HERIOT WATT UNIVERSITY

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EDINBURGH CAMPUS
BIODIVERSITY ACTION PLAN - 2020

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1 Introduction

1.1 Introduction

The Edinburgh Heriot Watt University campus occupies a vibrant green country landscape of varied habitats, that helps make the University such a distinctive place in which to study and work. This expression of biodiversity is part of a bigger picture, in which the approach taken by the University within its estate has wider implications. The aim of this biodiversity action plan is to help enact the potential of the University to lead the way into a resilient, sustainable future.

What is biodiversity?

"*Biological Diversity is 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*"
The UN Convention on Biological Diversity (1992)

Biodiversity is short for "biological diversity", the variety of life on earth. It includes all living organisms and the ecosystems in which they occur. Abundance and diversity of ecosystems, species, and genes and the interactions between them are a key part of biodiversity. Together they create an intricate balance that ensures the continuance of life in the natural world and the provision of oxygen, fresh water and a wide variety of natural resources that are essential for our well being.[1]

Why take action on biodiversity?

Put simply, humans have developed an immense capability to damage habitats and reduce biodiversity, through intent or through lack of care. Yet these habitats and species provide ecosystem services vital to our health, prosperity and sustainability. Through action to conserve, enhance and appropriately manage biodiversity at the local level, we can contribute to halting and reversing the global decline in biodiversity caused by human impacts; this can increase the resilience of our own ecosystem.

[1] Biodiversity on Campus : An EAUC Practical Guide

1.2 What is a biodiversity action plan?

A biodiversity action plan appraises the current inventory of habitats and species, considers their conservation status, proposes targets for their conservation and enhancement, and establishes a practical programme of actions to achieve those targets. It should stimulate local working partnerships to these ends, and raise awareness of the need for biodiversity conservation and enhancement in a local context.

Biodiversity action plans (BAPs) exist at different scales:

The UK Biodiversity Action Plan (1994), created in response to the UN Convention on Biological Diversity, describes the UK's biological resources and commits a detailed plan for the protection of these resources – which include 391 Species Action Plans, 45 Habitat Action Plans and 162 Local Biodiversity Action Plans with targeted actions.[2]

The Scottish Biodiversity Strategy (Scottish Government; 2015)[3] focuses on 'Six Big Steps for Nature'.

The Edinburgh Biodiversity Action Plan 2019-2021 (City of Edinburgh Council; 2019)[4] concentrates on awareness, engagement and participation to achieve biodiversity objectives.

These national and regional BAPs provide a framework of priorities within which local BAPs provide greater detail on delivery, spatial distribution, locally important habitats and species, and local partnerships engaged in the BAP.

[2] http://data.jncc.gov.uk/data/cb0ef1c9-2325-4d17-9f87-a5c84fe400bd/UKBAP-BiodiversityActionPlan-1994.pdf

[3] https://www.nature.scot/scotlands-biodiversity/scottish-biodiversity-strategy

[4] https://planningedinburgh.files.wordpress.com/2016/05/ebap-2016.pdf

1.3 What are its objectives?

A BAP should illuminate a practical path to delivery of enhanced biodiversity and greater engagement of people with their environment. It translates national and local biodiversity objectives into a programme of actions, describing their delivery mechanism, timescale and measure of performance.

1.4 Who owns it and how is it monitored?

The University is the lead and author of this plan, but ownership should be perceived as being shared by all partners and stakeholders in the biodiversity of Riccarton and its environs. Monitoring of the effectiveness of this plan will be undertaken by the University, with assistance from partners according to particular expertise and resources. The action plan will be monitored annually, and subject to full review every 5 years.

1.5 Consultations

The following organisations and people have been consulted during drafting of this plan :

City of Edinburgh Council - Biodiversity Officer

Scottish Natural Heritage- Operations Manager (Forth)

Heriot Watt University - Assistant Director of Estates Services

Heriot Watt University - Landscape Manager

Heriot Watt University - Environment & Energy Manager

1.6 Relationship to other University policies

A BAP should illuminate a practical path to delivery of enhanced biodiversity and greater engagement of people with their environment. It translates national and local biodiversity objectives into a programme of actions, describing their delivery mechanism, timescale and measure of performance.

The University **Strategy 2025** sets a target of "*pioneering a sector leading global approach to environmental sustainability*", and makes the following commitments on sustainability:

"*Environmental Sustainability – in addition to ensuring delivery of any statutory environmental requirements across campus locations, we will develop: globally relevant targets for our emissions; our organisation practises and behaviours; and, importantly, to quantify the net societal and global impact of flagship ground breaking research projects and policies*."

A key outcome within this strategic plan is for the University to hold a global reputation for transformative economic and societal impact that addresses Grand Challenges and contributes towards the UN Sustainable Development Goals. Measures and initiatives outlined within this Biodiversity Action Plan will directly support SDG 15 (Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss – Life On Land) and will support the attainment of other SDG's including SDG 13 (Climate Action) and SDG 14 (Life Below Water).

THE UNIVERSITY ENVIRONMENTAL POLICY DEFINES SUSTAINABILITY PERFORMANCE OBJECTIVES, INCLUDING:

- Procurement: minimising environmental impacts by adopting a sustainable approach to the purchasing of goods and services.
- Water: promoting conservation methods and working towards best practice through effective monitoring and targeting systems.
- Energy and greenhouse gas emissions: reducing energy consumption and associated emissions of greenhouse gases via the use of efficient energy management systems and the promotion of effective reduction methods and technologies. Significant progress has been made in managing energy related greenhouse gas emissions and activity in this area will continue to be prioritised in accordance with the University's status as a signatory to the Universities and Colleges Climate Commitment for Scotland.
- Waste: operating responsible and effective waste controls including the prioritisation of waste minimisation and recycling to divert waste from landfill disposal. The University has substantially increased recycling rates and will continue to implement projects to reduce waste and improve the sustainability of end of life disposal.
- Control of pollution: assessing risks and operating effective controls to reduce or eliminate the release of potential pollutants.
- Biodiversity: recognising the value of biodiversity and the importance of protecting and enhancing the diverse range of species and habitats on campus.
- Transport: implementing effective transport plans and promoting modal shift towards more sustainable transport options, including enhanced use of public transport and facilitating car sharing.
- Engagement & community: encouraging the involvement of staff and students in environmental and sustainability issues, and considering the likely environmental effect of University activities and developments on the local community.

The University considers that Conservation and Biodiversity are essential considerations in the management of Heriot-Watt University's estate. The Edinburgh campus benefits from an attractive parkland setting which provides a broad range of habitats. The University works to manage and enhance these by practices including:

- Hosting apiaries and planting wildflowers to attract and provide for a range of insect pollinators
- Enhancing biodiversity by selective planting of trees under the University's Woodland Management Plan
- Creating shelter and further opportunities for wildlife by leaving deadwood piles in woodland areas, and by installing breeding and roosting boxes for birds and bats
- Using low intervention landscape management practices, for example leaving perennials to stand over winter to as a food source and adopting reduced mowing regimes in appropriate areas of the campus
- Sensitively undertaking management processes to cater for wildlife, for example timing hedge-cutting operations to avoid the bird nesting season

The Lawn and Central Woodlands areas of the Edinburgh campus have for several years achieved certification under the Green Flag Award scheme, recognising the University's efforts to manage the natural heritage of the area while promoting broader access.

THE EDINBURGH CAMPUS STRATEGIC MASTERPLAN 2015 COMMITS TO THESE BIODIVERSITY PRINCIPLES:

- The University will comply with current legislation relating to the conservation of biodiversity and habitats on campus, and where possible set its own higher standards;
- An ecological survey of the whole campus will be obtained, to provide a base-line of information;
- Biodiversity Action Plan will be created, setting objectives for maintaining and improving biodiversity on campus whilst recognising the importance of the Historic Garden and Designed Landscape;
- Where appropriate, new habitats will be created through altering maintenance practices or as part of new developments;
- The University will work with local and national partners to promote and enhance biodiversity on the campus and in the wider region;
- Consultation between academic staff and management on biodiversity issues will be fostered;
- Staff, student and community awareness of biodiversity issues on campus will be encouraged;
- The campus will be promoted as an educational and recreational resource;

The masterplan includes a landscape strategy that promotes :

1. Preservation of mature and veteran trees
2. Long term management of woodlands
3. Enhancement planting in woodlands for greater diversity
4. Avenue tree and hedge planting alongside roads and car parks
5. Managing meadow grassland for biodiversity
6. Ponds & wetland habitats integrated

The Landscape Management Plan 2019 sets out greater detail on the current condition and management of the campus landscape, then plots a course to where it is desired to be. It sets out clear management objectives and operational prescriptions.

The Further and Higher Education (FHE) sector has an important part to play in conserving our natural heritage. FHE institutions also have a responsibility for educating the next generation of leaders about the importance of biodiversity and wider sustainability issues. Biodiversity initiatives are a crucial way to engage students and staff in sustainable development and provide a visible example of best practice.

The EAUC Biodiversity Guide provides guidance for the conservation, maintenance and enhancement of biodiversity.

1.7 Report authors

This report has been jointly produced by Ian White Associates Landscape Architects and Direct Ecology.

2 Baseline Study

2.1 Desk Study

A desk study was undertaken to determine the presence of any statutory designated nature conservation sites and non-statutory sites and ancient woodland inventory sites within 10 km, 5 km or 2 km respectively of the survey area. In addition a 2 km search was undertaken for protected and notable species. Searches for specific protected species were also undertaken to identify the nearest record to the site; only records within the last 25 years and that are not subject to commercial restrictions have been included. The following were consulted:

- Scottish Natural Heritage (SNH) SiteLink (SNH, 2019);
- Scotland's Environment Web Map; (Scottish Government, 2019)
- National Biodiversity Network (NBN) Atlas (NBN, 2016);
- Site Staff/Groundsmen;
- City of Edinburgh Local Biodiversity Action Plan (LBAP) (City of Edinburgh Council, 2019);
- City of Edinburgh Heritage sites (City of Edinburgh Council, 2019); and
- Scottish Biodiversity List (SBL) (Scottish Government, 2012).

Heriot Watt University does not include or border any statutory or non-statutory designated sites. Two Special Protection Areas (SPAs) were identified within a 10km radius of the site; the Firth of Forth SPA is located approximately 7.5 km north of site, and the Forth Islands SPA is located approximately 9 km north of site. In addition, two Sites of Special Scientific Interest (SSSIs) were identified within a 5 km radius of the site; Balerno Common is located approximately 4 km south of the site and Wester Craiglockhart Hill is located approximately 4.5 km east of the site. These are shown in Figure 1 (Appendix).

There are three Local Nature Reserves (LNR) within 5 km of the Edinburgh Campus. Corstorphine Hill is located approximately 4 km northeast of the site, Easter Craiglockhart Hill approximately 5 km east of the site and Cammo Estate approximately 4 km north of the site. Four blocks of woodland are noted on the Edinburgh Local Development Plan (LDP) as Local Nature Conservation Sites (LNCS). These are shown in Figure 1.

Three areas of woodland within the University boundary are listed on the Ancient Woodland Inventory; a further eight lie within 2 km of the site, the closest of which is situated approximately 50m to the west of the site. These are shown on Figure 2 (Appendix).

2.2 Phase 1 habitat survey

Field survey work was undertaken over the period May – August 2019. Habitats present on site were classified using the Joint Nature Conservation Committee (JNCC) Phase 1 Habitat Survey method (JNCC, 2010). Phase 1 habitat survey is a standard technique for classifying and mapping British habitats; the aim is to provide a record of habitats that are present on site. Plants and their frequency of occurrence were recorded using the subjective DAFOR scale (dominant, abundant, frequent, occasional or rare). During the survey, the presence, or potential presence, of protected species was noted; target notes and grid references of notable plant species were recorded. Any invasive non-native plant species present on site covered by the Wildlife and Natural Environments (Scotland) Act 2011 (WANE) were noted, but it was not a specific survey for these species.

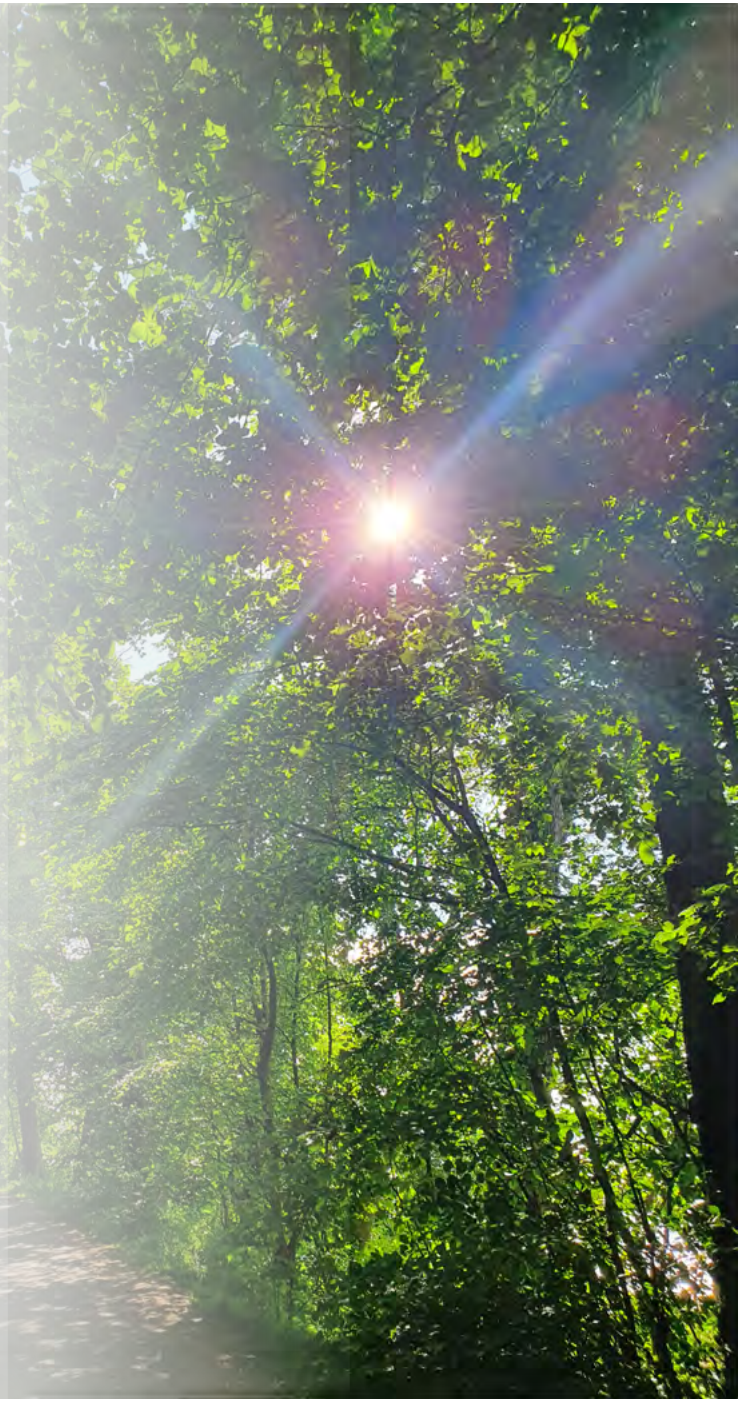
This survey was evaluated with reference to the Edinburgh BAP, to provide the following summary of habitats and their ecological value:

Mixed plantation woodland (A1.3.2) - Site value
Mature woodland with both native and non-native species. Areas are designated within the Local Development Plan and on the Ancient Woodland Inventory.

Dense scrub (A2.1) - Negligible value
Small pockets of scrub with common, widespread species present.

Scattered scrub (A2.2) - Site value
Present as a mosaic with unimproved neutral grassland, increasing the habitat and structural diversity available to wildlife

Mixed scattered trees (A3.3) - Site value
Many mature trees of native and non-native species, forming part of the historic designed landscape, irreplaceable due to age and stature. Other more recent semi-mature specimens.



Unimproved neutral grassland (B2.1) - Site value
Good species diversity in an unmanaged part of the campus, it contributes to habitat diversity and is uncommon in the wider landscape.

Semi-improved neutral grassland (B2.2) - Negligible value
Small extents of relatively unmanaged grassland, consisting of common, widespread species.

Semi-improved neutral grassland (B2.2) - Negligible value
Small extents of relatively unmanaged grassland, consisting of common, widespread species.

Improved grassland (B4) - Negligible value
Significant extents of limited species diversity, used for livestock.

Marshy grassland (B5) - Site value
Narrow extents of marshy grassland along small watercourses and SuDS ponds, which notably increase the habitat diversity within the campus.

Tall ruderal vegetation (C3.1) - Negligible value
Narrow extents bordering the small watercourse in the north of the campus.

Swamp (F1) - Site value
Stands of dense vegetation comprising part of the complex of SuDS ponds in the north of the campus.

Marginal vegetation (F2.1) - Site value
Stands of marginal vegetation on the edge of the open water parts of the SuDS ponds in the north of the campus.

Standing water (G1) - Site value
The main loch plus small extents in the SuDS ponds. Listed on the Scottish Biodiversity List. Also ephemeral pools elsewhere on campus.

Running water (G2) - Site value
Several drains and watercourses throughout the campus. Listed on the Scottish Biodiversity List.

Arable (J1.1) - Negligible
Significant areas within the north of the campus. Currently barley & brassicas.

Amenity grassland (J1.2) - Negligible
Highly managed closely mown grassland, common throughout; some foraging potential for birds.

Ephemeral/short perennial vegetation - Negligible
A single location, where ground has been significantly disturbed.

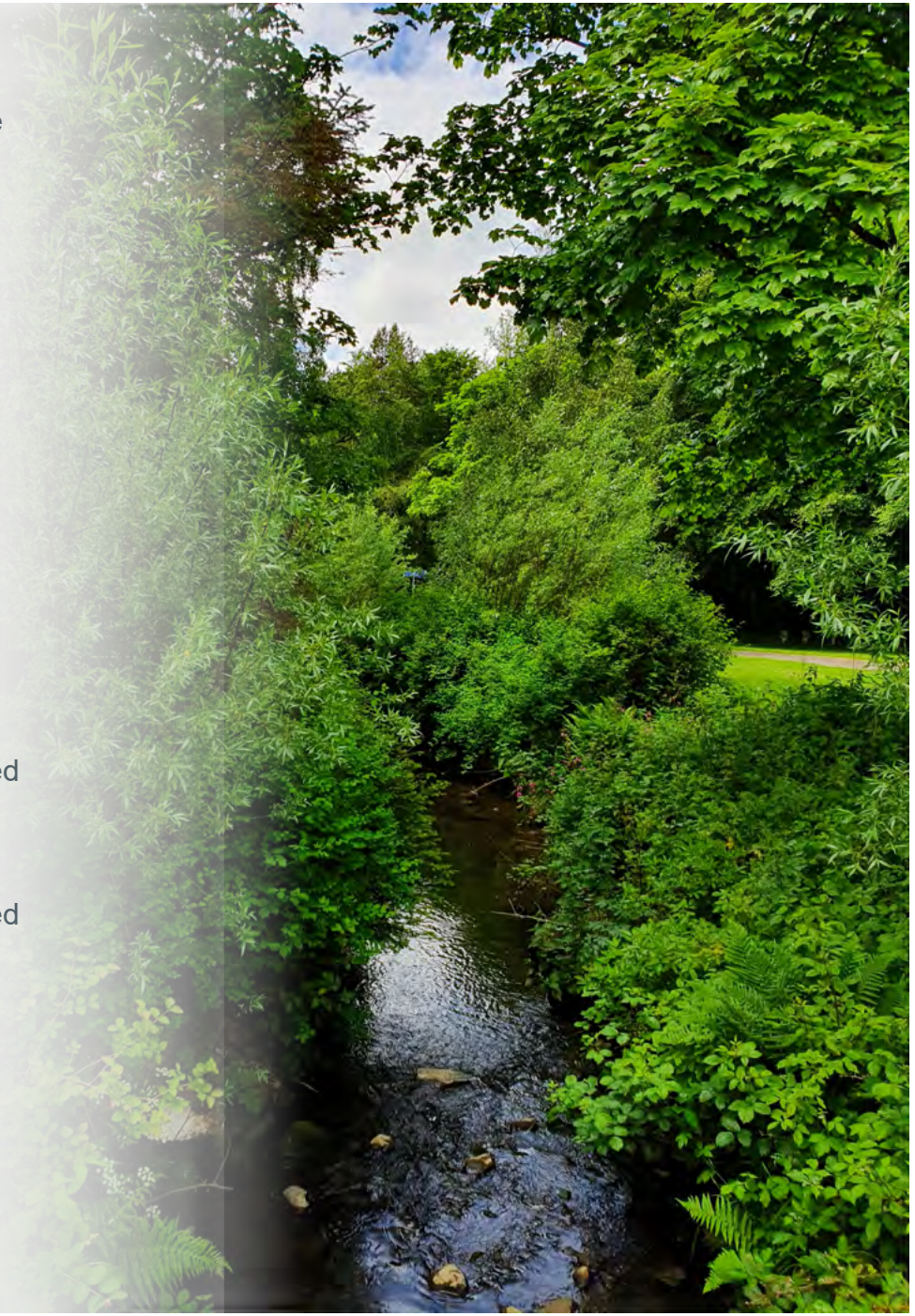
Introduced shrub (J1.4) - Negligible
Largely non-native and managed ornamental planting.

Hedge, species-poor (J2.3.2) - Site value
Potential for small mammals and birds, although highly managed. Listed on the Scottish Biodiversity List.

Hedge with trees, species-poor (J2.3.2) - Site value
Potential for small mammals and birds, although highly managed. Listed on the Scottish Biodiversity List.

Buildings and walls (J2.5 + J3.6) - Negligible

Bare ground and hardstandings (J4 + J5) - Negligible



2.3 Protected species walkover survey

The protected species walkover survey comprised a search for actual species, evidence of species and suitable habitats within site boundary where access was available. In all cases, where evidence of protected species were found a target note was made, location recorded and a photograph taken.
The following protected species were surveyed:

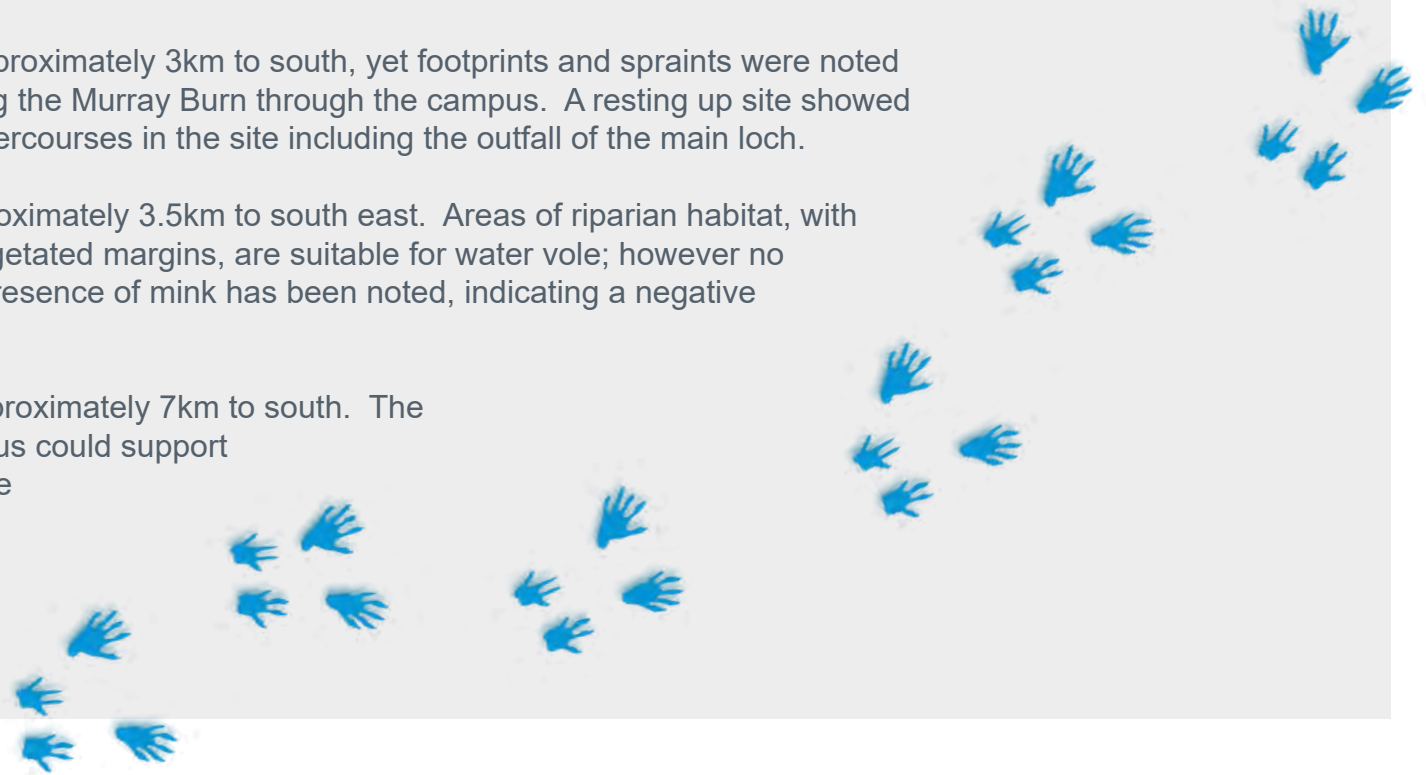
1. Badger. The mixed plantation woodland, dense scrub and hedgerows have high potential to support badger setts. A Main sett and a likely Annexe sett exist in woodland in the north-east part of the site; evidence of foraging, community activity and latrines in the south, west and north of the campus indicate that badgers are using much of the campus area.

2. Great crested newt. Although most of the ponds are likely to support populations of common toad, common frog and palmate newts. The varied vegetation structure including pools and wet ditches provides suitable areas for great crested newt, although they are surrounded with heavily managed grassland and arable land here are no desk study records for great crested newt from the site or close by, and their presence is considered unlikely. The nearest record of this species is approximately 5km to the west.

3. Otter. The closest record of otter is approximately 3km to south, yet footprints and spraints were noted amongst the roots of bankside trees along the Murray Burn through the campus. A resting up site showed signs of use. Otter are using the key watercourses in the site including the outfall of the main loch.

4. Water vole. The closest record is approximately 3.5km to south east. Areas of riparian habitat, with calm and slow flowing water with lush vegetated margins, are suitable for water vole; however no evidence of their presence was found. Presence of mink has been noted, indicating a negative influence on any water vole population.

5. Red squirrel. The closest record is approximately 7km to south. The mixed woodland plantations on the campus could support this species, but because grey squirrel are present it is unlikely that red squirrels will spread onto the site.



6. Bat activity & roosts. The following bat species are known to be present in this area of Scotland (Richardson, 2000; Harris and Yalden, 2008; Russ 2014):

- Common pipistrelle Pipistrellus pipistrellus;
- Soprano pipistrelle Pipistrellus pygmaeus;
- Nathusius' pipistrelle Pipistrellus nathusii (rarely);
- Daubenton's bat Myotis daubentonii;
- Natterer's bat Myotis nattereri;
- Brown long-eared bat Plecotus auritus;
- Leisler's bat Nyctalus leisleri (rarely).
- Noctule bat Nyctalus noctule

Therefore, it is possible that any of the regularly occurring species listed above could be present on site or within the surrounding landscape. All species listed above (with the exception of Leisler's bat) are Scottish Biodiversity list species (Scottish Government, 2012). The site provides a large number of opportunities for roosting bat species, in both buildings and trees. A maternity roost was confirmed in the Lord Balerno Building and many other buildings on site have high roost potential including the more modern buildings such as the Hugh Nisbet Building and older buildings including the Gate House. A survey of all buildings on site was not undertaken and it is likely that there are other bat roosts present within buildings on the site.

The campus has many mature trees with bat roost potential, including species such as oak, sycamore, cedar, yew, sweet chestnut, lime, giant sequoia and beech. Good potential for roosts exists with trees in association with the woodland in many areas of the site including around the Loch; these trees support features such as split limbs, dead wood and rot holes, which have moderate to high bat roosting potential as well as dead ivy, which has more limited bat roosting potential. In addition, bat boxes lie within the mixed plantation woodland on the northern side of the Loch and close to the Lyell building.

Many of the habitats within and adjacent to the survey area provide good foraging opportunities for bat species, with areas of mixed plantation woodland, hedgerows and scrub, woodland edges, open fields, water courses and open water all being suitable. All habitats are well connected to the surrounding area. Species likely to use the site include: common pipistrelle Pipistrellus pipistrellus and soprano pipistrelle Pipistrellus pygmaeus bats in all areas; Daubenton's Myotis daubentonii near areas of water; Natterer's Myotis nattereri and potentially brown long-eared Plecotus auritus associated with areas of woodland. The campus supports a number of bat species, with a maternity roost confirmed for soprano pipistrelle bats and other species using the campus are common pipistrelle, brown long-eared and Daubenton's. The most Daubenton's bat activity was recorded over the loch. The tree lines, water courses and woodland edges provide excellent foraging for bat species.

7. Birds (numerous species). A large number of habitats are present on site that support foraging and nesting bird species, including the mixed plantation woodland, scrub, scattered trees, hedgerows and buildings and the grassland habitats, riparian and emergent vegetation and water courses including standing water. In addition, the woodland and hedgerows provide good connectivity to other habitats around the site and provide corridors for species movement through the site. Four red-listed species and eleven amber-listed species were recorded using the site and it is likely that most of these species will be breeding on the site:

- Red list species : song thrush, mistle thrush, grey wagtail and yellowhammer.
- Amber list species : common gull, black headed gull, lesser black-backed gull, bullfinch, dunnock, mallard, mute swan, reed bunting, house martin, oystercatcher, willow warbler and oystercatcher.

A number of active house martin nests were recorded on one of the newer buildings in the north of the site (TN 68).

2.4 Landscape Management Practices

The University Landscape Management team implement the Landscape Management Plan (2019), which initiated the ecological survey, production of this BAP, and has the following key objectives relating to biodiversity:

1. The University will comply with current legislation relating to the conservation of biodiversity and habitats on campus, and where possible set its own higher standards;

2. The University will retain, protect and provide for succession of heritage landscape elements;

3. Species and structural diversity of woodlands will be increased;

4. Wildflower meadow management of grassland will be expanded;

5. Tree and woodland cover will be increased;

6. New habitats will be created through landscape management or within new developments;

7. The University will work with local and national partners to promote and enhance biodiversity on the campus and in the wider region;

8. The University will encourage engagement of academic staff in biodiversity matters;

9. The University will encourage staff, student and community awareness of biodiversity issues;

10. The campus will be promoted as an educational and recreational resource

Landscape management seeks to balance the requirement to provide an attractive and orderly setting with the desire to allow natural ecosystem processes and biodiversity. There is some pressure on resources available for landscape maintenance, thus changes in landscape management that reduce frequency and intensity of operations, as might be the case for increasing biodiversity, are favoured.

2.5 Pressures on Biodiversity

The Edinburgh Campus is subject to various pressures with the potential to inhibit or degrade biodiversity.

- Climatic change. This global anthropogenic phenomenon is producing a lengthening of the growing season and earlier flowering period in plants, with the potential disconnection of relationships with pollinating insects. Milder winter temperatures, longer autumn conditions and earlier springs are extending the period of activity of many species. This may result in changes to the balance of species in different habitats.

- Built development. The University is always evolving and renewing its buildings. When new buildings are constructed on landscape areas, they displace habitats and may cause fragmentation of habitat connections. Refurbishment of buildings may cause the loss of roosts for birds and bats, and damage to adjacent habitats.

- Damage to mature and veteran trees. Changes in ground conditions, paving, drainage and the excavation of utility trenches will all cause irreparable harm to the root systems of mature trees. Veteran trees form a unique habitat that takes centuries to develop, above and below ground.

- Senescence of veteran trees. As these old trees naturally decline and die, this complex habitat for invertebrates, birds and mammals will reduce in extent and diversity.

3 Biodiversity objectives

3.1 Biodiversity principles

There are a few key ecological principles that underpin biodiversity:

- **Scale** is important. Habitat fragmentation reduces the integrity and resilience of habitats;
- Connecting areas of habitat together into a network is essential for species conservation. These networks should extend across the campus boundaries.
- **Bioabundance** (number of organisms) is important as well as biodiversity (number of species)
- **Structural diversity** in vegetation is as important as species diversity
- **Edge habitats** and habitat mosaics have relatively high diversity value
- **Native plant species** should form the foundation of biodiversity
- Carefully **selected non-native species** can also enhance biodiversity
- **Habitat management** needs to be consistent, and based on knowledge of what is present
- **Invasive** non-native species are a major threat to habitat function and diversity
- Chemical weed & pest control should be avoided where possible

The University will take careful account of these principles when planning and implementing the design and management of building and landscape works.

3.2 Objectives for each habitat

3.2.1 Grassland

- Extend the area of diverse neutral grassland habitat, by reducing the area of amenity lawn.
- Allow more complex ecotones (transition areas) to develop along the margins between grassland and woodland or hedgerows.
- Use differential mowing of edges and path rides to maintain a cared-for appearance and allow for informal routes.

Encourage the development of greater sward diversity through modification of mowing timing and frequency and removal of cuttings to reduce fertility. Species diversity could also be encouraged by through the introduction of yellow rattle, a parasitic plant that feeds on grass roots, to reduce the degree of competition and thereby form a more open sward into which other native grass and forb (broad leaved herbaceous plant) species might establish.

A seasonal pause in mowing allows grasses and forbs to flower and set seed, providing nectar and seed for a large range of invertebrate and bird species, as well as insectivorous birds and mammals. Relaxation of mowing permits subtle variation in soil type and moisture conditions to be expressed as variations to plant communities.

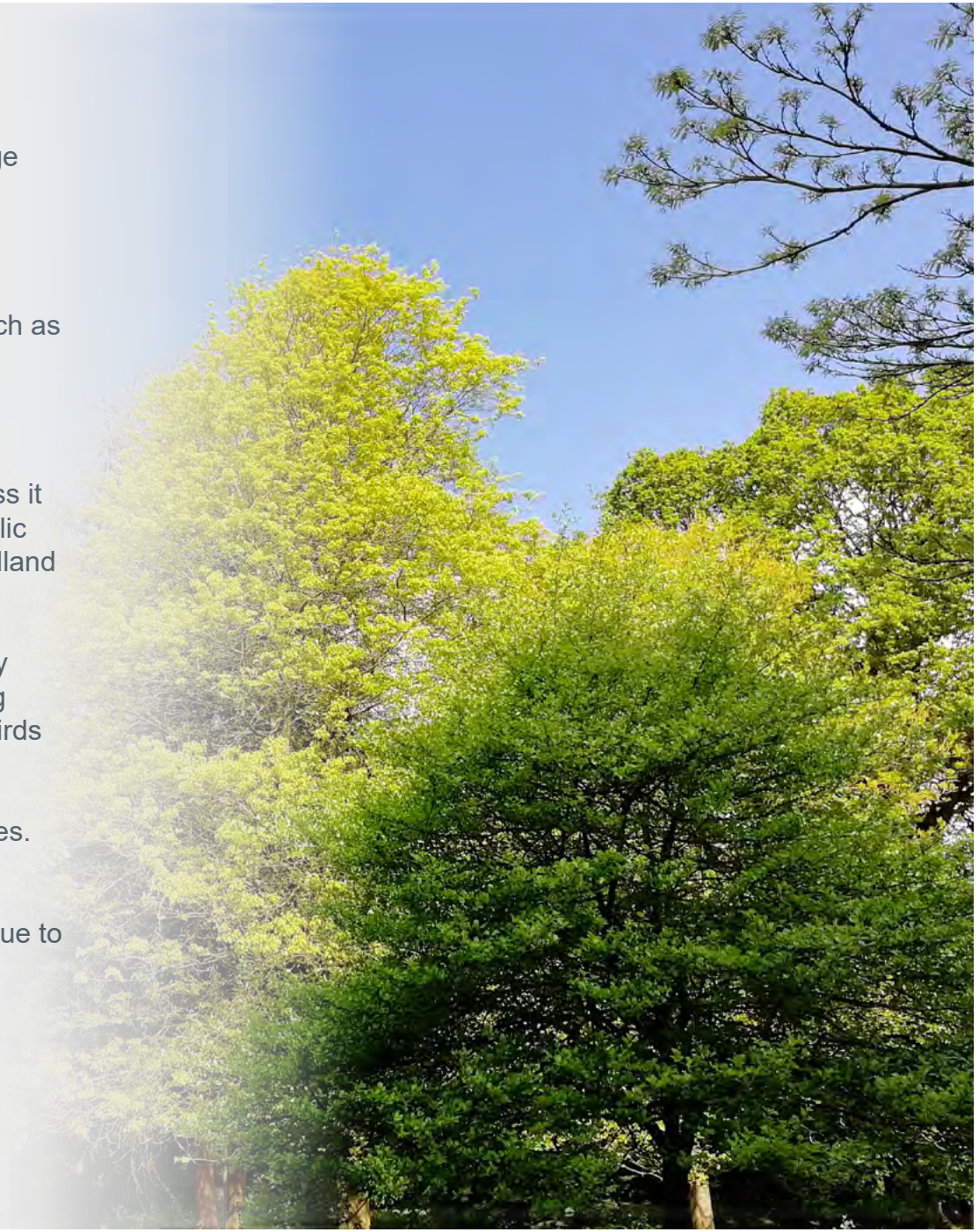
Birds benefit from such treatment, because ground-nesting species complete nesting before the hay cut in late summer; species such as Redshank, Lapwing and Curlew breed on moist grassland, whilst the Meadow Pipit favours thick rank grassland.

3.2.2 Trees and Woodland

The woodlands at Riccarton are of several types of distinct age and species structure.

Objectives that apply to all of the woodlands are:

- Establish a new generation of long-lived species trees, such as Oak and Lime;
- Improve age and canopy structure of woodlands;
- Standing dead wood, fallen timber etc. should be left unless it poses a safety hazard to particular footpaths or highly public areas, because of the exceptional value to specialist woodland invertebrates and birds such as owls;
- Provision of log piles and ‘bug-houses’ increase the variety and populations of woodland invertebrates, thereby fueling expansion of species higher up the food web, especially birds and bats;
- Installation of nesting boxes for various bird and bat species. Nesting boxes encourage breeding populations;
- Plan management in anticipation of the loss of ash trees due to Chalara pathogen;



A further layer of measures applicable to particular woodland and tree habitats within the campus are:

- Veteran trees require protection. These need regular condition inspections; habitat and soil within their rooting zones require consistent, sensitive management.
- The closed canopy woodland environment requires continued management to maintain a diverse woodland cover and provide for recreational use of paths. The woods contain many self-sown Sycamore trees that should be selectively thinned to favour native climax woodland species such as Oak.
- The structural diversity (mix of different canopy layers) of woodlands will benefit from understorey planting of native shrubs such as hazel and holly.
- Rhododendron and laurel requires removal from some areas of mature woodland, with stump treatment to prevent recurrence.
- Woodland belts planted in the 1960s and early 1970s are dominated by closely spaced pine trees, have very few understorey trees and shrubs, and lack ground flora. Selective thinning and interplanting with native woodland species will ultimately support more diversity and improve resilience of these woodlands.
- At the shoreline of the Loch, young self-sown alder and willow trees will require selective thinning and stump treatment, to maintain visual permeability and variety of edge habitat.
- Ornamental species of woodland character in the central gardens should be maintained with a progressive planting of new appropriate non-native trees. Retention of the mixed ornamental understorey in this area is appropriate for the historical / cultural character.
- Allow meadow grassland to grow beneath parkland trees. This is visually attractive, improves habitat structural diversity and reduces the risk of damage to stem and roots by mowing.

3.2.3 Hedgerows

- Vary maintenance of mixed hedges where practical and appropriate, to provide overgrown hedge habitat.
- Introduce hedge-laying as a management technique for native mixed hedges, to ensure their long-term vigour and form. Only a small length needs to be tackled in this way each year.
- Allow tall herb and grass vegetation to develop along the base of some hedges.

The University campus contains several kilometres of hedge, with great potential as linear habitat. Most hedges consist of a native mix of beech, hornbeam, field maple and hazel. They are currently maintained by annual cutting.

Overgrown hedges are much more attractive to invertebrate, bird and mammal species than highly maintained ones; they function more like a linear woodland edge, which is a very rich transition habitat. Infrequent cutting allows blossom and fruit/seed production; the physical volume and visual cover for nesting is much greater. This approach is not suitable everywhere, however where hedges meet woodland areas this approach would be appropriate.

Within the more urban core of the campus, a tidier and more formal approach is desirable.

3.2.4 Wetlands

- Expand the network of native wet meadow in ditches and swales as part of SUDS improvements.
- Provide a buffer margin of meadow around ponds, rather than amenity grassland.
- Monitor for the presence of invasive non-native species, taking early action to eradicate.
- Promoting habitat linkage between wetlands and hedge or woodland edges, to provide improved green network routes for amphibians and mammals.

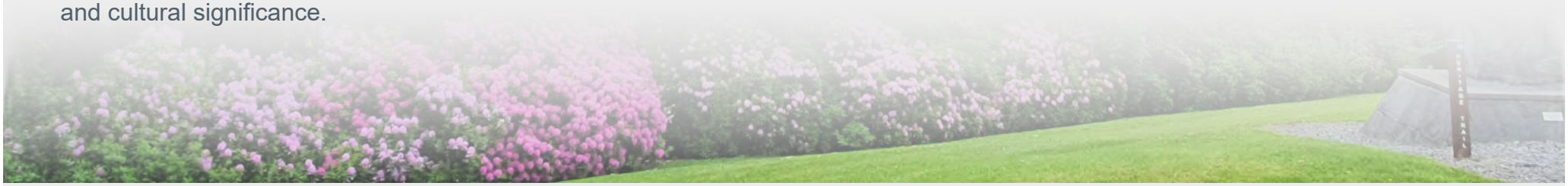
The University has a number of ponds and a sequence of wetland habitat in the research park extension. The local biodiversity value of these is significant, and can be increased by improving the connections between wetland habitats, so that they function as a network rather than as isolated 'islands' of habitat.

3.2.5 Edge Habitats

- Allow more complex ecotones to develop along margins between grassland and woodland or hedgerows.
- Leave edge areas uncut, or only cut periodically, so that seedheads are retained through winter and early stages of scrub can develop. But do not allow woodland to develop.

The transitions between wetland, grassland, woodland and hedgerows offer great potential, if allowed to develop as marginal 'ecotone' habitats. This requires a change in mindset so that such rough edges are not perceived as merely untidy. These transitions have structural diversity, which is especially important for invertebrates and birds, due to the presence of nectar-bearing flowers, seed-heads and insects upon which to feed. They in turn attract mammals and raptors.

The proposals stop short of allowing the development of scrub habitat due to the importance of the parkland aesthetic, which has historic and cultural significance.



3.2.6 Ornamental planting

- Develop structural diversity in planting, with varied canopy layers and a mix of deciduous and some evergreen plants represented wherever possible.
- Use a diversity of species to broaden the habitat value whilst meeting design objectives.
- Include diversity of food sources for invertebrates and birds (i.e. pollinator-friendly plants, berries, seed-heads) and consider edible fruiting species, such as apples, currants etc, for human enjoyment.
- Include invertebrate wood piles within ornamental planting.
- Use composted mulch to control weeds, rather than herbicide.
- Use climbing plants on walls.

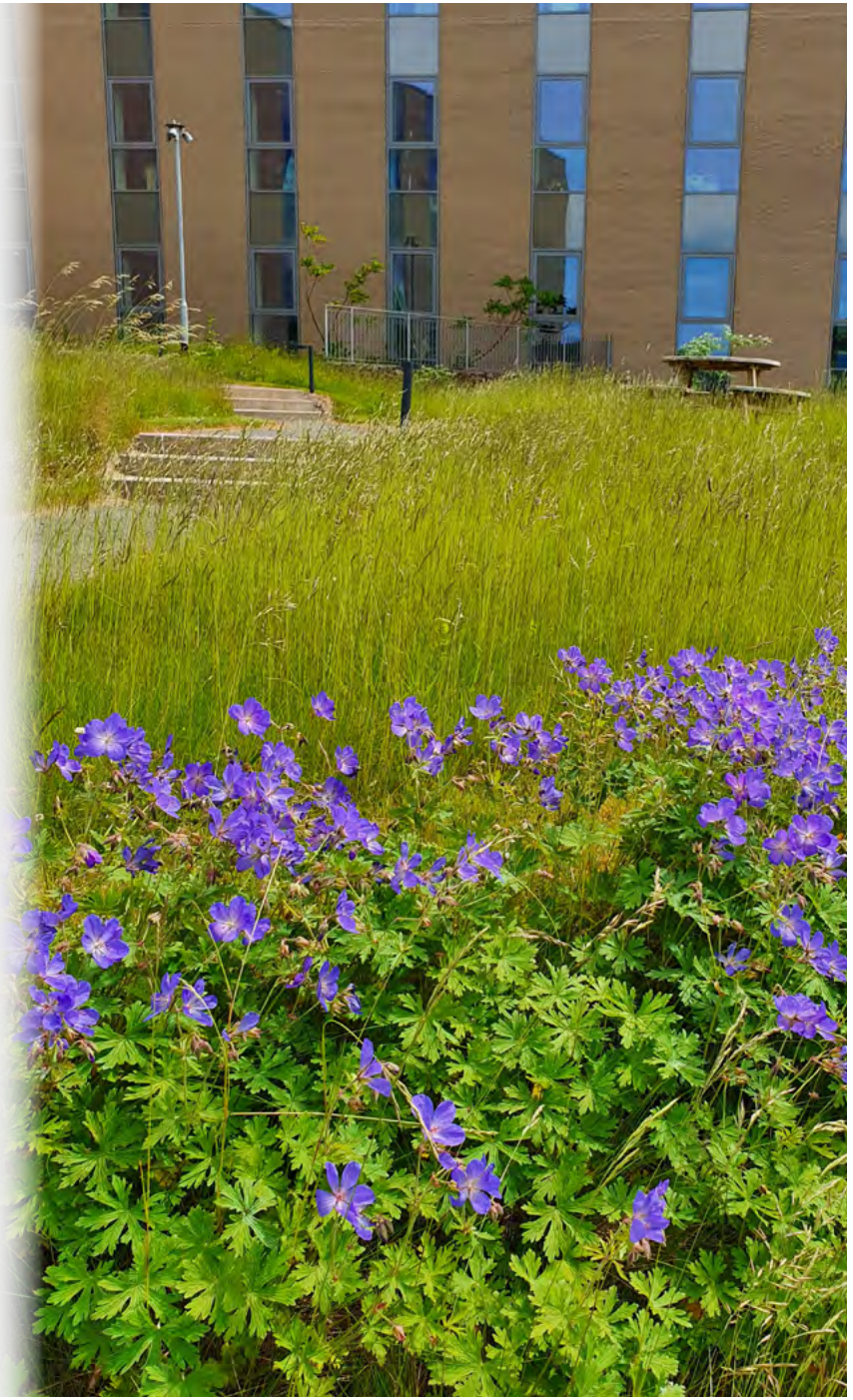
Ornamental planting is prevalent in the core areas of the campus, and in the central gardens. It provides cover for birds and invertebrates, but generally has very limited ecological value. With some change to landscape management and with careful supplemental planting, biodiversity value can be increased.

3.2.7 Built Environment

- Include integral bird and bat boxes in all new buildings on the campus.
- Extend the installation of bird and bat boxes on existing buildings.
- Consider green-roofs for new building projects. Varied types of roof vegetation should be used, rather than simply sedum mat. 'Blue roofs' that retain rainwater as part of SuDS should also be considered, and offer different vegetation opportunities.
- Consider green walls for suitable building elevations. Either planted green façade systems or climbing wire/trellis.
- Swift ledges and eaves for martin nest building should be provided on suitable elevations away from entrance doors; the latter are especially pertinent to elevations that face ponds.
- Install bee hotels on ancillary structures such as bin stores and fences
- Lighting to be narrowly focused on routes for people, rather than lighting landscape areas per se. Artificial lighting adversely affects nocturnal species, especially invertebrates.

As the University expands through new building projects it is important that existing buildings and any new buildings incorporate ecological measures to attract wildlife, reduce energy consumption and enhance microclimate.

For new development, such measures require early consideration by Architects and University Project teams, rather than following as a bolt-on feature, to ensure design integrity. These elements can be particularly helpful towards BREEAM assessment.



The loss of veteran trees must be avoided in all but exceptional circumstances; site planning of proposed development must treat these trees and their rooting zone as significant assets and constraints. Landscape proposals for the campus must reinforce the habitat network; where areas of habitat removal are unavoidable, compensatory habitat creation and management must be achieved. Plant selection should aim to create diverse vegetation structure that has high pollinator value, and provides edible fruit for wildlife. The planting of monocultural non-native 'ground-cover' lacking fruit or pollinator value must be avoided.

3.3 Species objectives

The habitat objectives described above will benefit a diverse range of species. Some species are worthy of special consideration due to their specific requirements that might not be met by general habitat improvements.

Badgers.

Sett locations will be documented, protected and monitored to record activity levels.

Birds.

Habitat management to benefit local priority species. Grounds staff will be made aware of the vulnerabilities of nesting birds to activities such as hedge trimming and grass-cutting; this will inform the timing of such operations.

Bats.

Roost sites will be documented, protected and monitored to record activity levels.

Newts.

Hibernacula will be provided in key locations close to wetland habitat.

4 Biodiversity actions

4.1 Implementation schemes

Avenue tree planting

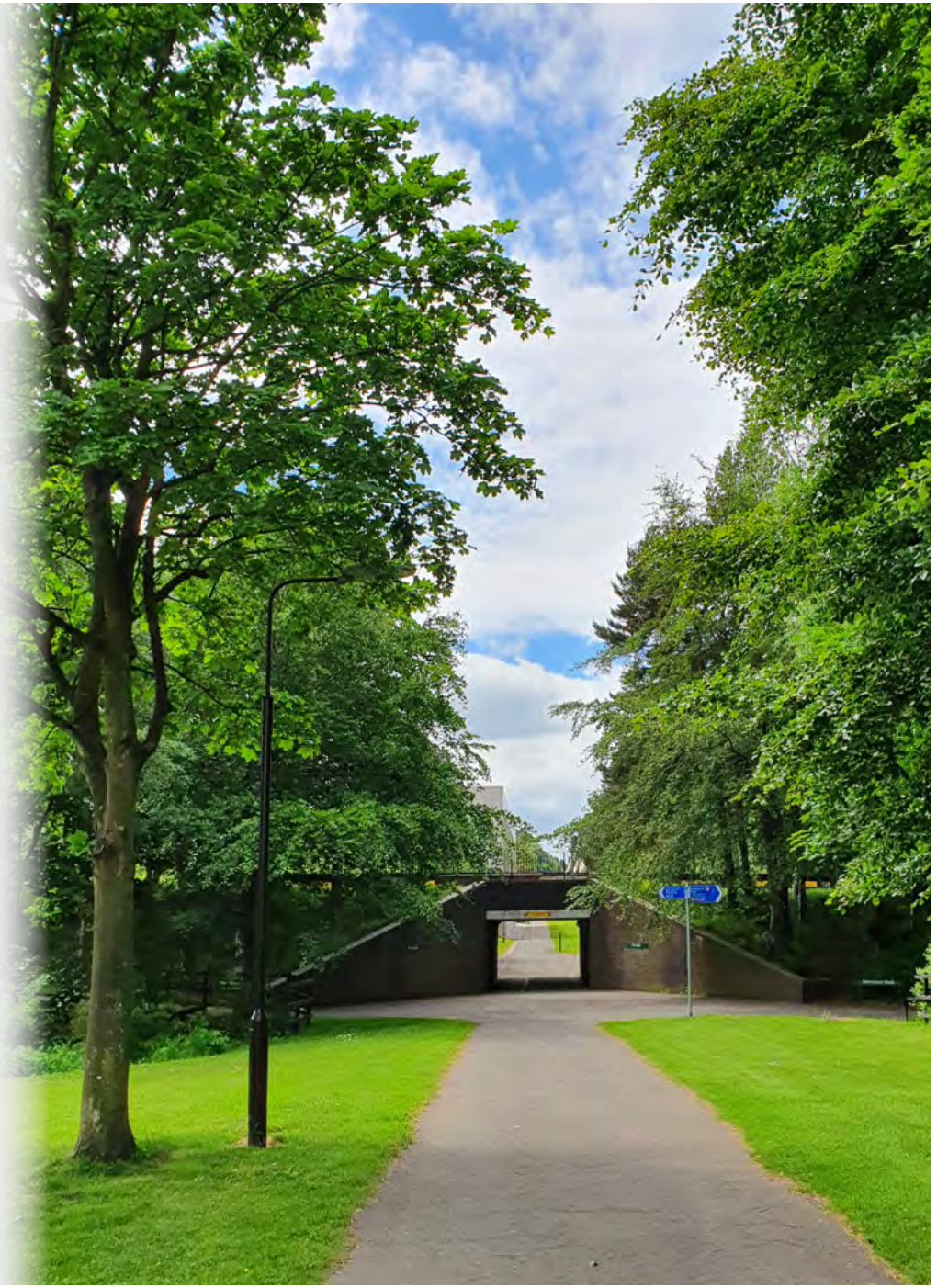
Plant avenue lime trees along the principal roads. These will grow into the large mature trees of the future, replacing those existing as they decline. Lime trees support a large biomass of aphids, which are food for other invertebrate and bird species. Their blossom is an important nectar source for insects, especially bees.

Interplanting of woodland to improve age, canopy structure and species diversity

In conjunction with selective thinning (described in management operations below), existing woodland belts should be interplanted with native understorey and ground flora species including hazel, holly, guelder rose and honeysuckle.
Where single species stands of conifers or pioneer species occur, interplant with oak and beech for long-term species balance.

Planting of woodland floor herbaceous plants

The woodland belts planted in the 1960/70s in general have sparse ground flora. Planting of native woodland species including bluebell, snowdrop, celandine, wood anemone and wild garlic should be undertaken selectively, following any thinning operations, to establish greater diversity. If species are transplanted by division from established populations on campus, care must be taken to avoid damage and to prevent the spread of non-native species (for example, the hybrid or Spanish bluebell).



Bird and bat boxes

Continue to install a range of different types on mature trees and on ancillary buildings/ structures. This should be a constant programme of increasing numbers and replacing boxes as they deteriorate.

Insect roosts ('bug hotels')

Create dry, sheltered nesting and hibernation niches in suitable locations against structures or freestanding. Include information for people to understand what their purpose is.

Replanting of ornamental shrub beds – main campus

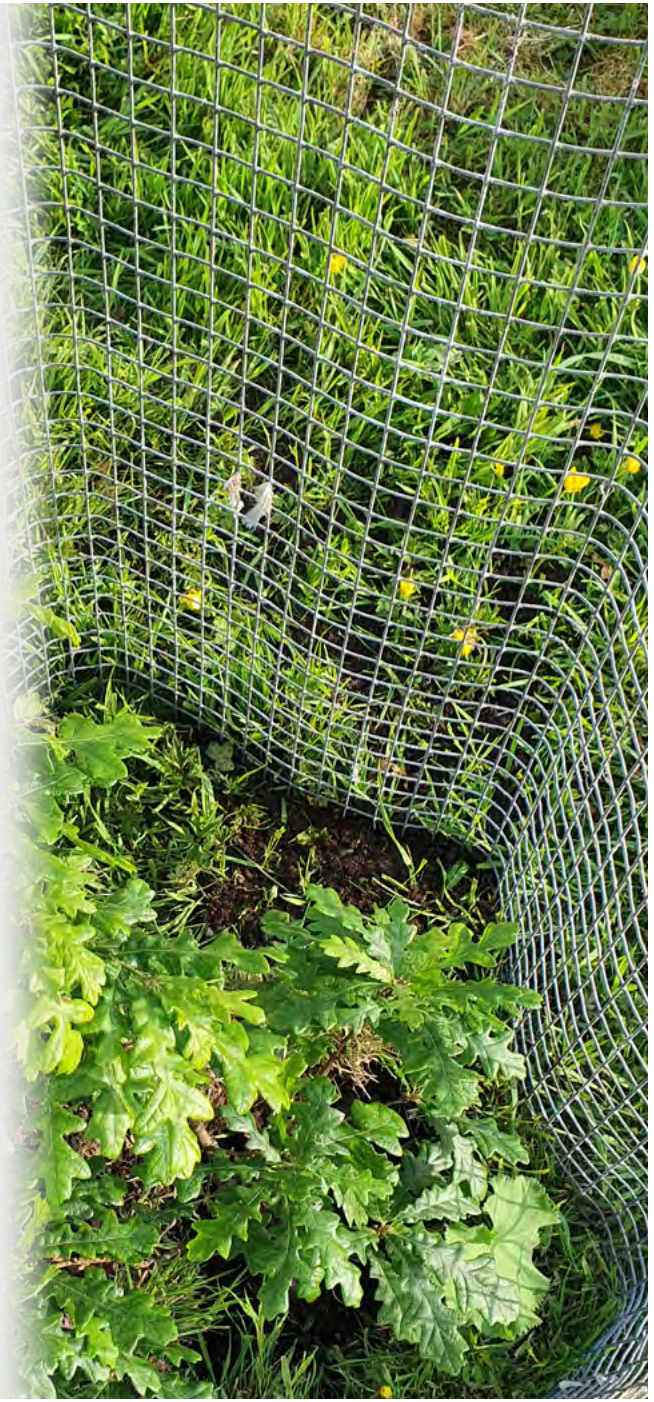
Remove or cut back to base single-species areas of mature ornamental woody shrubs which have become dull and too large. Replant with herbaceous and woody perennial species offering foliage, fruit, pollinator-friendly blossom and varied stature.

Replanting of ornamental shrub beds – research park extension

These plant beds are rather isolated and would be improved by replacement of dense ornamental planting with native woodland and hedgerow species, so that they form linear scrub habitat – a valuable biodiversity network resource. Hawthorn, hazel, guelder rose, blackthorn, dogwood, briar, bird cherry, crab apple and holly would replace the ornamental species; all of these native species respond to periodic coppicing, so that a varied structure can be achieved. They would provide a range of fruit/nut and blossom for birds, invertebrates and mammals.

Native bulb planting of low maintenance grassland areas

Bulb planting can be readily achieved in a piecemeal fashion, provided areas are marked on the landscape management plans and made known to maintenance operatives. Best associated with parkland trees where shading inhibits the vigour of grasses and relaxation of mowing is desirable. Bluebells, snowdrops and wild daffodil.



4.2 Landscape management for biodiversity

Meadows from amenity grassland

Progressively reduce mowing frequency and uplift arisings to gradually lower soil fertility, ending with 2 cuts per year – a hay cut in September and an aftermath cut in October to leave the area tidy through the winter. Arisings should be gathered and removed. It is helpful to maintain a mown margin so that the sometimes untidy appearance is tempered and appears designed rather than neglected. Mowing prevents the dominance of robust competitive grasses, forbs and the establishment of shrubs and trees. In order to encourage floral diversity, fertility should be lowered through removing the cut crop as hay; this is also required due to the volume of cut grass which if left would lead to uneven growth of grass and create bare patches and consequent weeds where clumps lie.

Cutting frequency : minimum 1 cut per growing season; a second 'aftermath' cut can be taken in October to leave a tidy appearance over winter.

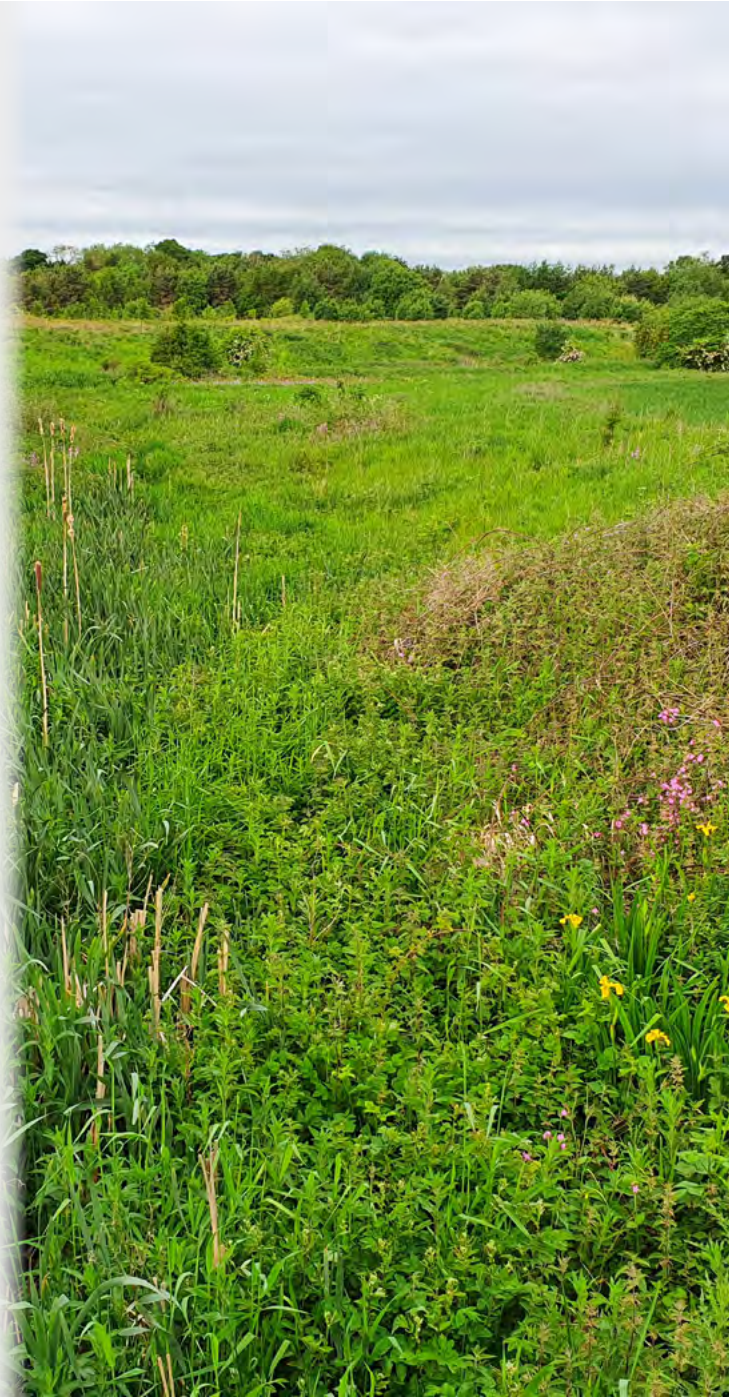
Cutting timing : late July-early August. Occasionally (i.e. 1 year in 5), the time of cut should be moved back to early September, in order to permit later flowering perennial species to set seed and thus maintain their population in the sward. Remove clippings to reduce fertility. No scarifying, aeration or moss treatment; herbicide spot treatment or hand weeding only of unwanted species.

Increase wet meadow margins

Expand wetland marginal habitat into adjacent meadow grassland. This requires a broader area to be taken completely out of mowing; follow the pattern of microtopography, with wetter habitat left in the valley and ditch features.

Meadow enrichment

Enrich the diversity of selected meadow areas through preparation (scarifying to open germination niches) and overseeding with native wildflowers.



Successional specimen tree planting including of heritage trees

Undertake progressive incremental planting of native and non-native specimen trees to form long-term replacements for the mature trees. In open areas these will be native deciduous species (oak, beech and lime) whilst in woodland and garden settings a much greater range of native and exotic species is appropriate - such as Douglas fir, southern beech and giant redwood, whose cones/seeds provide food for birds.

Woodland management of mature policies

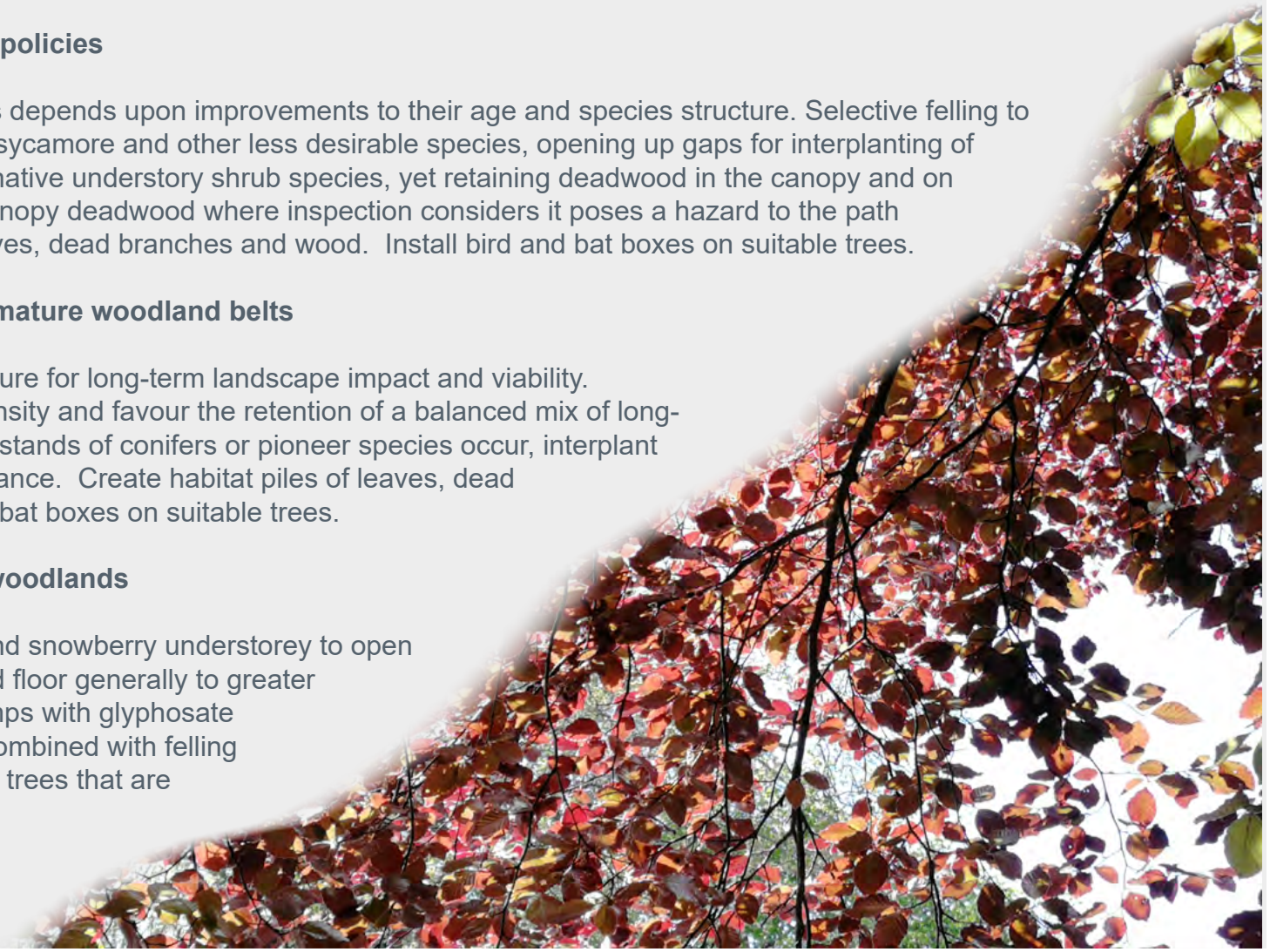
Long-term health of these woodlands depends upon improvements to their age and species structure. Selective felling to reduce the frequency and density of sycamore and other less desirable species, opening up gaps for interplanting of native woodland trees together with native understory shrub species, yet retaining deadwood in the canopy and on the woodland floor (only removing canopy deadwood where inspection considers it poses a hazard to the path network). Create habitat piles of leaves, dead branches and wood. Install bird and bat boxes on suitable trees.

Woodland management of young mature woodland belts

Improving the age and species structure for long-term landscape impact and viability. Selective thinning to reduce stem density and favour the retention of a balanced mix of long-lived species. Where single species stands of conifers or pioneer species occur, interplant with oak and beech for long-term balance. Create habitat piles of leaves, dead branches and wood. Install bird and bat boxes on suitable trees.

Understorey clearance in central woodlands

Clearance of rhododendron, laurel and snowberry understorey to open up woodland paths and the woodland floor generally to greater daylight and intervisibility. Treat stumps with glyphosate herbicide gel to prevent regrowth. Combined with felling of young mature self-sown sycamore trees that are crowding the heritage plantings.



Veteran tree protective measures

Intensive management of veteran trees to improve health and prolong life expectancy. Control of activities and removal of competing vegetation cover within the root protection area; decompaction of soil; targeted feeding. Deadwood, fungi, decay and sap run are fundamental to the veteran tree habitat. Never remove dead branches or trees unless absolutely necessary for health and safety reasons. If timber must be removed, leave it lying as near to the tree as possible.
Manage the surrounding land to reduce damage to root systems. Do not tarmac around the tree and relocate footpaths to reduce soil compaction. Reduce nearby use of agricultural and horticultural chemicals.

Planting of hedges around open car parks

New car parks at the south-east and north-west should be planted up with mixed native hedgerows in the manner successfully done elsewhere on campus, to provide visual order and better integration. Hedge species to be beech, hornbeam, field maple, guelder rose and hawthorn; the latter 2 species are additional to the existing mix, in order to provide greater berry and pollen resources.

Veteran trees

Protect the roots from excavation, compaction or changes in soil level. Manage public access to reduce the need to fell branches.

Meadow enrichment

Greater floristic diversity can be encouraged by sowing of suitable native wildflower species into grassland areas managed as meadow. This operation should be undertaken in autumn:

1. Cut the meadow sward to maximum 50mm height, and remove arisings

2. Harrow or rake the surface to expose bare soil amongst the sward

3. Sow wildflower seed at a rate up to 1g/m2. The seed must include yellow rattle, which will help reduce competitive grass growth, and can include other suitable annual, biennial and perennial species – such as poppy, corn marigold, devils bit scabious, eyebright and sweet vernal grass.

Pictorial Meadow

Colourful mixed floral meadow established from seed, with a long flowering period and many highlights, which are also beneficial sources of nectar. A mix consisting of perennials and viable annuals and biennials will be most appropriate, to avoid the need for annual reseeding.
Total weed-kill by herbicide or surface screefing, and apply a mulch of compost before seeding. Spot weed during germination and establishment period.
Cut back top growth following frost kill and natural seed drop.

Planted garden areas

Such areas should be kept to a limited extent as they place high demands on the maintenance team and are of limited biodiversity value.
Leave perennials standing through winter until spring to provide habitat and food source through the winter.

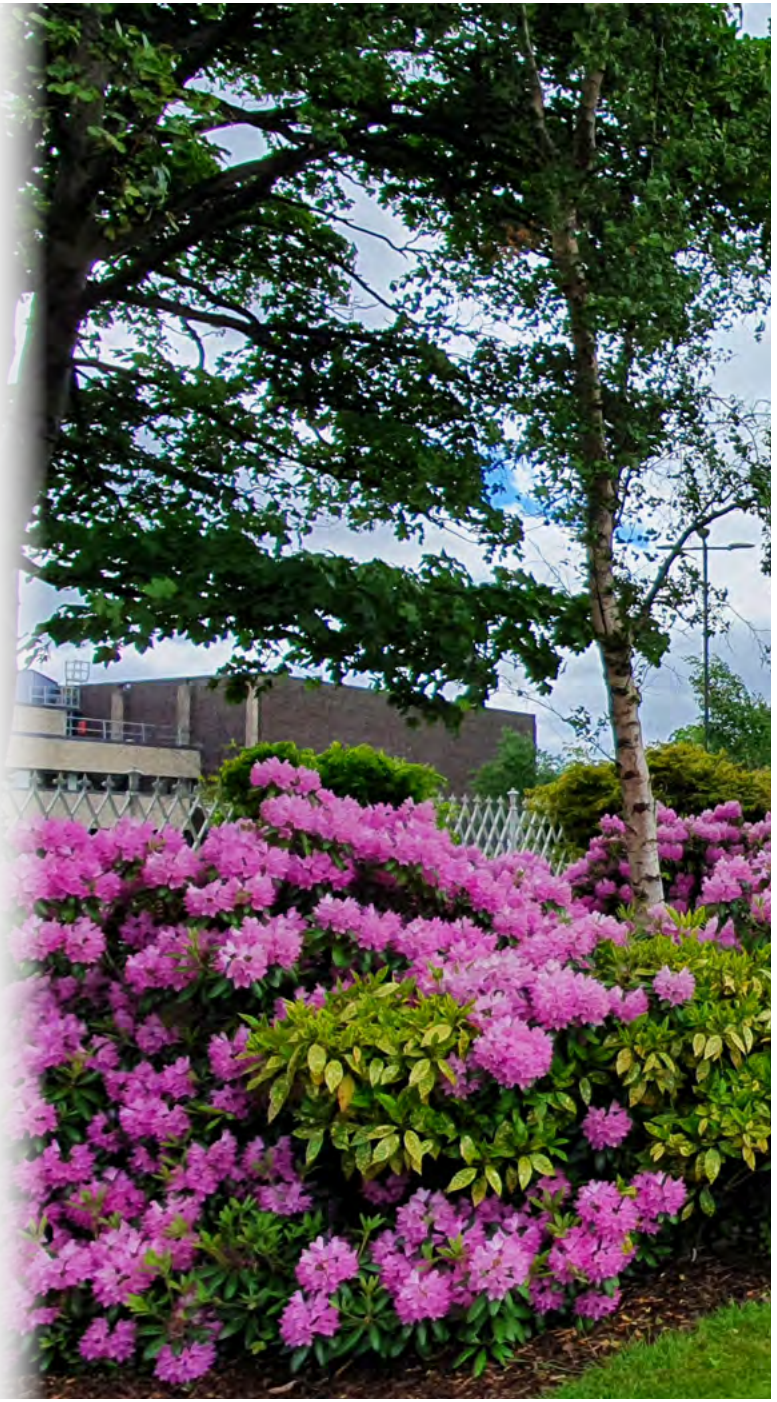
Provide diverse layered structure to the vegetation, with low, medium and tall plants and allowing some shrubs to grow to maturity undisturbed.

Take the opportunity to raise awareness and make a feature of low intervention areas by installing interpretation signs explaining what you have done. Encourage natural predators like ladybirds, hover flies and lacewings, by using suitable food plants for adults and/or larvae and by providing hibernation habitats. Diversify planting to discourage pests and diseases.

Lochans and swales

Practice low intervention horticulture. Not all areas need to be perfectly manicured and ‘tidy’
Leave perennials standing until spring to provide structure, habitat and food sources through the winter. Adopt a reduced mowing regime in grass swales; consider leaving them unsown (although they should still be cut at least every second year to prevent establishment of woody vegetation).

Take the opportunity to raise awareness and make a feature of low intervention areas by installing interpretation signs explaining what you have done.



Hedges

Encourage dense growth by annual cutting of top and faces.
Leave an unmanaged strip next to hedges in grass areas. This will allow the development of flowering plants and grasses and provide a good habitat for invertebrates. Mow once a year towards the end of the growth season and remove the cuttings.
Do not weed out vegetation from the base of established hedges;
Allow leaves to build up to add further to the habitat.

Chemical use - Herbicide, pesticide, fungicide, algicide and inorganic fertiliser

The use of horticultural chemicals should be minimised. Composted bark/ woodchip mulch generated from landscape management operations should be used where weed control is required, in conjunction with hand-weeding. Integrated Pest Management using biological control should be used where available; increasing biodiversity, especially of invertebrates, will have the effect of increasing natural predation of pest species. Installing bird boxes and bug hotels, as well as suitable companion plants (e.g. Tansy, nasturtium, rosemary), will boost natural pest control.

Inorganic fertilizer should be minimized in usage. The only part of the campus where high fertility is desirable is the sports fields; here the option to use organic alternatives to conventional inorganic fertilizer granules should be investigated – products such as poultry pellets or organic liquid feed. Maintaining a healthy soil with good drainage will help to provide for healthy grass growth without need of large nutrient inputs.

Encourage Sustainable sourcing of materials

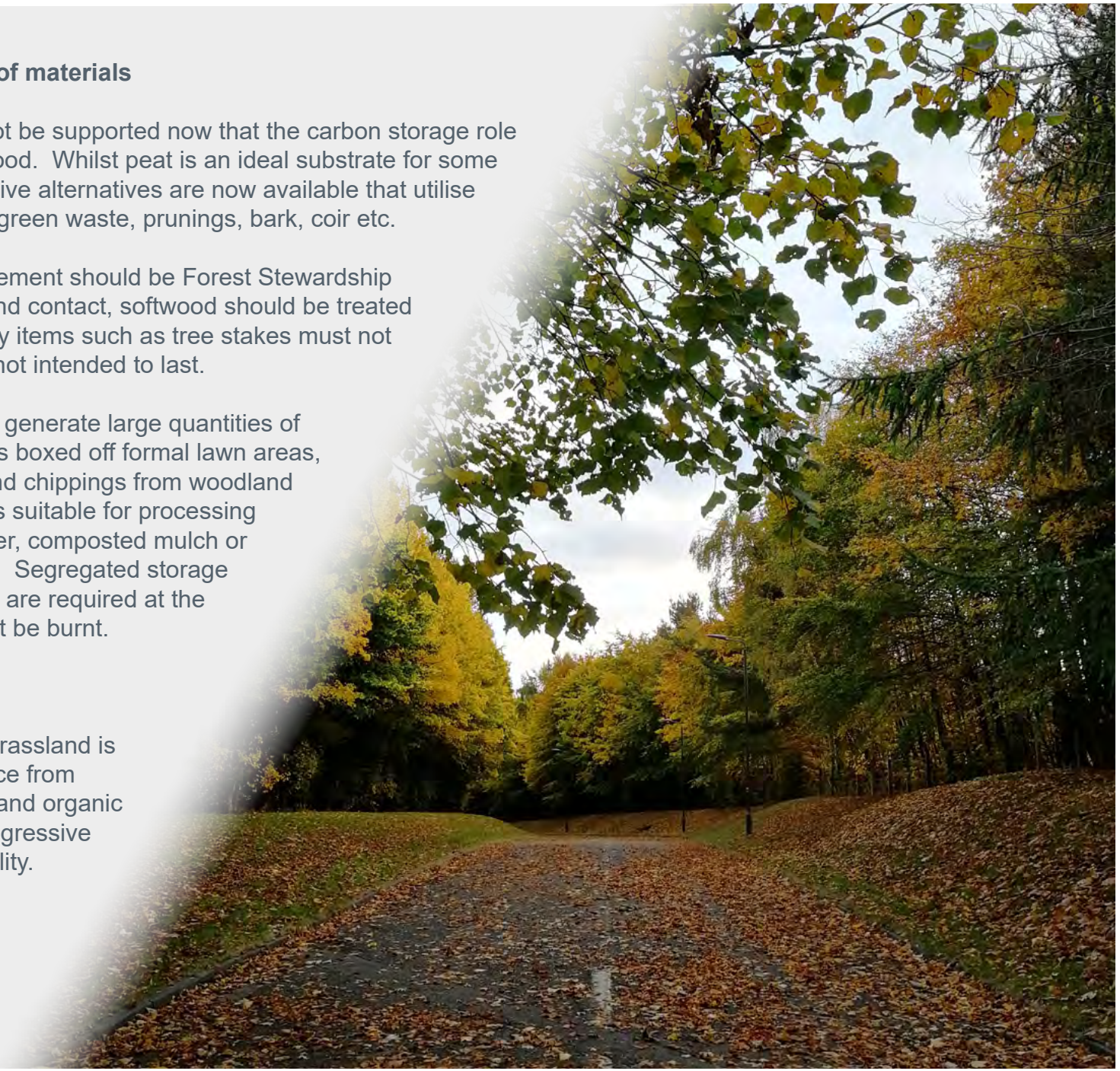
The use of peat in horticulture cannot be supported now that the carbon storage role of peatlands is more widely understood. Whilst peat is an ideal substrate for some propagation activities, suitably effective alternatives are now available that utilise composted waste products such as green waste, prunings, bark, coir etc.

All timber used in landscape management should be Forest Stewardship Council (FSC) certified. For in-ground contact, softwood should be treated to BS 8417: Use Class 4. Temporary items such as tree stakes must not be preservative treated as they are not intended to last.

Landscape management operations generate large quantities of green waste, including grass cuttings boxed off formal lawn areas, prunings from shrub beds, weeds and chippings from woodland management works. This material is suitable for processing to create either compost soil improver, composted mulch or chippings for informal path surfaces. Segregated storage piles, chipper and composting areas are required at the landscape base. Material should not be burnt.

Leaf sweeping

Clearance of leaves from meadow grassland is not required. Seasonal leaf clearance from ponds is important to avoid nutrient and organic matter loading which can lead to progressive deterioration in water depth and quality.



4.3 Influencing behaviour: health and wellbeing

A pleasant and biodiverse campus environment can contribute to the quality of physical and mental health of those who live and work on it; studies have established direct positive benefits. By making the greenspaces pleasant and engaging to people, they can encourage the proportion of active travel to work and act as a relief from stressful work, studies or personal situations. Greater biodiversity often increases visual interest and complexity; we find such habitats more interesting and diverting, and derive pleasure from knowing that they are inherently valuable for ecology.

4.4 Promotion and education

Providing information on campus ecology through selective use of signs as well as by a discrete part of the University website will help to derive more education value and serve to influence the attitudes and behavior of students and staff. A greater awareness and knowledge of ecology will help to form more sustainable thinking by all who pass through the University, spreading a positive message of biodiversity.

4.5 Collaboration and community

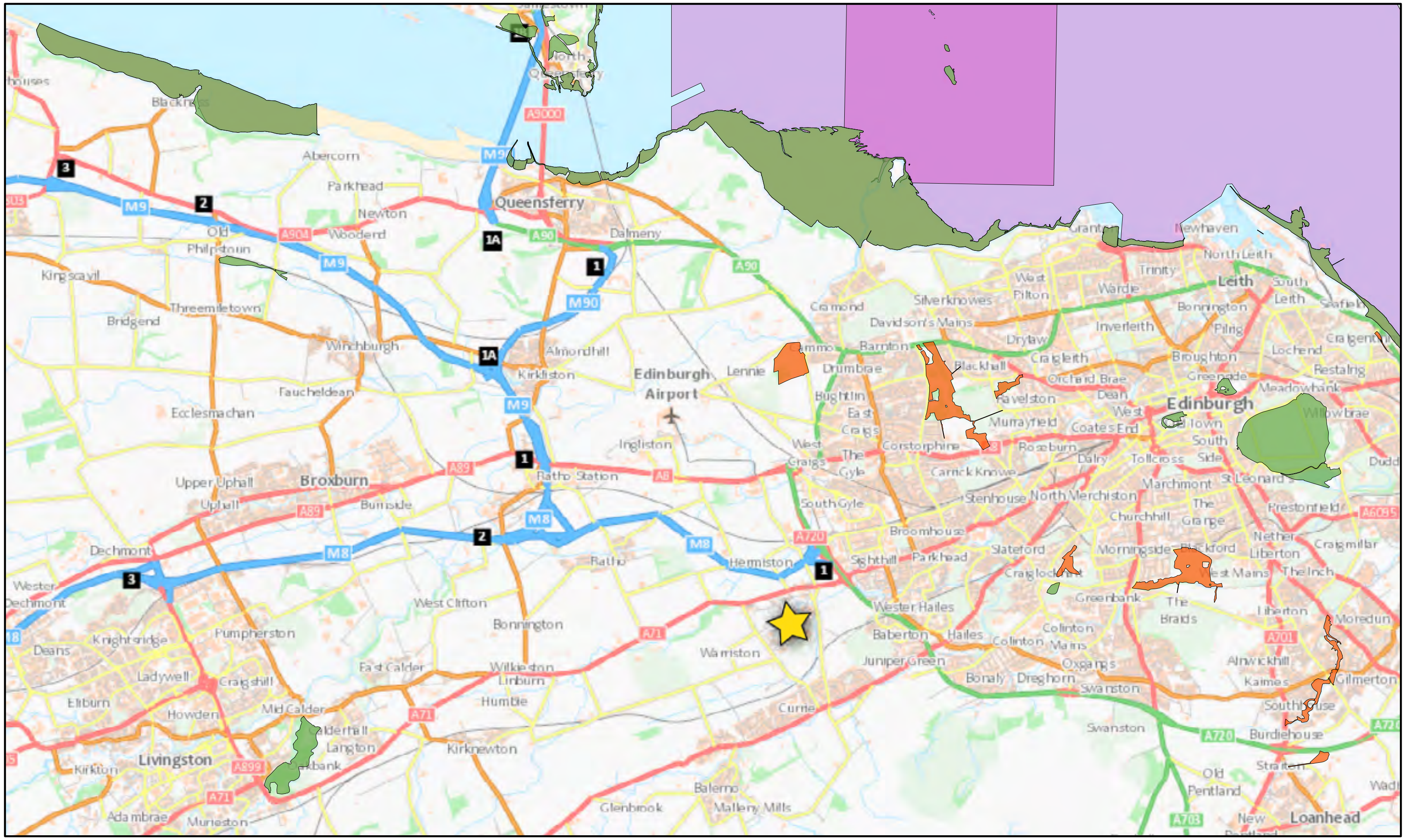
The engagement of campus users and residents in biodiversity initiatives increases the value of these projects and can increase the capacity to deliver biodiversity benefits on campus, in a time of constrained resources. It is recommended that a conservation and sustainability volunteer group be formed, perhaps in partnership with TCV (The Conservation Volunteers) who are active in the area. Opportunities for biodiversity enhancements can be identified to the group, or the group could generate ideas themselves.

The SNH Biodiversity Challenge Fund offers funding for “ambitious ideas to improve habitats, safeguard species and encourage increased access to nature”. For larger scale proposals, particularly when these could form part of a wider habitat network extending beyond the campus boundaries, early discussion with SNH would be welcomed.

4.6 Governance and review

Delivery of the Biodiversity Action Plan will be co-ordinated by Estates & Facilities Services, with reporting to the University’s Infrastructure Committee. Objectives and targets will be reviewed annually, while full review of the BAP will be held at 5 yearly intervals in order to maintain currency of the proposals within it, to update objectives and KPIs.

Appendix



Sites of Special Scientific Interest (SSSIs)	
Local Nature Reserves	
Special Protection Areas (SPAs)	
Heriot Watt University	

Local Protection Areas

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Location Data obtained from NatureScot - Scotland's Nature Agency

2021

Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere

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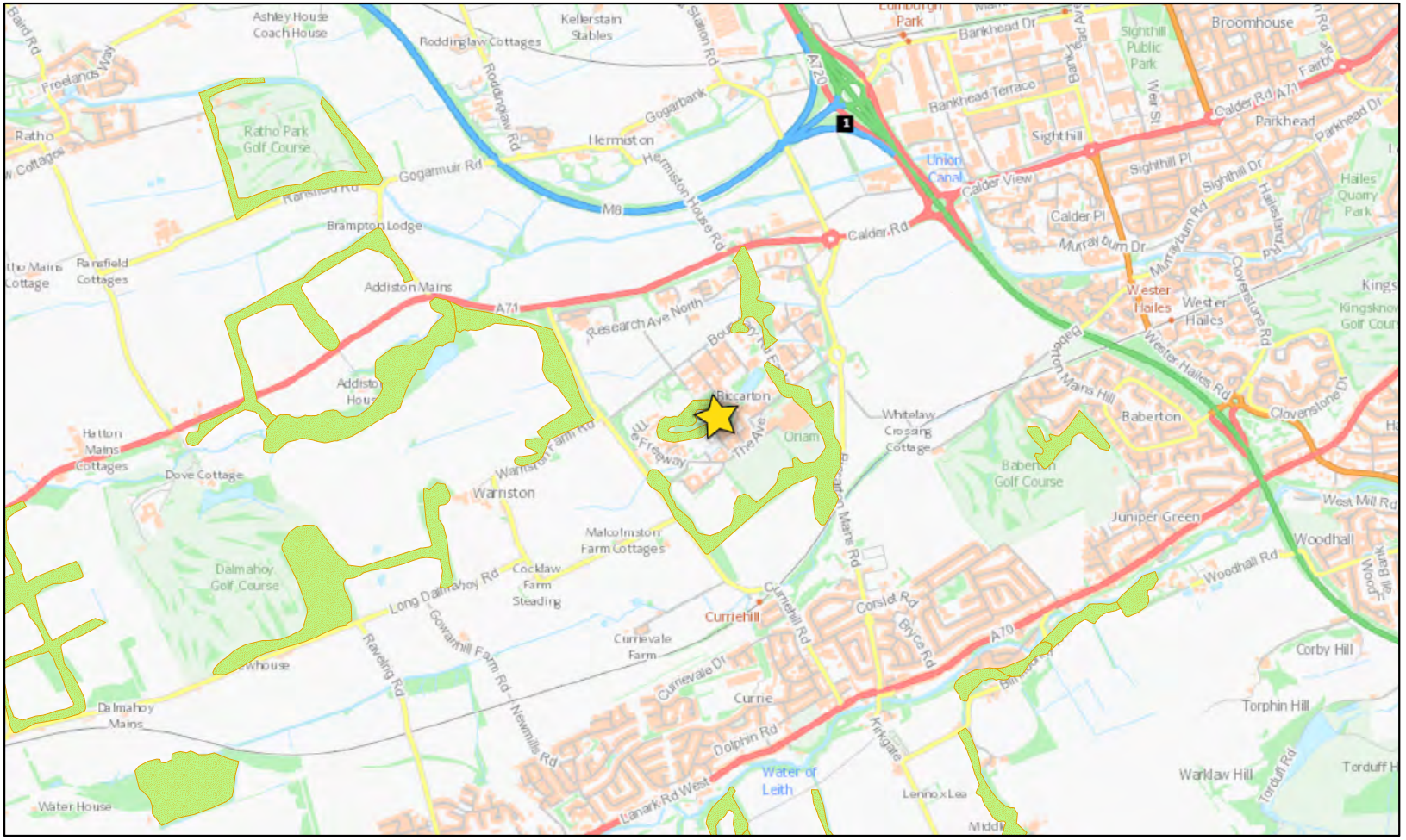
Figure 1


Ancient Woodland Inventory
Heriot Watt University
Ancient Woodland
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Location Data obtained fromSpatialData.gov.scot
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Figure 2