HERIOT WATT UNIVERSITY

Biodiversity Action Plan

2026

Contents

1 Introduction

1.1 A Vision for Biodiversity

Heriot Watt University at Edinburgh occupies a vibrant green campus 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 realise the potential of the University to lead the way into a resilient, sustainable future.

Heriot Watt University benefits from an extensive and mature parkland setting with charm and character that helps provide a calm and safe campus. Trees, woodlands, grassland, water habitats and ornamental gardens all contribute to this environment, especially the mature and veteran trees which form the landscape framework and are host to significant ecological diversity.

Proper management of the landscape requires a clear-sighted view extending years into the future. This Landscape & Biodiversity Management Plan provides a holistic guide to the stewardship of the campus at Riccarton. It gives clear objectives and guidance for ongoing management of the various habitats found on the campus as well as measures to enhance them, create new habitats, and interventions that will benefit individual species of wildlife.

1.2 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 us.[1]

1.3 The need for action

Why should the University take action on biodiversity?

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 wisely manage biodiversity at the local level, we can contribute to halting and reversing the global decline caused by human impacts; this can increase the resilience of our ecosystem.

As a leading institution for learning and research, Heriot Watt University has the ability, through its example, to influence the behaviour of many individuals and organisations to benefit biodiversity. The phrase “think globally, act locally” contains the essence of this opportunity; the University helps equip new generations to tackle environmental problems whilst demonstrating practical results here on the campus.

The State of Nature Scotland report (State of Nature Partnership; 2023) provides a sobering assessment of the level of biodiversity depletion in this country. Scotland has a Biodiversity Intactness Index (BII) of 45%, which means that species populations have declined to 45% of their presumed pre-modern levels;

[1]Biodiversity on Campus : An EAUC Practical Guide

this is amongst the lowest in the world (comparing with 77% global BII) and is far below the level of 90% necessary to retain a healthy functioning global ecosystem. Since 1994 Scotland has seen a 15% decline in species abundance, from a baseline already seriously impacted by declines in the 18th, 19th and 20th centuries. 11% of species are now classified as threatened with national extinction.[2] Arresting the decline, let alone achieving a reversal, will require commitment at all scales.

1.4 What is a biodiversity action plan?

A biodiversity action plan (BAP) 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 the targets. It should stimulate local working partnerships to these ends and raise awareness of the need for biodiversity conservation and enhancement in the local context.

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.

BAPs exist at different scales :

The Blueprint for Halting and Reversing Biodiversity Loss: The UK's National Biodiversity Strategy and Action Plan for 2030 ('UK NBSAP for 2030') was created as a result of the UN Convention on Biological Diversity adoption of the Global Biodiversity Framework (GBF). It sets out 23 ambitious UK targets that align with the 23 GBF targets. In contrast to the previous National BAP, published in 1994, it does not provide details such as Species Action Plans, Habitat Action Plans or Local Biodiversity Action Plan targets.[3]

The Scottish Biodiversity Strategy to 2045 : Tackling the Nature Emergency in Scotland (Scottish Government; 2024)[4] sets out an ambition for Scotland to be Nature Positive by 2030 and to have restored and regenerated biodiversity across the country by 2045. It promotes the following Vision : "By 2045, Scotland will have restored and regenerated biodiversity across our land, freshwater and seas. Our natural environment, our habitats, ecosystems and species, will be diverse, thriving, resilient and adapting to climate change. Regenerated biodiversity will drive a sustainable economy and support thriving communities, and people will play their part in the stewardship of nature for future generations."

The Scottish Biodiversity Delivery Plan 2024-2030 (Scottish Government; 2024)[5] draws out priority actions needed to achieve the 2030 aim of a Nature Positive Scotland. These actions are essential to ensure we are on the right trajectory to restore nature at pace and scale. In this Delivery Plan priority actions are described under the six objectives set out in the strategy. These objectives are aligned to, and consider, the drivers of biodiversity loss within the Scottish context:

1. Accelerate ecosystem restoration and regeneration
2. Protect nature on land and at sea, across and beyond protected areas
3. Embed Nature Positive farming, fishing and forestry
4. Protect and support the recovery of vulnerable and important species and habitats
5. Invest in nature
6. Take action on the indirect drivers of biodiversity loss

The Edinburgh Biodiversity Action Plan 2022-2027 (City of Edinburgh Council; 2022)[6] meets the Council's statutory duty under the Nature Conservation (Scotland) Act 2004 for all public bodies to further the conservation of biodiversity. The Council has signed the Edinburgh Declaration which

[2] https://stateofnature.org.uk/wp-content/uploads/2023/09/TP26056-SoN-Scotland-summary-report-v5-1.pdf
[3] https://uk.chm-cbd.net/sites/gb/files/2025-04/31.03.2025_UK_National_Biodiversity_Strategy_and_Action_Plan.pdf
[4] https://www.gov.scot/publications/scottish-biodiversity-strategy-2045/
[5] https://www.gov.scot/publications/scottish-biodiversity-delivery-plan-20242030/documents/
[6] https://www.edinburgh.gov.uk/downloads/file/33491/edinburgh-biodiversity-action-plan-2022-2027

recognizes the essential role of local and regional governments in delivering biodiversity outcomes to help meet global targets. It has a Vision for Edinburgh as "The Natural Capital of Scotland – A Nature Positive City enabling people to engage with nature". The Edinburgh BAP lists a total of 8 Priority Habitats and 74 species action plans.

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.

1.5 Who owns it?

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 expertise and resources. The action plan will be monitored annually, and subject to full review every 5 years.

1.6 Relationship to other University policies

The University Strategy 2025[7] 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 (SDGs). 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 Global Environmental Sustainability Policy 2025[8] 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.

[7] https://strategy2025.hw.ac.uk/wp-content/uploads/2019/06/Strategy_2025.pdf

[8] https://www.hw.ac.uk/document-library/policy/global-environmental-sustainability-policy.pdf

- 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 has produced a Statement on Biodiversity and Conservation which states 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 Environmental Association for Universities and Colleges (EAUC) has produced a Biodiversity Guide for the conservation, maintenance and enhancement of biodiversity.

1.7 Authors

This report has been jointly produced by RaeburnFarquharBowen 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:

- NatureScot SiteLink (NatureScot, 2025);
- Scotland's Environment Web Map; (Scottish Government, 2025);
- National Biodiversity Network (NBN) Atlas (NBN, 2025);
- City of Edinburgh Local Biodiversity Action Plan 2022-2027 (LBAP) (City of Edinburgh Council, 2026);
- Old and New Towns of Edinburgh World Heritage Site Management Plan (City of Edinburgh Council, 2024);
- Scottish Biodiversity List (SBL) (Scottish Government, 2025);
- Direct Ecology Ltd previous records from surveys undertaken in 2019;
- Site Staff/Groundsmen.

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 on Figure 2.

There are three Local Nature Reserves (LNR) within 5 km of the proposed development site. 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 on Figure 2.

Three areas of woodland within the University boundary are listed on the Ancient Woodland Inventory; a further fourteen lie within 2 km of the site, the closest of which is situated approximately 50m to the west of the site. Forty blocks of woodland on the Native Woodland Survey of Scotland were identified within 2km of the site, one of which was inside the site on the western boundary, and a further two were adjacent, these will be considered further in the assessment. In addition, seven blocks designated with a Tree Protection Order (TPO) were noted within 2km of the site, but the closest was approximately 1km away. These are shown on Figure 3.

2.2 UK Habitat Classification

2.2.1 Survey description and findings

A UKHAB survey was undertaken in October 2025. The habitat survey area comprised the site and the protected species survey included a 30 m buffer, where access was available. Survey for protected species was not undertaken in unsuitable habitat. Notable site features were recorded as target notes, using a handheld GPS device.

The site was mapped using the UK Habitat Classification (UKHab). The most recent version of the UKHab guidance1 was used with plants and their frequency of occurrence recorded using the subjective DAFOR scale (dominant, abundant, frequent, occasional, or rare). Any invasive and invasive non-native

plant species covered by the Wildlife and Natural Environments (Scotland) Act 2011 (WANE) were noted, although a specific survey for these was not undertaken. Target notes of notable plant species were made.

The UKHab habitats recorded on site are summarised below in the order found within the *UK Habitat Classification Documentation Version 2.0* (UKHab, 2023), not in order of ecological value :

- Other neutral grassland (g3c) + 10 + 14 + 32 + 201 + 524
- Modified grassland (g4) + 108 + 524
- Other woodland; mixed (w1h) + 204 + 524
- Native hedgerow (h2a)
- Non-native and ornamental hedgerow (h2b)
- Aquatic marginal vegetation (f2d) + 10 + 32
- Arable and horticulture (c1)
- Buildings (u1b5)
- Other developed land (u1b6)
- Suburban mosaic of developed and natural surface (u1d) + 32 + 524 + 847
- Other standing waters (r1g) + 42 + 46 + 500
- Other rivers and streams (r2b)

Refer to *Figure 2 – Ecological Survey Plan* in the appendix.

2.3 Protected species walkover survey and NBN Atlas records

A walkover survey for evidence of protected species was undertaken, focusing on species that are likely to be present in the area. Walkover field surveys identified the presence of, and the suitability of habitats to support, protected species within the site and up to 30m beyond the site boundary, where accessible. The following protected species were surveyed :

2.3.1 Badger.

No records of badger *Meles meles* were obtained from the NBN Atlas search within 2km of the site. However, during the 2019 survey, a main badger sett and annex were discovered in the woodland to the northwest of the site and evidence of badger foraging was present across the campus. During surveys of the woodland in the south-west in 2023 mammal paths thought to be used by badger were recorded.

Multiple disused badger setts were recorded across the site; none showed signs of recent activity, though occasional use cannot be ruled out. Fresh evidence of badger presence was noted in the southern part of the site, where latrines, mammal paths, badger claw marks and signs of foraging were recorded. The findings indicate sporadic badger presence, with occasional latrine use and foraging, but no evidence of sustained occupation of setts. This marks a shift since 2019, when a confirmed active sett and widespread foraging was evident. The site continues to provide suitable habitat, but there is no indication of sustained sett use by a resident social group.

2.3.2 Otter.

No records of otter were obtained from the NBN Atlas search within 2km of the site. However, during the 2019 survey, spraints, prints, a confirmed resting site, and several potential resting sites were recorded along the water courses across the northern and eastern side of the site.

Evidence of otter activity was concentrated along the northern part of the site, where potential resting sites and several spraints were found, as well as a potential holt amongst roots of a yew tree. Spraints were also noted on rocks within the burn in the northeast of the campus as well as beneath a road bridge on the burn just east of the loch. Otter were found to be using all the small waterways on the north side of the campus, as well as the Murray Burn along the eastern boundary. Since 2019 recorded activity has shifted from widespread use of the Murray Burn and connected watercourses to a more localised concentration in the northern part of the

campus. Spraints, resting sites, and paths confirm continued use, though overall distribution appears narrower, although this may have been a seasonal difference.

2.3.3 Water vole.

Although no records of water vole *Arvicola amphibius* were obtained from within 2km of the site, the absence of records should not be taken to mean that this species is not present in the search area. The closest record is approximately 3.5km to south east.

Several ditches with slower-flowing water and lush vegetated margins are present on the site, offering suitable habitat features for water vole. However, no signs of water vole were present during the field survey. In the past mink has been recorded, indicating a negative influence on any water vole population.

2.3.4 Red squirrel.

No records of red squirrels were obtained from within 2km of the site. Only grey squirrels were recorded during the 2019 survey. The absence of local records should not be taken as confirmation that the species is entirely absent, particularly as the Saving Scotland's Red Squirrel database reports sightings within Edinburgh city centre in 2024

Areas of mixed woodland within the site are considered suitable for red squirrel, as they support cone-bearing coniferous trees such as Scots pine, as well as small-seeded deciduous trees including birch and ash, which could provide a potential food source. Evidence of squirrel activity (dreys, feeding signs, and scratch marks) was recorded in both the southeast and southwest of the site. Although the woodland habitat is suitable for red squirrel, the activity recorded is likely attributable to grey squirrel, as this species was observed across the site during the survey; grey squirrel are likely excluding red squirrels from establishing.

2.3.5 Reptiles & amphibians (*Herpetofauna*)

No records of reptiles or amphibians were obtained from within 2km of the site. The absence of records should not be taken to mean that this species is not present in the search area. The desk study from 2019 found the nearest record for great crested newts approximately 5km west of the site.

Potential herpetofauna habitat is present in several areas of the site. Stone walling offers potential hibernacula opportunities, whilst ponds and slower-flowing ditches across the campus offer breeding habitat as well as refuge and overwintering sites for both amphibians and reptiles. The ponds are likely to support populations of common toad, common frog and palmate newts. The varied vegetation structure across the campus, including pools and wet ditches, provides suitable areas for great crested newt, although they are surrounded with heavily managed grassland and arable land which inhibit natural movement and foraging.

The 2019 HIS assessment showed varied suitability for great crested newts across six waterbodies on the site. Since 2019 the number of ponds has decreased but two of the HIS assessed waterbodies remain: The Loch and the Fire Pond, which are assessed as poor or below average. The Site lies within Geographic Location Zone B, where suitability for great crested newts is considered marginal. Aquatic conditions differed considerably, with The Loch particularly constrained by steep artificial banks, heavy waterfowl use, siltation and the presence of fish. There are no desk study records for great crested newt from the site or close by, and their presence is considered unlikely.

2.3.6 Bat roosts

A comprehensive ground level tree assessment of potential roosting features was not undertaken during the protected species survey. However, incidental trees with bat roost potential (broken limbs, cracks, knotholes, woodpecker holes) were noted when these features were observed. An assessment was made if further features are likely to be present at height. Trees were categorized as per Tables 1b & c in accordance with BCT Guidance for assessing

the suitability of trees for roosting features (Bat Conservation Trust *Bat Surveys for Professional Ecologists: Good Practice Guidelines* Collins, 2023).

2.3.7 Bat activity

In line with Bat Conservation Trust (BCT) guidance a single night-time bat walkover survey was carried out to ascertain the use of the site by foraging and commuting bats, identify the species present on site and to complement the static remote detector deployments. Surveyors started the survey before sunset, were stationed at potential flight lines close to a previously identified roost, and remained in position to count and observe behaviour and make acoustic recordings of commuting and foraging bats for 50 minutes after sunset. Walking of the site did not start until at least 30 minutes after sunset, the exact time being determined by observations during the initial part of the survey. A pre-designated route was designed to cover as much of the area as possible and passed close to areas of high foraging value and linear features that may be utilised by bats for commuting. Acoustic recordings and time-stamped narrative about observations were completed during the transect. Stops or detours were undertaken in response to observations. No night vision aids were used during this transect. Full-spectrum bat detectors with GPS mapping were used to record any calls during the transects. Times, species and number of bats, flight direction, flight height, type of flight, apparent behaviour, appearance, response to landscape features and response to weather conditions were recorded along with any additional observations about their behaviour. The surveys were undertaken under suitable weather conditions (i.e., dry, with little wind and temperatures above 7 °C).

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 bats in buildings and in the many mature trees which include 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 have been hung within the mixed plantation woodland on the northern side of the Loch and close to the Lyell building.

A maternity roost for soprano pipistrelle 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. Intensive activity of Daubenton's bat was recorded over the Loch.

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 observed or likely to use the site include:

- Common pipistrelle *Pipistrellus pipistrellus* and soprano pipistrelle *Pipistrellus pygmaeus* 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.

2.3.8 Birds

No records of birds were obtained from the NBN Atlas search within 2km of the site. A full breeding or wintering bird survey was not undertaken, but all birds seen during the surveys were recorded.

An assessment was made of the suitability of the habitats present on site for birds for nesting and foraging. Many 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.

In this most recent survey, 7 amber list species and 15 green list species were seen; it is likely that most of these species will be breeding on the site:

- Amber list species : black headed gull, dunnock, kestrel, lesser black-backed gull, mallard, moorhen, house martin, and wood pigeon.
- Amber list species : blue tit, buzzard, chaffinch, coot, pigeon, goosander, great tit, Kingfisher, mute swan, pheasant, pied wagtail, robin, swallow, treecreeper, tufted duck.

During the 2019 survey, red-list species identified on site included mistle thrush, yellowhammer, common gull and house martin. House martins were particularly abundant, with numerous active nests observed on buildings in the northern part of the site. During a 2024 survey herring gull (red-list), woodpigeon and wren (amber list), and several green-list species including kingfisher (a schedule 1 species) were observed.

2.3.9 Additional mammal features were recorded. A small den beneath a rotten stump was considered suitable for species such as otter, fox, badger, or pine marten, although no signs confirmed current use. A hole on the bank of the burn considered suitable for fox or otter had no evidence of occupation. Pine martens were not recorded on site during the survey but the Martens on the Move 2025 distribution map confirms their presence in the wider area.

2.4 Summary of ecological value and significance of the campus

The campus estate of Heriot Watt University at Riccarton contains a variety of habitats of local interest. The woodlands include some ancient woodland as well as extensive areas of broadleaved and mixed plantations dating back almost two centuries.

There is a mix of habitats which include built structures, open grassland, parkland trees and freshwater; these provide important habitat and species connectivity, forming a strong element in the local nature network. These established habitats make the site an important place for local biodiversity within the surrounding farmland.

Several of the habitats recorded are of **site value** (neutral grassland, mixed woodland mixed, standing waters, aquatic marginal vegetation and reedbeds). The remaining habitats are of **negligible value**, offering relatively limited habitat resource, species and structural diversity, and being common in the wider landscape. The value of UKHab habitats is given in table 1.

Woodlands and trees are a dominant feature and are important for a variety of bird species. The mature broadleaved and mixed woodlands have significant ecological value for the assemblage of fungal, invertebrate, bird and bat populations that they support. None are of sufficient quality to merit

conservation designation, but they nonetheless are locally significant. The semi-natural woodland habitat is suitable for larger mammal species, providing suitable conditions for foraging and sett building by badger. The estate contains a number of veteran trees that enhance its ecological diversity and character, hosting significant invertebrate and fungal diversity.

The campus is home to common and soprano pipistrelle, brown long-eared and Daubenton's bats. These bats forage over the meadows, edge habitats and freshwater loch; mature trees with folded bark, cavities and branch scars provide roosting opportunities, as do some of the buildings.

Large areas of ground are grassland. Some areas are of a neutral grassland type that includes some diversity in grass and forb species and shows some variation of species content between drier and wetter areas. But there are also large expanses of species-poor improved grassland consisting of vigorous cultivated varieties of grass; such a sward results from the ground having been cultivated, seeded and probably fertilised in the past. Improved grassland ("amenity grass") has low botanical diversity and ecological value.

Since the last biodiversity action plan report in 2019 landscape management has shifted towards a more ecologically sensitive approach. The frequency of grass-cutting has been reduced in some areas, permitting more of the natural characteristics of the sward to show, both in the presence of non-grass species such as common knapweed, yellow rattle, yarrow and selfheal, and in the flowering of grasses and forbs alike. This compares to the regularly mown amenity grass where flowering is restricted to daisy, dandelion and annual meadow grass. Additionally, the grounds team have created pollinator banks of wildflowers by removing turf and seeding with wildflowers. These changes are likely to improve habitat quality and support greater species diversity across the site.

Open water and margin habitats play an important part at Riccarton. Although man-made in origin, the loch and firepond provide ecological hotspots; the diverse range of invertebrates present in large numbers in and around ponds attracts birds, bats, amphibians and mammals. Ponds are a habitat listed in the Edinburgh and Scottish biodiversity action plans.

The presence of invasive ornamental shrub species such as *Rhododendrons*, *Prunus laurocerasus* and *Symphoricarpos* in some of the older woodlands inhibits native woodland understorey and field layer species through dense shading and competition. The extent of colonisation by sycamore also is a cause for concern, leading to reduction in tree canopy diversity, overshading and heavy leaf drop onto other plants; progression towards a monoculture at the expense of other native species will reduce the ecological value of woodland. Since 2019 there has been targeted clearance of invasive shrubs from the central woodland.

Veteran trees are of high ecological value and make a disproportionate contribution to campus biodiversity. Great diversity of fungal and invertebrate species is found on the oldest, most textured and complex canopies; indeed, such diversity only occurs once this degree of maturity is reached and cannot be created through new tree planting. These veteran trees are effectively irreplaceable and must be viewed as a finite asset. Furthermore, the scars and cavities they bear provide roosting sites for bats, which are subject to legal protection; removing or disturbing an active bat roost is a criminal offence, therefore a precautionary approach should always be adopted when considering any works that might affect a veteran tree.

2.5 Landscape Management Practices

2.5.1 Landscape Management overview

The University Landscape Management team implement the Landscape Management Plan through a detailed programme of operations developed by the Landscape Operations Manager, with 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.

The grounds management team is well-equipped with a range of horticultural machinery and tools. Recent adaptations and purchasing has facilitated a change in grassland management; added to the tractor-drawn gang mowers which keep grass clipped short there are now flail and disc mowers suitable for cutting tall grass and wildflowers in late summer. This permits relaxation of the cutting to just a single, or perhaps 2, cuts per season with grasses and forbs flowering and setting seed before they are cut.

Woodland management is undertaken by the grounds team but large or complex tree felling or surgery work is done by contractor. The team are aware of the potential for bat roosts and bird nests in mature trees; inspection is made before any work to mature trees, and tree works are normally done during the winter months when bird nesting is reduced and visibility good.

2.5.2 Progress with biodiversity management

Since the last biodiversity action plan in 2019, landscape management has adopted a more ecologically sensitive approach in several habitats, which are likely to improve habitat quality and support greater species diversity across the site:

I. The frequency of grass-cutting has been reduced in some areas, permitting more of the natural characteristics of the sward to show, both in the presence of non-grass species such as common knapweed, yellow rattle, yarrow and selfheal, and in the flowering of grasses and forbs alike. This compares to the regularly mown amenity grass where flowering is restricted to daisy, dandelion and annual meadow grass.
II. Pollinator banks of native wildflowers have been created by removing turf and seeding the exposed soil with wildflower seed mix.
III. Laurel and Rhododendron stands have been reduced in the central woodland, allowing light to reach the woodland floor and promoting a more natural and diverse woodland flora. This has also improved visibility and daylighting of paths, making them more attractive to all users particularly women.
IV. Selective felling of sycamore trees has been undertaken in the central woodland; together with clearance of storm-damaged trees this will vary the canopy structure and permit more light to reach the canopy

2.6 Pressures on biodiversity

The campus at Riccarton 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, which 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.
- Invasive non-native plant species. As well as the 'big 3' terrestrial plants – Japanese knotweed, giant hogweed and Himalyan balsam – there are a number of aquatic plants and a growing range of other plants that have proven to be fast spreading, dominant and difficult to eradicate from natural habitats. Most of these plants have highly mobile means of spreading, by seed or vegetative fragments, and so a landowner must be ever vigilant to the arrival of them onto their land. Eradication is laborious and costly, in some cases requiring specialist expertise, so control of these species can be a significant drain on resources.
- Plant pests and pathogens. In recent years the disastrous impacts of ash dieback disease and Phytophthora on tree cover in Scotland have thrown light onto the vulnerability to the spread of new pathogens in this era of easy movement of horticultural plant stock. It is expected that a changing climate will allow pest species to extend their range northwards, bringing novel risks to habitats in Scotland.
- Safety concerns affecting tree management. Standing dead wood is a valuable part of the woodland ecosystem, supporting diverse fungi, invertebrates, birds and other animals in a unique range of microhabitats only found in decaying wood. However, in a campus setting with a large population of people using paths that pass beneath the canopies of trees and woodland, the need to keep people safe from falling wood conflicts with the desire for deadwood habitat.
- Light pollution. External lighting significantly impacts insects, bird and mammal species naturally active at night. Artificial lighting influences or disrupts their behaviour and in the case of prey species can increase predation or expenditure of energy to avoid it. There has been a creeping expansion of lighting in the environment, without recognition of the importance of darkness to nature and also to ourselves. Providing a safe and usable campus environment for staff and students requires lighting of the path network, but the extent of this lighting, the level of lighting, type of lamp and hours of operation can all contribute to the degree of adverse impact.
- Litter and pollution. Although a move away from plastic packaging may have reduced the problem, plastic wrappers remain common especially for daytime snack foods and these cause ecological as well as visual impacts – ingestion causes choking and wounding, microplastics have toxic effects, and discarded containers can act as traps. Pollution is most likely arise from rainfall passing over hard surfaces and washing the accumulated oils, debris and chemical residues into adjacent habitats especially watercourses and wetlands. Such diffuse pollution can cause direct toxicity, but is more likely to cause nutrient enrichment (eutrophication) and lead to reduced oxygen levels in freshwater habitat due to the impact of algae, microbes and bacterial decomposition. This lack of dissolved oxygen results in reduction of invertebrate, fish and amphibian diversity.

3 Biodiversity objectives and recommendations

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, so it is more valuable to have contiguous area of a habitat than smaller pieces;
- Connecting areas of habitat together into a network is essential for species conservation. These networks should extend across the campus boundaries. The ability of species to bridge across gaps varies with the habitat type and the nature of the obstacle; for instance, woodland birds are able to move freely across fields between woodlands, but frogs may not be able to transit even a narrow gap between wetlands if the gap is a hostile environment such as buildings or sports fields.
- Bioabundance (number of organisms) is important as well as biodiversity (number of species). For instance, aphids are an important prey for many carnivorous species and some plant species support a large aphid population which is of ecological value.
- Structural diversity in vegetation is important, not just species diversity. Management should aim to create multi-layered vegetation habitat for the range of cover, texture, nesting opportunities, shade and moisture conditions as well as the flowers and fruit.
- Edge habitats and habitat mosaics have relatively high diversity value, although they may lack some of the specialist species found in larger patches of single habitat.
- Native plant species should form the foundation of biodiversity. They support other native species that are adapted to them and contribute to BAP targets.
- Carefully selected non-native species may also support biodiversity but should only be planted in a managed garden setting. No species that is invasive or naturalizes freely should be planted.
- Habitat management needs to be consistent and well-informed. Understand what is there before changing the way it is managed.
- Invasive non-native species are a major threat to habitat function and diversity. Vigilance is required to identify their arrival and prompt action to prevent their further spread.
- Chemical weed & pest control should be avoided where possible. By improving the health of the ecosystem it will be better able to deal with pests. Alternative means of weed control are available; altering expectations of weed control and horticultural tidiness is also part of managing for biodiversity.

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 and recommendations for each habitat

Refer to *Figure 1 – Biodiversity Action Plan Layout* in the appendix.

3.2.1 Grassland

- Extend the area of diverse neutral grassland habitat, by reducing the area of amenity lawn.
- Allow more complex ecotones 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.
- Allow meadow grassland to grow beneath parkland and avenue trees. This is visually attractive, improves habitat structural diversity and reduces the risk of damage to stem and roots by mowing.
- Enrich the diversity of selected meadow areas through preparation (scarifying to open germination niches) and overseeding with native wildflowers including yellow rattle.

Encourage the development of greater sward diversity through modification of mowing timing and

frequency and removal of cuttings to reduce fertility. Increased mowing frequency leads to grasses being favoured, whilst cessation of mowing of a fertile system leads to tall rank grassland and eventually the development of scrub/woodland habitat which in many places would be inappropriate.

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.

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 (broadleaved herbaceous plant) species might establish.

Bulb planting in association with shaded areas under parkland trees can be undertaken incrementally each year. Planted areas should be marked on the landscape management plans and made known to maintenance operatives so that they are left unmown until later in the Summer. Bluebells, snowdrops, wood anemone, celandine and wild daffodil are suitable native species.

Grass areas should be zoned by type, based upon function:

Zone 1 Regularly mown, short and tidy amenity grass;
Zone 2 Periodically/seasonally mown meadow grassland;
Zone 3 Permanent tall grass/herb margins

Zone 1 areas should be reduced in comparison to current coverage, because significant parts of the campus do not require close-cropped grassland for functional or aesthetic reasons.

Zone 2 grassland offers the opportunity over time to develop greater sward diversity. Progressive reduction of soil fertility is desirable to improve species diversity; this is achieved by removal of grass clippings and also by establishment of hemiparasitic yellow rattle in the sward. Relatively infertile conditions allows those less-vigorous species to survive which are otherwise crowded out by a few robust grass species. 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 and would consist of :

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.

Reduced mowing frequency requires the use of a tractor drawn flail mower with collector or traditional hay cutter with a separate lifting operation. For larger plots it may be worthwhile bailing the hay for collection by a local farmer requiring fodder. No scarifying, aeration or moss treatment; herbicide spot treatment or hand weeding only of unwanted species.

The first cut should be timed to allow completion of bird nesting and setting of seed by grasses and forbs; typically this would be after the end of August, which coincides nicely with the start of the academic year. 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. Arisings must be collected and removed. A further mow can then be undertaken prior to winter, to leave tidy cover through the winter months. It is helpful to maintain a more regularly mown margin to meadow grassland so that the sometimes untidy appearance is tempered and appears designed rather than neglected.

Zone 3 margins should develop along the interface with other habitats, creating valuable 'ecotone' transitional habitat. Naturally rather less tidy, such treatment is best kept to peripheries or along linear features such as watercourses, hedges and tree belts.

The University has established several wildflower banks consisting of diverse and colourful mixed floral meadow established from seed. These have a long flowering period and many highlights through the season, which are also beneficial sources of nectar. A mix consisting of perennials, annuals and biennials will avoids the need for annual reseeding. The ground is prepared by screefing of the surface sward and topsoil, then spreading a mulch of sterile compost before seeding. Spot weed during germination and establishment period. In the winter following, cut back top growth following frost kill and natural seed drop.

3.2.2 Trees & woodlands

The University estate at Riccarton has significant areas of mature woodland as well as individuals and groups of large specimen trees, which together contribute to the special character of the campus. The effective management of trees, which are long-lived and sensitive, requires a holistic view that covers safety, amenity, heritage, landscape character and long-term sustainability of the University woodland estate.

The key aims of tree and woodland management are :

- To sustain, in good health, the tree and woodland resource
- To provide for continuance through succession recruitment and planting of trees and woodland
- To maintain the special landscape character of the historic parkland campus
- To increase biodiversity through managing for species and structural diversity
- To allow safe routes and activities for people, identifying and addressing tree hazards
- To provide a multi-functional campus landscape in which trees play their part

In woodlands, a diverse structure with canopy, sub-canopy/understorey, shrub layer and field layer is generally to be sought, as it provides maximum ecological benefit. It also makes the woodlands more visually effective for screening and affording shelter from wind. This may be achieved by thinning of trees to encourage sub-canopy layers but may also require interplanting of suitable native species – hazel, holly, hawthorn and bird cherry. Planting of native woodland floor plants is suggested for established plantation woodland so that a more diverse ground flora can develop. This can include plug or pot grown honeysuckle, anemone, celandine and bulbs of bluebell and snowdrop.

The woodland belts planted in the 1970s in general have sparse ground flora compared to natural long-established woodlands. Planting of native woodland species including bluebell, snowdrop, celandine, wood anemone and wild garlic will develop a more diverse ground flora and can be undertaken selectively, following woodland thinning operations. If species are transplanted by division from established populations on campus, care must be taken to avoid causing damage and to prevent the spread of non-native species (for example, the hybrid Spanish bluebell).

The woodlands at Riccarton are of several types of distinct age and species structure. Objectives that apply to all of the woodlands are:

1. Improve the age and structural diversity (mix of different canopy layers) of woodlands through selective thinning and interplanting of native canopy, understorey and ground flora species including hazel, holly, guelder rose and honeysuckle.
2. Establish a new generation of long-lived species trees, such as Oak and Lime, by interplanting of woodland and planting of new parkland trees.
3. 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

4. Continue the reduction of Rhododendron and laurel understorey, together with dense sycamore saplings, to allow a natural woodland floor flora to develop.
5. Manage the loss of ash trees due to *Chalara* pathogen, including planting of other native tree species to maintain the tree canopy in the long term
6. Woodland understorey enrichment through planting of native shrub and ground flora (e.g. hazel, holly, bird cherry, honeysuckle, bluebells, anemone, woodrush). Removal of vigorous laurel and Rhododendron in the central woodland
7. Woodland belts planted in the early 1970s have not been adequately thinned, have very few understorey trees and shrubs, and lack ground flora. Selective thinning and interplanting with native woodland species, including oak, beech, gean and hazel, for long-term species balance and canopy structure will ultimately support more diversity and improve resilience of these woodlands.
8. To retain views and landscape character around the Loch, young alder and willow seedlings need thinning and stump treatment otherwise they will proliferate and form dense shoreline tree cover.
9. Progressive inter-planting of new 'heritage trees' (i.e. non-native conifer and broadleaved species of large stature) in the central woodland will maintain its character as a woodland arboretum.
10. 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
11. Installation of nesting boxes for various bird and bat species.

Management of the University's woodland estate is a long-term process, requiring annual investment in the following activities :

- Regular inspections - to ensure that safety hazards are identified and remediation work undertaken so that people on the campus are not exposed to unreasonable risk. This survey should guide management and include monitoring identify plant pests or pathogens
- Safety and biosecurity works – precautionary tree surgery work and responding to damage caused by storm events or the presence of damaging pathogens
- Woodland management – thinning and coppicing work to encourage good tree form, density and canopy diversity
- Restocking – Planting to provide long-term replacement and proper species mix
- Maintaining public access - ride clearance and path maintenance work

Woodland management of mature policies should aim to improve their age and species structure. Selective felling to reduce the frequency and density of sycamore and other less desirable species, opening 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).

Woodland management of young mature woodland belts needs to make them more viable in the long term, with improved age and species structure. 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.

Planting of trees alongside Boundary Roads North and South and within car parks remains an aspiration of the Masterplan; this will improve biodiversity, connectedness of the tree canopy, enrich the character, and provide shade in summer. The roadside landscape is generous in scale with space for large-growing and long-lived species such as oak, lime and sweet chestnut which will grow into the large mature trees of the future, replacing existing trees as they decline. Lime trees have traditionally been used in this role, at The Avenue and the North Drive; they 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. Planting more than one species in each row and avenue is a biosecurity precaution to protect against future pests, diseases or climate change impacts.

Planting guidance

Planting should be undertaken during winter dormancy using bare-root stock for economy and establishment success. Weed control is paramount during establishment until 3 years after planting.

For woodland planting, transplant stock of 40-60 cm or 60-80cm should be planted at 2.5m centres for new woodland, or interplanting within existing woodland trees. Closer planting is not advised due to the burden of early thinning it would impose. New woodland should be a balance of canopy tree species, understorey species and shrub layer species; field layer species can be introduced later once woodland conditions of shade and reduced grass are formed. In the central woodland and gardens a range of exotic species is appropriate - such as Douglas fir, southern beech and giant redwood, whose cones/seeds provide food for birds.

Parkland specimen tree planting should be of heavy or extra heavy standard (12-14 or 14-16cm girth), for immediate impact and robustness. These should be short staked using 3 stakes and flexible belt, to permit stem movement. Vermin guard should be provided to the stem. Remove stakes and ties within 4 years.

3.2.3 Veteran trees

Veteran trees are defined as very mature trees, typically exceeding 2 centuries of life. This great age enables them to develop unique characteristics such as enormous girth, broad spreading canopy including deadwood, complex ecology and imposing character. These trees are of exceptional value for their physical stature, visual character, ecological diversity (including protected species of bat and nationally rare invertebrates) and their historical continuity in the designed landscape.

They are extremely vulnerable to disturbance; any change to ground level, soil characteristics. Water balance or ground vegetation cover in proximity to their canopy or root zone is likely to have consequences for their survival. The large stature of these trees represent long-term investment in woody growth which means they lack morphological plasticity – they cannot adjust to changed conditions without shedding significant parts of their woody crown, which can be catastrophic to their health or to safety. The RPA recommendations of BS5837:2012 must be strictly enforced.

The use of soil decompaction/aeration and root feeding can help reduce stress on these trees, so that they can enjoy better health and resist pathogens. Such action should be combined with the use of organic mulch in the core part of the RPA, to reduce drought stress caused by competing ground vegetation. In the wider RPA, reducing the intensity of grassland management also helps to reduce competitive stress.

Wood pasture, consisting of mature and veteran trees growing within meadow grassland, is a very valuable habitat. At Riccarton there is a modified form of wood pasture, in which the effect of grazing is removed and replaced by mechanical grass cutting; Reducing the frequency of cut so that tall grass and herb vegetation is allowed to flourish maximises biodiversity value of this habitat. As part of this management, fallen dead-wood should be left to lie beneath the tree canopy.

Where new development is proposed on the University grounds, there should be an assumption of retention of existing trees of Category A and B unless there is overwhelming need that affects the actual viability of the development. Site planning options should explore layouts that secure retention of existing trees. Retained trees in proximity to works shall be protected, including their rooting zone (RPA Root Protection Area), following the recommendations of BS5837 : 2012. No change to ground level, storing of materials, washing, movement or parking of vehicles, or fires shall be permitted within the fenced zone. A minor loss of RPA may be acceptable, subject to detailed appraisal by an arboriculturalist.

All tree felling or surgery works shall be undertaken in accordance with sound arboricultural practice and BS 3998 Recommendations for Tree Work and will always be undertaken by the specialist contractor employed by the University and under direct control of the Landscape Manager, or by the University's own team.

3.2.4 Hedgerows

1. Vary maintenance of mixed hedges where practical and appropriate, to provide overgrown hedge habitat.
2. 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.
3. Allow tall herb and grass vegetation to develop along the base of some hedges.
4. Plant new hedges around the more recent car parks to the south-east and north-west of the campus
5. Allow leaf mulch to develop in the base of hedges, as a habitat

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. Leave an unmanaged strip next to hedges in grass areas as 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.

Car parks lacking any visual enclosure or biodiversity value should be planted up with mixed native hedgerows in the manner successfully done elsewhere on campus, to provide visual order and better integration. A native hedge species mix of beech, hornbeam, field maple, hazel, guelder rose and hawthorn adds 2 species to the existing mix, in order to provide greater blossom and fruit for wildlife.

3.2.5 Ponds & Wetlands

The number of ponds in the lowland agricultural landscape of the UK has greatly reduced over the last century, which has led to a severe decline in the population of frogs, toads and newts as well as many invertebrate species. The University has several ponds and areas of wetland habitat, of significant local biodiversity value. Their value could be further increased by improving the connections between wetland habitats, so that they function as a network rather than as isolated ‘islands’ of habitat.

1. Expand the network of native wet meadow in ditches and swales as part of SUDS improvements.
2. Provide a buffer margin of unmown meadow around ponds, rather than amenity grassland; follow the pattern of microtopography, with wetter habitat left in the valley and ditch features.
3. Promoting habitat linkage between wetlands and hedge or woodland edges, to provide improved green network routes for amphibians and mammals.
4. Monitor for the presence of invasive non-native species, taking early action to eradicate.
5. Regularly remove tree seedlings to prevent succession to dense woodland, except where that is the desired habitat type.

Amphibians require suitable terrestrial habitat as well as aquatic habitat; creating meadow grassland next to ponds gives frogs and newts territory to move and feed in, and it is especially beneficial if it links between different wetlands to form a wetland network. Construction of hibernacula, consisting of a crevice-filled stone and timber mound covered with turf and with multiple piped entry points, will provide a winter safe haven for these species and should be located within meadow grassland above the level of winter flooding.

3.2.6 Edge Habitats

1. Allow more complex ecotones to develop along margins between grassland and woodland or hedgerows.

2. 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.

3.2.7 Ornamental planting

1. Such areas should be kept to a limited extent as they place high demands on the maintenance team and are of limited biodiversity value.
2. Winter pruning of ornamental planting, both shrubs and herbaceous plants, should be left as late as possible to maintain cover and seedheads as food source through the winter.
3. Pruning of dense shrub areas should be avoided during the period March to July when birds may be nesting.
4. Replanting of ornamental shrub beds that consist of large areas of single-species mature ornamental woody shrubs; these become dull and too large. Replant with herbaceous and woody perennial species offering foliage, fruit, pollinator-friendly blossom and varied stature.
5. Develop structural diversity in planting, with a diverse layered structure to the vegetation including low, medium and tall plants and allowing some shrubs to grow to maturity undisturbed. A mix of deciduous and some evergreen plants represented wherever possible.
6. Use a diversity of species to broaden the habitat value whilst meeting design objectives.
7. Encourage natural predators like ladybirds, hover flies and lacewings, by using suitable food plants for adults and/or larvae and by providing hibernation habitats.
8. 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.
9. Include invertebrate wood piles within ornamental planting.
10. Use climbing plants on walls.
11. Diversify planting to discourage pests and diseases.
12. Take the opportunity to raise awareness and make a feature of low intervention areas by installing interpretation signs explaining what you have done.

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 limited ecological value (although the heather growing alongside The Freeway is especially valuable to pollinators). With some change to landscape management and with careful supplemental planting, biodiversity value can be increased.

Ornamental shrub beds growing on the research park extension are rather isolated and may be improved by gradual 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.

3.2.8 The built environment

1. Include integral bird and bat boxes in all new buildings on the campus.
2. Install bird boxes on existing buildings. These should include diverse types : swift boxes, swallow ledges, small bird boxes with a range of aperture size
3. Install ledges and eaves for martins on suitable elevations away from entrance doors, especially on elevations that face ponds.

4. Install bat boxes on walls of existing buildings, at minimum 5m height.
5. Consider the potential to grow climbing plants on suitable building elevations, where the vegetation will not cover doors or windows or interfere with ventilation louvres, etc. Installation of climbing wires or trellis is necessary for some species. Avoid ivy due to the potential damage it can cause.
6. 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 may add further value to a green-roof system.
7. Install bee hotels on ancillary structures such as bin stores and fences
8. Lighting to be narrowly focused on routes for people, rather than lighting landscape areas per se. Artificial lighting adversely affects nocturnal species, especially invertebrates.

Retro-fitting of wildlife improvements to existing buildings can be a practical and relatively low-cost measure to increase habitat value. Durable and inconspicuous bird and bat boxes can be mounted on the building façade without affecting weathertightness or causing staining.

As the University expands through new building projects it is important that new buildings incorporate ecological measures to attract wildlife, reduce energy consumption and enhance microclimate. Such measures require early consideration by Architects and University project teams, so that they are properly integrated. 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.

3.2.9 Arable farmland

1. Introduce conservation headlands and field margins.
2. Introduce water margins 3-6m width along the existing burn ditch.
3. Practice the retention of winter stubble to provide food and cover for insects, birds and mammals and to protect the soil from erosion (protecting the watercourses).

Arable farmland has very low ecological value, but it is now common practice to leave uncropped margins around the crop; these margins are not cultivated, fertilized or treated with herbicides and pesticides. They provide corridors of tall herbs and grasses through which wildlife can pass; the flowers and seed-heads give food for pollinators and birds.

These measures would all be supported by the Agri-Environment Climate Scheme of the Rural Payments Service. Arable land on the University estate is leased to a tenant farmer, who would make the change in management and apply for the funding support.

3.2.10 Invasive non-native species (INNS)

1. Progressive removal of laurel and Rhododendron from the woodlands, with stump treatment to prevent regrowth
2. Progressive removal of snowberry and cotoneaster from ornamental shrub beds as these beds are renewed, replanting with alternative non-invasive species
3. Monitor and record any Himalayan balsam, Japanese knotweed and giant hogweed found on site so that prompt eradication can be organized.
4. Monitor for other INNS including aquatic plants

3.2.11 Impacts of plant diseases

Ash Dieback Disease (*Chalara fraxinaceae*).
A serious and invariably fatal fungal pathogen of European ash, *Fraxinus excelsior*, *Chalara* has rapidly spread across the UK and is seen to be very prevalent in local ash trees and woodlands. Infection of saplings and young trees occurs easily and leads to rapid dieback; the stem and branches die, desiccate and quickly lose structural strength, which can lead to sudden catastrophic collapse. Because of this, a cautious approach to felling of infected trees is necessary, and the risk of limb-fall to the public presents a hazard.

Phytopthora ramorum.
A serious and invariably fatal fungal pathogen that infects many species, chiefly larch and Rhododendron, *Phytopthora* is present in Scotland where it is spreading outwards from an epicentre in Dumfries-shire. Stirling lies within Zone 2 as defined by Scottish Forestry; in this zone, monitoring of any incidence of the disease is underway, and where it occurs a Statutory Plant Health Notice (SPHN) is served requiring felling of all larch trees within 500m of the infected trees. The selective removal of larch from the campus should be planned for; this need not take place all at once, but rather in a progressive manner to suit other sylvicultural objectives and so as to maintain windfirm trees. The larches provide attractive foliage and forest floor conditions, and support red squirrel feeding and dreys, so it would be a shame to lose them prematurely. Monitoring for symptoms of the disease is prudent, and if any cases are detected then a SPHN would be issued by Scottish Forestry requiring removal of trees within a short period.

Oak Processionary Moth (OPM).
This insect is a threat to all species of oak trees and has been spreading through Europe. Biosecurity measures to prevent its spread have restricted the availability of oak, and the sourcing of oak trees for future planting on the campus is likely to become more difficult – unless capacity significantly expands in the UK tree nursery market. If succession planting of oak trees across the campus is to be achieved, then it would be worthwhile developing a nursery for propagation of oak trees in the University grounds maintenance yards. Such trees can be grown from acorns collected in the grounds. To eliminate the risk of importing OPM into the estate consider a ban on the purchase of oak trees.

3.3 Objectives and recommendations for protected species

3.3.1 Badger

1. Encourage or plant native scrub habitat that supports foraging – apples, hawthorn, blackthorn and bramble
2. Avoid disturbance in areas used by badger. Cover planting may help achieve this.
3. Setts, whether in use or disused, should be recorded by the grounds team so that they can be protected from disturbance during landscape management work.

3.3.2 Otter

1. Keep watercourses clear of litter and pollution
2. Protect and expand native riparian vegetation as a corridor along both banks of watercourses, providing cover for commuting otters
3. Build an artificial holt in the bank of the Murray Burn
4. Plant native riparian trees and shrubs in the riparian corridors to improve cover where they are currently very open
5. Potential holts and resting sites should be recorded by the grounds team so that they can be protected from disturbance during landscape management work.

3.3.3 Bats

1. Promote vegetation corridors such as linear woodlands, lines of trees, hedges and riparian vegetation as these are valuable commuting routes
2. Mount bat boxes to buildings and mature trees at least 3m above ground level and facing south or southeast to maximise sunlight.

3. Control the extent of external lighting and when replacing old lights ensure that wildlife-friendly new lights are installed – following the *Bats and Artificial Lighting at Night Guidance* (Miles et al, 2023).
4. Integrate bat boxes into any future buildings
5. Prior to any works on buildings or mature trees, ensure surveys have been undertaken to identify and protect any roosting bats. Bats and their roosts are legally protected from disturbance, at risk of criminal prosecution.
6. Inform staff and students about the presence of bat roosts and their value.

3.3.4 Birds

1. Pruning or vegetation clearance of hedges, trees, woodlands or shrubs should be undertaken outside the bird breeding season (March to September, inclusive) to avoid causing disturbance to them. Birds on their nest are legally protected from disturbance, at risk of criminal prosecution.
2. If pruning or clearance work needs to be undertaken during the breeding season, a check for nesting birds should be undertaken prior to works and any areas with active nests be left undisturbed, postponing the work.
3. Mount a range of bird boxes to buildings and mature trees to maximise nesting opportunities. Boxes to suit a variety of birds should be installed, including wall-hung swift, house sparrow and martin boxes. Boxes with different size and apertures should be hung on buildings, fences and trees.
4. Integrate bird boxes, particularly swift bricks, into the design of any future buildings

3.4 Objectives and recommendations for Invertebrates

3.4.1 Overview

Invertebrate populations are the backbone of biodiversity and should be integrated into all biodiversity enhancement plans. Ensuring that there are a range of natural habitats available to provide diverse invertebrate families with feeding, nesting and hibernating opportunities is one of the best ways to sustain biodiversity on any site. Invertebrate numbers and diversity in the UK have drastically declined in recent years so a helping hand is required.

3.4.2 Habitat management and creation

1. A dedicated invertebrate survey should be carried out to establish the baseline populations present on the campus.
2. Leave some untidy ‘wild’ areas which include long grass, ruderal plants (‘weeds’ such as nettle, thistle and fireweed) and native shrubs such as bramble, raspberry and elder. As well as being of value for pollinators, the fruit and seeds are great for a range of birds and the hollow dead stems are used for nesting by bees and wasps.
3. Create forage and hibernation sites for insects by leaving piles of leaf litter, woodland brash and stones. Also, autumn leaves should wherever possible be left where they fall on unpaved ground as they provide widespread cover and support detritovores (insects and fungi that feed on dead organic matter). These features should be in both sunlit places and shady spots, for a range of warmth and moisture. Piles of dead material should not be disturbed or removed once put in place.
4. Areas of bare ground are important for ground nesting bees which require loose, undisturbed soil. The creation of a bee bank would form a suitable voluntary or student project or research project.
5. The creation of stone walls and rock areas within formal planting areas can be both ornamental and beneficial for insects.
6. Log and compost piles should be created within the woodland areas to provide deadwood habitat for invertebrates. The volume of lying deadwood should be allowed to increase over time, and some more interesting pieces can be situated in ornamental beds too.
7. Small, frequent habitats for insects should be distributed around the site to support a healthy population of invertebrates in all areas of the campus.

8. Plants that support specific moth and butterfly species should be targeted, providing nectar food source and a place to lay their eggs; this should include night-scented flowers for moths. Butterfly Conservation provides several lists of plant species for butterflies, moths and caterpillars.
9. Install bug boxes and bug hotels as features on buildings, walls, fences and in garden spaces where the more natural shelter and hibernation features above cannot be provided (or where a visible feature is desired for the educational value it gives). Bug boxes and hotels provide space for invertebrates to hibernate, pupate and establish nests. Once installed the bug hotels and boxes should be inspected annually and any replacements or adjustments should be made outside of the hibernation period and small mammal main breeding period (as small mammals will also make use of them).

3.4.3 External lighting mitigation

External lighting in the UK significantly impacts insect populations. The presence of external lighting attracts nocturnal insects and act like traps, exhausting their energy reserves, distracting them from feeding, disrupting their mating rituals and exposing them to increased risk of predation. There has been a creeping expansion of lighting in the environment, without recognition of the importance of darkness to nature and also to ourselves.

It is not just insects that are adversely affected by lighting. A significant number of our bird and mammal species are active at night, or have behaviour governed by crepuscular conditions (for instance, the dawn chorus of songbirds triggered by increasing light levels). Artificial lighting influences or disrupts their behaviour and in the case of prey species can increase predation or expenditure of energy to avoid it.

The detrimental effect of lighting is most apparent in bats, which have suffered declining numbers over the past century. Lighting of commuting and foraging routes causes some species to adapt their flight patterns and to avoid areas where they would otherwise feed; the attraction of insects to lights leaves unlit areas denuded of prey. So, it is helpful to lean on The Bat Conservation Trust for the expertise in its recommendations to help minimise the impact of artificial lighting (*Artificial Lighting and Wildlife*, 2014). Some simple measures can be taken to reduce the adverse impacts of lighting :

1. Use warm-white LED light sources (<2700K ideally, <3000K as a minimum) which are less attractive to moths. Warm-white light is also preferred by people.
2. Install fully shielded light fittings that direct light downwards with no upward light spill into the sky or adjacent trees and hedges.
3. Install timer switches together with PIR motion sensors so that lights dim and then turn off in the middle part of the night except when activated by movement of a person using the lit path. The period 10pm – 6am is commonly used by Councils in the UK as a period when lighting output reduces; for a University campus a shorter period e.g. 11:30pm – 6:30am may be more appropriate.
4. Use lower intensity bulbs, provided they are effective.
5. Remove unshielded or high-intensity floodlights unless critical to function (i.e. they may be necessary for sports fields, but are not so for a service yard).
6. Do not install uplights (no matter how persuasive the designer may be!) as these are particularly harmful to nocturnal insects.
7. Do not install UV or blue-white lights as these are much more disruptive to all nocturnal wildlife.

3.5 Operational measures

Opportunities to improve the environmental performance of landscape management operations should be regularly reviewed; some changes may have biodiversity benefits on site, others may result in upstream benefits in the supply chain or downstream benefits in terms of waste reduction.

The following are potential opportunities, which may already be exploited :

1. Seek to utilise felled timber or to sell it into the timber processing market. The UK runs a massive deficit in timber imports, projecting a global footprint in timber extraction; home-grown timber from well-managed woodlands has fewer adverse habitat and transportation impacts.
2. If timber sale or use is not feasible, felled wood should be distributed as habitat log piles to support invertebrate and fungal diversity.
3. Continue to chip and compost small wood and prunings to create mulch, which when used suppresses weeds and retains moisture in the soil of trees and planted beds.
4. Continue to compost organic material for use as a soil conditioner.
5. Utlise topsoil removed from wildflower beds to blend with compost for plant propagation and containers.
6. Consider alternatives to plastic for containers, tree guards and other products used by the grounds management team

The use of horticultural chemicals (including herbicide, pesticide, fungicide, algicide) 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.

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 compost, 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. If tree shelters and guards are used to protect against rodents and deer, plastic-free alternatives are now available although their durability in use is not yet fully proven; if plastic items are used, a plan should be made for their removal for re-use or recycling once the plants are established.

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.

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.

3.6 Action on Climate Change

Climate change effects

Anthropogenic climate change will impose stresses on plants and people alike at Riccarton :

1. Intense rainfall events are becoming more likely and of greater intensity. Robust SUDS that maximise the capacity of soil and vegetation to act as a sponge and filter for rainfall - trying to

allow a natural rainwater cycle rather than treating rainfall as a problem to be rapidly removed. Trees and woodlands, with their extensive root systems increasing soil porosity and the effects of transpiration from foliage, can contribute to this sponge function.

2. Period of seasonal drought may be more likely and this will affect trees particularly ones which are mature or veteran in age. When planting trees the species selected will need to be resilient to predicted conditions.
3. Shade and cooling provided by trees will become an important ecosystem service; we are needing to think about summer heat in a way we have not previously in Scotland. These shading effects can benefit the external environment and also can influence conditions inside buildings by reducing solar gain and maintaining lower ambient temperatures.
4. Increased temperatures will bring increase in the range and vigour of pests and diseases; new ones will establish themselves. Biosecurity measures and moving towards domestic provenance/sourcing of plants (especially native species) are increasingly important.
5. Management of veteran trees will need to adapt to higher summer temperatures and drought. Boosting soil health will help reduce drought stress - using techniques such as mulching with organic matter, soil aeration/decompaction, promoting mycorrhiza, and reducing competition of grass cover.

The adverse impacts of disease and of a warming climate are likely to impose stresses on our native trees and woodlands that could lead to loss of diversity and even of tree cover. To counter this, the introduction of tree species not native to Scotland may be prudent. The aim should be to maintain the character of the estate parkland and woods, but by broadening the range of tree species we can guard against the ravages of future new diseases, drought or seasonal change.

Suitable species to consider planting are hornbeam, sweet chestnut, tulip tree, Turkish hazel, plane, *Nothofagus, Zelkova, Robinia, Catalpa and Nyssa,* as well as maples.
The University will seek to address the causes of climate change by reducing resource use in construction and promoting lower intensity of land management.

Construction action	Campus management action
Reduce the use of cement concrete and promote the use of innovative low-carbon alternatives	Minimise fuel use in maintenance operations
Source materials as locally as possible, supporting market innovation in Scotland	Reduce the use of chemical herbicides and pesticides, developing the use of alternative methods
Use recycled materials	Seek to maximise soft or permeable landscape cover to allow rainfall to infiltrate and to minimise thermal storage
Integrate green/blue technology into the building envelope	On-site composting of green waste for re-use in landscape operations
Embed renewable energy generation	Facilitate the segregation and recycling of waste
Design to maximise energy efficiency	Peat-free for all plant purchasing and propagation

Measures to reduce climate effects can be positive also for biodiversity. Green/blue techniques for buildings, such as green roofs or façade greening, can provide valuable habitat especially for invertebrates. Solar panels on a roof or on the ground can be combined with a cover of green-roof or meadow vegetation with all the benefits for pollinators, birds, reptiles, amphibians and mammals that come with extensive floral meadow habitat.

3.7 Health and wellbeing

A pleasant and biodiverse campus environment can contribute appreciably to the quality of physical and mental health of those who live and work on it.

“There is growing evidence that living close to and spending time in and around green or blue spaces … is associated with fewer mental health problems. The proposed mechanisms underpinning this association include increased social contact, reduced cognitive impairment, reduced stress, and mental and physical health-promoting physical activity, alongside indirect mechanisms within wider ecological systems, such as improved air quality.”
Geary R, Thompson D, Mizen A et al. *Ambient greenness, access to local green spaces, and subsequent mental health: a 10-year longitudinal dynamic panel study of 2·3 million adults in Wales* The Lancet Planetary Health, 7, e809-e818

By making the greenspaces pleasant and engaging to people, the University can encourage the proportion of active travel and offer a relief from stressful work, studies or personal situations. This engagement with nature can influence the personal beliefs and behaviors of students, encouraging a caring attitude towards it. 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 because of the organisms that live there.

3.8 Influencing behaviour : 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. Ecological awareness can be a valued part of a rounded education; it should not be reserved solely for those studying natural sciences but should influence those in any discipline, to build environmentally responsible attitudes for their future careers.

3.9 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.

3.10 Biodiversity guidelines for new development

Any building or refurbishment works on the campus should realise opportunities for improving biodiversity, even if there are no landscape works associated with the project. The University will continue to apply and follow all relevant legislation and guidelines in association with new development projects. The Biodiversity Action Plan must form a part of the project briefing requirements and the following guidance notes should be incorporated into the briefing material given to any project team created for developments on the campus

3.10.1 Trees

If there are trees within a development site they should be retained and protected wherever possible.

A Tree Survey should be carried out by a qualified and competent arboriculturalist, and a report should be prepared in accordance with BS 5837:2005 to identify the species, age, condition and relative

category of importance. This will not only help to identify those trees that should or should not be retained (due to condition) but also inform priorities for retention whereby the design team can look at layout options, that explore the potential for retention where possible.

A Tree Constraints Plan, which identifies trees to be retained and protected during the construction works, those requiring works or surgery, and those to be removed either due to condition, or to accommodate the development, should be produced. This will also detail the measures of protection for the Contractor to follow.

The impact of new underground service routing on mature trees requires careful consideration to ensure the full root protection areas (RPAs) are not compromised, due to the vulnerability of the tree to root loss.

Trees should be felled outwith the bird nesting season (1st March – 31st July) as all wild birds are afforded protection under the Wildlife and Countryside Act 1981 (as amended). If felling is required during the nesting season an ecologist inspection will be necessary, and the results of this may still prevent felling - any active nests identified should be protected until the young have fledged and where a Schedule 1(3) species is involved, mitigation for impacts should be devised and implemented.

3.10.2 Birds and Bats

Disturbance of nesting birds or bats is an offence. Thorough survey by an ecologist is required in advance of works affecting existing trees or buildings which may contain nests or roosts. Particular attention should be paid to any site clearance or development work affecting buildings, as this is where swifts, swallows, house martins and barn owls preferentially choose to nest.

The aim of new development should be to increase roosting opportunities for birds and bats on the campus through the integration of bird and bat boxes as detailed in this Biodiversity Action Plan:

3.10.3 Drainage

Best practice design of surface water drainage employs a range of SUDS measures to reduce and control water run-off and pollution, contribute to ecological and habitat diversity, and provide valued amenity in a range of ways:

- Permeable paved surfaces, especially for car parking reduce potential for flooding.
- Meadow and wetland swales provide habitat corridors for amphibians, invertebrates and mammals.
- New ponds and basins would be particularly valuable habitat enhancements.
- The existing ponds and loch would benefit from new inputs of clean water, such as can be provided by SUDS. Control of nutrient inputs to the Loch is vital to avoid creating eutrophic conditions.

3.10.4 Ornamental Planting

To support maximum biodiversity in relatively small areas of planting, the aim should be to have planting that provides 4 elements attractive to wildlife :

- Structural diversity (a range of habit and canopy level)
- Cover
- Food plants (foliage and fruit) – which can include edible fruit for people to browse
- Sources of nectar and pollen

The use of native and non-native plants is appropriate provided no plant listed on the NatureScot invasive species list is included. Be guided by the RHS Plants for Pollinators guidance https://www.rhs.org.uk/science/research/plants-for-pollinators and avoid using cultivated varieties that have complex double-flowers (these are inaccessible to many native pollinators).

The provision of structural diversity is important, with a range of canopy heights, from lawn up to forest trees, and to allow the necessary linkage of habitats to neighbouring sites, particularly wetlands and edge habitats.

The creation of cover, feeding and a good invertebrate population need not mean that the required landscape structure and order be sacrificed; the dual roles of biodiversity and creation of a well-ordered attractive setting to the University can be complimentary.

3.10.5 The Biodiversity Action Plan

The project team should ensure reference is made to the current Biodiversity Action Plan and UKHAB ecology survey. Consideration of how to protect, retain or enhance, existing habitats and provide new opportunities for wildlife need to be an intrinsic part of the design development process; this BAP provides many recommendations and guidance to help inform the design of new works within the University estate.

3.11 Governance and review of the BAP

Delivery of the Biodiversity Action Plan will be a responsibility of the Estates Department, under the Estates Committee. Objectives and targets will be reviewed annually, and will form part of the Environmental Management System KPIs (BS EN ISO 14001).

A full review of the BAP should be held at 5 yearly intervals in order to maintain currency of the proposals within it, to update objectives and KPIs. The next review will be due in 2031.