2024-2026

Ecosystem Resilience and Biodiversity Action Plan (ERBAP)

ERBAP Steering Group
Cardiff University

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Cardiff University Ecosystem Resilience and Biodiversity Action Plan (ERBAP) 2024-2026

ERBAP Steering Group

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List of Abbreviations

BAP Biodiversity Action Plan
BRED Biodiversity and Resilience Ecosystems Duty
CBD Convention on Biological Diversity
CL BAP Cardiff Local Biodiversity Action Plan
CWCW Cardiff Wildlife & Cardiff Wildflower
DECCA Diversity, Extent, Condition, Connectivity and Adaptability
ECO Environmental Compliance Officer
EMS Environmental Management Systems
ERBAP Cardiff University Ecosystem Resilience and Biodiversity Action Plan
GI Green infrastructure
HFC Hedgehog Friendly Campus
HPIB Habitats of Principal Importance for Biodiversity
IPBES Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
LERC Local Environmental Records Centres
LNP Local Nature Partnership
MOOC Massive Open Online Course
NGOs Non-governmental organisations
NRAP Nature Recovery Action Plan
NRW Natural Resource Wales
PHEW Positive, Health, Environment and Wellbeing Fortnight
SDGs Sustainable Development Goals
WG Welsh Government

Chapter 1. Background

Biodiversity and Resilience Narrative

The United Nations' Convention on Biological Diversity (CBD), which was opened for signatures at the 1992 Rio Earth Summit, recognised the need for international action to halt biodiversity loss. Over 25 years later, 'The Global Assessment Report' of the UN's Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) warned that if we want to halt biodiversity loss, slow the deterioration of nature, and meet biodiversity, climate, and sustainable development goals by 2030, *"business as usual" will not work and will instead drive societies and economies to more risks.* According to the report, the biomass of wild mammals has fallen by 82%, natural ecosystems have lost about half of their area, and a million species are at risk of extinction.
As a signatory of the Environmental Association of Universities and Colleges (EAUC) SDG Accord, Cardiff University is committed to embedding the UN's Sustainable Development Goals (SDGs) throughout the institution. The SDGs were adopted in 2015 and set out a series of 17 goals that outline urgent actions needed to achieve sustainable development by 2030. Of these goals, the most relevant to Cardiff University's Biodiversity Action Plan are:

- SDG 3: Ensure healthy lives and promote well-being for all at all ages.
- SDG 11: Make cities and human settlements inclusive, safe, resilient, and sustainable.
- SDG 13: Take urgent action to combat climate change and its impacts.
- 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.

At a national level, biodiversity has been addressed through the UK Biodiversity Action Plan (BAP)[1]. The BAP followed the Articles of the CBD and included *assessments* of the state of a given biodiversity component (including accurately documenting it), identifying *critical actions* needed to improve the state of that biodiversity, over a short, medium, and long timescale, *implementing* those plans and finally *monitoring* the outcomes and applying remedial actions needed. Welsh legislation confirms Wales' legal commitment to biodiversity conservation. Section 6 of the Environment (Wales) Act 2016 introduced an *"enhanced biodiversity and resilience of ecosystems duty (the S6 duty)"* for public authorities, which requires that they *"seek to maintain and enhance biodiversity so far as consistent with the proper exercise of their functions and in so doing promote the resilience of ecosystems"*. To comply with the S6 duty public authorities *"should embed the consideration of biodiversity and ecosystems into their early thinking and business planning…as well as their day-to-day activities"*. Cardiff University submitted its preliminary Section 6 report to Welsh Government on 20th December 2019 and its second report in December 2022[2]. The link to the report is in **Appendix 1**.

Further, one of the seven goals of the Well-being of Future Generations (Wales) Act 2015 is to strive for a resilient Wales: *"A nation which maintains and enhances a biodiverse natural environment with healthy functioning ecosystems that support social, economic and ecological resilience and the capacity to adapt to change."* Both the Environment (Wales) Act and the Well-Being of Future Generations Act frame biodiversity with respects to its contribution to achieving ecosystem resilience. Natural Resources Wales (NRW), the environmental body of Welsh Government, has developed a framework for evaluating ecosystem resilience based on five attributes, referred to as **DECCA: Diversity, Extent, Condition, Connectivity and Adaptability**.

[1] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69203/pb12772-conbiouk-071004.pdf
[2] https://www.cardiff.ac.uk/public-information/policies-and-procedures/health-safety-and-environment/

In recognition that the Welsh policy context recognises the importance of ecosystem resilience and biodiversity as a vital component of resilience, we refer to our plan as the **Cardiff University Ecosystem Resilience and Biodiversity Action Plan (ERBAP)**. This is because in addition to biodiversity, we consider the connectivity, condition, and extent of the terrestrial ecosystems across Cardiff University's estate. A brief description of NRW's attributes for considering resilience follows.

Diversity. Diversity matters at different levels and scales, from genes to species and from habitats to landscapes. It supports the complexity of ecosystem functions and the cascades of interactions that deliver services and benefits[3]. If diversity is lost, systems may deteriorate and ultimately collapse. The function of individual components of a system are also susceptible to disturbance; diversity provides redundancy of functions and enhances the capacity of the system as a whole to adapt to future change[4]. It is important to note that diversity must also be 'appropriate'; some ecosystems, e.g., peat bogs, may have relatively low diversity, but, nonetheless, the particular range of species and habitats they contain are critical for their functioning.

Extent. The greater the extent of a habitat or species, the more able it will be to cope with disturbance. For example, a larger area of habitat can support larger populations, which are less likely to go extinct (and potentially also have a wider genetic diversity conferring greater adaptive capacity) and are less affected by detrimental edge effects. Many species have a minimum size of habitat required to support a population, below which they may become extinct[5]. Size also influences ecological processes, for example, a raised bog large enough to support its own hydrological system is likely to be more resilient than smaller bogs.

Condition. Condition is a broad term that interacts with the other attributes. We employ it here to make a link to how a system is managed, what inputs are applied, what is taken from it, and how it is influenced by the management of the surrounding land. An ecosystem in poor condition will be 'stressed' and have reduced capacity to resist, recover or adapt to new disturbances, or to deliver ecosystem services effectively. Condition can be thought of in terms of broad ecosystem components relating to biodiversity, air, water, and land. Resilience assessments therefore consider the condition of sites, including soil, air and water quality, and the impacts of major land/sea uses and industries.

Connectivity. Connectivity among habitats allows the movement within and between ecosystems of flora, fauna, and funga, nutrients, abiotic material, and energy. Connecting of two or more habitat patches enables an exchange of genetic material, nutrients, goods, culture, knowledge, etc., therefore their local condition improves. Connectivity allows ecosystems to function and recover from disturbance, but it is reduced by habitat loss and fragmentation, creation of barriers, and loss of features that allow movement across the landscape. In a few situations, connectivity may have negative aspects, for example, if it risks facilitating the spread of diseases, fire, or invasive non-native species[6].

[3]Ceulemans, R., U. Gaedke, T. Klauschies, and C. Guill. 2019. The effects of functional diversity on biomass production, variability, and resilience of ecosystem functions in a tritrophic system. *Scientific reports*, *9*(1):1-16.
[4]Byrnes, J. E., L. Gamfeldt, F. Isbell, J. S. Lefcheck, J. N. Griffin, A. Hector, B. J. Cardinale, D. U. Hooper, L. E. Dee, and J. E. Duffy. 2014. Investigating the relationship between biodiversity and ecosystem multifunctionality: challenges and solutions. *Methods in Ecology and Evolution*, 5(2):111-124.
[5]Harte, J., A. B. Smith, and D. Storch. 2009. Biodiversity scales from plots to biomes with a universal species–area curve. *Ecology letters*, 12(8):789-797.
[6]Gilarranz, L. J., B. Rayfield, G. Liñán-Cembrano, J. Bascompte, and A. Gonzalez. 2017. Effects of network modularity on the spread of perturbation impact in experimental metapopulations. *Science*, 357:199–201.

Adaptability. Adaptability differs from the other attributes because it is part of the *definition* of resilience rather than an attribute that *supports* it. However, its inclusion in the Environment (Wales) Act is important because it emphasises one of the most important features of resilience: dynamism and the ability to adapt to change. This is especially relevant for climate change, which is now regarded as inevitable and during which we cannot expect to maintain the *status quo*. Instead, we need to think in terms of changing species distributions, composition of ecological communities, and ecosystem functions and processes. This is where the elements of diversity, extent, condition, and connectivity start to link and provide the basis for adaptation to happen. For example, maintaining diversity hotspots and connectivity between them can facilitate species' range shift[7].

The adaptability of habitat patches is an outcome of their resilience. The overall adaptability of ecosystems invites specific consideration of the adaptive cycles which many ecosystems undergo – understanding that ecosystems are not static entities and will change over time. The key question is whether ecosystems will adapt and change in the desired direction given future environmental, and socioeconomic changes, and demands such as climate change. Such challenges need to be addressed by active management of habitats across the university's estate, including direct habitat interventions and Systemic Design.

In addition to the NRW attributes of ecosystem resilience, the Environment (Wales) Act sets out nine simple principles of sustainable management of natural resources to underpin natural resources management. Cardiff University seeks to integrate these ways of workings within the governance structure of the ERBAP. These principles are[8]:

Adaptability: plan, monitor, review and change our work as we gain a better understanding through our improved evidence. This will be done through the **annual audit** as well as the regular periods of revision of the ERBAP.

Scale dependence: take decisions and actions at the right level, from global to local. We need to work together to identify the most appropriate scale for delivering the environmental and wider, cultural, social, and economic priorities and opportunities that our evidence highlights. The ERBAP creates a centralised plan of action to guide professional services and research actions involving on-the-ground decisions. To scale up actions, Cardiff University is working with other partners across the Cardiff city-region to join up our green spaces and create a more comprehensive ecological network across the city.

Working together: ensure all stakeholders can play a role in conserving and sustainably managing our natural resources through engagement in, codesigning and cocreating projects, providing evidence, and cooperating and collaborating at the local, regional, and national level. The ERBAP Steering Group includes stakeholders from the university's professional services community, the student body, and academics, engaging with other government bodies, including Cardiff City Council (a representative which sits on our ERBAP Steering Group) and NRW (South Central Area Statements team), as well as NGOs, other Universities in the Cardiff city-region, and local communities.

[7]Thomas C. D., P. K. Gillingham, R. B. Bradbury, D. B. Roy, B. J. Anderson, J. M. Baxter, N. A. D. Bourn, H. Q. P. Crick, R. A. Findon, R. Fox, J. A. Hodgson, A. R. Holt, M. D. Morecroft, N. J. O'Hanlon, T. H. Oliver, J. W. Pearce-Higgins, D. A. Procter, J. A. Thomas, K. J. Walker, C. A. Walmsley, R. J. Wilson, and J. K. Hill. 2012 protected areas facilitate species' range expansion. *Proceedings of the National Academy of Sciences of the United States of America*, 109 (35):14,063-14,068.

[8]Cited from https://gov.wales/sites/default/files/publications/2019-05/environment-wales-act-2016-sustainable-management-natural-resources.pdf

Engaging with the public: ensure transparency and that local communities have an opportunity to have their say on how our natural resources should be managed. The ERBAP Steering Group promotes public engagement through outreach events, targeting NGOs, students, and the public. Cardiff University also engages communities through citizen science projects (e.g., the Spot-a-Bee App) and encourages participation in both monitoring and managing existing habitats.

Gaining evidence: improve our evidence base to increase our understanding of our natural resources, how they function and the benefits that they provide. This evidence will help us all to understand better the steps that we can take to manage our estate more sustainably. A full range of evidence will be needed, not only environmental, but also, cultural, social, and economic, gathered from experts, stakeholders, and local communities. The ERBAP will be supported by evidence routinely collected through undergraduate courses, research projects, and citizen science.

Understanding the benefits: increase our understanding of the value of our natural resources and how they support each other so that we and future generations continue to receive economic, social, cultural, and environmental benefits whilst reducing our environmental impact. These objectives will be carried out through engagement of academics, future professionals, and citizens, via dissemination, outreach, and education.

Long-term approach: the impacts of our decisions and actions need to be considered not only for their effect in the short term but also over the longer term, in accordance with the Well-being of Future Generations Act. Therefore, decisions need to be taken with long-term as well short-term benefits in mind, and need to evolve as conditions change. Strengthening resilience takes time and needs to be critically evaluated at 5-year intervals or more.

Prevention: take steps to prevent significant damage to our ecosystems. The ERBAP seeks both to restore and protect our green spaces and the benefits they provide to society. To mitigate events such as accidental damage and unforeseen consequences of management actions, future scenarios will be evaluated, and contingency plans developed to prevent major negative consequences for the university's green estate.

Resilience: ensure that our decisions consider the resilience of our ecosystems and their ability to provide benefits in the long term. This is at the heart of the ERBAP and why we consider not just the number of species we conserve, but also the extent, condition, connectivity, and adaptability of their habitat. As such we need to acknowledge the specific environment that Cardiff's urban setting provides, how that varies across the university's estate, and the role of social and cultural processes in forming this matrix.

With the Environment (Wales) Act, the Well-being of Future Generations Act, and the Planning Act, we in principle have a broader integrated framework for ecosystem resilience, which incorporates the application of biodiversity policy and management. This framework can be placed in the context of Natural Resource Planning and the development of 'Area Statements' by NRW for placing ecosystem resilience and biodiversity policy in a local context, and discussions have been ongoing with stakeholders, including Cardiff University staff, in terms of what the statements should look like. At the same time, a number of working groups have been set up to help with ideas for delivery of WG's Environment Act, including relevant ones on *Ecosystem Resilience and Restoration* and *Urban Green Infrastructure*.

Society faces both a biodiversity crisis and a climate emergency, which have been acknowledged by the university's Declaration of November 2019 and current work to develop our route to net zero by 2030 for scopes 1 and 2, and before 2050 for scope 3. However, we cannot address climate change without also considering conserving and increasing

biodiversity. The ERBAP seeks opportunities to conserve and promote the diversity of species on the university's estate, which can also dovetail with actions to reduce carbon emissions and increase carbon sequestration. Within the urban environment, the conservation of biodiversity is particularly important because wildlife areas may suffer from pollution and fragmentation, so efforts should encompass the protection of remaining sites of interest for biodiversity, enhancement of sites of potential value, and the creation of new habitats. The IPBES report highlights some policy tools, options, and exemplary actions in ***urban areas***, such as the promotion of nature-based solutions; increasing access to urban services and a healthy urban environment for low-income communities; improving access to green spaces; sustainable production and consumption; and ecological connectivity within urban spaces, particularly with native species. With the ERBAP, we seek to address these concerns, and by doing so, to join the rank of UK universities who have also dedicated themselves to working to halt biodiversity loss.

Cardiff University staff have, for example, worked over the last several years to improve the number of pollinators within the Cardiff urban region by installing beehives on the roof of several university buildings. However, pollinators and other wildlife require access to suitable habitat and diverse forage throughout the year to prosper. The ERBAP seeks to take a joined-up approach to work across university sites, with professional services, academic researchers, students, and with Cardiff City Council and other actors to create a corridor of quality green spaces across the Cardiff city region. The ERBAP identifies a series of principles to guide landscape maintenance practices and will incorporate this into the tender process. As the ERBAP develops, further locations and principles will be included in maintenance practices. Principles include leaving designated and design spaces for wildflower meadows, reducing and eliminating the use of herbicides, surveying the tree population and using digital tools to inform species and location selection for future tree plantings, and timing of hedge clipping to consider nesting species.

Given the above, the development of the ERBAP 2021-2023 was timely and the current review will continue to map onto best practice, as well as supporting Cardiff University's Environmental Sustainability Enabling Strategy[9], to achieve its underpinning goals, and the University's ISO 14001 certified Environmental Management System. In 2020, many UK universities already had BAPs, so we were somewhat behind. However, we examined how these were framed within the context of each university's local environment and developed the ERBAP by taking some of the best elements of these plans. In addition, we needed to ensure that the ERBAP was consistent with Cardiff City Council's 2019 Green Infrastructure and Biodiversity and Resilience of Ecosystems Duty Action Plans[10] and that of other relevant land holders, so that we ensure we manage the university's estate in a manner consistent with council aspiration and to maintain green infrastructure in a way that enhances biodiversity and connectivity, leveraging synergistic improvements for biodiversity city-wide.

Aims

Cardiff University's ERBAP has the following general aims.

1. **Characterise**. The ERBAP aims to characterise the **level and distribution** of biological diversity, measured both within species (abundance, demographic resilience, genetic diversity) and among species (community-level biodiversity for all major groups of indigenous plants and animals). The ERBAP also aims to characterise the current status of biodiversity related **ecosystem services** across the university's

[9] https://www.cardiff.ac.uk/__data/assets/pdf_file/0006/1197555/SustainableStrat.pdf
[10] cardiff.moderngov.co.uk/documents/s34305/Cabinet%2026%20Sept%202019%20Biodiversity%20BRED%20App.pdf

estate, including levels of connectivity, green infrastructure functionality (carbon sequestration, sustainable drainage, urban cooling, air quality remediation), pollination services and cultural value. These biodiversity characteristics will be evaluated using intensive surveys and data analysis to capture fully the annual cycle of the ecosystems within the university's estate. Characterisation will be carried out by staff, students and local citizen volunteers and will follow Welsh legislation's DECCA (Diversity, Extent, Condition, Connectedness, Adaptability) framework.

2. **Manage**. The ERBAP will use the data collected in the characterisation phase to establish the most effective management strategies for maintenance, restoration, and enhancement of the university's green estate by:

    a) **Mitigation**. First, practices that negatively impact on the estate's biodiversity and related ecosystem services will be changed and/or mitigated by ameliorative measures relevant to those practices. This will require an inventory of those practices and their consequences for the university's green estate.
    b) **Restoration**. Identification of strategic habitats and functions shown in the characterisation phase to be in unsatisfactory condition will be targeted for restoration and/or enhancement during the period of the BAP, including a phased restoration plan around the university's estate focusing on enhancing biodiversity under the DECCA framework.
    c) **Enhancement**. We will evaluate the university's green estate with an aim to enhance its biodiversity performance, regardless of its current status, following the DECCA framework (which includes connectivity within the estate and with local green infrastructure). Enhancements will be phased and will involve habitat modification, including planting with native species, removal of invasive plant species, increasing native biodiversity using infrastructure and installations such as refugia, connectivity measures and introduction of appropriate new management practices. Overall, we aim to continue to restore and enhance the functionality and biodiversity of the university's green estate in this next ERBAP cycle.

3. **Monitor**. The ERBAP will institute a rolling monitoring program that will evaluate changes and the impact of management practices on biodiversity and ecosystem services by engagement with academic and professional services staff, by educational opportunities afforded to students across all colleges and by engagement with local volunteers. Monitoring activities will be as inclusive as possible to create a 'living laboratory', thereby embedding the activities of the ERBAP within the university's day-to-day life and activities.

4. **Promote, Engage and Mobilise**. The ERBAP will continue to focus on the promotion of biodiversity and the ecosystems services it produces with staff and students, including involving them in the activities described above. The ERBAP will also continue to engage with local authorities and stakeholders with a view to making the university's green estate a focus for community activities of educational and well-being relevance. This will be realised further by using the university's green estate as a focus for community interaction through co-design, co-creation, exhibitions, installations, and hard landscaping.

State-of-the-Art: Cardiff University's Biodiversity and Estate

Species

At Cardiff University we have to date identified eighteen species (or species groups) of wildlife and wildflower as our priorities for conservation action (**Table 1**). The list includes all of the Species of Principal Importance for Biodiversity (SPIBs - under Section 7 of the Environment (Wales) Act 2016)[11], which currently occur at Cardiff University, as well as the Priority Species identified in the Cardiff Local Biodiversity Action Plan, 2008 (CL BAP)[12].

The list also includes some species chosen by the Cardiff University community for special attention. In January-February 2019, the Cardiff Wildlife & Cardiff Wildflowers (CWCW) Staff Group ran a consultation on Yammer about the possibility of developing a 'Wildlife & Wildflower Plan' for Cardiff University. The consultation documents were read by 308 members of staff and attracted 167 contributions. The contributors identified ten species (or species groups) of wildlife and wildflower as community priorities for conservation action at Cardiff University.

Also included in the list are several sensitive groups identified from records as present on university grounds, warranting their prioritisation in ongoing management plans. These records were made by members of the Biodiversity Action Plan Working Group and, as described in detail below, by assimilation of recent historical records of the extant flora and fauna through iRecord. The conservation of these groups is largely achievable in parallel with existing aims relating to the other priority species.

We acknowledge that for some of the species on the following list (e.g., black redstart, tree sparrow) it may not be possible to improve numbers, as their absence relates to ecological factors that extend beyond Cardiff University's ability to influence. However, there are many other species on the list (e.g., finches, warblers, raptors, other thrushes) that are known and commonly visit the site and the numbers of which we expect to enhance through targeted actions.

[11] https://www.biodiversitywales.org.uk/Environment-Wales-Act

[12] https://www.outdoorcardiff.com/wp-content/uploads/Cardiff-LBAP-2008.pdf

Table 1. Species and species groups identified to date as priorities for conservation action and management

Cardiff University Priority Species						
#	Common name	Species name	Species of Principal Importance for Biodiversity	Cardiff Local Biodiversity Action Plan	Cardiff University Wildlife & Wildflower Plan	Status at Cardiff University in 2020
1	Slow worm	*Anguis fragilis*	yes	yes	yes	Present at one site
2	Common pipistrelle	*Pipistrellus pipistrellus*	yes	yes	yes	Use at least three sites
3	Newts	*Lissotriton vulgaris; L. helveticus; Triturus cristatus*	yes	yes	yes	Not recorded
4	Black-headed gull	*Larus ridibundus*	yes	yes	no	Present at one site
5	Herring gull	*Larus argentatus* subsp. *argentatus*	yes	yes	no	Present at several sites
6	House sparrow	*Passer domesticus*	yes	no	no	Present at several sites
7	Cinnabar moth	*Tyria jacobeae*	no	yes	no	Breeds at two sites
8	Hedgehog	*Erinaceus europaeus*	yes	no	yes	Uses at least three sites, may breed
9	Swift	*Apus apus*	no	no	yes	Breeds at one site
10	Tawny owl	*Strix aluco*	no	no	yes	Uses one site
11	Garden birds	Incl. *Prunella modularis, Turdus philomelos, Sturnus vulgaris*	yes	no	yes	Present at most sites
12	Pollinators	Incl. *Spilosoma lutea, Malacosoma neustria*	no	no	yes	Present at most sites
13	Bluebell	*Hyacinthoides non-scripta*	no	no	yes	Present at four sites
14	Welsh daffodil	*Narcissus pseudonarcissus*	no	no	yes	Not recorded
15	Soil fauna/flora	Incl. Acari, Trichoniscidae, various Coleoptera, Chilopoda, Fungi	no	no	no	Present at all sites
16	Veteran trees	Incl. *Quercus* spp., *Fagus sylvatica*, *Fraxinus excelsior*	yes	no	no	Present at several sites
17	Saproxylic fauna/flora	Incl. Lucanidae, Syrphidae, Fungi	no	no	no	Present at some sites
18	Moths	Var. Lepidoptera	no	no	no	Present at all sites

Habitats

As well as our priority species (or species groups) we have also identified five priority habitats (**Table 2**). The first four of these are all *Habitats of Principal Importance for Biodiversity* under the Environment (Wales) Act 2016 (HPIBs) as well as *Priority Habitats* under the 2008 Cardiff Local Biodiversity Action Plan (CL BAP) and were independently also chosen as priorities by the Cardiff University Community in the 2019 Wildlife & Wildflower Plan. The fifth, veteran trees, was selected given its provision of several key microhabitats on which a large contingent of EU red-listed species, mostly saproxylic beetles, depend; several similar beetles have been recorded on university grounds, very likely depending on the existing provision of these microhabitats.

Table 2. Habitats identified to date as priorities for conservation action and management

Cardiff University Priority Habitats					
#	Common name	Habitat of Principal Importance for Biodiversity	Cardiff Local Biodiversity Action Plan	Cardiff University Wildlife & Wildflower Plan	Status at Cardiff University in 2020
1	Lowland neutral grassland meadow	yes	yes	yes	Currently c.2,475m^2 across eight sites. All converted from improved grassland, but with some remnant and several colonising species.
2	Ponds	yes	yes	yes	Currently only one mini-pond across all sites, but another pond was historically present.
3	Lowland mixed deciduous woodland	yes	yes	yes	Around 9,000m^2 across three sites.
4	Hedgerow	yes	yes	yes	Over 3km present across several sites.
5	Veteran trees	yes	no	no	At least three sites containing veteran trees.

Our priority species and habitats are spread across the university campus. In **Table 3** we indicate the diversity and extent of our key sites with some comments on condition and connectivity where known. The species are not shown at site level to protect their location. It is worth noting that these values and statements are approximate and require further survey during the ERBAP's characterisation stage. The grey lines in **Table 3** state the aspirations for each site; these may be subject to change based on the outcome of data collected in the characterisation stage. Characterisation of each site will then be used to establish the most effective management strategies for maintenance, restoration, and enhancement of the university's green estate, and the aspirations may be revised at that time.

Table 3. Key sites for biodiversity across Cardiff University's estate, including DECCA commentary. Determination of species poor or species rich status was determined based on training from National Trust[13]: "*Species poor areas are dominated by ryegrass and usually have poor biodiversity. Semi-improved areas have less ryegrass and a few species. Species rich areas have 15+ vascular plants, or more than 30% flowering plant coverage present and little ryegrass*". Areas currently considered as species rich will be monitored in the future for CHEGD fungi indicative biodiverse sites.

Cardiff University Sites					
Site	**Meadow**	**Ponds**	**Woodland**	**Hedgerow**	**Priority Species**
Sports Fields 2020	1,030m^2 Species Poor	mini		870m Connected	10
Sports Fields 2026 Aspiration	*530m^2 Species Poor*	*mini*		*870m Connected*	*7*[14]
University Hall 2020	68m^2 *Species Poor*	previously	8,200m^2 Connected	580m Connected	6
University Hall 2026 Aspiration	*418m^2 Semi-Improved*	*yes*	*8,200m^2 Connected*	*580m Connected*	*10*
Redwood 2020	c538m^2 Not surveyed				5
Redwood 2026 Aspiration	*c538m^2 Species Rich*	*yes*		*yes*	*7*
Talybont North 2020	420m^2 Species Rich		300m^2 Connected	610m Connected	5
Talybont North 2026 Aspiration	*420m^2 Species Rich*		*300m^2 Connected*	*610m Connected*	*5*
Talybont South 2020	85m^2 Species Poor			450m Connected	5
Talybont South 2026 Aspiration	*85m^2 Species Rich*			*450m Connected*	*5*
Cartwright Court 2020	216m^2 Species Poor		350m^2 Connected	370m Connected	5
Cartwright Court 2026 Aspiration	*216m^2 Species Rich*		*350m^2 Connected*	*370m Connected*	*5*
Bute Building 2020	no				3
Bute Building 2026 Aspiration	*500m^2 Species Rich*			*yes*	*5*
Trevithick Building 2020	0			yes	0
Trevithick Building 2026 Aspiration	*400m^2* Species Rich			*yes*	*5*
Cubric 2020	No			yes	2
Cubric 2026 Aspiration	*250m^2 Species Rich*			*yes*	*5*
Main Building 2020				300m Connected	3

[13] http://www.magnificentmeadows.org.uk/assets/pdfs/How_to_identify_different_types_of_grassland.pdf

[14] The Sports Fields underwent major redevelopment in 2021. In this ERBAP cycle we will be re-assessing how much of the biodiversity has been retained.

***Main Building 2026* Aspiration**				300m Connected	3
Hadyn Ellis Building 2020	70m^2 Semi-Improved				3
Hadyn Ellis Building 2026 Aspiration	*70m^2* *Semi-Improved*				*3*
Remembrance Garden 2020					3
Remembrance Garden 2026 Aspiration					*3*
5-7 Corbett Road 2020				50m Not connected	2
5-7 Corbett Road 2026 Aspiration				*50m* *Not connected*	*2*
Senghennyd Court 2020	76m^2 Species Rich				2
Senghennyd Court 2026 Aspiration	*76m^2* *Species Rich*				*2*
Roy Jenkins 2020					2
Roy Jenkins 2026 Aspiration					*2*
Gordon Hall 2020				80m Not connected	1
Gordon Hall 2026 Aspiration				*80m* *Not connected*	*1*

The ERBAP needs to build on the work that has already been done to identify areas of biodiversity importance and to map areas of important green infrastructure across the university's estate. Further work is needed to **characterise** both the faunal, floral, and fungal diversity across the university's estate by surveying sites in detail throughout the year.

During 2024, we will map all of the university's current green areas using GIS (Geographical Information System) software, and create data layers (e.g., species data, habitat data, habitat enhancement measures, etc.).

In this new ERBAP cycle, we plan to implement species surveys through a mix of approaches. Firstly, we want to provide baseline species data to inform management and conservation actions and against which to measure achievement of targets. Ability to carry out and complete university-wide baseline surveys will highly depend on professional services staff, academic staff, student, and community engagement, as well as funding. For priority species, baseline data will be collected via an initial desktop exercise (access to online databases), opportunistic recording (e.g., by encouraging the university community to share what they see on campus via the CWCW Viva Engage Yammer group or by using wildlife recording apps), and, where possible, via targeted surveys. For priority species groups, data will be collected via nature walks, bioblitzes, and where possible via targeted surveys. If funding becomes available, preliminary ecological appraisals will be outsourced.

In the long-term, we will establish a monitoring programme, with surveys of some groups ideally carried out quarterly. We will integrate survey work in degree curricula, for instance in modules with a field work component, and as part of student research projects. These surveys will be carried out as described in the ERBAP 'Survey and Monitoring Strategy' section in **Chapter 3**.

Local Context and Activities

Cardiff City Council

Cardiff University is based largely within the city centre, in diverse locations featuring a wide variety of built infrastructure, green spaces and usage patterns by university staff and students, and the public. This makes green infrastructure management challenging and highly context specific. In the context of DECCA, it also means that the university's patches of green estate cannot be seen in isolation, either in its own right, or within this context of the green estate, which is present adjacent and close to the university, management of much of which is the responsibility of Cardiff City Council. In 2019, the Council produced a new Green Infrastructure (GI) and a Biodiversity and Resilience Ecosystems Duty (BRED) Forward Plan[15] and the university's ERBAP is very much contextualised by these documents. The GI Plan has the aim to produce "*multi-functional, connected green spaces that make the best use of land - at the same time providing green open space for all, helping wildlife to flourish, and delivering a wide range of economic, health and community benefits*." The BRED Action Plan is positioned to "*deliver the objectives of the Green Infrastructure Plan as well as those of the Nature Recovery Action Plan (2015*)."

The overall vision of these plans is that *'Cardiff's distinctive natural heritage will provide a network of Green Infrastructure which will be protected, enhanced, developed and managed to ensure that its integrity and connectivity is sustained for the economic, social and environmental benefit of the City and the Region.*' It is clear that Cardiff University's estate, especially that located within the Cathays Park site and surroundings, is therefore of extreme importance for Cardiff City Council to achieve this vision and as such we must work in close collaboration with the Council to ensure our ERBAP activities are consistent with this vision and with direct management activities carried out by the council. At the same time, Cardiff University employs >6,600 staff and has >33,000 students, all of whom are, at some time or other, users of the city's green infrastructure and facilities, and who stand to benefit substantially by a joined-up approach to green space and biodiversity management in their surroundings.

Cardiff City Council's GI Plan is framed explicitly within the concept of resilience identified in the Well-being of Future Generations Act, and this is a major reason why the university's ERBAP is also framed in this way. Among other policy drivers, the Council's Plan also acknowledges the role of Natural Resources Wales' Area Statements activity, which are intended to help facilitate the sustainable management of Wales' natural resources. Cardiff City Council and all of Cardiff University's estate are situated within the South-Central Area Statement boundary[16]. Its six main objectives include *protection and enhancement of Cardiff's ecosystems to ensure that they continue to support diverse habitats and species, allowing them to adapt to change* (Objective 1). This includes the following activities:

1. Mapping of ecosystems, and preparation and implementation of management plans for specific ecosystems;
2. Delivery of city-wide and cross-boundary initiatives including projects to support removal of invasive species, increased planting of pollinators and protection of endangered habitats and species;
3. Ensuring ecosystems are resilient, in terms of their extent, diversity, connectivity and condition (DECCA);

[15] https://cardiff.moderngov.co.uk/documents/s34305/Cabinet%2026%20Sept%202019%20Biodiversity%20BRED%20App.pdf

[16] https://naturalresources.wales/about-us/area-statements/south-central-wales-area-statement/introduction-to-south-central-area-statement/?lang=en

4. Provision of ecosystem corridors in new and existing developments;
5. Ongoing work with volunteers to improve local biodiversity;
6. Monitoring and recording of species and habitats;
7. Provision of information and training for volunteers and local people.

The other objectives include: management of green infrastructure to enhance climate resilience and provide protection to people and places (including flood management, provision of shade and other microhabitats, sustainable urban drainage and monitoring climate change impacts on green infrastructure); supporting the local economy and tourism, providing benefits for physical and mental health by improving, promoting and creating connected, multi-functional green infrastructure; enabling citizens to participate in learning, training and volunteering to foster social inclusion and equality and improve life chances; to enhance Cardiff sense of place – Cardiff is already known as one of Europe's greenest cities and the GI Plan seeks to enhance this heritage.

The BRED Action Plan aims to bring the general activities in the GI Plan to bear on the objectives of Welsh Government's Nature Recovery Action Plan (NRAP), which include "S*afeguarding species and habitats of principal importance and improving their management*"; "*Increasing the resilience of our natural environment by restoring degraded habitats and creating habitats*"; "*Tackling key pressures on species and habitats*" and "*Improving evidence, understanding and monitoring*". A large number of activities are envisaged as part of a "Greening the City" plan, which is embedded in the GI Delivery Plan 2019-2022. Although many of these are site-specific, they include general objectives to map GI-based ecosystem services, development of a Green Lane network plan, installation of wildlife explorer trails across the parks system, installation of interpretation boards, and development of park management plans. Overall, there is an aim to increase tree canopy cover from 19% to 25% by 2030, form a Local Nature Partnership (now formed, see below), and produce a local Nature Recovery Action and a Pollinator Plan for the city.

It can be seen that the above objectives map very well with the objectives of the university's ERBAP. However, to ensure ERBAP activities are consistent with Cardiff City Council's GI and BRED Plans in both a spatial and temporal manner, specific joined up thinking and activities are required. Direct co-working opportunities need to be identified, resourced, managed and monitored. To enable these activities to be identified and developed, a member of Cardiff City Council currently sits on the ERBAP Steering Group (Cardiff Council, Conservation Officer) and a member of the university sits on the Cardiff Local Nature Partnership (LNP) steering committee (Chair of the ERBAP Steering Group). The LNP steering committee comprises representatives from local government, NRW, a variety of NGOs, Cardiff Civic Society, and actors such as the university. Collaboration is ongoing, and the LNP has already provided advice on habitat enhancement plans for some of the university key sites, as well as funding. There are also potential deployment opportunities for Cardiff University students in LNP activities for projects and as volunteering posts.

Natural Resources Wales

NRW's South Central Area Statement works at a wider spatial scale and has, among its main objectives, the aim to build resilient ecosystems, connect people with nature, improve health and improve air quality. The team is aware of the development of the university's ERBAP. Under the Building Resilient Ecosystems theme, urban ecosystems are a priority and working through Local Nature Partnerships, Public Authorities and Public Service Boards, the Area Statements team will provide advice to stakeholders with developing their evidence base, understanding ecological networks at a wider spatial scale for synergistic planning and will develop resilience-based area plans.

Pharmabees

The award winning Pharmabees project traces its roots back to Dr Jenny Hawkins, a former student of the School of Pharmacy who in 2015 completed a PhD entitled 'Apothecary Bee's, using the bee as a tool for drug discovery'. Jenny discovered a 'super honey' from Tywyn in North Wales, which killed hospital superbugs, and determined that this activity was due to specific plants the bees visited during foraging. To recreate super honey, beehives were installed on the roof of the Pharmacy (Redwood) Building and Tywyn plants were planted to provide the 'super' food for the bees[17].

Using the experience from the Redwood Building, Pharmabees engaged with the wider university resulting in the installation of hives and bug boxes on more university buildings. A collaboration with the charity Buglife resulted in planting of a wildlife meadow at the Redwood Building, which developed into a memorial garden (in commemoration of Prof Chris McGuigan) with a grass free lawn. In 2016, this gained a Green Flag Community Award, which has been awarded annually since the site was developed.

Pharmabees is also closely aligned with two "Flagship" projects; Caer Heritage and the Grangetown Community Project, who have installed a pollinator friendly community garden and are in the process of seeding a wildflower meadow. These collaborations continue to evolve.

In 2018, in collaboration with the Student Union's Wildlife and Conservation Society (WildSoc), Pharmabees gained funding from Grow Wild to establish 10 pollinator friendly areas across the estate. The newly created gardens cover the whole of the Cardiff University site, with planting on the Sports Fields; the Heath Park Campus; the Queen's Building site; the Cathays site and the new Maindy Road site. The project culminated with a talk from the prestigious academic Professor David Goulson, who is one of the foremost bumblebee researchers. The project engaged in the region of 500 people from within and around Cardiff University. There are now 10 areas that can be further developed over the next few years with the involvement of staff and student societies.

Increased engagement with Welsh Government led to Pharmabees curating a conference on behalf of the Welsh Assembly Government Pollinator Action Group entitled 'Bee Well Cardiff, Joining the Dots'.

Interest came from beyond the university campus, resulting in engagement on biodiversity, antibiotics, and antibiotic resistance with 12 secondary schools, 30 primary schools as well as six community projects in South Wales and overseas. This enabled the development of structured evidence-based engagement with schools, campus, and community. The team has evidenced increases in knowledge and understanding, which highlight positive behavioural and value changes relating to biodiversity, bees, the environment, science, and wellbeing. To engage with communities on the importance of this work, a website was created highlighting how university research is having a real-world impact and how the public can contribute[18]. The website hosts a link to spin-out citizen science project 'Spot-a-Bee' in which the public use mobile phones to upload images of bees and plants onto google maps to build a map of bee friendly plants in Cardiff. So far there have been over 16,000 entries, with some from as far as California and Angola. Pharmabees is looking to link the apps output with national databases and to use the data as a planning tool to identify urban areas that are in need of plants and to monitor the impact of climate changes on flora and fauna. Further engagement with schools and university students is planned. The project has also supported the development of a new

[17] https://youtu.be/tQctVn4QQQU

[18] https://www.cardiff.ac.uk/pharmabees

school's engagement resource called the 'Climate Classroom', which features an algal bioreactor which captures carbon dioxide in the classroom and highlights the importance of climate change.

The Pharmabees project is now recognised as part of the university's Environmental Sustainability Strategy. Over 1,000m2 of pollinator friendly, carbon-sequestering plants have been planted at the university. The university was also awarded Bee Friendly Status by the Welsh Assembly Government. In 2017, the project received several national awards, which included sustainability awards from the Guardian and Sustain Wales. The project has engaged with a diverse range of organisations such as community gardens, schools, industry, health boards, Welsh Assembly Government, and the Women's Institute.

The project has also enhanced links with partner organisations from across South Wales to enrich the biodiversity of green spaces beyond the confines of the university and to encourage more engagement and pollinators across the region. The Pharmabees team co-created bee-friendly, plant-rich environments to make the university and Cardiff a better place to work and live. In addition to this, they are currently running a wildflower seed mix project across South Wales in which they are asking the public to grow their experimental mix of wildflower seeds at home and record the insects that visit them.

These developments led to the co-creation of wellbeing space with health boards. Wellbeing space at Llandough Hospital has been cited as an example of good practice by the Auditor General for Wales. Recent projects include a rewilding project at Ystrad Mynach hospital in which Pharmabees has created a nature trail to provide a space for NHS staff to connect with nature and an awarding winning community garden in Abercynon. These two sites are part of a university initiative known as green prescribing in which we use the power of spending time in nature to support mental health and resilience.

Cardiff University Meadow Areas

Since 2015, nine meadow areas have been created on campus by the university Grounds maintenance team (SPORT) and Pharmabees in collaboration with Residences, Estates, and WildSoc. The seeds used were provided by Buglife's Urban Buzz project and the Kew Gardens Community Gardens project. The meadows are all on neutral soil and all were planted with exclusively native and archaeophyte species. The predominant species planted were oxeye daisy, wild carrot, yarrow, salad burnet, knapweed, meadow buttercups, bird's foot trefoil and red and white clover. Some meadows have established or recruited less common plants, including tufted vetch, perforate St John's wort, yellow rattle, wild arum, lesser celandine, common centaury, fox-and-cubs, musk mallow, and lady's and hedge bedstraw.

In addition to this, 4,300 native bluebells were planted across five sites to provide a seed bank for the future (previously the native bluebell was extinct on campus). These meadow areas were all previously lawn areas (improved or semi-improved grasslands) and are now being managed as meadows as part of Cardiff University's grounds contract. Fifty viper's bugloss plants were cultivated from seed and introduced in 2019 based on guidance from Pharmabees pollen research. These have become established on at least two sites.

The Cardiff Wildlife & Cardiff Wildflower (CWCW) Staff Group

The Cardiff Wildlife & Cardiff Wildflower (CWCW) Staff Group is part of Cardiff University's private Viva Engage Yammer network, which is open to all members of staff at Cardiff University. The group was created in 2018 and immediately prior to publication of the ERBAP 2021-2023 had around 400 members (currently this number sits at 485). The purpose of the group is to share knowledge and enthusiasm about Cardiff University's biodiversity, and local

environmental projects. There is an average of one post a week, usually photographs or videos of wild animals and plants taken on the university grounds, or other local initiatives, petitions and offers.

In January 2019, to celebrate the CWCW Staff Group reaching 250 members, the group ran a survey to select priority species and habitats for Cardiff University to work towards protecting (see **Table 1** above). The results of this survey were developed into a Cardiff University Wildlife & Wildflower Plan, which was one of the starting documents presented to the ERBAP Steering Group at the start of its tenure.

Governance and Decision Making

The ERBAP continues to be managed by a Steering Group, which has been constituted since August 2019. This group and its remit arose from the university's Environmental Sustainability Enabling Strategy 2018-2023, which included a priority "*To enhance the biodiversity of our campus by promoting pollinator planting across our green spaces*" as part of the goal of Underpinning a Resilient University. Four biodiversity objectives were outlined under this priority:

1. Linking with the Well-being strategy to develop a community garden and food growing space;
2. Expanding the Welsh Government pollinator friendly initiative across university buildings;
3. Building partnerships with our neighbours to develop biodiversity corridors across the city;
4. Continuing creation of wildflower/bee friendly planting around university campuses.

The ERBAP Steering Group initially comprised members of academic staff: Prof Michael Bruford (Dean for Environmental Sustainability as Chair), Prof Steve Ormerod (BIOSI), Prof Les Baillie (PHRMY), Dr Angelina Sanderson-Bellamy (PLACE/BIOSI), Dr Marie Davidova (ARCHI); postgraduate students: Jordan Cuff and Maximilian Tercel (BIOSI); Student Union Ethical and Environmental Officer: Julia Komar; Professional Services Staff: Justine Jenkins (PHRMY as secretary), Katrina Henderson (SSWEL), Dr Lee Raye (CSERV), Andrew Thompson (ESTAT), Chris James (ESTAT); and a representative of Cardiff City Council: Nicola Hutchinson (Conservation Officer).

The ERBAP Steering Group reported on an *ad hoc* basis to the Environmental Management Systems (EMS) Steering Group, a subcommittee of the Health, Safety and Environment (HSE) Committee, but had not yet been formally constituted within the university's committee reporting structure, nor had general principles regarding membership been established.

In the ERBAP 2021-23, it was suggested that the ERBAP Steering Group **formally reports to the EMS Steering Group** when it sits and that as part of the ERBAP, its Steering Group **formally reviews membership**, including **criteria**, **balance** (at the time there were no formal undergraduate student members, or members of the local community) and **how decisions are formally taken** (at the time via *ad hoc* consensus) prior to submission to the EMS Steering Group and HSE Committee for approval. In 2022, the reporting moved from the HSE Committee to the newly formed Environmental Sustainability Sub-Committee (ESS).

Some of the original group members have since left the university and the ERBAP Steering Group, with other colleagues stepping in their places. The membership has also been expanded to include other key representatives (see current members in the 'Authors' list), and official ToR (Terms of Reference), Steering Group membership, and reporting process have been formally established (see **Appendix 2**).

The ERBAP Steering Group meets monthly to discuss the development of the ERBAP itself, relevant activities in and around the university's estate, partnership activities, resourcing, and infrastructure. It also advises and assists the EMS Steering Group and ESS on biodiversity-related matters, providing updates, and establishing Biodiversity Targets, KPIs, and Key Delivery Actions for the Environmental Sustainability Action Plan (2023/2024, see **Appendix 3**).

Chapter 2. Review of Cardiff University Ecosystem Resilience and Biodiversity Action Plan 2021-2023

Production and Review of the Ecosystem Resilience and Biodiversity Action Plan

This ERBAP has been produced and reviewed collaboratively by members of the Steering Group, for discussion, modification and ultimately recommendation by the University Executive Board and Council. It is recognised that a period of consultation will be required by the university and stakeholders to assess the actions recommended. The timescale of the first ERBAP followed the current University Way Forward period (i.e., from 2021 to 2023), although some of the recommendations extended until 2030, to align with the university's Climate Emergency Declaration, the UN's Sustainable Development Goals, and the Council's tree canopy cover target. A new University Strategy will be developed in 2024, led by the new Vice Chancellor, Professor Wendy Larner, and will be informed by the outcomes of Y Sgwrs Fawr - The Big Conversation currently ongoing with staff and students. We will revise the ERBAP annually and, if needed, align activities once the new University Strategy is published.

Appointment of a Biodiversity Officer

A central recommendation of the ERBAP 2021-2023 was the appointment of a Biodiversity Officer for the university. The responsibilities of the role are to:

- Oversee habitat improvements delivered as part of the university's ERBAP.
- Lead the maintenance of Cardiff University's existing high-value biodiversity areas.
- Take responsibility for the monitoring of priority species on Cardiff University sites and ensure species data are digitised in a suitable database for future researchers and reported to the South East Wales Biodiversity Records Centre.
- Maintain detailed records of all biodiversity projects including GIS maps, project proposals, risk assessments, and photographs.
- Produce management plans as required to support biodiversity-friendly management of sites.
- Act as a first point of call for biodiversity queries / projects.
- Run volunteer planting and monitoring events on campus for volunteer students and staff.
- Help to apply for project funding and environmental prizes.
- Keep in contact with the Environmental Site Portering, and Grounds Maintenance teams.
- Liaise with the press office to share important news and photographs and support external communication.
- Liaise with partners at Cardiff City Council, the Local Nature Partnership and Natural Resources Wales, and support engagement with stakeholders and the wider community.

Advertisement of the role (open-ended contract, 0.5 FTE, sitting on the Carbon Net Zero team - ESTAT) was agreed in July 2023, with the new Biodiversity Officer appointed in August 2023.

The delay in appointing a Biodiversity Officer affected our ability to achieve most of the original targets. Some of the targets have thus been rolled out into the new ERBAP cycle.

Resourcing Strategy

Implementing the ERBAP requires additional resources, including financial, human, and infrastructural. In addition to internal resources that may come directly from those provided to the Estates department (e.g., for ground management and enhancement), educational and volunteering activities (via students and staff) and from School activities, the university is eligible for external funding to help enhance the green infrastructure, enable local stakeholder engagement via citizen groups, schools, and as members of the Local Nature Partnership. The funding already attracted by the Pharmabees project is testament to the availability of external resources if sound projects and programmes are developed. External funding applications have been and continue to be developed by members of the ERBAP Steering Group from academic and other sources, and currently external funding opportunities are being identified, monitored regularly, and prioritised for application. However, the success of this approach is contingent on the time and availability of members of the Steering Group and others to develop proposals. It is expected that the appointment of the new Biodiversity Officer will enhance this activity in the next cycle, enabling external funds to be leveraged more efficiently to reduce future costs of the ERBAP and even generate research income.

Species and Habitats Targets

Surveying and Monitoring

Achieving the original ERBAP targets for surveying and monitoring of the priority species and species groups highly depended on the appointment of a Biodiversity Officer to coordinate activities and secure the support of staff and student volunteers, so most targets have now been rolled out or revised in the new ERBAP. We refer below to where progress has been made against the ERBAP 2021-2023 Species targets.

Slow worms

The initial characterisation study for slow worms (*Anguis fragilis*) has been completed. A comprehensive report resulting from six monitoring seasons at one of the university sites has been produced by Dr L Raye and published on the university website.

Hedgehogs

Baseline studies using footprint tunnels to determine presence of hedgehogs under the Hedgehog Friendly Campus (HFC) campaign, were conducted in 2021 (six sites), 2022 (nine sites), and 2023 (two sites). Some of the sites were surveyed every year, with one site being surveyed twice a year, in Spring and Autumn (see **Appendix 1**). In total, we have so far confirmed the presence of hedgehogs at 14 different university sites, which include both the Cathays and the Heath Park campuses.

Invertebrates

In June 2022, we ran a bioblitz focused on invertebrate species, including pollinators, at the Main Building site. One of the aims of the bioblitz was to collate species baseline data before a bug hotel and log/leaf piles were added to the site (see **Appendix 1**).

Trees

During Spring 2022, a Visual Tree Assessment & Arboricultural survey was conducted across campus with the generation of three specific campus reports. The surveys were conducted by the university Grounds teams and Grounds contractor. Reports detail the species of tree, height, stem and crown diameter, level of maturity, and current condition.

Biodiversity Recording Apps

We reported opportunistic sightings of wildlife on campus via biodiversity recording apps (e.g., LERC Wales, Spot-a-Bee, iNaturalist, iRecord, Hedgehog Street, Mammal Mapper). We also encouraged staff and students, as well as local communities to use these applications. Data has been collected for wildflowers, mammals, garden birds, pollinators (including moths) and other invertebrates on university grounds.

'No Mow May'

Since 2021, the university has signed up for Plantlife's annual 'No Mow May' campaign. Several schools and residence sites have taken part and we have received positive feedback from staff and students. The involvement in 'No Mow May' has prompt the development of a new mowing regime and management of green spaces for the university estate.

Management of Green Spaces

A survey was carried out in December 2022 with members of the ERBAP Steering Group, Estates Operations team, and the university Grounds contractor, to identify areas for low management to benefit biodiversity (**Table 4**). The following actions were agreed to be taken forward:

- areas that are actively used by people will continue to be managed regularly (grass cut).
- areas that are not actively in use by people will be left mainly uncut. However, a half meter portion will be cut around to signal the intent of leaving these areas for wildlife and to keep borders tidy and safe access. Signage will also be added to these areas.
- areas that are left for wildlife will be maintained (cut) only three times a year, in March/April - cut and collect; October – cut and leave; November - cut and collect.
- during 'No Mow May', all areas, including the normally highly maintained areas (e.g., grass areas in Main Building, University Hall) will be left uncut.
- trimming of shrubs and bushes in the Autumn/Winter will be delayed until all berries are taken by birds and other wildlife.
- in Autumn, fallen tree leaves will be left on site when they do not pose a health and safety risk to people. In cases where leaves need to be removed, they will be collected and transferred to borders (leaf piles) to create safe areas for hibernating hedgehogs and overwintering insects.
- if trees are identified for coppicing or removal, branches or logs removed will be collected and placed on site to form wood/log piles for wildlife.
- areas identified by Building and Residence Managers, plus Grounds teams, as suitable for the purpose can be left completely unmanaged for wildlife.
- a comprehensive low management plan, including GIS maps of target areas and agreed actions for each area, will be developed for the university.

Table 4. Details of where the newly agreed management actions for green spaces are being trialled: location of site, where area is left uncut during 'No Mow May', where the new low mow regime is being implemented, where a 50cm perimeter cut is being added to uncut areas, creation of leaf litter piles (under the 'Leave the Leaves' campaign), and where wildflower meadows are under development

Location	'No Mow May'	New 'Low Mow' regime	50cm mow	Leave the Leaves	Meadow under development
Main Building	yes	-	-	yes	-
Sir Martin Evans / Tower / Law courtyard	yes	yes	-	-	yes
Law (Park Place)	yes	yes	yes	-	-
Redwood Building	yes	yes	yes	-	-
Bute Building	yes	yes	yes	-	-
Temple of Peace (Column Road & Museum Avenue only)	yes	yes	yes	-	-
John Percival Building courtyard	yes	yes	-	-	yes
Cardiff Business School Postgraduate Teaching Centre courtyard	yes	yes	-	yes	yes
Colum Drive campus	yes	yes	yes	-	-
Aberdare Hall	yes	-	-	yes	-
School of Music	yes	-	-	-	-
Haydn Ellis Building	yes	yes	yes	-	-
Optometry Building	yes	yes	yes	-	-

Habitat Enhancement for Wildlife

We have enhanced habitat for wildlife at several sites on campus (**Table 5**). We have used trail cameras at some of the sites to record wildlife presence and behaviour when using nest houses and feeding and water stations. A *Keep Wales Tidy* litter pick hub has been set up on one of the sites, which provides equipment to staff, students, and local communities to carry out litter picks on campus and in the wider city. We were successful in obtaining support (via provision of equipment and materials) from the *Cardiff Local Nature Partnership* and *Keep Wales Tidy* community grant schemes to enhance the John Percival Building and the Trevithick Building green areas, respectively.

Table 5. Habitat enhancement for wildlife at Cardiff University sites

Location	Bee / bug hotel	Hedgehog house	Feeding station	Water station	Log pile	Leaf pile	Hoverfly lagoons	Hedgehog highway	Litter pick hub
Main Building	yes	yes	-	yes	yes	yes	-	-	-
Haydn Ellis Building	yes	yes	yes	yes	yes	-	-	-	-
Cardiff Business School Post Graduate centre courtyard	yes	yes	-	yes	yes	yes	yes	-	-
Sir Martin Evans / Tower / Law courtyard	-	-	-	yes	-	-	yes	-	yes
University Hall	-	yes	-	-	yes	-	-	-	-
Aberdare Hall	-	-	-	-	yes	yes	-	-	-
Talybont North	-	yes	-	-	yes	-	-	-	-
Trevithick Building	-	yes	-	-	yes	-	-	-	-
John Percival Building	-	yes	-	-	-	-	-	yes	-

Tree Planting

Soft landscape enhancement plans have been developed in conjunction with the university Grounds contractor for six areas across the campus, including sports fields and residency sites. These plans are currently under consultation with site managers. In early 2023, we organised a tree planting event at the Talybont Glasshouse Complex site, supported by *Coed Caerdydd*, and university staff and student volunteers.

Sustainable Development Goals (SDGs)

Each year the university submits data against our performance towards the United Nations' Sustainable Development Goals (SDGs). Calibrated indicators provide comprehensive and balanced comparisons across three broad areas: research, outreach, and stewardship.

In 2023, the university's overall score improved from 88.5% to 91.2%, and we ranked 52nd out of 1591 ranked institutions worldwide. The data submitted was for 10 SDG's including:

- SDG 3: Good Health and Wellbeing – 31st in the World, up from 41st (1st in the UK)
- SDG 12: Responsible Consumption and Production - 24th in the World, up from 90th (12th in the UK)
- SDG 13: Climate Action – 60th in the World, up from 83rd (17th in the UK)

- SDG 14: Life Below Water – 6th, up from 55th (1st in the UK)
- SDG 15: Life on Land – 11th, up from 26th (4th in the UK)

Engagement and Mobilisation Plan

The biggest success of the ERBAP 2021-2023 has come from the engagement and mobilisation plan. We have been steadily building awareness and gathering support for ERBAP activities from internal and external stakeholders.

ERBAP activities have previously been embedded within the behavioural change programme, Green Impact and, in recent years, within the university's efforts to achieve Hedgehog Friendly Campus (HFC) accreditation. These two schemes encouraged the building of biodiversity-friendly teams from across the university and establishment of Biodiversity Hubs (see **Chapter 3**). These teams actively raised awareness to the threats posed to hedgehogs, pollinators, and other wildlife among the Cardiff University community and undertook a range of activities to further ERBAP aims. Since 2021, ERBAP activities are included into the staff and student Sustainability Week, which runs annually in March, and into the staff Positive, Health, Environment and Wellbeing (PHEW) fortnight run annually in July. We have also run several awareness-raising events during Hedgehog Awareness Week (usually in May) and Insect Week (June). We delivered ERBAP/HFC engagement stalls at several events organised by the Students Union (e.g., Fresher's Week), university catering team (e.g., farmer's markets), and biodiversity-friendly teams (e.g., CARBS community day). At staff away days, we gave talks on the progress of our HFC campaign and about the changes we are making on campus to help biodiversity. We have run two 'Homes for Wildlife' workshops for staff and students. At these workshops, participants have built hedgehog houses and bee/bug hotels by re-purposing wooden pallets from the university's waste stream. We developed and delivered interactive online and in-situ educational sessions on hedgehogs to community groups, and to primary and secondary schools.

In March 2022, the HFC team were awarded an Earth Hour 2022 Community Activity Grant for the *HogBuzz: Engaging staff and students with the Hedgehog Friendly Campus campaign at Cardiff University* project. This allowed us to continue to raise awareness about the campaign, acquire footprint tracking tunnels, two wildlife cameras, wildflower seeds and planting equipment. It also enabled us to run an event that included wildflower sowing and hedgehog survey training sessions.

We organised regular litter picks on campus and with local communities and each year we sign up to the Big Hog Friendly Litter Pick Challenge. Since 2021, we have collected more than 300 bags of rubbish from campus and local areas.

In March 2023, we were again awarded an Earth Hour Community Activity Grant for the *MiniHavens: Inspiring people in Wales to create habitats for the remarkable minibeasts on our doorstep* project. This project resulted from a collaboration between us, colleagues in the National Museum Cardiff (Entomology) and the Frozen Ark. This allowed us to engage with university staff and students, the community group Boosting Nature, and primary school pupils (via the Children's University), place more wildlife homes on site, and actively promote the use of wildlife recording apps.

We continue to engage and strengthen our existing links with relevant organisations (e.g. via the Cardiff City Nature Network), community groups, and local authorities.

We have developed a sustainability area on the university website, including subpages that reference the ERBAP and our Hedgehog Friendly Campus accreditation.

Education Plan

Environmental Sustainability Induction for Staff

All new staff receive a corporate induction and supporting documentation issued by Human Resources. The Environmental Sustainability Induction forms part of the induction process for staff. The induction presentation provides a slide dedicated to the work related to the ERBAP and associated activities including:

- Environment Act 2016 – Section 6
- Biodiversity Strategy and Action Plan
- Regrow Borneo
- Bee Friendly status
- Pharmabees project
- Greening Cathays
- Green Flag Community Award
- Great Bluebell Project
- Creation of natural habitat
- Slow worm project
- Hedgehog Friendly Campus
- Wildflower planting – community gardens
- Wildlife and Wildflower Yammer group

Biodiversity Training

We have offered biodiversity monitoring training to our staff and students, especially under the Hedgehog Friendly Campus campaign. We have provided training on how to monitor hedgehogs using footprint tunnels and wildlife cameras, on invertebrate species survey techniques, and on how to take tree measurements.

Biodiversity Engagement through Teaching

Master's students from the Welsh School of Architecture were commissioned to develop a Tree Planting Guide (a project titled Biodiverse Campus). The resulting tree planting guide takes into consideration various architectural, ecological, climatic, seasonal and policy considerations. The project focused on developing guidelines on planting 'the right tree in the right place'. The audiences for these guidelines are architects and landscape designers who will engage with Cardiff University Estates in the future as well as the local council.

Chapter 3. Action Plan 2024-2026

Species and Community Biodiversity Plan

The ERBAP's central aims are described above but summarised here:

1. Characterise the level and distribution of biological diversity, measured both within and among species and the status of biodiversity-related ecosystem services across the university's estate. These will be evaluated by intensive surveys and data analysis.
2. Using data collected in the categorisation phase, establish the most effective management strategies for maintenance, restoration, and enhancement of the university's green estate by mitigation.
3. Target any strategic habitats and functions identified to be in unsatisfactory conditions for restoration and/or enhancement, including the creation of a phased restoration plan

around the university's estate focusing on enhancing biodiversity under the DECCA framework.

4. Continue to evaluate the university's green estate with an aim to enhance its biodiversity performance, regardless of its current status. Continue to restore and enhance the functionality and biodiversity of the university's green estate.
5. Implement a rolling monitoring program to evaluate changes and the impact of management practices on biodiversity and ecosystem services. Monitoring activities will be as inclusive as possible to create a 'living laboratory', thereby embedding the activities of the ERBAP within the university's day-to-day life and activities.
6. Continue to focus on the promotion of biodiversity and ecosystems services with staff and students, local authorities, and stakeholders. The university's green estate will be used as a focus for community interaction.

Review of other Biodiversity Action Plans

In the original ERBAP, we first carried out a review of the available BAPs across the Russell Group, Welsh Universities, and local authorities to establish the scope of these documents and to benchmark best practice across relevant sectors. In the Russell Group, BAPs have been produced by Bristol, Durham, Exeter, Glasgow, Leeds, Liverpool, Newcastle, Nottingham, Oxford, Sheffield, Southampton, UCL, Warwick and York. Particular attention was paid to GW4 universities Bristol and Exeter. For Welsh HEIs, BAPs have been produced by Aberystwyth, Bangor, Swansea, South Wales, and Wrexham-Glyndwr. BAPs have also been produced by Cardiff City Council (superseded by the GI and BRED plans described above), Bristol Council and we also examined Bridgend's Plan. We identified the key elements of these plans with special reference to the HEI sector (**Table 6**) and mapped these onto institutional plans to see what aspects are commonly included and to identify best practice.

Table 6. Key elements of Higher Educational Institution Biodiversity Action Plans

	Russell Group (with plans)	Welsh HEIs (with plans)
Legislative Framework	8	1
Global narrative	3	2
Local (including university) narrative	5	3
Environmental Association of Universities and Colleges (EAUC) policy	1	0
Survey of competitors	1	0
Estates Plan		
Management1	9	1
Mitigation2	2	1
Restoration3	1	0
Monitoring4	5	3
Green Infrastructure / connectivity / spatial plan	4	0
Maps including habitats	7	4
Environmental Management Systems 14001 compliance	1	2
EcoCampus Bronze, Silver, Gold, and Platinum Awards (Cardiff University currently holds the platinum award)	0	1
Green Impact	7	2
Building Research Establishment Environmental Assessment Method (BREAAM)	1	0
Green Flag	2	1
Edible campus	1	0
Institutional decisions and governance	1	0

Biodiversity Officer / coordinator	1	0
Funding strategy	2	0
Annual survey / bioblitz	1	0
Species Plans	3	1
Publication of a biodiversity report	2	0
Awareness raising / communications	3	1
Action Plan (timebound)	7	2
Local Partnerships	5	0
Education Plan (including Teaching and outreach)	1	0
Student body involvement	4	0
Staff involvement (volunteering)	4	0
Healthy living (mindfulness, gardens)	1	0

Best Practice

Relatively comprehensive documents have been produced by **Exeter (Penryn campus**, this is, however, a very estates-driven report), **Glasgow** (possibly the most comprehensive which combines most potential facets of what a university BAP could include), **Leeds** (a very academic document, and has almost no estates component), **Nottingham** (solely estates driven, to the extent that academics and students have not been involved at all), **Sheffield** (also very estates-driven), **Swansea** (quite comprehensive, but perhaps more academically driven) and **UCL** (very estates-driven). The original ERBAP Steering Group aimed to take the best elements of these plans to produce a comprehensive ERBAP for Cardiff University based on best practice. In this next ERBAP cycle, we will continue to review the best elements of BAPs from other organisations. We will also consult and review evidence-based literature (e.g., using the *Conservation Evidence* platform and resources) and applying findings in our decision-making process to ensure that proposed habitat enhancement measures and conservation actions are effective.

One aim of the ERBAP is to conserve the *Priority Species* at Cardiff University through proper management of our *Priority Habitats* (especially where the priority species are known to occur, **Table 7**). The plan also aims to put into place monitoring procedures for our priority habitats and species. The new ERBAP will establish a comprehensive characterisation program to revisit and map all sites and habitats on the university's green estate.

Table 7. Threats facing the Priority Species and Species Groups identified in the ERBAP

Threats facing our Priority Species			
Priority Species	**International Threats according to IUCN**	**National Threats**	**Local Threats (those relevant to Cardiff University populations have asterisks*)**
Slow worm	Agricultural intensification, residential development, fires, forestry.	Loss of habitat, predation	Roadkill, loss of field margins, hedgerows, meadows*, rough grassland*, residential development*, human disturbance*, predation*
Newts	Pollution of water, loss of ponds, introduction of fish	Habitat loss, intensification of farming	Predation*, loss of ponds*

Tawny owl	Loss of woodland, pesticide use, traffic, powerlines	Vole population	Loss of woodland*, use of pesticides*, traffic*, powerlines*, presence of voles*
Black headed gull	Disease, oil spills, pollution	Predation	Disease*, predation*, pollution
Herring gull	Disease, oil spills, pollution, wind farms	Decrease in waste food available, predation	Disease*, decrease in waste food*, predation*, pollution
Swift	Residential development, re-roofing or demolition	Refurbishment of buildings	Building renovation*, disturbance*, demolition*, international factors
Garden birds	Loss of invertebrates, intensification of agriculture, loss of hedgerows, scrub and grassland, soil drainage, pesticides, climate change	Agricultural intensification (loss of food), use of pesticide	Loss of wildflowers*, use of pesticides (esp. slug pellets)*, intensification of agriculture, pollution*, climate change*
Pollinators	Intensification of agriculture, pesticide use, loss of wildflowers, invasive species, disease, climate change	Land use intensification, loss of habitat, disease, use of pesticides, climate change	Use of pesticides*, disease*, climate change*, loss of habitat*, intensified land use
Hedgehog	None	Habitat loss, intensification of agriculture, prey availability, roadkill, predation	Agricultural and residential development*, roadkill*, bonfires
Pipistrelle	Persecution, disturbance, building renovation	Refurbishment of buildings, disturbance	Climate change*, residential development/ renovation*, roads*, disturbance*
Bluebell	-	Destruction of woodland, collection in wild, hybridisation with Spanish bluebells	Destruction of woodland*, change in management*, regular mowing*, trampling*, collection*, introduction of Spanish bluebells*
Welsh daffodil	-	Agricultural intensification, poor management	Agricultural intensification, poor management*
Soil fauna/flora	Habitat quality erosion, agricultural intensification, land use change	Habitat quality erosion, agricultural intensification, land use change	Agricultural intensification, use of pesticides*, pollution*, land use change*
Veteran trees	Deforestation, agricultural intensification	Deforestation, agricultural intensification	Agricultural intensification, destruction of woodland*, change in management*

Saproxylic fauna/flora	Habitat loss, land use change, over management	Habitat loss, land use change, over management	Agricultural intensification, destruction of woodland*, change in management*, reduced habitat connectivity*
Moths	Climate change, deforestation, agricultural intensification, habitat loss, land use change	Climate change, deforestation, agricultural intensification, habitat loss, land use change	Deforestation, agricultural intensification, light pollution, habitat loss, land use change

Survey and Monitoring Strategy

A monitoring strategy was devised in the original ERBAP to account for the broadest feasible taxonomic range of flora and fauna. In the new ERBAP cycle, efforts will be made to implement as many of these strategies as necessary to characterise fully Cardiff University's biodiversity under the constraints of the available expertise, material, labour, funding, and permissions (i.e. licenses). When possible, monitoring will account for temporal and spatial variation in diversity across all university grounds. Material will need to be collected regularly, preserved, and subsequently identified for characterisation of extant invertebrate fauna, whereas vertebrates, plants, and fungi can be surveyed and recorded without collection. We will endeavour to deposit in an animal biobank (e.g., The Frozen Ark, CryoArks network) any invertebrate material that is collected for identification purposes. Surveys of groups requiring highly specialist taxonomic knowledge will be restricted by the availability of relevant expertise for the necessary identifications. For longevity, these surveys can be incorporated into teaching practices in the School of Biosciences and any other relevant university schools where possible. The surveys will comprise various techniques employed at regular intervals depending on the labour and potential ecological disruption associated with each:

Microhabitats

- Visual surveys of sites have already been initially conducted and can be updated as management reform continues.

Invertebrates

- **Ground-running invertebrates** – Pitfall traps (buried cups with mesh covering and lid to prevent rodent entry and rainfall) and vacuum sampling will be carried out for ground-running diurnal and nocturnal invertebrates.
- **Flying invertebrates** – Sticky/Malaise/Interception traps will be employed as appropriate depending on footfall, access, and habitat structure. Charismatic fauna such as butterflies will be photographed and initiatives such as the Big Butterfly Count encouraged on university grounds.
- **Light-attracted nocturnal species** – Light trapping is already being conducted across Cardiff by university staff and students and will be implemented on university grounds.

Vertebrates

- **Mammals** – Camera traps and Longworth traps will be used, subject to appropriate licenses, expertise, and presence of shrew holes.
- **Bats** – Bat detectors/stationary bat detectors will be used, particularly in sites thought to contain bats.

- **Birds** – Dawn chorus surveys for songbirds and visual surveys for larger birds including gulls, particularly herring gulls, will be employed.
- **Hedgehogs/small mammals** – Footprint tunnel surveys and torching (in line with Hedgehog Friendly Campus accreditation) will be used, subject to appropriate licenses.
- **Reptiles** – Refugia surveys are already being carried out on the most appropriate sites and will be sustained, with additional surveys considered where suitable habitat arises.
- **Amphibians** – No ponds are currently present, but once established, torching, spawn counts/searches and bottle traps will be used, subject to appropriate licensing (although no greater crested newts have been recorded so far on university grounds).

Flora/Fungi

- **Wildflowers** – Full site surveys have been previously conducted. Visual/photo surveys with additional full site surveys will be carried out.
- **Ground vegetation** – Visual/photo surveys will be carried out.
- **Trees** – Visual/photo surveys will build upon the current extent of cataloguing, which has already characterised a large contingent of the floral biodiversity.
- **Fungi** – Visual/photo surveys of macrofungal fruit bodies will be carried out.

Whenever possible we will engage and collaborate with relevant university student societies, staff/student groups (Biodiversity Hubs), Grounds contractor, local partners (NRW, LNP, Wildlife Trusts), NGOs, and local conservation/expert groups to carry out targeted surveys.

To supplement these, historical records across university grounds have been and will be collected continually from the widely used nature recording site/app iRecord, using the "activity" functionality. These records have been compiled for all Cardiff University grounds, with several species included in these records contributing to the development of the priority species list for future management above. We will re-engage with the Cardiff Wildlife & Cardiff Wildflower (CWCW) Viva Engage Yammer group and encourage members to post photos and submit records of biodiversity found on campus.

The Library Services team is preparing a literature review of biodiversity-related student and research theses from projects carried out on campus. This work will be extended to create a *small biodiversity archive holding* for institutional records and relevant unpublished coursework (e.g., project work submitted by Welsh School of Architecture students) to make these more accessible and inform future ERBAP activities.

Bioblitz activities will also be carried out to increase the rate of recording on university grounds, particularly by groups and individuals with expert knowledge of specialist taxonomic groups. Wildlife recording using the LERC Wales app and species ID apps will be encouraged on campus (e.g., during lunch walks), as well as participation in national citizen science projects (e.g., Big Butterfly Count, Big Garden Birdwatch, Every Flower Counts, etc.).

Table 8 presents the specific survey and habitat enhancement plan for each of the identified priority species for conservation. The plan will be overseen by the Biodiversity Officer and wider ERBAP Steering Group, but it is important to note that achieving these targets will highly depend on mobilisation of students and staff, on support provided by experts and internal and external specialist groups, and financial resources.

Table 8. ERBAP 2024-2026 Surveys and Habitat Enhancement Targets for Priority Species and Species Groups

Priority Species/Species Groups	Species-Specific Survey and Habitat Enhancement Targets 2024-2026
Slow Worms	▪ Determine if slow worm population still occurs on campus grounds ▪ Set up a cat-deterrent system ▪ Add warning and information signage ▪ Survey other areas for slow worms ▪ Place reptile hibernacula at key sites ▪ Set-up long-term monitoring programme for slow worms
Newts	▪ Explore the creation of ponds on campus ▪ Explore the creation of compost heaps ▪ Build more log piles
Tawny owls	▪ Add warning and information signage ▪ Create additional hedgerow and/or rough grassland to encourage small mammals and birds ▪ Set up dusk survey programme* *with support from Ornithological Student Society, WildSoc, BIOSI
Gulls	▪ Initial bird walks to confirm presence of gulls* ▪ Set up a gull survey programme to include four yearly visits to key sites, looking for any signs of disease and predation, and counting number of nests* *with support from Ornithological Student Society, WildSoc, BIOSI
Swifts	▪ Determine if swift population still occurs on campus grounds ▪ Develop swift-friendly site policy ▪ Develop environmental assessment and mitigation protocol, to be followed if university needs to develop any environmentally sensitive areas ▪ Place swift boxes/bricks ▪ Add warning and information signage ▪ Set-up long-term monitoring programme for swifts* *with support from Ornithological Student Society, WildSoc, BIOSI
Garden birds	▪ Initial desktop exercise (access to online databases) ▪ Bird walks to confirm what species occur in campus (breeding, resident, migrant species)* ▪ Set-up long-term monitoring programme for garden birds* ▪ Develop new guidance to reduce / eliminate the use of pesticides on campus ▪ Set new targets to reduce / eliminate the use of pesticides on campus *with support from Ornithological Society, WildSoc, BIOSI
Pollinators	▪ Initial desktop exercise (online databases, Spot-a-Bee) ▪ Run regular nature walks and bioblitzes ▪ Encourage use of wildlife recording apps (e.g., LERC Wales, iRecord, Spot-a-Bee apps) ▪ Develop new guidance to reduce / eliminate the use of pesticides on campus

	▪ Set new targets to reduce / eliminate the use of pesticides on campus *with help from Pharmabees, WildSoc, BIOSI, NGOs
Hedgehogs	▪ Continue to survey new sites for hedgehogs* ▪ Repeat surveys yearly at key sites* ▪ Continue to enhance sites with hedgehog houses, log/leaf piles, water and feeding stations ▪ Achieve Gold and Platinum Hedgehog Friendly Campus accreditations ▪ Develop new guidance to reduce / eliminate the use of pesticides on campus ▪ Set new targets to reduce / eliminate the use of pesticides on campus *with support of Cardiff University Hedgehog Friendly Campus team and Biodiversity Hubs teams
Pipistrelles	▪ Carry out initial characterisation study for pipistrelles using acoustic methods* ▪ Develop bat-friendly site policy ▪ Develop environmental assessment and mitigation protocol, to be followed if university needs to develop any environmentally sensitive areas ▪ Place bat boxes/bricks ▪ Add warning and information signage ▪ Set-up dusk survey programme for bats* *with support from local expert groups
Bluebells	▪ Carry out initial characterisation study, including identification of any potential invasive species or hybrids* ▪ Where identified, remove Spanish bluebells ▪ Develop environmental assessment and mitigation protocol, to be followed if university needs to develop any environmentally sensitive areas ▪ Add warning and information signage *with support from Grounds team, NGOs, local expert groups
Welsh daffodils	▪ Carry out initial characterisation study ▪ Develop environmental assessment and mitigation protocol, to be followed if university needs to develop any environmentally sensitive areas ▪ Add warning and information signage ▪ Ban the planting of horticultural daffodils and replace all horticultural daffodils by wild Welsh daffodils ▪ Plant wild Welsh daffodils at the Llanrumney Sports Fields *with support from Grounds team, NGOs, local expert groups
Soil fauna/flora/funga	▪ Carry out initial characterisation study ▪ Develop new guidance to reduce / eliminate the use of pesticides on campus ▪ Set new targets to reduce / eliminate the use of pesticides on campus *with support from BIOSI, local expert groups

Veteran trees	▪ Maintain old-growth trees as long as they are deemed structurally safe ▪ Existing trees will be allowed to mature. Thorough assessments will be carried out regarding the structural safety of trees, with trees affected by fungal decay, hollowing or even death not inherently resulting in their removal unless they pose a risk to human safety (policy already in place) ▪ When a need to fell a tree due to safety concerns is identified, endeavours should be made to allow logs to remain on site to function as wildlife habitats
Saproxylic fauna/funga	▪ Carry out initial characterisation study* ▪ Develop new guidance to reduce / eliminate the use of pesticides on campus ▪ Set new targets to reduce / eliminate the use of pesticides on campus *with support from BIOSI, local expert groups
Moths	▪ Desktop exercise (online databases) ▪ Run regular nature walks and bioblitzes to record moth caterpillars ▪ Set up dusk survey for moths ▪ Develop new guidance to reduce / eliminate the use of pesticides on campus ▪ Set new targets to reduce / eliminate the use of pesticides on campus *with support from WildSoc, BIOSI, NGOs

Mapping of University Green Estate

Using GIS software, we will map the areas and type of land use across our green estate. This system will allow us to also add a range of different data layers, including for example species records, habitat creation and habitat enhancements (e.g., hibernacula, nest boxes, bug hotels, water stations, log and leaf piles, signage, nature trail, etc.), threats to biodiversity (focus on priority species), and location of invasive species, which can be used to identify future conservation actions and for research purposes.

Mowing and Trimming Regime

Each year, we will sign up to Plantlife's 'No Mow May' campaign across the university estate, except for sports pitches, and the rest of the year the grounds will be maintained according to the new mowing and trimming regime agreed with our Estates Building Operations team and Grounds contractor (see **Chapter 2** for details). In short, mowing will be reduced to 2/3 times a year in the majority of areas (with a half-meter mowed border maintained throughout the year); all hedgerows will be visually inspected before trimming; no trimming of hedges and shrubs will be planned during bird nesting season (March-August, in compliance with the Wildlife & Countryside Act, 1981), and trimming will be delayed in autumn/winter until fruit is taken by wildlife; fallen leaves will be left on site or collected and deposited in border areas; and logs from coppiced or felled trees will be left on site.

We will add signage to sites to indicate to visitors that we are changing the mowing regime to help save wildlife. We will use templates created by the Welsh Government for the *It's for Them* campaign. Bilingual stickers (Welsh/English) provided by the Hedgehog Friendly

Campus scheme will be added to all machinery (strimmers and mowers) to remind users to check vegetation for hedgehogs and other wildlife before maintenance work.

We will endeavour to monitor annually changes in flora and fauna composition of these areas and update procedures as needed. With the help of our Estates Building Operations colleagues and Grounds contractor, we will map the areas and actions agreed for each site and develop an official guidance for site maintenance.

Wildflowers, Hedge, and Tree Planting

Informed by data collected from low mow areas, we will determine where and when these areas need to be supplemented with native wildflower seeds (e.g., using Pharmabees mix, UK native wildflower seed mixes). Across the university, we will identify opportunities to increase the area currently covered by meadow habitat.

Plans for hedge and tree planting have been developed by our Grounds contractor for six sites, and these are currently under consultation with site managers. With the help of our Grounds contractor, staff, and students, we aim to plant, at these sites, shrub and broadleaf species from native sources provided by *Coed Caerdydd*. Before any planting occurs, a suitable time and maintenance plan will need to be agreed with site managers and local staff teams to ensure a high survival rate of the planted trees.

The ERBAP Steering Group will explore with the Estates Building Operations team and Grounds contractor opportunities to create dead hedges in some of our green spaces. These structures offer great ecological benefits for a range of wildlife, including invertebrates, birds, small mammals, and hedgehogs, while providing a carbon-efficient way of breaking down organic matter on site, avoiding the need for transport or burning of cut wood and trimmings.

Ponds, Water Butts, Water Stations, Bird Baths

Ponds are extremely important habitats, as they provide breeding habitat for species such as amphibians and dragonflies, provide feeding areas for bats and birds, and a water source for a range of wildlife, including hedgehogs. We will investigate the possibility of creating mini ponds across the university estate. We define a mini pond as any small, shallow body of water that has been designed to attract aquatic species such as frogs, newts, dragonflies, and that can function as well as a water source for other animals such as birds, mammals, and a range of insects.

There was only a small mini pond present during the initial habitat audit, and we have recently placed a small water trough at one of our wildlife corners. The water trough was already relatively shallow with an in-built small ramp, but pebbles, bricks, and logs were added by the Hedgehog Friendly Campus team to facilitate escape by hedgehogs and other smaller animals (e.g., pollinators). At least, hoverflies, birds, and hedgehogs are known to have use it as a water source. We will be developing this structure so that it can act as a mini pond to attract further wildlife.

The ERBAP Steering Group and the Estates Building Operations team receive regular requests to install water butts on campus, where teams comprised of staff have volunteered to help manage and maintain sites. Placing water butts on site would enable teams to use the rainwater harvested to irrigate plants instead of using water from the mains water pipe. Water butts can pose a significant risk to people, particularly if used during warmer months, so water hygiene will need to be ensured throughout. There are ways to minimise this risk and we will consult with water safety specialist colleagues within the Estates Building Services Mechanical team to evaluate future requests.

We have already placed two water stations to provide drinking water for wildlife and we have built four more that can be placed at Biodiversity Hubs sites. These water stations are made with PVC pipes, disconnector trap, and push on cap (following the model design shared by the University of York Hedgehog Friendly Campus team). We recommend adding a small flower planter (containing drainage holes) with some pebbles to reduce risk of trapping and drowning of smaller animals. Bird baths have also been placed at some of the Biodiversity Hubs sites and we will encourage other teams to install these and water bowls safely to support wildlife, especially in warmer and hot weather, under our *#Water4Wildlife* campaign.

To minimise risks to people and wildlife, together with our colleagues in the Estates Building Operations team, we will conduct a health and safety review and develop a step-by-step guidance document, with maintenance requirements and associated risk assessments, to be used by university teams that submit requests to establish mini ponds, place water butts, water stations, or bird baths at their sites. Requests and detailed plans will be reviewed by the ERBAP Steering Group and will need final approval from Estates and site managers.

Sports and Garden Netting

Sports and garden netting are known hazards for wildlife, including hedgehogs and foxes. Sports netting (e.g., tennis or football nets) and garden netting will need to be secured at a safe height or stored inside after use (at least 1 foot/30 cm from the ground) to prevent hedgehogs and other wildlife becoming entangled. In line with advice from the Hedgehog Friendly Campus toolkit, and in collaboration with our Sports Operational Manager, we will develop a clear and detailed guidance on how to minimise risks and how to proceed if an animal is found trapped in netting. This information will be shared as well in staff briefings.

In addition, new staff joining the Grounds and Sports Facilities teams will be encouraged to attend specific training (e.g., Hedgehog Ecology and Management for Practitioners Workshop organised by the People's Trust for Endangered Species - PTES) regarding threats to hedgehogs and what to do to mitigate them.

Use of Pesticides, Rodenticides, and Invasive Species

In this ERBAP cycle, we will map in detail where pesticides and rodenticides are being used across the university estate, what alternatives are being trialled, and the outcomes of those trials. This exercise will allow us to produce a list of existing products and methods that are in use, develop and publish guidelines for improvement, and set more ambitious targets to reduce or eliminate use of chemicals that are harmful to wildlife. We will continue to work closely with the Grounds team and site managers, and consult with relevant external organisations (e.g., Stand for Nature Cardiff – Wildlife Trust of South & West Wales, Pesticide Action Network UK).

During the species and habitat surveys, we will endeavour to record sightings of invasive plant species and this information will be communicated to our Grounds team and site managers. Strategies have been already devised internally to deal with non-native and invasive species, and we will aim to collate these to inform the development of a full management guidance document.

Table 9 summarises the proposed targets to enhance habitats and reduce threats to wildlife across the university estate. Activities will be overseen by the ERBAP Steering Group and, in consultation with the Estates Building Operations team, implemented by the Biodiversity Officer, Biodiversity Hubs, Sports Operations & Services Manager, Llanrumney Sports Fields Grounds Manager, and Grounds contractor. Achievement of some of the targets will depend

on the success of the ERBAP mobilisation plan to engage staff, students, and local communities in the activities, and on the available budget for purchases and to support changes to the original grounds contract.

Table 9. ERBAP 2024-2026 Proposed Habitat Enhancement and Reduction of Threats to Wildlife Targets

Target	Steps	Timeline	Responsible
Mapping of University Green Estate Map green spaces and create GIS data layers	▪ Map of green estate ▪ Map wildlife-friendly areas ▪ Map habitat enhancement structures (bird and bat boxes, hedgehog houses, log and leaf piles, hoverfly lagoons, etc.) ▪ Map habitat enhancement measures ('No Mow May', new mow regime, leave the leaves, etc.)	By July 2024	ERBAP Steering Group
Mowing and Trimming Regime Adopt new low mow management scheme across the estate on areas identified in 2022/2023 and extend number of areas where scheme is applied	▪ Adopt new mowing and trimming regime ▪ Map actions agreed for each area and develop an official guidance for site maintenance ▪ Add *It's for Them* signage to sites ▪ Add bilingual stickers to remind trimmers and mower users to check for wildlife (provided by HFC) ▪ Monitor annually changes in flora, fauna, and funga composition of low mow areas ▪ Update procedures as needed	By December 2024	Estates Maintenance Manager / Grounds contractor
Wildflowers, Hedge, and Tree Planting Plant more hedgehog/wildlife -friendly plants and trees* *plant species suggestions by Hedgehog Friendly Campus	▪ Supplement low mow areas with native wildflower seed mixes ▪ Plant native wildflowers and flowering plants with a nectar source (e.g., oxeye daisies, hostas, fennel, candytuft, yarrow, wild marjoram, and ornamental thistles) ▪ Identify areas to increase area covered by meadow habitat on university estate ▪ Finalise tree and hedge planting plan consultation phase with site managers ▪ Update proposed tree and hedge planting plans if needed ▪ Provide list and number of desired species to *Coed Caerdydd* ▪ Plant native hedgerows (particularly blackthorn and	Annually	Grounds contractor in consultation with ERBAP Steering Group

	hawthorn) where hedgehogs can nest ▪ Where possible, plant native, deciduous trees with medium-sized leaves (e.g., hazel, oak, beech, hornbean, and lime) so hedgehogs can use the fallen leaves as nesting material ▪ Where possible, plant fruit trees such as crab apple and wild cherry, because fallen fruit encourages invertebrates ▪ Where possible, allow brambles, nettles, ivy, etc. to grow with low maintenance ▪ Explore opportunities to create dead hedges on university green spaces		
Ponds, Water Butts, Water Stations, Bird Baths Develop specific guidance for Biodiversity Hubs	▪ Assess where these are needed ▪ Develop risk assessments ▪ Develop guidance document	By December 2024	Biodiversity Officer / Biodiversity Hubs in consultation with Estates Maintenance Manager
Sports and Garden Netting Develop specific guidance for Sports Fields	▪ Map where sports and garden netting are being used on campus ▪ Develop guidance document	By September 2024	Biodiversity Officer / Sport Operations & Services Manager / Sports Fields Grounds Manager
Reduce and eliminate use of pesticides, herbicides, and rodenticides	▪ Map where pesticides, herbicides, and rodenticides are being used in campus ▪ Research wildlife-friendly methods to achieve same results ▪ Consult with relevant external organisations (e.g., Stand for Nature, PAN UK) ▪ Set a new target for reducing and eliminating these products on campus	By December 2024	Biodiversity Officer / Estates Maintenance Manager / Grounds contractor / Sport Operations & Services Manager / Sports Fields Grounds Manager
Mapping of Invasive Species	▪ Map invasive species ▪ Develop guidance document	By July 2026	Grounds contractor / ERBAP Steering Group

Planetary Health and Carbon Sequestration

It is expected that implementation of the ERBAP will have a profound impact at a local scale, and some of its actions have the potential to positively affect the health of the planet and, by association, support human health.

In terms of human health, loss of biodiversity has been linked with:

- Increased risks of infectious disease;
- Food insecurity and poor nutrition;
- Compromised medicines supply and research;
- Impacted wellbeing and pleasure derived from the natural world.

The actions causing climate change are one of the primary drivers of biodiversity loss across the planet. In turn, healthy ecosystems are key to mitigate the effects of climate change. It is important to consider nature-based solutions to tackle both the biodiversity crisis and the climate emergency, for example through ecosystem protection and restoration, and increase of green infrastructure.

The ERBAP Steering Group will establish how our activities can contribute to planetary health and carbon sequestration. We will reach out to colleagues from the university's Planetary Health Research Network to explore opportunities for synergies and will be looking at innovative ways to support carbon capture, alongside targeted tree planting.

Recommendations

The Biodiversity Officer will liaise with the Estates Campus Development team on a regular basis to inform the ERBAP Steering Group of any future building plans, refurbishments, or maintenance work that can have a direct or indirect impact on areas being managed for biodiversity. A checklist on how new builds and refurbished areas can be enhanced for wildlife (e.g., use of bee and bat bricks, place hedgehog highways, etc.) will be compiled by the Biodiversity Officer, and this will be shared with the Estates Campus Development and Building Operations teams. Note that to include hedgehog highways, estate building plans will need to be checked by the Hedgehog Friendly Campus team to ensure their location are safe for hedgehogs.

We recommend that where scrub habitat has been lost during building developments, the university endeavours to re-plant or re-establish this habitat within a 2 km radius of the original site. We also recommend that where needed (e.g., car parks where priority species have been detected) hedgehog and other wildlife crossing signs are placed in campus, providing that budget is available.

As part of the Hedgehog Friendly Campus accreditation, ecological appraisals for planned new building developments will need to account for hedgehogs in the habitat survey and include proposed recommendations to mitigate risk and enhance the site for hedgehogs. The ERBAP Steering Group recommends that this request is extended to include other ERBAP priority species and species groups.

Awareness Raising, Training, and Mobilisation Plan

There are several communities with which the ERBAP Steering Group will continue to engage with, including:

1. Professional Services

2. Academic staff
3. University students
4. Cardiff communities and community groups
5. Local primary schools
6. Local government
7. Environmental NGOs

ERBAP activities will continue to be embedded in the Hedgehog Friendly Campus (HFC) campaign (to achieve Gold and Platinum and maintain these accreditations). The majority of ERBAP mobilisation within the university community has been around the HFC campaign and this led, initially, to the creation of three HFC Hubs (BIOSI, HEBHOGS, CARBS), which have been very active in the past two years. These hubs are run by university staff and student volunteers that organise a series of events throughout the year to raise awareness, fundraise, and to contribute to ERBAP survey and habitat enhancement efforts.

Given the extent of the university grounds and its spread across two campuses and wider city areas we feel that the hub approach is vital to enable us to deliver ERBAP aims within the timelines proposed, as it harnesses the enthusiasm of staff groups formed during the university's Green Impact scheme and expands it to include practical actions to help biodiversity on campus. And this is the reason why 'increase of number of hubs' is one of the new biodiversity targets set in the university's Environmental Sustainability Action Plan (2023/2024) (see **Appendix 3**).

As a result of this new set target, we will continue to work to support and develop the initial HFC Hubs (BIOSI, HEBHOGS, CARBS) and create and develop additional ones (e.g., Pharmacy, John Percival, Trevithick Gardens, Heath Park West, Library Services – already underway) all under the name of Biodiversity Hubs. We have created a centralised system to collate evidence of the activities of the hubs for reporting purposes, and as a forum to share best practice and upcoming events.

Table 10 briefly describes the Biodiversity Hubs and some of their activities.

Table 10. Cardiff University Biodiversity Hubs

#	Biodiversity Hub	Description of Activities
1	**BIOSI**	The School of Biosciences (BIOSI) hub is located in the Sir Martin Evans Building and supports activities carried out to promote biodiversity in the Main Building green area and the green grass patches between BIOSI2, BIOSI3 and the Tower Building. The BIOSI hub team coordinates the Hedgehog Friendly Campus campaign at the university, is working to establish a wildflower meadow and insect haven around BIOSI and have successfully established a Keep Wales Tidy hub on site, which loans litter pick equipment to university staff and students, and to local communities. They provide advice on actions to help hedgehogs on campus, training on hedgehog surveys, and run hedgehog surveys across the university in collaboration with other hubs. The team also organises litter picks, runs engagement events related to biodiversity (delivering sessions to primary schools and community groups, carrying out bioblitzes, etc.), facilitates wildflower and tree planting events, and supports the other hubs with their own activities.
2	**HEBHOGS**	The HEBHOGS hub is located in the Hadyn Ellis Building (HEB) and encompasses the surrounding green areas. The HEBHOGS team started feeding and monitoring the wildlife in the area in 2021 and have gone from strength to strength. The team runs a monthly litter pick covering OPTOM, CUBRIC, SPARK and HEB, carries out hedgehog surveys using footprint tunnels in spring and autumn. They have built bug hotels, hog houses, a hedgehog feeding station, created log piles, and placed a water wildlife station and bird bath on site. A

		wildlife camera has also been placed on site to observe wildlife throughout the day/night. The team is also very active in supporting ERBAP engagement activities within the university, with local communities and primary schools, and runs wildlife homes building workshops every year using reclaimed wooden pallet waste.
3	**CARBS PTC Wildlife and Wellbeing**	The Cardiff Business School and Postgraduate Teaching Centre (CARBS PTC) has an established area of land adjacent to their building. Working with the university Estates Building Operations and the Grounds teams, the area has been allowed to return to a natural state with only path trimming in place. Log piles, hedgehog houses, bee and bug hotels, hoverfly lagoons, and water stations have all been placed on site, and community groups have helped with wildflower planting and the running of a community garden. The area also functions as a wellbeing space with outdoors furniture and 'Happy to Chat' benches. The CARBS hub team runs several staff, students, and community events each year to promote the area and the biodiversity present on site.
4	**Pharmacy**	The School of Pharmacy currently maintains the green areas around the Redwood Building as a wildflower meadow, with an area at the front designated in memory of a colleague (Prof Chris McGuigan). This winter, an orchard is being planted to the rear of the building with apple, pear, and plum trees. Most of the area is mowed twice a year with just the area around the memorial bench and the grass free lawn kept short. There is a small bed that contains medicinal herbs, planted with a grant from Buglife, and a beebank to the rear of the building. Since 2016, the whole site has been awarded a Green Flag Community Award. Pharmabees is an award-winning, Pharmacy-led, Cardiff University civic mission project, which engages students of all ages across South Wales in conversations around biodiversity, climate change and how engaging with nature enhances mental resilience (green prescribing). Engagement is delivered across a range of activities from classroom sessions to hands on, including community-led nature positive activities, such as creating places for nature.
5	**John Percival Courtyard**	The John Percival Courtyard remains an underutilised space and a plan has been recently developed to transform the area to be used as a community garden and an activity and wellness space. The John Percival hub team aims to increase and maintain local biodiversity at the site, through the incorporation of hedgehog houses, bird and bat boxes, bee and insect hotels, and an assortment of flora species. The plan also includes developing this outdoor space with café-adjacent seating (accessible park tables) to benefit students and staff. Once completed, it is expected that the area will be used for outdoor activities and learning space that can be used for community/local school outreach, open days, and classroom functions. One hedgehog house and a hedgehog highway have already been placed, and a sensory garden has been created with the help of pupils from a local primary school.
6	**Trevithick Gardens**	Trevithick Gardens are located at the rear of the Trevithick Building. A path connects the front of the building and a paved area outside the main student common room to a bridge that leads to Senghennydd Halls of Residence. The gardens are a treasure trove of trees, birds, and insects. A group of student and staff volunteers are working together to further enhance the area's biodiversity through planting schemes and the creation of wildlife sanctuaries. The area hosts a community garden, installed by Keep Wales Tidy, and serves as an outside recreational area for our students during the summer months. An individual plan has been developed for this area.
7	**HCARE**	The School of Healthcare (HCARE) is situated across two sites. The Heath campus is shared with Cardiff and Vale University Health Board. The Heath Park West site has been newly acquired and is the main hub for activity to maintain and improve the diversity of species on the site. Installation of hedgehog, bee and bug hotels, and tree planting are planned for the site in 2024. The Eco committee that consists of professional services, academic staff and students is active in enabling student and staff activities to promote biodiversity. The School of Medicine and library services have partnered in planned activities such as litter picks and hedgehog surveys.

8	**Libraries**	The Libraries hub includes the Arts and Social Studies Library and surrounding green spaces and indirectly other buildings on the Cathays campus: the Main Building, the Bute Building, and Trevithick, as well as the Heath Park libraries (Health, Archie Cochrane, and Brian Cooke). The libraries serve students, staff, and members of the public. The Libraries hub is newly established and has started hosting regular litter picks since November 2023. With the support of the ERBAP Steering Group, the Libraries Hub team aims to arrange biodiversity surveys of all their sites.

One of the awareness raising aims proposed in the original ERBAP was the production of a booklet of "*The Wildlife and Wildflowers of Cardiff University".* We will be taking this forward into the new ERBAP, and information to populate the booklet will come from the characterisation phase, and this effort can be supported by student projects. The booklet will list the 100 most common species found in the different priority habitats of Cardiff University. It will be a basic field guide and include photographs of all 100 species in their Cardiff habitat. These booklets can be sold in the Students' Union and at other locations around campus. They will help raise awareness about Cardiff University's wildlife and wildflowers. The money raised will be put exclusively towards funding for biodiversity projects (e.g., meadow, woodland, hedgerow, or pond creation; bird, bug, bat or hedgehog boxes) at Cardiff University. Following from this we hope to create a *nature trail* across the university estate, with respective signage located at each of the Biodiversity Hubs. We are keen to co-create a physical nature trail, with digital components, with the help of our students. For example, with support from the ERBAP Steering Group, students from the Welsh School of Architecture can design the trail and develop prototypes, and computer science students can drive the digital components of the trail. We will be exploring as well different ways in which we can fund interpretation boards to place at key sites (e.g., sponsorship from local businesses and university sub-contractors, collaborating with RemakerSpace).

We will be launching a lunchtime *Biodiversity Seminar Series* open to everyone at the university to engage with staff and students across the different university schools and departments. The seminar series will include talks to increase species identification and survey techniques skills among the university community, as well as research talks, case-studies, and other biodiversity-related subjects. We hope that this will foster a space for new ideas to arise, and to broaden collaboration and participation on future ERBAP activities. We aim to invite a range of speakers from within the university, from NGO's and local expert groups. Where possible, the seminars will have follow-up activities to support the survey efforts.

During *Fresher's Week 2024*, and each subsequent year, we will be present at the student fairs with our engagement stall and will run a guided tour of the wildlife and wildflowers of Cardiff University. This will help raise awareness and goodwill towards the biodiversity of Cardiff, especially amongst students who have recently moved to the city. During the tour we can advertise and sell the *Wildlife and Wildflowers of Cardiff University* booklets to raise money for additional conservation projects. We will run similar events during *Sustainability Week* (March) and *Positive, Health, Environment and Wellbeing (PHEW) fortnight* (July), as well as staff induction activities. As in previous years, our Biodiversity Officer will be available to deliver talks at various staff away days on the work that is being done on campus to promote biodiversity.

The Student's Union (SU) will continue to be actively involved with ERBAP activities, including supporting the School of Pharmacy-led 'Greening Cathays' project that aims to create a pollinator trail across the Cathays Campus and surrounding areas in partnership with National Museum Cardiff, Transport for Wales, and Creative Cardiff. The Student Life Volunteering Group will also support ERBAP projects across campus. The progress of the Student Life Group's work and ERBAP activities will be posted on SU social media throughout the

academic year. During Go Green Week in the SU there will be a strong emphasis on biodiversity, for the purpose of raising awareness as well as promoting student engagement with ERBAP activities.

Pharmabees activities, detailed above, have already engaged extensively across Cardiff communities (neighbourhoods, schools, and hospitals) to add more quality green spaces that contribute to biodiversity. The ERBAP will create further synergies with Pharmabees to enhance community engagement.

Mobilisation of various local communities will also occur through this engagement plan. Local communities and NGOs will be invited to codesign projects, participate in activities, and workshops, such as gardening workshops, bioblitzes, hedgehog surveys, tree and wildflower planting, seed bombing, concerts, healthy food, etc. In this way, we seek to elicit and include ideas from our communities and to collaborate in bringing those ideas to life. We will also welcome community groups and local schools on campus to participate in biodiversity-related projects (including via Passport to the City / Cardiff Children's University programme) and will support them in developing their own grounds to become more wildlife-friendly.

The university and Cardiff communities will be further mobilised through the promotion of mobile phone apps to employ citizen science approaches to measuring and monitoring biodiversity on the university campus and throughout the wider city (see *MiniHavens* project in **Chapter 2**).

Following from the successful collaboration on the *MiniHavens* project, the ERBAP Steering Group, with support from the Biodiversity Officer and Pharmabees, will partner with National Museum Cardiff colleagues to engage with museum visitors through both displays and specific events during the year and co-design engagement projects to deliver at local schools.

We aim to use the same approach to establish collaborations with Bute Park and many of our local environmental NGOs, such as BugLife, Butterfly Conservation, Wildlife Trust, and community groups in other areas of the city (e.g., Railway Gardens).

As part of the Hedgehog Friendly Campus accreditation, we will continue to offer interactive online and in-situ sessions on hedgehogs to local primary and secondary schools and deliver our engagement stall at community venues. We will also support an FE college through their own HFC journey.

A new webpage on the university website will be designed to centralise ERBAP documentation and associated activities.

ERBAP Steering Group members will continue to attend the Local Nature Partnership (LNP) and Cardiff City Nature Network meetings. These meetings provide an opportunity to monitor Cardiff University's alignment with local biodiversity aims to ensure a cohesive approach to biodiversity enhancement in the city and orchestrate a greater degree of connectedness between arising and existing habitats. We will also contribute and support the development of the Nature Recovery Action Plan (NRAP).

Our Biodiversity Officer has joined the Section 6 Biodiversity Duty Working Group, led by the Wales Biodiversity Partnership. This working group includes a range of public authorities (e.g., Wildlife Trust, Local Authorities, Welsh Water, Public Health, universities) and it is an opportunity to discuss matters related to the Section 6 Duty, receive updates on current biodiversity policy developments, updates on biodiversity training modules, share the progress of the ERBAP and hear updates from other participant organisations. Additionally, through the

ERBAP Chair's participation in the LNP and Cardiff Council's Conservation Officer's role in the ERBAP Steering Group, engagement with local government is facilitated.

Table 11 summarises the proposed actions to raise awareness to the ERBAP activities, train staff and students on related subjects and how we plan to mobilise the university and local communities to get involved in ERBAP activities and promote biodiversity in their own green spaces. The ERBAP Steering Group, Safety and Wellbeing team, Biodiversity Officer, and Biodiversity Hubs will be responsible for delivering on these targets.

Table 11. ERBAP 2024-2026 Awareness Raising, Training, and Mobilisation Plan Targets

Target	Steps	Timeline	Responsible
Establish, link, and increase number of Biodiversity Hubs	▪ Create forum for Hub leads to discuss and share ideas ▪ Leads to be invited to attend ERBAP meetings ▪ Create centralised storage system to deposit Hub documents and collate evidence needed for reporting purposes ▪ Annual event to celebrate the Hubs achievements	Annually	Biodiversity Officer / Biodiversity Hubs
Produce a booklet of "*The Wildlife and Wildflowers of Cardiff University*"	▪ Following from the characterisation phase, collate a list of the 100 most common wildlife and wildflowers species found in the different priority habitats of Cardiff University ▪ Student projects to support the co-creation of booklet (encourage interdisciplinary work)	By July 2025	ERBAP Steering Group* *supported by student projects
Develop a nature trail (physical and digital components)	▪ Use data from the characterisation phase to choose key species ▪ Co-create the nature trail with students from schools with relevant expertise ▪ Students from Welsh School of Architecture to design and create prototype for physical signage ▪ Computer science students to develop the digital components of the trail	By July 2026	ERBAP Steering Group* *supported by student projects
Launch and establish seminar series focused on biodiversity (online)	▪ Create initial draft with proposed themes ▪ Invite speakers ▪ Develop associated activities (e.g., bioblitz, nature walk) ▪ Advertise seminar series widely among students, staff, and local communities ▪ Centralise storage of recorded talks	November 2023 - December 2024	Biodiversity Officer
ERBAP and HFC stall and activities presence at	▪ Develop and deliver guided tours of the wildlife and wildflowers of Cardiff University during Fresher's week	Annually	Biodiversity Officer* / Biodiversity Hubs

Fresher's Week, Sustainability Week, PHEW, etc.	▪ Organise biodiversity surveys during Sustainability Week ▪ Organise hedgehog surveys and litter pick events during PHEW fortnight		*supported by student volunteers
Delivery of *Greening Cathays* project	▪ Support Pharmabees to deliver this project ▪ Planting Project next to Cathays Railway Station	March 2025	Pharmabees* / ERBAP Steering Group *supported by student volunteers and local communities
Green Prescribing	▪ Create opportunities and support staff, students, and local communities to connect with nature-based activities	Annually	Pharmabees
Engagement with local communities and local primary and secondary schools	▪ Continue to develop engagement sessions to incorporate a wider range of ERBAP activities ▪ Support local communities and schools to improve their green spaces for wildlife ▪ Create opportunities for local community groups and primary school pupils to participate in ERBAP activities on university green spaces (e.g., via Passport to the City / Children's University programmes) ▪ Run hedgehog surveys with local communities and primary schools	Annually	Biodiversity Officer* *supported by student volunteers
ERBAP webpage	▪ Design new webpage for the university website to centralise ERBAP-related information and documentation	By September 2024	ERBAP Steering Group / Safety and Wellbeing team

Education Plan

An audit and review of all the courses offered at Cardiff University will be conducted to ensure they all address sustainability (environmental, social, and economic). A wider review of SDG content within the full curriculum is advocated within the Education for Sustainable Development (ESD) Action Plan. It is expected that this exercise is completed during the timeframe of this ERBAP. Whenever possible, the university will integrate the ERBAP into its curriculum across schools and colleges and ensure that all students can engage with biodiversity. This will be performed through 'living laboratories' via real life student's projects. Therefore, e.g., architecture students will work on extending habitats for identified species of importance, whilst music students will be analysing the sounds of bumblebees. Outputs from these kinds of student projects can be presented through public events to inspire and promote further engagement. We will also discuss the viability of implementing the outcomes of student

projects during the co-creation process. Surveys of taxonomically specialist groups will be incorporated into teaching practices in the School of Biosciences (BIOSI) and other relevant schools where possible.

Survey and interventionist activities could be conducted in a multi-disciplinary setting, for example through regularly held bioblitz, with students from different schools working together to achieve learning objectives. In addition to bioblitz activities, multi-discipline, cross-school student, post-graduate, and staff collaborations will be supported through ERBAP sponsored project competitions, such as designing a bug hotel, with submitted projects being evaluated and the winning project team being awarded during Sustainability Week. Further annual competitions will be sponsored by ERBAP, including an annual competition for Cardiff University students, Cardiff primary and secondary students and Cardiff community members to submit an essay about the value of priority species for Cardiff. A winning essay will be selected from each participant category and announced and published during Sustainability Week.

We will liaise with the Student Futures team to integrate ERBAP activities into the Cardiff Award programme for students.

References to the ERBAP and related activities will be incorporated into the induction programme for students.

A summary of targets relating to the Education Plan can be found in **Table 12**. The ERBAP Steering Group, the Environmental Sustainability Sub-Committee, and the Safety and Wellbeing team will be responsible for delivering these targets.

Table 12. ERBAP 2024-2026 Education Plan Targets

Target	Timeline	Responsible
Audit of ERBAP-relevant university courses with sustainability content - (associated with ESD Action Plan activity on Living Labs)	July 2026	Environmental Sustainability Sub-Committee
Facilitate co-creation of projects with students and implement on campus when viable (associated with ESD Action Plan activity on Living Labs)	Annually	ERBAP Steering Group
Implementing Knowledge Gap Prize	First prize to be awarded during Sustainability Week March 2025	Safety and Wellbeing team
Integrate ERBAP into Cardiff Award for Students (associated with ESD Action Plan activity on Living Labs)	July 2025	ERBAP Steering Group
Include ERBAP references into Induction for students (associated with ESD Action Plan activity on Living Labs)	July 2025	ERBAP Steering Group

ERBAP Review and Reporting

Internally, ERBAP updates will continue to be reported regularly at all levels of the organisation, including quarterly to the Environmental Management Systems (EMS) Steering Group and to the Environmental Sustainability Sub-Committee (ESS).

The university's ISO 14001 Environmental Management System ensures that our environmental Aspects and Impacts are maintained to include biodiversity and ERBAP activities. We also maintain a legal register to ensure existing and new biodiversity legislation is captured and the university is compliant with such legislation. Annual external audits are managed by the university's Safety and Staff Wellbeing team (SSWEL) to ensure our environmental actions remain effective.

The ERBAP Steering Group will monitor and evaluate progress against proposed targets and produce short annual reports to be shared internally with staff and students and externally via a range of channels (e.g., BLAS, Viva Engage Yammer, university social media accounts, website, Student Union channels). During the review process, ERBAP targets might need to be updated to account for any changes in relevant legislation, city-wide biodiversity strategies, or university policies. A full report of activities will be published at the end of 2026, in accordance with the requirements of the Section 6 Duty of the Environment (Wales) Act 2016.

Appendix 1. Cardiff University Section 6 Biodiversity Report

https://www.cardiff.ac.uk/public-information/policies-and-procedures/health-safety-and-environment

Appendix 2. Ecosystem Resilience and Biodiversity Action Plan (ERBAP) Steering Group Constitution

Purpose

1. To oversee the development and implementation of the Ecosystem Resilience and Biodiversity Action Plan (ERBAP) and programmes of activity ***and advise and assist the Environmental Management Systems (EMS) Steering Group and Environmental Sustainability Sub-Committee on these matters.***

Composition and Membership

2. The Steering Group shall be composed as follows:

Membership

- Academic Lead, who shall be the Chair
- Deputy Chair
- Learning, Teaching and Research Lead(s)
- Biodiversity Officer
- College Registrars or their nominee
- Director of Estates and Campus Facilities, or nominee
- Net Zero Programme Manager
- Representative from Campus Grounds contractor
- Representative from Estates and Campus Services
- Representative of Residences Services
- Representative from Student Life
- Catering Manager
- Hedgehog Friendly Campus Project Lead
- Research and Engagement Manager and administrative support
- Pharmabees Lead Researcher or nominee
- Representative from Library Services
- Research and Engagement Manager and administrative support
- Representative of the Environmental Management System group
- Biodiversity/HFC Hub Leads
- College ECO representative

- Communications representative
- Student representative nominated by the President of the Students' Union

External representation

- Cardiff Parks
- Wildlife partnerships

We reserve the right to Co-opt members as and when required.

Occurrence

3. The ERBAP shall meet monthly. A Report of each meeting will be made to the EMS Steering Group which reports to the Environmental Sustainability Sub-Committee.

Terms of Reference

Responsibility to scrutinise the university's performance, and to recommend proposals, in the following areas of business:

1. The operation of the university's Ecosystem Resilience and Biodiversity Action Plan identifying and recommending resources needed to achieve agreed aims and linking with the Environmental Sustainability Strategy;
2. Characterise the biodiversity and state of natural habitats across Cardiff University's campuses.
3. Establish the most effective management strategies for maintenance, restoration, and enhancement of the university's green estates. These will be based on the principles of mitigating, restoring, and enhancing green spaces for biodiversity.
4. Implement a monitoring programme to evaluate the impact of management practices on biodiversity and ecosystem services.
5. Promote, engage, and mobilise staff, students and community members living around Cardiff University to participate in ERBAP activities and to be champions of ecosystem resilience and biodiversity.
6. Inform the Environmental Management System to ensure all ERBAP impacts are identified, and relevant legislation (current and emerging) is identified and complied with e.g., Production of the Section 6 report for Welsh Government on a 3-year cycle;
7. Explore ways of embedding ERBAP activities within Learning, Teaching and Research supporting UN SDG 13, SDG 14, and SDG 15;
8. Build relationships with external individuals and organisations who are relevant to the implementation of Cardiff's Ecosystem Resilience and Biodiversity Action Plan, championing and promoting the university's approach;
9. Utilise Cardiff University expertise, knowledge and research that contribute to and support the above aims;
10. Keep under review consultation, communication, and information for both internal and external stakeholders, in relation to Ecosystem Resilience and Biodiversity.

Mode of Operation

The Steering Group will take into consideration the following in all matters:

- the student interest and public interest
- sustainability
- equality, diversity, and inclusion

Version Control

Due for review: September 2024

Appendix 3. Biodiversity Targets, KPIs, and Key Delivery Actions for Environmental Sustainability Action Plan (2023/2024)

Priority	Headline commitment	Targets	KPIs	Key Delivery Actions	Supporting policy/ plan/ strategy	Target Date
Biodiversity	We will enhance the biodiversity and natural ecosystems on our estate	Map the hectares of land and type of land use across our green estate Increase the number of biodiversity hubs across campus	Percentage of estate mapped (%) Hectares of green space for each type of land use (ha) Number of biodiversity hubs across campus (#) Number of biodiversity initiatives (#)	Update the Ecosystem Resilience and Biodiversity Action Plan (ERBAP) and work through the actions	Ecosystem Resilience and Biodiversity Action Plan (ERBAP) Environmental Management System	Dec 23
				Maintain Hedgehog Friendly Campus accreditation and strive for Gold accreditation		Jul 24
				Comply with Section 6 Biodiversity and Resilience of Ecosystems Duty		Jul 24
				Seek opportunities to benefit biodiversity and carbon offsetting through tree planting and onsite land opportunities		Jul 24
Responsible Lead/ Department	ERBAP Steering Group					
Link to SDGs	SDG 3 SDG 11 SDG 13 SDG 15					