March/April.
Bats (Internal inspection)	Internal inspection: restrictions necessary at certain types of roost
Bats (Emergence counts)	Emergence counts
Bats (Activity surveys)	Activity surveys: repeated visits required
Badger (walkover)	Surveys possible in summer, but not ideal due to density of vegetation




The Survey Year

Badger (bait-marking)													Surveys generally need to encompass the entire spring period
Otters													River flow rates are more restrictive than seasonal constraints

Optimum survey season		Surveys appropriate		Surveys possible, but may be inconclusive		Surveys not appropriate (not possible or not advised for welfare reasons)	