Edge Hill University

Biodiversity Action Plan 2022

Prepared by fpcr

Front page: Aerial view of the Campus
Opposite: Top left Black Mulberry Flowers. Top right True fox sedge. Bottom Forest school.

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1.0 INTRODUCTION

1.1 As part of Edge Hill University's Environmental and Sustainability Strategy, a strategic ambition is to protect and enhance biodiversity across the campus. As part of that strategic ambition, FPCR have been commission by Edge Hill University (EHU) to provide an ecological assessment of their Ormskirk Campus. The assessment informs a Biodiversity Action Plan (BAP) which aims to help retain and protect ecological biodiversity and to implement measures to maximise biodiversity across the campus.

1.2 This report aims to assess and evaluate the existing ecological value of the Ormskirk Campus by identifying the following:

- Ecological relationships with existing Nature Conservation Sites and/or 'habitat' corridors local to the area;
- The range and quality of flora and fauna present, including, but not limited to habitats and protected/notable species;
- Existing areas of biodiversity value within the campus; and
- The existing ecological initiatives developed and on-going by the University.

1.3 The results of the above are used to inform a series of recommended biodiversity enhancement measures to be implemented across the campus, to contribute to the BAP aims of maximising biodiversity. These recommendations have then gone on to form the core actions set out in the BAP prepared for the campus.

Background

Why is Biodiversity Important?

1.4 Biodiversity is essential to providing humans with the ecosystem services that we rely on. From pollination, soil fertility, food, medicine, reducing air pollution, carbon storage, and mental health benefits, biodiversity is a key component in a wide variety of natural processes that are fundamental to the survival, health and wellbeing of humans.

1.5 However, biodiversity loss is accelerating and is an urgent global problem that will have profound impacts on everyone. It is therefore imperative for people around the world to tackle biodiversity loss through the implementation of measures to conserve existing resources, while also providing opportunities for enhancing biodiversity.

UK Biodiversity Loss

1.6 The RSPB's State of Nature 2019 Report[1] highlighted some stark findings on the state of biodiversity in the UK, showing that wildlife in this country continues to decline. Some of the greatest drivers for these changes include climate change, urbanisation, pollution and invasive non-native species, which are all relevant to the urban environment that the Ormskirk Campus is set within. The following bullet points include some key figures drawn from the report that highlight the scale of biodiversity loss in this country:

- 15% of species are threatened with extinction from Great Britain;
- 97% of the UK's wildflower meadows have been lost in the last century;
- There have been long-term decreases in the average abundances of butterflies since 1976 (16%) and moths since 1970 (25%);
- The total number of breeding birds in the UK fell by 44 million between 1967 and 2009; and
- Of all the indicator species assessed in the RSPB study, the average distribution of species across the UK has fallen by 5% since 1970 across the broad spectrum of taxa studied.

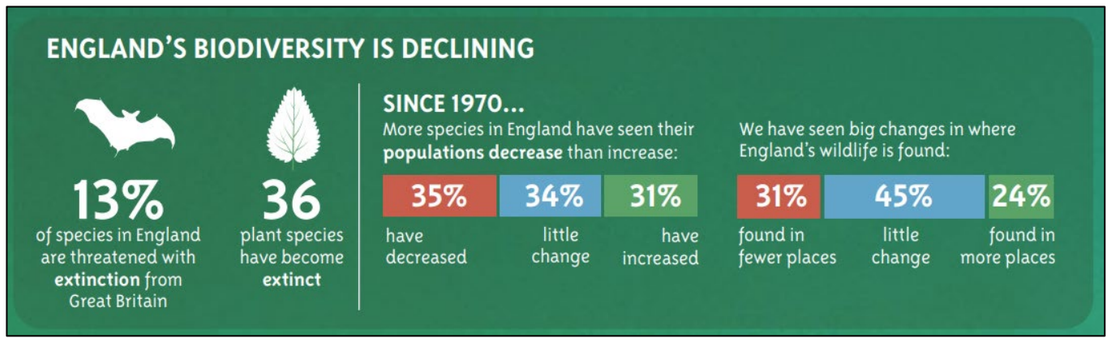


Image taken from the State of Nature Infographics webpage[2]

Biodiversity Action Plan

1.7 The purpose of this document is to:

- Review existing EHU documents/polices related to biodiversity;
- Review existing biological records from within and nearby the EHU campus;
- Report the findings of a habitat survey of the EHU campus;
- Identify current biodiversity resources at the EHU campus and recommend protection and enhancement measures; and
- Identify opportunities to create new biodiversity resources.

Review Methodology

1.8 The review has involved the following actions, which are detailed in turn on the next page:

- Site survey;
- Consultation;
- Review of relevant documents; and
- Desk study.

Site survey

1.9 Baseline habitats were identified and mapped by using the Extended Phase 1 Habitat Survey[3] methodology, which is used to determine broad habitat types in the wider countryside. This involved a systematic walk over of the survey area during which representative plant species lists were compiled for each habitat mapped. In addition, key features which provided or had the potential to provide value for wildlife were mapped.

1.1 The survey was undertaken on the 25th and 26th May 2022 by Ian Hunter (BSBI Field Identification Skills Certificate Level 5), a suitably experienced Associate Ecologist from FPCR, with over thirteen years' relevant experience in habitat

[1] https://nbn.org.uk/stateofnature2019/

[2] https://nbn.org.uk/wp-content/uploads/2019/09/State-of-Nature-2019-England-27-09-19.pdf

[3] JNCC (2010), Handbook for Phase 1 habitat survey - a technique for environmental audit

surveying. He is a full member of the Chartered Institute of Ecology and Environmental Management (CIEEM).

1.2 Vascular plant nomenclature followed Stace (2019)[4] and assessment of abundance for plants was made using the DAFOR scale, where:

D - Dominant

A - Abundant

F - Frequent

O - Occasional

R - Rare

L - Locally (e.g. LF Locally Frequent or LA Locally Abundant)

1.10 It should be noted that the surveyor's intention was to present as comprehensive an account of the botanical diversity present within the campus as possible, and it is considered that the data collected is a robust baseline audit for the Campus. However, the results of the survey should be treated as a snapshot of the campus and the actual botanical diversity noted is likely to be higher. In particular, a comprehensive walkover of all ornamental planting beds and campus trees was not possible and the botanical diversity within these areas is much higher than recorded. Likewise, a detailed aquatic plant survey of the ponds and lakes was not undertaken.

Consultation

1.11 A site meeting was undertaken with the University's Sustainability Manager on 25th May 2022 to: discuss the previous BAP, review work undertaken during the plan period, and consider future management and the University's aspirations for the new BAP. A further virtual meeting took place with the University's Sustainability Manager and the head groundskeeper on the 5th August 2022, to discuss the preliminary results, current management practices and additional background information.

Review of relevant documents

1.12 A review of existing EHU documents was undertaken to establish any previously recommended management activities and to establish any existing biodiversity objectives and/or policies.

1.13 The following documents and reports have been reviewed:

- Edge Hill Biodiversity Action Plan 2019;
- Edge Hill University Grounds Management Plan 2000-2024;
- Environmental Sustainability Report 2020/21; and
- Edge Hill University Sustainability webpage https://www.edgehill.ac.uk/sustainability/.

Desk study

1.14 In order to compile existing baseline information, relevant ecological data was requested from both statutory and non-statutory nature conservation organisations, including:

- LERN (Lancashire Environment Record Network); and
- Multi Agency Government Information Centre (MAGIC).

1.15 In addition to the above, West Lancashire Borough Council's planning website was searched for planning applications within the campus. Where ecological reports were submitted with these applications, a review of these for protected/notable species surveys results was undertaken.

1.16 Further inspection using colour OS maps and aerial photographs from Google Maps/Earth, was also undertaken in order to provide additional context and identify any features of potential importance for nature conservation in the wider area.

1.17 The search area for biodiversity information was related to the significance of sites and species, and potential zones of influence, as follows:

- 10km around the campus for sites of International Importance (e.g. Special Areas of Conservation [SACs], Special Protection Areas [SPAs], Ramsar sites).
- 2km around the campus for sites of National or Regional Importance (e.g. Sites of Special Scientific Interest [SSSIs]) and protected and/or notable species.
- 1km around the campus for sites of County Importance sites (e.g. Local Wildlife Site [LWS], proposed Wildlife Sites [pLWS]).

1.18 Where designated sites of county, national or international nature conservation importance are located outside of these zones, it is unlikely that they will have an influence, or could be influenced by, by the habitats/fauna recorded at the Ormskirk Campus.

[4] Stace, C (2019) New Flora of the British Isles. 4th edn. C&M Floristics

2.0 REVIEW

Edge Hill Biodiversity Action Plan 2019

2.1 The previous plan, 'Biodiversity Action Plan for Edge Hill University 2019', contained two main themes which were:

- Proposed management strategies; and
- Biodiversity improvement measures.

2.2 The details of each of these themes are summarised in the following tables, and where relevant shown on Figure 3.

Proposed Management Strategies	
Area/Species	Action
University Meadows	Mown once annually in mid-August to enhance botanical diversity to allow native wildflower species to set seed and to supress rank grass species. Thinning of planted and successional scrub.
Dune Helleborine *Epipactis dunensis* (within Durning Centre carpark)	Protection from trampling. No fertiliser or pesticide to be applied to this area. Weeding only by hand. Strimming after flowering period October-March. Yearly monitoring.
Lake 1	Contains curly pondweed. When dredged must be treated as controlled waste.
Lake 2	Supports Southern Marsh-orchid (*Dactylorhiza praetermissa*), Northern Marsh- orchid (*Dactylorhiza purpurella*) and Marsh-orchid hybrids (*Dacylorhiza x grandis*) in the amenity verges. Amenity verges should be mown once annually in mid-August or reduce the amenity area then cut the retained area containing the orchids once annually in mid-August.
Pond 1	Marginal vegetation is strimmed once annually to prevent successional scrub outcompeting forb species.
Pond 2	Contains New Zealand pygmyweed. Have pond treated by licenced contractor.

Biodiversity Improvement Measures	
Area/Species	Action
Landscaping	New landscaping should use native species and avoid non-native planting
Bats	Install bat boxes on trees and buildings near potential commuting routes away from artificial lighting and direct sunlight
Birds	Existing bird boxes are in deteriorating conditions and rarely used Install new bird boxes in suitable locations
Green hay	Freshly cut hay from species rich MG5 meadows should be spread over the new meadows. Contact Lancashire Wildlife Trust, Lancashire Council or Natural England to identify donor sites for hay.
Ponds	If created in new developments, margins should be gently sloping with marginal wetland and aquatic macrophytes. Do not introduce fish to ponds.
Plant translocations	Edge Hill to continue to work with Tyrer Partnership to act as a receptor for red list plant species from other proposed development site.

Other Documents

2.3 The Grounds Management Plan, Sustainability Report, and Sustainability Website contains a number of biodiversity objectives together with examples of management action that have been implemented or that are ongoing.

2.1 The objectives together with implemented and ongoing management actions are described in the following table.

Objective	Description
Habitat Management	Manage habitats and infrastructure to maximize and realize their potential for biodiversity without compromising the operational and amenity functions of the campus.
Creation of new roof top gardens and brown roofs to maximise biodiversity in new developments	
Tree stock is maintained and increased to enhance the landscape for future generations. Tree loss will be replaced on a two for one basis	
Wildflower corridors planted around western lake and on centre reservation on the front drive	
A weevil (*Stenopelmus rufinasus*) has been introduced to the western and eastern lake as a natural biological control of algae and Azolla weed.	
Planting native species in native areas and exotic species in the more modern parts of the site.	
It is accepted that some areas of scrub, brambles and nettles may appear to be neglected but they do have a rich wildlife value. These areas will be contained and benefit from minimal disturbance, regarded as positive management to encourage biodiversity.	
There has been an established meadow management regime at university campus as part of the new expansion of the campus and the management of this will be managed under most stringent guidelines over the next four years during its creation and beyond.	
Timber from felled trees is left as habitat piles, although the risk of summer fires must be considered.	
Prevent harmful levels of algal build up on all Sustainable Urban Drainage Systems (SUDs)	
Species Management	Maintain and enhance habitats and infrastructure for species of ecological importance through a program of targeted management actions.
Bug hotel added to forest school area	
Swift bricks in HUB buildings	
Where possible old trees, are left as bat roosts or for wood boring birds and insects. However, safety is of paramount	
Create a Hedgehog Friendly Campus working group and gain Hedgehog Friendly Campus status	
Survey and Monitoring	Carry out a targeted program of survey work that will improve knowledge of the biodiversity interest of the campus and help to inform future management planning decisions. Determine the extent to which the estate management works achieve the operational objectives of this management plan, by carrying out a targeted program of monitoring work.
Encourage links with partnership groups/friends groups which may undertake biodiversity surveys and assist with habitat creation and management tasks	

Objective	Description
Sustainable Practice	Identify, implement, and promote sustainable habitat management techniques. Identify commercial opportunities for the sale of estate management bi products.
Minimising pesticide use to an absolute minimum and as a last resort	
nimising the use of peat including sourcing plant material from suppliers adopting a peat free regime. Garden waste used as soil ameliorant instead of peat. Chipped bark and wood chippings used in a similar way for mulching borders	
Promotion and Marketing	Promote student and public awareness of the University 's biodiversity work, through use of appropriate media sources.
Manage and promote links with Wildlife Trust, Students, and local community groups	
Encourage links with partnership groups/friends' groups which may undertake biodiversity surveys and assist with habitat creation and management tasks	
Increase community engagement with events, activities and actions that Edge Hill University undertake regarding sustainability	
Increase the number of partner organisations involved in SustainNET by a minimum of 2 per year	
Run at least one event per year that is open to staff, students, and the wider community to promote sustainability	
Increase the number of students becoming Sustainability Champions each year by 5%	
Administration	Record and retain details of habitat management, biodiversity events, survey and monitoring results.

3.0 DESK STUDY - REVIEW OF BIOLOGICAL RECORDS

Designated Sites

3.1 The Ormskirk Campus does not contain or overlap any designated sites.

3.2 As shown on Figure 1 (below), within 10km there are two sites of international importance: Martin Mere RAMSAR and Martin Mere special protection area (SPA). Martin Mere is also designated as a site of special scientific importance (SSSI).

3.3 Martin Mere is located 6.2km to the north of the campus (see Figure 1). It is a low-lying complex of water, marsh and grassland which supports over 20,000 wintering water birds and internationally important numbers of Bewick's swan *Cygnus columbianus bewickii*, pink-footed goose *Anser brachyrhynchus*, wigeon *Anas penelope*, northern pintail *Anas acuta*, and nationally important numbers of ruff *Philomachus pugnax*.

3.4 No nationally designated sites are located within 2km of the campus.

Non-statutory Designations

3.5 In Lancashire, local wildlife sites designated by the local authority are called Biological Heritage Sites (BHS).

3.6 One BHS is present within 1km of the campus boundary, and this is Ruff Wood (see Figure 1). Ruff wood is located adjacent to the north campus boundary, but on the opposite side of Ruff Lane and therefore both the Campus and the BHS do not share a common boundary. The BHS is a mixed conifer and broad-leaved woodland and was designated due to the presence of red squirrel *Sciurus vulgaris*.

Protected/Notable and Other Species Records

3.7 A total of 79 species have previously been recorded within the campus. These were identified from the biological records search and review of ecology reports.

3.8 These records included:

- 33 bird species;
- 28 flowering plant species;
- 6 invertebrate species;
- 5 terrestrial mammals (including bats);
- 3 amphibian species;
- 2 fern species;
- 1 moss species; and
- 1 horsetail species.

3.9 Individual species include:

- two species with legal protection under the Conservation of Habitats and Species Regulations 2017 (as amended), namely common pipistrelle *Pipistrellus pipistrellus* and noctule bat *Nyctalus 7octule*;
- three species with legal protection under the Wildlife and Countryside Act 1981 (as amended), namely common pipistrelle, noctule and water vole *Arvicola amphibius*;
- 16 Natural Environment and Rural Communities Act 2006 Section 41 Species of Principal Importance;
- 31 Lancashire priority species;
- 13 Birds of Conservation Concern Red List species;
- 12 Birds of Conservation Concern Amber List species; and
- 11 species with other conservation designations.

3.10 Some of the species fall within more than one group in relation legal status and conservation designations, for example noctule bat is legally protected under the Conservation of Habitats and Species Regulations 2017 (as amended) and the Wildlife and Countryside Act 1981 (as amended),but is also a NERC Act Section 41 Species and a local priority species.

3.11 When legal protection is discussed within this document, this refers only to legal protection against actions that may realistically occur within the Campus. For example, common frog is protected but only against offences related to offering them for sale or advertising them for sale, which is not considered relevant here.

3.12 The species returned in the data search are discussed below with reference to their species group, known presence onsite, legal status, and conservation designation. A full list of these species is provided in Appendix B.

3.13 The location for a significant number of species records for the campus are recorded at Margaret Bain Hall. Given the precision of grid references, it is considered that Margaret Bain Hall is not the true location where these species were recorded, but either where the recorder was based or an arbitrary location on campus the recorder assigned to all of their records.

3.14 As the majority of records were not the result of detailed and targeted survey effort, they are only likely to represent a fraction of the actual species that are, or have been, present at the Campus.

3.15 The onsite fauna records are discussed below and shown on Figure 2, below. The grid references provided in the data search varied in precision ranging from 1m accuracy to 1,000m accuracy. Only records with 100m or less accuracy are shown. Grid references refer to an area a record could have been located in rather than a single precise location; records with a 100m precision could be located anywhere within a 100mx100m square and the grid reference refers to the south-west corner of that grid square. As such, several records that have been reported onsite with low precision may appear plotted outside of the campus boundary.

Birds

3.16 A range of bird species were reported in the data search. In total, 33 species were reported and 25 of these species have a conservation designation including seven Section 41 species, 16 LBAP species, 13 BoCC Red species and 13 BoCC Amber species (some species have more than one designation).

3.17 These species included:

- generalist passerine species including house sparrow *Passer domesticus* (S41 LBAP BoCC Red), dunnock *Prunella modularis* (S41 LBAP BoCC Amber), song thrush *Turdus philomelos* (LBAP BoCC Red) and wren *Troglodytes troglodytes* (BoCC Red);
- ground nesting passerines including skylark *Alauda arvensis* (S41 LBAP BoCC Red);
- hirundines including swift *Apus apus* (LBAP BoCC Red) and house martin *Delichon urbicum* (BoCC Red);
- waterfowl including mallard *Anas platyrhynchos* (BoCC Amber) and moorhen *Gallinula chloropus* (BoCC Amber).

Invertebrates

3.18 Six invertebrate species have been recorded within the campus. These were one beetle species, two moth species (ghost moth *Hepialus humuli* and rosy rustic *Hydraecia micacea* which are S41 species) and three butterflies.

Water vole

3.19 Water vole are legally protected under the Wildlife and Countryside Act 1981 (as amended) and are a S41 and LBAP species.

3.20 A formal survey for water vole was undertaken in 2015 as part of the Phase 11 development. Water vole presence was confirmed in Pond 1 and field signs included droppings, feeding remains, trampled pathways and burrows. This document also discusses a previous survey that was undertaken in 2013 that also found positive signs of water vole within Pond 1. The survey reports also indicate that water vole were present in a pond off site to the south west. The offsite pond and Pond 1 are linked via a ditch that runs through the culvert under St Helens Road.

Bats

3.21 All UK bat species are protected under the Conservation of Habitats and Species Regulations 2017 (as amended) and the Wildlife and Countryside Act 1981 (as amended).

3.22 Two bat species have previously been recorded within the Campus: common pipistrelle and noctule. The records are sparce and scattered but are mostly from the western half of the campus, and they refer to activity records rather than roosts. Based on the habitats present across the campus, bats are expected to be more widespread than reported, and therefore the data gathered from the desk study is not considered to represent a true distribution of bats at the Campus.

Hedgehog

3.23 Hedgehog *Erinaceus europaeus*, which is a S41 and LBAP species, has previously been recorded at the campus. Records are mostly distributed in the north-western third of the campus, near to campus buildings.

3.24 Hedgehog monitoring has also been undertaken by the University with the most recent survey undertaken in July 2022. These have shown hedgehog to be present in multiple locations within the main campus blocks and at the north-west part of the trim trail.

Brown hare

3.25 Two records of brown hare *Lepus europaeus* (S41 LBAP), which is usually a resident of arable fields, were reported onsite. One from car park B next to the Lodge building and one from Margaret Bain Hall (which has been discussed above in Paragraph 3.13).

3.26 In addition to these records, hare was recorded during the habitat survey, in the meadow area to the south of the Campus.

Red squirrel

3.27 Three records of red squirrel were reported onsite, with the most recent being from 1996. Staff at the University have indicated that red squirrels have not been sighted on campus in recent years, but offsite records indicate that red squirrel may still be present in the local area, with two records dating from 2021.

3.28 Grey squirrel *Sciurus carolinensis*, which is an invasive non-native species, is also present in the local area and has been recorded onsite in 2022 by campus staff.

3.29 The interaction between grey and red squirrels is complex, but where both species are present, red squirrel are usually outcompeted and their populations decline, unless intensive grey squirrel control is undertaken.

3.30 Where woodland management for red squirrel is undertaken, this can also benefit grey squirrel if grey squirrel control is not undertaken simultaneously.

3.31 As it is unlikely that any action within the campus could benefit red squirrels without also benefiting grey squirrel, red squirrel are not considered further in this management plan.

Amphibians

3.32 Common toad (S41 and LBAP), common frog (S41) and smooth newt have all previously been recorded within the campus. Common toad has been reported in Pond 1 and all other records are from Margaret Bain Hall (see Paragraph 3.13).

3.33 With the exception of pond 1 these records do not give a clear picture if the water bodies onsite are used by amphibians and if amphibians breed onsite.

3.34 Great crested newts (GCN) are a legally protected under the Conservation of Habitats and Species Regulations 2017 (as amended) and the Wildlife and Countryside Act 1981 (as amended). GCN are present in the wider landscape but the nearest know population is approximately 2km from the Campus, despite suitable terrestrial and aquatic habitat being present on Campus.

Figure 1: Designated Sites Plan

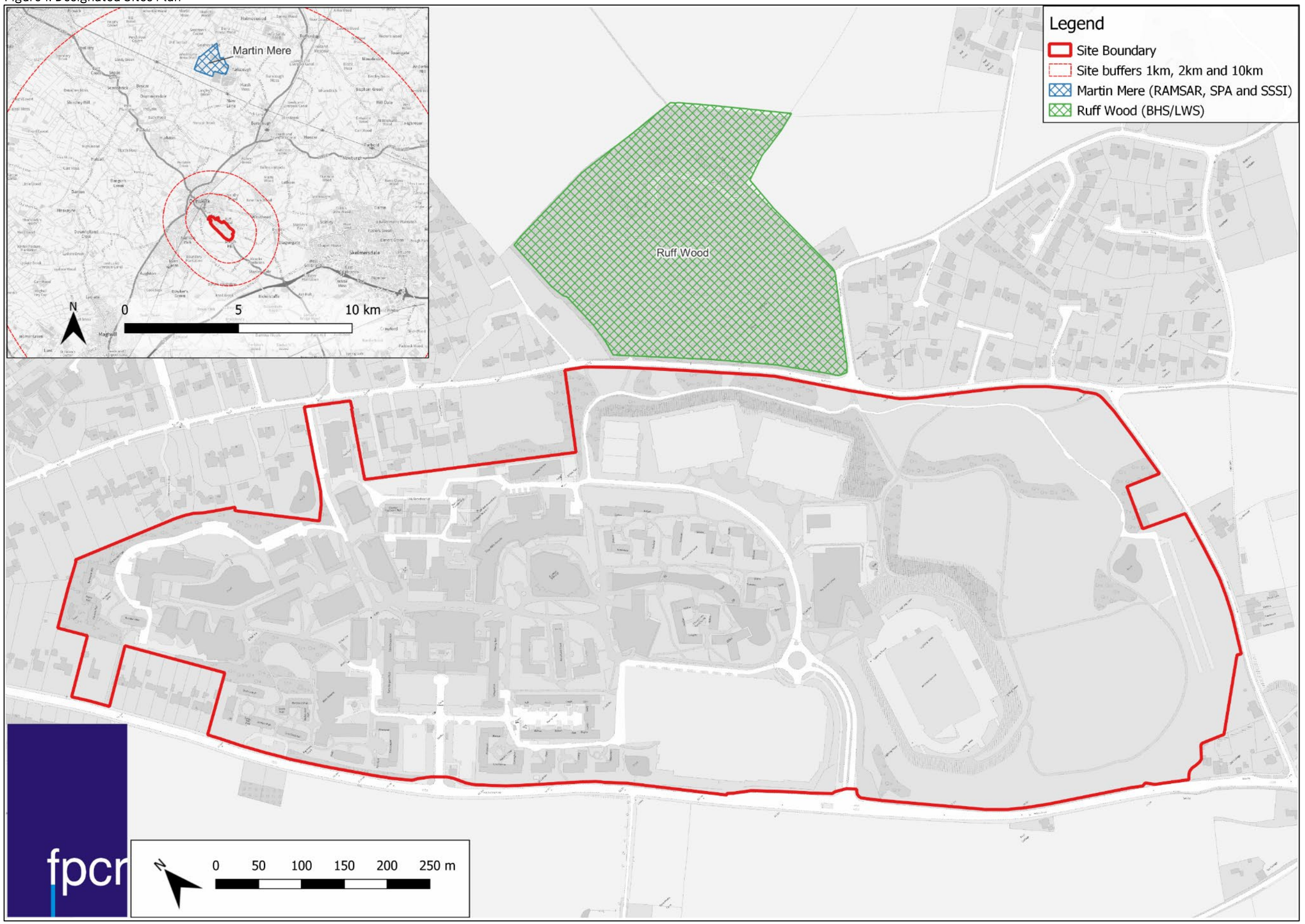


Figure 2: Notable Species Locations

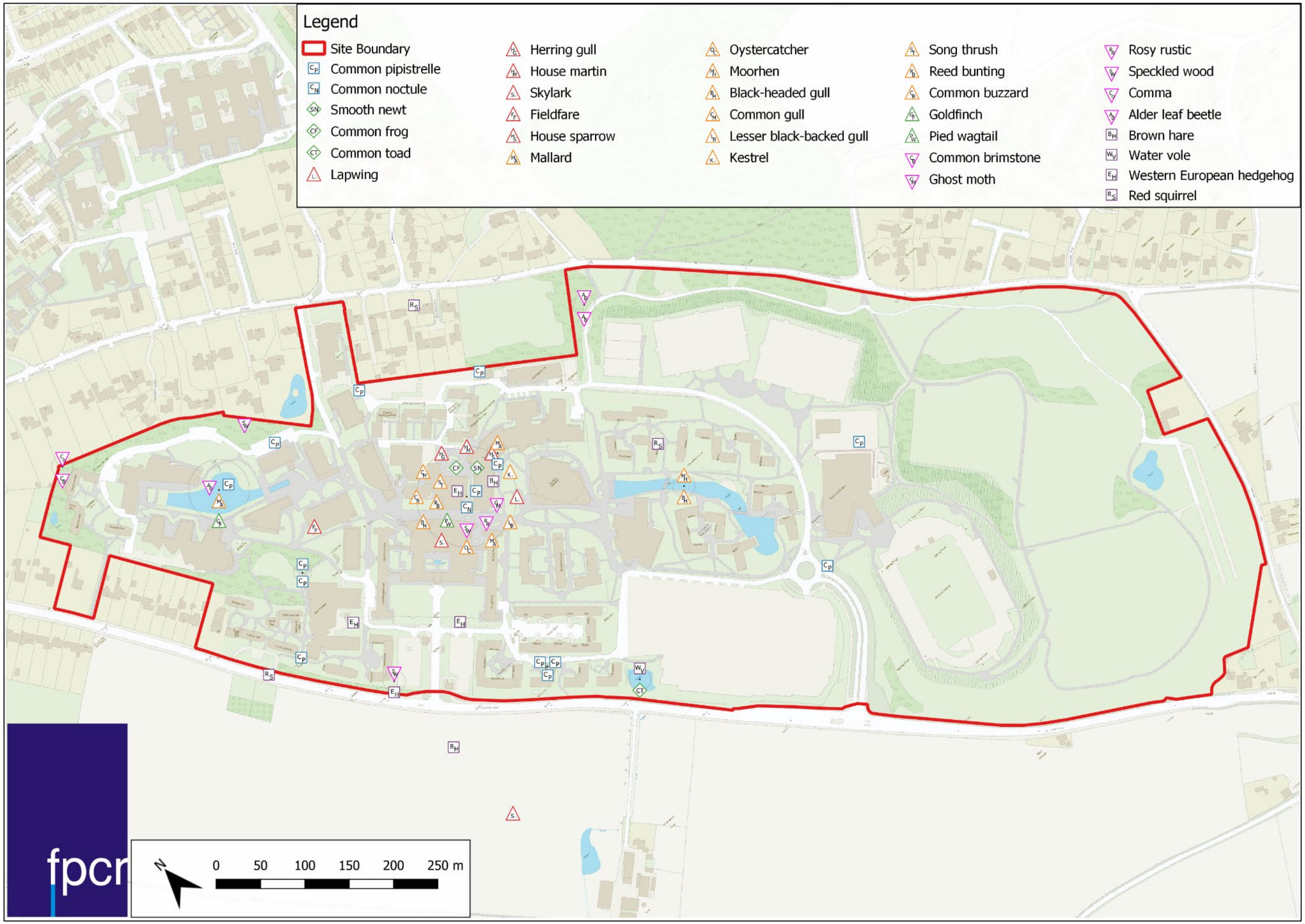
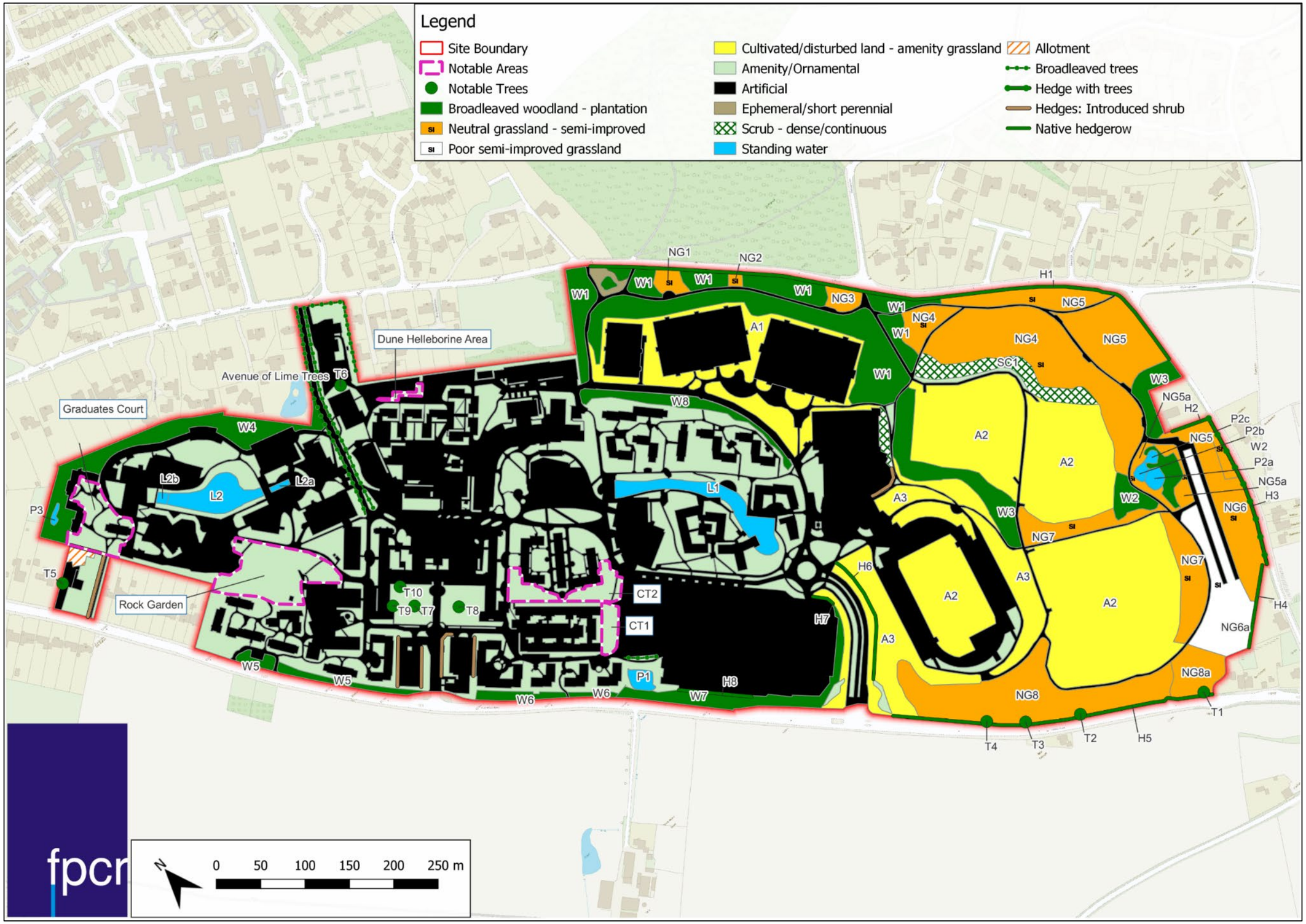


Figure 3: Campus Wide Phase 1 Habitat Plan



4.0 FIELD SURVEY

4.1 The results of the Extended Phase 1 habitat survey are detailed below with a campus-wide habitat plan shown in figure 3 above. Figures 4-6 below provide detailed maps of the distinct areas of the campus. A full list of plant species recorded within each habitat during the survey provided in Appendix A.

Campus Overview

4.2 From a biodiversity perspective, the Campus can be split into two broad areas: the eastern 'Meadows' area and the wider university campus. The meadows area features a mosaic of recently created semi-natural habitats which, together with the sports facilities, provide a multi-functional recreational area for students and locals. Much of the eastern area has been specifically designed and managed to provide a range of opportunities for wildlife. Habitats in this area are comprised predominantly of native species.

4.3 The western extent of the campus features the campus faculty buildings and student accommodation. Within this area, as fitting its increasingly formal setting, the habitats are primarily of interest for their aesthetic, horticultural and recreational appeal. Nevertheless, botanical diversity is high throughout this area, although increasingly composed of non-native species. A number of biodiversity hotspots and notable areas were recorded throughout the Campus area, which are discussed below together with a more general overview of the Campus in general.

Eastern Area

Woodland / Trim Trail Area

4.4 A prominent feature of the eastern section of the campus is the newly created native woodland and associated mosaic of habitats, which can be found to the north and east of the AstroTurf pitches. A recently created area, which despite its relatively young age features a diverse mix of habitats and is one of the campus's biodiversity hotspots. The component habitats within this area are described below, with a detailed map and photographs overleaf.

Broadleaved Plantation Woodland (W1)

4.5 The woodland within this area is approximately 10 years old and as such features a relatively open canopy structure with an intimate mixture of predominantly native species. Silver birch *Betula pendula*, goat willow *Salix caprea* and grey willow *Salix cinerea* were the most frequently recorded canopy species, together with a diverse mix of canopy forming trees and understorey shrubs at lower frequencies, including: pedunculate oak *Quercus robur*, alder *Alnus glutinosa*, wild cherry *Prunus avium*, gorse *Ulex europaeus*, hazel *Corylus avellana*, hawthorn *Crataegus monogyna*, blackthorn *Prunus spinosa* and alder buckthorn *Frangula alnus*. As is typical in recently created woodlands, due to the short open canopy, the ground flora lacked many species typically associated with mature closed canopy woodland. The ground flora instead was akin to a species rich tall grassland community, which adds significantly to the biodiversity and amenity value of this area of the campus.

4.6 In localised areas, where single species clumps of fast-growing canopy trees had been planted, the canopy was beginning to close and the species diversity within the ground flora reduced slightly (Photo 2).

4.7 A tall species-rich grassland community was noted throughout this area within glades, less frequently managed margins (Photo 3) and scalloped edges (Photo 1). This community was characterised by an abundance of oxeye daisy *Leucanthemum vulgare*, where it was growing with common knapweed *Centaurea nigra*, common bird's-foot-trefoil *Lotus corniculatus* and yarrow *Achillea millefolium*.

4.8 The woodland margins along the internal trim trail featured a hard step gradient between the tall wildflower rich grassland at the woodland edge and the more regularly managed grassland at the path edges (photo 4). This hard edge was also present to the south between the botanically diverse grassland associated with the scalloped edges along the sunny south facing slope and the neighbouring amenity grassland A1 (Photo 3). Locally, along the southern edge of the woodland, stone gabion retaining walls were present, which would provide additional habitat for small mammals, amphibians and invertebrates.

Semi-improved Neutral Grassland

4.9 Three permanent glades of species rich grassland were recorded within the woodland complex, all on the northern boundary with Ruff Lane. The community furthest west – NG1 (Photo 5) – was the most wildflower rich of the three, and perhaps of the entire campus. The sward was formed by fine leaved grasses, principally red fescue *Festuca rubra* and sweet vernal-grass *Anthoxanthum odoratum*. The wildflowers oxeye daisy, common knapweed, southern marsh-orchid *Dactylorhiza praetermissa*, yarrow, perforate St John's-wort *Hypericum perforatum* and common bird's-foot-trefoil were all present in good numbers. The community featured some scattered young grey willow and rowan *Sorbus aucuparia*, in addition to some recently planted saplings in tree tubes. Small anthills were noted through this habitat, which despite the age of the grassland were assumed to be yellow meadow-ant *Lasius flavus*.

4.10 Yellow meadow-ants can add significantly to a grassland's biodiversity, both in terms of invertebrate diversity and biomass, as well as due to the micro-variations in topography and small patches of bare ground they produce, which increases the botanical diversity. In fact, a number of wildflowers and mosses, such as thyme-leaved sandwort *Arenaria serpyllifolia* are preferential to anthills.

4.11 Further east, grasslands NG2 and NG3 were similar to the community described above, featuring a similar mix of wildflowers, with the additional incidence of kidney vetch *Anthyllis vulneraria* in NG2 and cat's-ear *Hypochaeris radicata* and field forget-me-not *Myosotis arvensis* in NG3. However, common knapweed and oxeye daisy decreased in abundance with ribwort plantain *Plantago lanceolata*, white clover *Trifolium repens* and lesser trefoil *Trifolium dubium* being the characteristic species in these communities.

Short Amenity Grassland

4.12 The peripheries of the AstroTurf pitches and a 2m buffer along the footpath through the woodland, featured a frequently mown amenity grassland community (labelled A1 below). Despite the regular management, this community was moderately species rich, and featured a range of low scrambling and rosette forming wildflower species such as lesser trefoil, yarrow, daisy *Bellis perennis*, self-heal *Prunella vulgaris*, common vetch *Vicia sativa* and common bird's-foot-trefoil. The non-flowering rosettes of bee orchid *Ophrys apifera* were scattered through this habitat at low densities, with one area, targeted noted in figure 4 below, having 10+ plants in a small area.

Ephemeral / Short perennial

4.13 To the north of the trim trail area, adjacent to Ruff lane was a small, disturbed laying down / work area, which featured cut log and mulch piles (Photo 6).

Hedgerows

4.14 The northern boundary of the area was formed by a hedgerow along Ruff Lane. Hawthorn was the most frequent species recorded, along with hazel, blackthorn, guelder-rose *Viburnum opulus* and rowan.

Figure 4: Woodland W1 and Trim Trail Plan

Photo 1: Scalloped edge on sunny south facing bank W1

Photo 2: Dense single species stand W1

Photo 3: Woodland W1 and Amenity Grassland A1 transition

Photo 4: Footpath, with grassland/scrub/woodland transition

Photo 5: Species-rich glade with tree planting (NG1)

Photo 6: Laying down / work area (ephemeral / short perennial

Meadows Area

Semi-improved neutral grassland

4.15 A prominent feature of the eastern section of the campus was a series of recently created neutral grassland meadows (NG4-8). Due to the seed mixture used in creation, the community compositions of these grasslands were comparable across the communities mapped, which is to be expected for newly created grasslands. The communities recorded contain a number of species typically associated with old meadows, specifically common knapweed and oxeye daisy and to a lesser extent common bird's-foot-trefoil. These species are preferential towards NVC community MG5 (*Cynosurus cristatus – Centaurea nigra* grassland)[E], a priority grassland habitat type. Despite this superficial resemblance to MG5, the grassland overall lacked the diversity of associated species seen in the best examples of this grassland type. Nevertheless, the eastern meadows provide a significant area of good quality grassland rich in native wildflowers, which provide important habitat for insects to complete their life cycles.

4.16 There were subtle differences in community composition and species richness across the different mapped parcels. The swards were typically comprised of a mixture of Yorkshire-fog *Holcus lanatus*, red fescue, perennial rye-grass *Lolium perenne*, cock's-foot *Dactylis glomerata* and sweet vernal-grass, with the bulk of the herbaceous diversity typically including ribwort plantain, common knapweed, white clover and oxeye daisy.

4.17 Community NG8 (Photo 9) was marginally the most diverse grassland in this area with common knapweed, ribwort plantain, lesser trefoil and oxeye daisy all frequent with common bird's-foot-trefoil, meadow buttercup *Ranunculus acris* and hairy tare *Ervilla hirsuta* occasional. Of note within this grassland was an intergeneric hybrid between *Schedonorus x Lolium* and changing forget-me-not *Myosotis discolor*. The grassland featured scattered young, planted tree standards of Scots pine *Pinus sylvestris*, silver birch, beech *Fagus sylvatica* and pedunculate oak, which added to the structural diversity of the area and gave the southern boundary a parkland feel. The eastern extent of grassland community NG8, described above, featured an open woodland community with 30-40% canopy coverage, labelled NG8a on figure 5 below. Goat willow, hawthorn and pedunculate oak were the characteristic species, together with blackthorn and buckthorn *Rhamnus cathartica*. Within the open areas, the ground flora was consistent with neutral grassland NG8, with the additional incidence of goat's-beard *Tragopogon pratensis*.

4.18 Communities NG4 and NG5, recorded to the north and east of scrub Sc1 featured tall vigorously growing swards, within which cock's-foot and tall fescue *Schedonorus arundinaceus* played a more prominent role. Despite this, a high cover of wildflowers were noted, with NG4 characterised by oxeye daisy and ribwort plantain, with common knapweed increasing significantly in abundance within NG5, forming almost single species stands locally (Photo 7). Such vigorously growing swards are often indicative of more nutrient rich soil and would benefit from additional management to limit grass growth and reduce nutrient loads. Additionally, the dominance of a single species within the sward can be indicative of consistent mowing periods over an extended timeframe, which preferentially favour particular species. In this instance, a late summer mowing period may be favouring the growth and seeding of common knapweed.

4.19 NG5a was the tall grassy margins surrounding pond P2 and was similar in composition to NG5, but with the additional incidence of fox-and-cubs *Pilosella aurantiaca*, rough horsetail *Equisetum hyemale*, red campion *Silene dioica*, beaked hawk's-beard *Crepis vesicaria* and common sorrel *Rumex acetosa* (Photo 11).

4.20 NG6 was recorded at the eastern edge of the area, bordering Hill Lane. This area is used occasionally for temporary parking and at the time of survey had recently been cut, which is in contrast with the other grasslands of this type within the meadows area. Despite the more intensive management, the grassland remained moderately species rich with common knapweed, ribwort plantain, yarrow and lesser trefoil all well represented. Further east, these wildflowers disappear from the sward almost entirely and the community resulting in a species poor grass dominated sward (see NG6a overleaf).

4.21 Finally, community NG7 was unmanaged strips of neutral grassland recorded to the north and east of the rugby pitches (Photo 12). Again, common knapweed and ribwort plantain were prominent species within the grassland, but in this instance common vetch and hairy tare showed increased abundance.

Woodland

4.22 A small area of willow dominated woodland (W2, overleaf) was recorded at the eastern and western extent of pond P2. Both planted and self-sown goat- and grey willow formed a low dense canopy, with less open space than the woodland recorded across the eastern section of the Campus. Downy birch *Betula pubescens* was occasional and gorse was locally frequent at the margins. Due to the dense canopy, the species diversity of the ground flora was low, being dominated by the grasses tall fescue, Yorkshire-fog and soft rush *Juncus effusus*.

4.23 Woodland W3 was recorded on a west facing bank between the football pitches and the athletics pitch and was similar in canopy composition and structure to woodland W1 described above. The woodland featured a diverse mix of trees and shrubs including, goat willow, gorse, silver birch, buckthorn, hazel, wild cherry and guelder-rose. The ground flora was similarly species rich, particularly within the glades and extensive unmanaged margins, with oxeye daisy, common vetch and hairy tare all frequent and kidney vetch, common fleabane *Pulicaria dysenterica* and cat's-ear also recorded. Yellow meadow-ant hills were noted within this habitat.

Scrub

4.24 An area of mixed scrub, labelled Sc1 on figure 5 below, was noted along a south facing bank to the south of grassland community NG4. The community lacked a significant cover of canopy forming trees seen within the recently created woodland communities recorded in proximity. Hawthorn and gorse were the most frequently recorded species, growing together with blackthorn, dog-rose *Rosa canina*, grey willow and hazel, in an open structured community. Scattered pioneer tree species such as rowan, silver and downy birch were present. The habitat featured a high proportion of glades and unmanaged margins, which supported neutral grassland characterised by red fescue, tall fescue and oxeye daisy.

[E] The NVC is a vegetation classification system based on plant species composition and frequency within a sampled stand of vegetation. The system has been produced following detailed studies of the vascular plant, bryophyte (mosses and liverworts) and lichen species which occur within distinct vegetation types. The system covers nearly all natural, semi-natural and some major artificial vegetation communities and is documented over 5 volumes of British Plant Communities with Volume 3 covering grassland and montane communities. There are 268 community types spread across 12 major types of habitat. Many of these community types are then divided further into 'sub-communities', of which there are 578, with some broken down even further into a third level known as 'variants'

[JNCC. (2008). UK Habitat Classification – NVC types and their names. [online]. Available at: http://jncc.defra.gov.uk/page-4264

Amenity Grassland

4.25 The central sports pitches featured an amenity grassland community with understandably limited botanical diversity. These communities, denoted as A2 on figure 5 below, were dominated by perennial rye-grass, with species such as Yorkshire-fog, white clover and dandelion *Taraxacum officinale agg.*. Some botanical interest was noted along the gravel drains at the margins of the fields, where species such as common stork's-bill *Erodium cicutarium*, Dove's-foot crane's-bill *Geranium molle* and field pansy *Viola arvensis* were noted (Photo 12).

4.26 The slopes surrounding the athletics track featured a frequently managed amenity grassland community of moderate species diversity (denoted A3 on figure 5 overleaf and shown on photo 8). The sward comprised red fescue, perennial rye-grass and creeping bent *Agrostis stolonifera*, and was short mown, except for a small area bordering woodland W3 to the north. Lesser trefoil was frequent, with slender trefoil *Trifolium micranthum* also noted and common vetch, ribwort plantain, yarrow and bee orchid scattered throughout.

Pond P2

4.27 Pond P2 present to the eastern extent of the campus, is best described as three contiguous waterbodies, with significant variability between them. P2a, which is furthest south, was the only waterbody of the three which was holding water at the time of survey and featured a central area of open water fringed with tall marginal vegetation (Photo 10). Common reed *Phragmites australis* was abundant, growing with locally frequent reed sweet-grass *Glyceria maxima*, occasional reed-mace *Typha latifolia* and galingale *Cyperus longus* as a rarity. The invasive species New Zealand pygmyweed *Crassula helmsii* was frequent on the margins of the habitat, extending into the open water, but at lower frequencies.

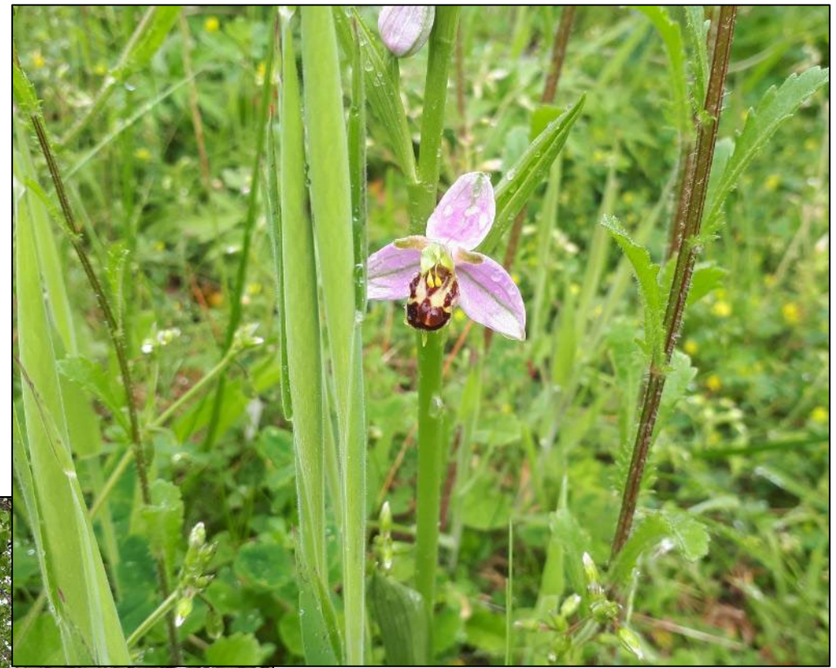
4.28 Adjacent to the north-east was P2b, which in common with many waterbodies during the exceptionally dry summer of 2022, was dry during the survey. The pond featured abundant reed sweet-grass at the margins, together with yellow iris *Iris pseudacorus*. New Zealand pygmyweed formed a dense carpet over much of the dry pond basin.

4.29 The most species-rich of the three ponds was P2c to the north, which was bordered by a group of young mixed willows which was shading much of the surface of the pond. Willow species noted in this area included grey, goat, osier *Salix viminalis*, white *S. alba* and the hybrid between grey willow and osier *S. x holosericea*. P2c featured a dry basin at the time of survey, fringed with short marginal vegetation comprising lesser pond-sedge *Carex acutiformis*, common spike-rush *Eleocharis palustris* and galingale. New Zealand pygmyweed was present at low frequency within the dry basin of P2c. The locally rare tubular water-dropwort *Oenanthe fistulosa* was recorded within the marginal vegetation along with the likely introduced rough horsetail and the non-native Siberian Iris *Iris sibirica*.

Hedgerows

4.30 Native hedgerows were recorded along outer boundary of the meadows area. These were generally species poor, dominated by hawthorn with scattered specimens of guelder-rose, holly *Ilex aquifolium*, blackthorn and garden privet *Ligustrum ovalifolium*. The invasive species Japanese rose *Rosa rugosa* was recorded within hedgerow H4, which bordered a neighbouring garden.

4.31 Hedgerow H5, recorded along St Helens Road, was notable due to the presence of three mature wych elms *Ulmus glabra* (trees T1, T2 and T4) and a single English elm *Ulmus procera agg.* standard (T3). Elms of this size are a rare occurrence in the UK, since the elm population was decimated by Dutch elm disease *Ophiostoma novo-ulmi* in the 1970's; these trees are likely to have avoided infection rather than resistant.



Top Bee Orchid. Bottom Mature wych elm (T1)

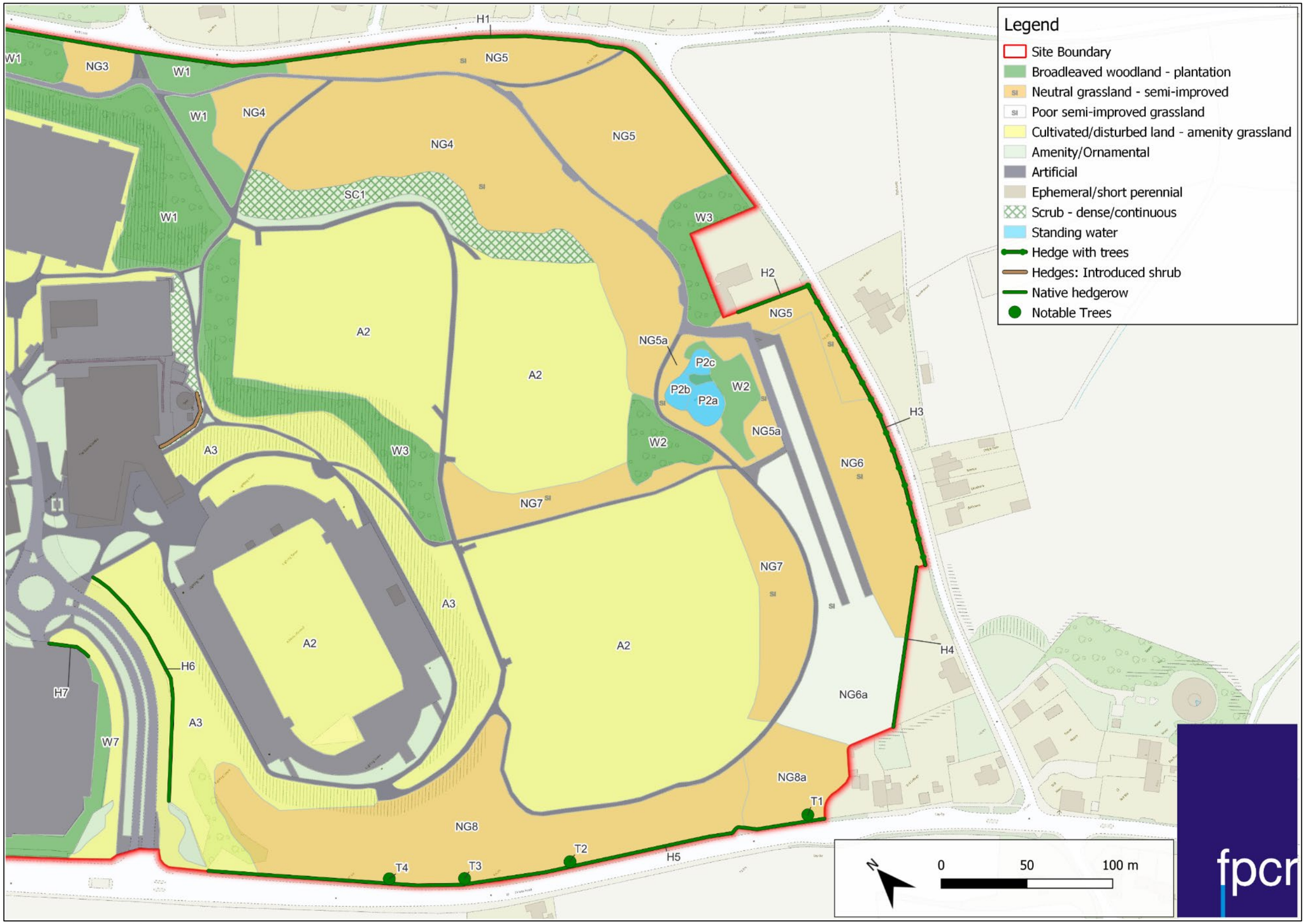


Figure 5: Meadows Area Plan

Photo 7: Common knapweed dominated grassland NG5

Photo 8: Foreground: Amenity grassland A3. Background: Woodland W3

Photo 9: Grassland NG8, with standard trees

Photo 10: Pond P2a, open water with tall marginal vegetation

Photo 11: Grassland NG5a adjacent to P2, with locally frequent rough horsetail

Photo 12: left: Neutral grassland NG7. Right: Amenity Grassland A1 with gravel drain

Campus Area

Graduates Court and Northern Woodland (W4)

4.32 Graduates Court and the associated woodland W4 to the rear, which runs along the northern boundary of the campus, eastwards to the department of Biology, is notable for the diversity of exotic and ornamental trees. Although the high proportion of non-native species within this area does limit its value to biodiversity, the heritage, cultural and educational appeal of the area should be acknowledged. Graduates court is the site of a former arboretum, which was incorporated into the greenspace of the development of the area and gives explanation to the diversity of mature exotic specimens in this area (Photo 17). Notable specimens include: Indian horse chestnut *Aesculus indica*, holm oak *Quercus ilex*, turkey oak *Quercus cerris*, Rauli *Nothofagus alpina* and dawn redwood *Metasequoia glyptostroboides*.

4.33 The northern boundary woodland W4 is of variable age, with the oldest section to the east being approximately 20 years old, and the area behind Graduates Court approximately 10 years old. The woodland has incorporated existing mature specimen trees, which adds to its structural diversity.

4.34 The woodland is densely planted, with clear planting lines still evident and little evidence of thinning works undertaken (Photo 13). The canopy is formed by a diverse mix of at least 18 different native and non-native trees, of which American lime *Tilia americana*, silver birch, grey alder *Alnus incana* and aspen *Populus tremula* were the most frequently recorded. Pedunculate oak, Italian alder *Alnus cordata*, black pine *Pinus nigra* and crack-willow *Salix x fragilis* were noted at lower frequencies. In addition to this, a diverse mix of understory shrubs were noted, including native species such as bird cherry *Prunus padus*, wych elm and hawthorn, but also ornamental species and varieties, such as red-berried elder *Sambucus 19acemose*, purple elder *Sambucus nigra f. porphyrophylla*, Turkish hazel *Corylus colurna* and highclare holly *Ilex x altaclerensis*. Notable specimens within this area included a mature Wellingtonia *Sequoiadendron giganteum* and black mulberry *Morus nigra* (Photo 15). The ground flora through this woodland was heavily shaded and species poor, with common nettle *Urtica dioica* and bramble *Rubus fruticosus agg.* forming dense patches locally and hybrid bluebell *Hyacinthoides x massartiana* and ivy *Hedera helix* less frequently recorded. The invasive species variegated yellow archangel *Lamiastrum galeobdolon subsp. Argentatum* and three-cornered leek *Allium triquetrum* were present locally within the ground flora.

4.35 A woodland pond (P3) was noted within this woodland and in common with the wider area included a mix of planted native and non-native species (Photo 14). Of particular note were the non-native ferns ostrich *Matteuccia struthiopteris* and sensitive fern *Onoclea sensibilis* on the banks of the pond, which were growing with pendulous sedge *Carex pendula*, wood spurge *Euphorbia amygdaloides* and the invasive giant rhubarb *Gunnera tinctoria*. The pond itself included marsh cinquefoil *Comarum palustre*, yellow water lily *Nuphar lutea*, common club-rush *Schoenoplectus lacustris* and creeping jenny *Lysimachia nummularia*.

4.36 Hargrave House, located off St Helens Road, adjacent to Graduates Court is a former residential property repurposed for police training. The property featured a large, detached property with associated garden with amenity lawn. Of note in this area were a large multi-stemmed horse chestnut *Aesculus hippocastanum* pollard which had a number of veteran features (tree T5). The grounds of Hargrave House also featured the Campus allotment area, comprising of a number of raised planting beds, green houses and polytunnels (Photo 18). A comprehensive species list of associated flora was not made for the allotment. However, previous botanical recording in this area had identified a number of notable arable weeds, namely field woundwort *Stachys arvensis* and corn spurrey *Spergula arvensis*[F] . Devil's bit scabious *Succisa pratensis* was noted in this area as a likely garden escape.

Southern Woodland Strips

4.37 The southern boundary along St Helens Road featured a narrow band of woodland (woodlands W5-7 as shown on Figure 6 below), which formed a continuous linear feature broken only by a single vehicular- and a number of pedestrian entrances.

4.38 At its northern extent (areas labelled W5 on figure 6 overleaf), this woodland was characterised by an upper canopy of ash *Fraxinus excelsior* Scots pine and silver birch, together with lime *Tilia x europaea*, false-acacia *Robinia pseudoacacia*, sweet chestnut *Castanea sativa* at lower frequencies. A dense understorey of predominantly non-native species, either as short shrubby garden border plants such as snowberry *Symphoricarpos albus*, David's viburnum *Viburnum davidii*, bridewort *Spiraea sp.* and hydrangea *Hydrangea macrophylla* or as taller densely shaded understorey shrubs such as holly, rhododendron *Rhodendron ponticum* and Himalayan honeysuckle *Leycesteria formosa*. Due to the dense shade, the ground flora within this section was limited to locally frequent ivy, bramble and great woodrush *Luzula sylvatica*, along with occasional hybrid bluebell.

4.39 The central section, labelled W6, was similar in structure to the community described above, but with pedunculate oak increasing in abundance within the canopy. However, locally along its length, the woodland belt featured a narrow band of boundary trees with an established understorey and ground flora, as well as a band of scattered planted trees with a frequently managed amenity grassland ground flora.

To the south (W7), bordering the main campus carpark this woodland belt is comprised of ash, Scots pine and aspen. The woodland is bordered in part by native hedgerows and internally is a shallow drainage ditch, which was dry at the time of survey. To the south, stone gabions form the woodland boundary which featured locally frequent low scrambling cotoneaster *Cotoneaster dammeri / x suecicus [ident]*.

Veteran Horse chestnut T5

[F] https://www.linkedin.com/pulse/notable-flora-edge-hill-university-joshua-styles

Figure 6: Campus Areas

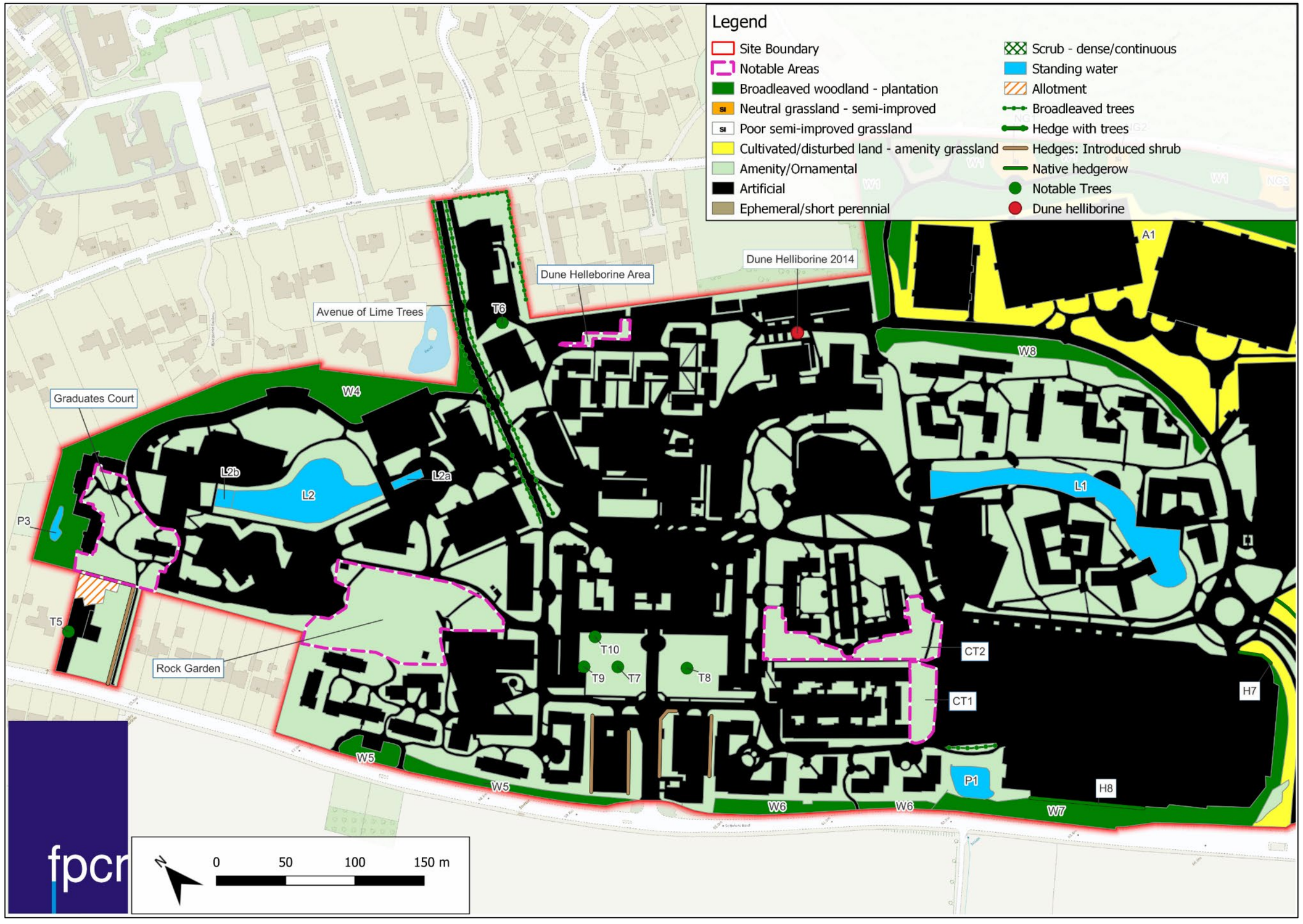


Photo 13: Woodland W4

Photo 14: Pond P3

Photo 15: Black Mulberry within woodland W4

Photo 16: Deadwood pile and variegated yellow archangel within woodland W4

Photo 17: Graduates Court Trees

Photo 18: Allotments within the grounds of Hargrave House

Rock Garden

4.40 To the north of the Rose Theatre and associated with the outdoor amphitheatre was the campus rock garden, which includes a collection of predominantly ornamental Himalayan and Japanese species in a formal country park / Himalayan garden setting. Although primarily of horticultural and recreational interest, this area does contain features of note. Along with the rhododendrons and ornamental maples *Acer palmatum 'Areum' / 'Atropurpureum'*, (Photo 19) the garden featured a variety of ferns both native and non-native, including male fern *Dryopteris filix-mas*, lady fern *Athyrium filix-femina*, ostrich fern and soft shield-fern *Polystichum setiferum*. The western section of the rock garden featured a damp area featuring tall herb vegetation. Although non-native species such as Chinese rodgersia *Rodgersia aesculifolia* and garden Solomon's-seal *Polygonatum x hybridum* were common here, native species such as yellow iris and pendulous sedge added to the interest.

4.41 Centrally, the outdoor amphitheatre comprised an area of closely mown amenity grassland (Photo 20), with the eastern extent featuring a small area of beech dominated closed canopy woodland. In this area, the amenity grassland ground flora had been left un-mown and a number flowering plants such as hybrid-bluebell, betony *Betonica officinalis* and red campion added to the interest. The invasive plant three-cornered leek was recorded within the ground flora.

4.42 The northern section of the rock garden features a forest school / outside workshop. A number of man-made invertebrate habitat niches, including deadwood piles, bug hotels, compost piles and ornate nest boxes were present (Photo 21).

Orchid Area – Durning Centre Carpark

4.43 The most notable botanical record for the Campus is dune helleborine *Epipactis dunensis* which was discovered on campus in 2014 within a vegetated island within a carpark to the rear of the Durning Centre. At the time of survey, this area had been protected by the use of temporary Heras fencing (Photo 22).

4.44 From the fence line, a count of 15 non-flowering spikes of helleborine orchids were noted, which are assumed to be *E. dunensis*. The orchids were growing within short ephemeral vegetation and grassland at the base of trees planted within the island. The tree cover in this area was primarily downy birch with some silver birch and wild cherry. Associated ground flora vegetation included rough meadow-grass *Poa trivialis* and creeping bent within the more grass dominated areas, and daisy, common ragwort *Jacobaea vulgaris*, bramble and creeping thistle *Cirsium arvense* within the open partially vegetated areas. A single bush of the invasive Himalayan cotoneaster *Cotoneaster simonsii* was noted in this area.

4.45 The previous BAP noted that a single flowering spike had also been recorded in 2014 adjacent to the Dunning Centre (SD 42432 07442 see figure 6). A thorough search of this area was made during the survey but no evidence of dune helleborine was noted.

Right: Dune Helleborine (from EHU BAP 2019)

Photo 19: Rock garden formal planting

Photo 20: Rock Garden amphitheatre and tree planting.

Photo 21: Rock garden forest school, with ornamental nest boxes

Photo 22: Dune helleborine area

Photo 23: Lake L1 showing water feature and dense marginal vegetation

Photo 24: Lake L1 showing artificial beach and colonising vegetation on gabion wall

Lakes

Lake L1

4.46 Located at the eastern extent of the main campus area, Lake L1 is the most heavily engineered of the waterbodies present on Campus, with steep reinforced margins along the majority of its length (Photo 23). Despite this, the lake still featured a reasonably diverse mix of native tall marginal vegetation with common reed, lesser pond-sedge, lesser reed-mace *Typha angustifolia*, yellow iris and grey club-rush *Schoenoplectus tabernaemontani* all forming extensive patches. In addition to the native flora, the lake also featured a mixture of ornamental plants including the invasive giant rhubarb, a variegated form of grey club-rush *Schoenoplectus tabernaemontani var. albescens* and white wood-rush *Luzula nivea*.

4.47 A comprehensive aquatic plant survey was not undertaken on the lake, but observations from the margins suggest that the lake doesn't support a wide variety of submerged aquatic vegetation, with only spiked water-milfoil *Myriophyllum spicatum* noted. From historic surveys, the lake was known to feature the invasive species, curly waterweed *Lagarosiphon major*, which has subsequently been treated through the use of pond dye to limit photosynthesis potential of this species and filamentous algae. It is highly likely that this treatment has limited the diversity of aquatic vegetation within the waterbody.

4.48 A small artificial beach was present adjacent the lake, which was devoid of vegetation, except for opportunistic annuals growing within the sand trapped within the neighbouring gabion walls. Within this area hare's-foot clover *Trifolium arvense* and annual pearlwort *Sagina apetala* were noted, which was the only location on Campus these species were recorded (Photo 24).

Lake L2

4.49 Lake L2, which is found to the west of the campus, provides an attractive focal point for Campus users, and supports a diverse and unusual flora. The majority of the Lake featured a naturalistic profile with edges gently shelved or stepped to introduce a variety of niches for aquatic and marginal plants. Water levels were clearly allowed to fluctuate which had created damp draw down zones, providing additional habitat. As a result, despite the lake being relatively recently created it supports a diverse, and in some regards an unusual, flora.

4.50 The lake was fringed by tall marginal vegetation with lesser reed-mace, lesser pond sedge, common reed and branched bur-reed *Sparganium erectum* all well represented. Locally, short marginal vegetation was present with bog-bean *Menyanthes trifoliata* and grey club-rush frequent (Photo 25). Further upslope within the damp drawdown zones pendulous sedge was frequent together with common bistort *Bistorta officinalis*, marsh marigold *Caltha palustris*, yellow iris and locally dotted loosestrife *Lysimachia punctata*. A number of non-native species were also noted within the drawdown zone including plantain lily *Hosta spp.*, giant rhubarb, Indian rhubarb *Darmera peltata* and monkeyflower *Erythranthe guttata*.

4.51 Notably, the southern margin of the Lake contains a population of true fox-sedge *Carex vulpina*, which is a red data list species in England; the nearest know population is 120km away in Fishlake, South Yorkshire. In addition to this, tufted-sedge *Carex elata*, which is only known from one hectad within west Lancashire and Merseyside, was also noted at the pond margin. Although undoubtedly introduced on Campus, these sedges are notable additions to the flora of the Campus.

4.52 Also of note was the presence of giant meadowsweet *Filipendula camtschatica* a striking non-native plant which is similar to its native relative but has been recorded at only a handful of locations across the UK.

4.53 The lake is artificially connected to two associated water features in close proximity. The first is the filter reed bed adjacent to the west of the Lake (L2a, shown on photo 26). This small waterbody featured abundant common reed, with bamboo *Chimonobambusa sp.*, pendulous sedge and giant rhubarb at the margins. The second associated waterbody (L2b) is located to the east of the lake and is a rectangular raised feature, with stepped levels. The waterbody was notable for the presence of fringed water-lily *Nymphoides peltata* a non-native species related to bogbean. Spiked water-milfoil, unbranched bur-reed *Sparganium emersum* and lesser reed mace were also present within the waterbody.

Pond P1

4.54 Pond P1, located between Palatine Court Halls and the main campus car park, was heavily vegetated featuring dominant lesser reed-mace, with locally frequent yellow iris (Photo 27). The north-western bank is formed by stone gabions covered with scrambling ivy with a toe of large loose boulder sized rocks. The southwestern bank was bordered by the boundary woodland W7, which in this section featured dense bramble growth within the ground flora.

4.55 The pond was notable for the species rich grassland present on the ponds north-eastern and south-eastern banks, which included species which had limited distribution across the wider campus, including ragged robin *Silene flos-cuculi* and greater bird's-foot-trefoil *Lotus pedunculatus* on the lower slopes; and sheep's-sorrel *Rumex acetosella* which was present on the dry disturbed ground associated with anthills.

4.56 Chinese bramble *Rubus tricolor* was encroaching extensively along eastern bank, which was to the detriment of the native wildflower species in this area. Additionally, of note were three recently pollarded white willows.

General features

4.57 The majority of the developed campus area comprised made ground formally landscaped with amenity grassland, ornamental planting beds and a mix of native and ornamental trees.

Campus Trees

4.58 A wide variety of trees were noted around the campus, which outside of the areas discussed above (principally Graduates Court and the rock garden) were predominantly young- or intermediate aged trees, with mature specimens being more local.

4.59 A band of mature trees were present between Woodland Court Halls and Forest Court Halls (CT1), before extending southwards adjacent Forest Court Halls (CT2). CT1 featured a mature canopy of beech, pedunculate oak, Scots pine, birch and sycamore *Acer pseudoplatanus* over a mixture of shady infrequently managed amenity grassland and short formal planting beds. Of note was the presence of buckthorn as an understory shrub. CT2 on the other hand featured a mature canopy of beech, Scots pine and horse chestnut over a relatively undisturbed ground flora characterised by bramble and locally frequent patches of nettle and rosebay willowherb *Chamaenerion angustifolium*.

4.60 Further north around the Catalyst building were a collection of mature and early mature trees, predominantly Scots pine, Monterey pine *Pinus radiata*, birch and alder growing over

wide bands of structured ornamental beds, amenity grassland and short formal beech and yew *Taxus baccata* hedges.

4.61 Mature trees were also common around the Tech Hub. Of particular note were an avenue of mature common lime trees which ran southwards along either side of the entrance off Ruff Lane. Mature tree lines can provide important wildlife corridors, particularly in urban environments. Additionally, a mature wych elm (T6) was noted in front of the Tech Hub.

4.62 Finally, two prominent semi-mature sweet chestnut (T7) and copper beech *Fagus sylvatica 'Purpurea'* (T8) standards with open grown forms were present on the lawn in front of the main building. The northern end of this area also featured two large southern magnolia *Magnolia grandiflora* trees (T9 &10).

4.63 As noted previously, four mature elm trees (T1 – T4) were noted within hedgerow H5 in the meadows area and a single mature wych elm (T6) was noted in front of the Tech Hub. Elms of this size are notable, since the elm population was decimated by Dutch elm disease.

Amenity Grassland

4.64 The majority of grasslands within the campus area were regularly managed to maintain a neat formal appearance.

Despite this, they generally contained some wildflower species, primarily white clover, lesser trefoil, daisy and yarrow. Locally, where this habitat was present in less public facing areas, such as narrow strips behind campus accommodation or near to woodland planting these grasslands appeared less frequently managed and species such as cat's-ear, common vetch, lady's bedstraw *Galium verum* and wild carrot *Daucus carota* were noted at low frequencies.

Planting beds

4.65 Ornamental planting beds were a common feature of the campus; these were highly variable in terms of species planted (Photos 28 & 29). Predominantly, they comprised non-native shrubby planting with hydrangea, Rose of Sharon *Hypericum calycinum*, Wilson's honeysuckle *Lonicera nitida*, red tip photinia *Photinia × fraseri* and Oregon grape *Mahonia aquifolium* among the species noted. Taller herbaceous species including New Zealand flax *Phormium tenax*, Jerusalem sage *Phlomis fruticosa*, Mediterranean spurge *Euphorbia characias* and pampas grass *Cortaderia selloana* formed the taller structural borders. The smaller herbaceous beds included mixed geranium species, garden bistort *Persicaria bistorta 'Superba'*, Plantain lilies and coral bells *Heuchera sp.*. A number of invasive plants were included within the planting mix, including three-cornered leek, montbretia *Crocosmia x crocosmiiflora*, and giant rhubarb.

Opposite: Strawberry dogwood. Above Pollarded White Willow

Photo 25: Lake L2 showing bogbean and grey club-rush swamp in foreground

Photo 26: Lake L2 with associated reed filter bed to right of frame

Photo 27: Pond P1 showing Chinese bramble in foreground and dense marginal vegetation within waterbody

Photo 28: Example of formal planting beds showing caried structure

Photo 29: Example of landscaped greenspace within the campus

Photo 30: Example of deadwood habitat within formal landscaping

Notable Plants

4.66 The Phase 1 habitat survey identified a total of 327 species of plant within the campus. As discussed previously, this represents a snapshot of the botanical richness of the campus with the actual figure considerably higher.

4.67 Several plant species recorded either during the survey or identified during other surveys are of note: a) as being representative of good quality habitat, b) species which have shown marked declines over recent decades, or c) which are of a restricted distribution both locally or nationally[7]. These notable species are listed in the table below.

Common name	Scientific name	Status and comments	Location on Campus
Dune helleborine	*Epipactis dunensis*	Nationally Rare	Durning Centre Car Park. Previously recorded adjacent to Dunning Centre but not during recent survey
Tubular water-dropwort	*Oenanthe fistulosa*	Red List: Vulnerable; NERC SPI; Locally Scarce and declining	Pond P2
True fox-sedge	*Carex vulpina*	Red list Vulnerable; NERC SPI; Nationally Rare Presumed introduced	Lake L2 south-east margin
Tufted-sedge	*Carex elata*	Uncommon sedge nationally, present in only 1 hectad within west Lancashire and Merseyside	Lake L2 east margin
Rough horsetail	*Equisetum hyemale*	Presumed introduced – likely garden variety	Pond P2 and lake L2
Blue-eyed-grass	*Sisyrinchium bermudiana*	Nationally scarce	Previously recorded within the meadows area.
Field woundwort	*Stachys arvensis*	Red list near threatened	Previously recorded within the allotment area
Corn spurrey	*Spergula arvensis*	Red list vulnerable	Previously recorded within the allotment area

Invasive species and problem plants

4.68 A number of invasive and problem plants were recorded across the campus with the species recorded listed in the table below. The table also includes invasive species which have been previously noted within the campus.

Common name	Scientific name	Location(s) / Comments
New Zealand pigmyweed	*Crassula helmsii*	Pond P2.
Three-cornered leek	*Allium triquetrum*	Rock Garden, northern woodland (W4) and planting beds
Rhododendron	*Rhodendron ponticum*	Northern woodland W4, southern woodlands W5 and W6, Rock Garden, and planting beds
Variegated yellow archangel	*Lamiastrum galeobdolon subsp. argentatum*	Northern Woodland W4.
Giant rhubarb	*Gunnera tinctoria*	Pond P3, Lakes L1 and L2, rock garden.
Montbretia	*Crocosmia x crocosmiiflora*	Southern woodland W6, Forest court trees CT2, Planting beds.
Japanese rose	*Rosa rugosa*	Hedgerow H4, planting beds.
Himalayan cotoneaster	*Cotoneaster simonsii*	Planting beds and Dune Helleborine area
Curly waterweed	*Lagarosiphon major*	Not noted on survey but previously recorded within pond P2 and Lake L1.
Japanese Knotweed	*Reynoutria japonica*	Not noted on survey but previously recorded within campus. Assumed treated.
Chinese bramble	*Rubus tricolor*	Pond P1, southern Woodland W5. Not listed as an invasive species on schedule 9 of the Wildlife and Countryside Act 1981 (as amended), but shows invasive qualities.

4.69 Where invasive and problem plants such as rhododendron, three cornered leek and montbretia are present in the formal planting within the Campus, it is considered that they present a low risk of spreading and causing issues within semi-natural habitats in the locality. If budgets allow and in order to reduce risk to zero the removal of these species from the planting beds would be of benefit (noting the removal of rhododendron from the rock garden would be undesirable and unpractical). However, where invasive and problem plants are present within or in close proximity to semi-natural habitats, options should be explored to remove these species

4.70 New Zealand pygmyweed. This species is present within pond P2, to the east campus where it forms extensive carpets within the dry pond basin P2b and is also present occasionally within the tall marginal vegetation surrounding P2a. Unfortunately, effective management measures for the control of New Zealand pygmyweed are not fully developed and as a result it is extremely difficult to eliminate from waterbodies entirely. The killing of the plant using herbicide / hot foam treatments, when waterbodies dry out, has been shown to significantly reduce abundance in the short term[8]. However, the same study observed the plant recolonising from deeper water and returning to its former extent within one growing season. Mechanical removal of the species has similar short-term effects, but also acts as a potential vector for dispersal, as the plant can recolonise new habitats from a spilt fragment as little as 5mm. As such, it is considered that existing control measures would be impractical pragmatically, financially and ecologically, and with little guarantee of long-term success.

4.71 Research has shown that disturbance of the margins of water bodies has the effect of increasing abundance of New Zealand pygmyweed, as the species can quickly colonise bare ground[9]. Research also shows that native, tall, competitive marginal species, such as common reed *Phragmites australis*

[7] http://bsbidb.org.uk/maps/

[8] Ewald, N.C. (2014) *Crassula helmsii* in the New Forest – a report on the status, spread and impact of this non-native invasive plant, and the efficacy of novel control techniques following a 2 year trial. Partner Annex Report for RINSE prepared on behalf of the New Forest Non-Native Plants Project. Freshwater Habitats Trust, Oxford.

[9] Dean CE (2015) The ecology, impacts, and control of *Crassula helmsii*. Thesis, University of Bournemouth, 182 pp

have the effect of limiting New Zealand pygmyweed abundance. This is evident within pond P2, where New Zealand pygmyweed is most abundant within the dried out disturbed ground adjacent to pond P2b, but reduces in abundance amongst the tall marginal vegetation. Given the above, an effective measure for limiting the abundance of New Zealand pygmyweed in this instance would be the introduction of additional rhizomes of species such as reed-mace (including lesser reed-mace), common reed, reed sweet-grass and even bog-bean along the open seasonally dry margins of P2b.

4.72 Variegated yellow archangel. The plant is shallow rooting and can be mechanically removed, although care should be taken to remove all of the plant material as the runners easily break up when disturbed and have the potential to propagate new colonies. Roots should be carefully excavated up to 0.5 – 1.0m in depth and all arisings carefully bagged and removed off-site to a licensed landfill. The plant can re-grow from a small piece of root so extra care must be taken to remove all of the plant material from the site. Waste materials containing variegated yellow archangel are considered 'controlled' waste and must be disposed of appropriately at a licensed landfill.

4.73 Chinese bramble. Although not strictly an invasive species listed on schedule 9 of the Wildlife and Countryside Act 1981 (as amended) (WCA), Chinese bramble can behave in an invasive manner, encroaching rapidly into open areas, out competing existing vegetation. This is evident on the banks of pond P1, where the species has encroached across the eastern bank, to the exclusion of much of the native flora. The species can be mechanically removed and as above care should be taken to remove all of the plant material.

5.0 OBJECTIVES DISCUSSION

5.1 Whilst steps have already been taken to improve the ecological biodiversity campus, there are multiple opportunities available to further improve greenspaces for wildlife. These include a range of principles that can be employed moving forward to safeguard areas of habitat that have been identified as supporting ecological value and encouraging more widespread engagement of students and staff in the campus greenspace.

Objective 1: Protect and Enhance Existing Ecological Resources

5.2 A major cornerstone of the BAP will focus on ensuring all existing areas of biodiversity value are identified, protected and enhanced throughout the BAP period. The following measures are recommended to enhance existing habitats through sensitive management strategies. The recommended management prescriptions for the various habitats are provided in Section 6, which should form the basis of management across the campus.

General Measures across Campus

5.3 Any future ornamental and campus tree planting should seek to incorporate a higher proportion of native species within the planting mix. Although non-native species can provide important sources of pollen, nectar and fruit, native species have been shown to support a much higher diversity of species due to plant-fauna interactions which have evolved naturally over time.

5.4 The use of broad-spectrum herbicide and pesticide should be avoided. Specialist advice should be taken where their use is required for the control of invasive and problem species.

5.5 Semi-natural habitats are, as-a-rule, nutrient poor habitats. Increases in nutrient levels are a key factor in biodiversity decline, as they favour fast growing competitive species. As such, the application of fertiliser should be avoided except where strictly necessary within future ornamental planting within landscaped areas. Where fertilisers are used, they should be applied locally to those plants they are considered necessary for.

5.6 The sale of horticultural peat is due to be banned in England from 2030. Prior to this, the use of peat should be avoided within the any campus horticultural works.

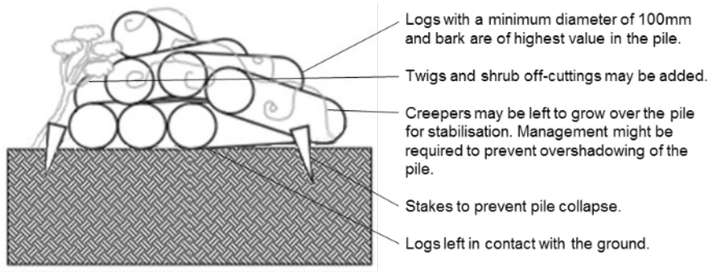
5.7 Regularly mown amenity grassland is extensive across the campus. Significant benefits to biodiversity can be delivered through increasing the abundance and diversity of native plants within this habitat, by reducing the intensity of management. The creation of 'wildflower lawns' within select locations within the campus would provide this benefit and would involve over-sowing existing areas with a range of low growing scrambling and rosette species which are tolerant of disturbance and regular mowing. If left unmown during May and June, such areas will produce a good display of flowering plants of benefit to pollinators. It should be noted that this will create a more informal appearance of these areas and so the locations should be selected with this in mind. Suggested areas for this intervention would be the rear of any residential halls and on the grassy slopes adjacent to woodland W8.

5.8 There is a good variety of deadwood habitats within the Campus and the aim should be to continue the re-use of any arisings from on-site arboricultural works to create additional deadwood habitat. Through the next BAP period, focus should switch to increasing the diversity of deadwood types. This can be achieved by introducing variety in the size type and position of deadwood around the campus, such as:

- Partially burying larger pieces or the bottom pieces of a deadwood piles;
- Introducing large pieces of deadwood into the existing campus ponds;
- Positioning deadwood piles in partial shade (which provides benefits to a wider range of invertebrates) and full shade (which is preferential to fungi);
- In the event of mature tree failure or tree death within the Campus, options should be explored to retain as much of the physical structure of the tree *in situ* as standing deadwood snags; and
- Variations in the type of deadwood piles created, as per the two examples below.

5.9 Example 1 (Figure 7): Larger diameter logs (at least 100mm thick) with bark are of most value, particularly hard wood like ash, oak and beech. Freshly cut willow and poplar may re-sprout, which will not deliver the desired deadwood habitat.

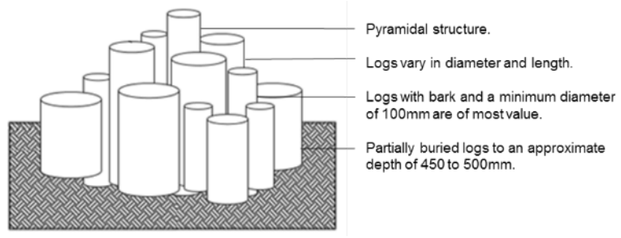
Figure 7: Dead Wood Pile Detail



5.10 Example 2 (Figure 8): Vertical dead wood habitat will be created by partially burying logs vertically side by side in the ground to an approximate depth of 450mm to 500mm, to

form a pyramidal structure. Logs should vary in diameter and length.

Figure 8: Vertical Dead Wood Detail



5.11 A greater variety of pollinator-friendly plants should be introduced in ornamental planting beds. This should include native wildflowers within the ground flora to enhance these areas of formal greenspace which will benefit invertebrates.

5.12 Wildflower seeds should be introduced at the bases of established street trees, where feasible.

Woodland Management

5.13 In the first instance, all plastic tree guards should be removed from the woodlands and recycled where possible.

Trim Trail Woodland (W1) and Associated Woodland (W3)

5.14 The management aims for the trim trail woodland (W1) and the associated woodland within the meadow areas to the south-east (W3) should be to continue the establishment of a structurally diverse woodland community whilst maintaining the existing grassland interest. The objective is to maintain a habitat with permanent and mobile open areas of up to 20% of the woodland, amongst woodland of mixed age and density. The woodland should contain some standing and fallen deadwood.

5.15 To ensure this, as the woodland develops, selective thinning, coppicing and ringbarking of a small proportion of the woodland should be undertaken on a 10 year cycle. This will diversify the structure, open up temporary areas of open space and encourage natural regeneration of trees and shrubs.

5.16 The existing species rich grassland glades (NG1-3) should be maintained as permanent areas of open space within the woodland. In the first instance, this would involve removing and re-planting any recent tree planting from these areas, specifically within NG1. The areas would then be managed through mowing or strimming, with arisings removed as per the wider meadow grassland discussed below, but with allowance for tall rank grass to develop along the woodland margins.

5.17 The planting design of the woodland has incorporated open scalloped edges along the boundaries of the habitat. Within W1, these are present on a sunny south facing bank and the interplay in these areas between the grassland and neighbouring scrub and woodland provides important microclimates for invertebrates. Management should focus on keeping these areas open through removal of encroaching scrub and by cutting / strimming the grassland once per year with arisings removed to maintain a species rich sward. Scrub species bordering these scalloped edges should be coppiced, on rotation on a short cycle, to maintain a gradual transition from maturing canopy trees, through short scrub to grassland (see Figure 9 overleaf).

5.18 Likewise, along the internal footpath where the grass is regularly mown, management could be relaxed to incorporate a strip of grassland which is only cut once per annum and an inner strip adjacent to the path which is kept short.

5.19 At present, the transition between this habitat and the neighbouring amenity grassland areas is sharply delineated. Where space and usage requirements allow, relaxing mowing in these areas would allow a softer transition from woodland-scrub-tall grassland (see Figure 10 below).

Scrub Sc1

5.20 The management of the scrub habitat (Sc1) should broadly follow the principles of the woodland management, but with more extensive coppicing and felling undertaken on a shorter cycle of 5 years. This is due to the faster growth of shrub species and will create a more dynamic, structurally diverse, scrub community. As with the woodland habitat, any existing glades and scalloped edges should be managed to ensure some permanent areas of open space persist within the habitat.

Woodland W3

5.21 This woodland currently features dense growth of willow, which in places is starting to form a low, closed canopy. In contrast to the remaining woodland within the eastern extent of the campus, this area should be managed to maintain this dense scrubby growth. Woodland of this structure – present in proximity to pond P2 and its associated marginal vegetation – will increase potential nesting habitat for species such as reed bunting.

Figure 9: Illustrative scalloped edge management

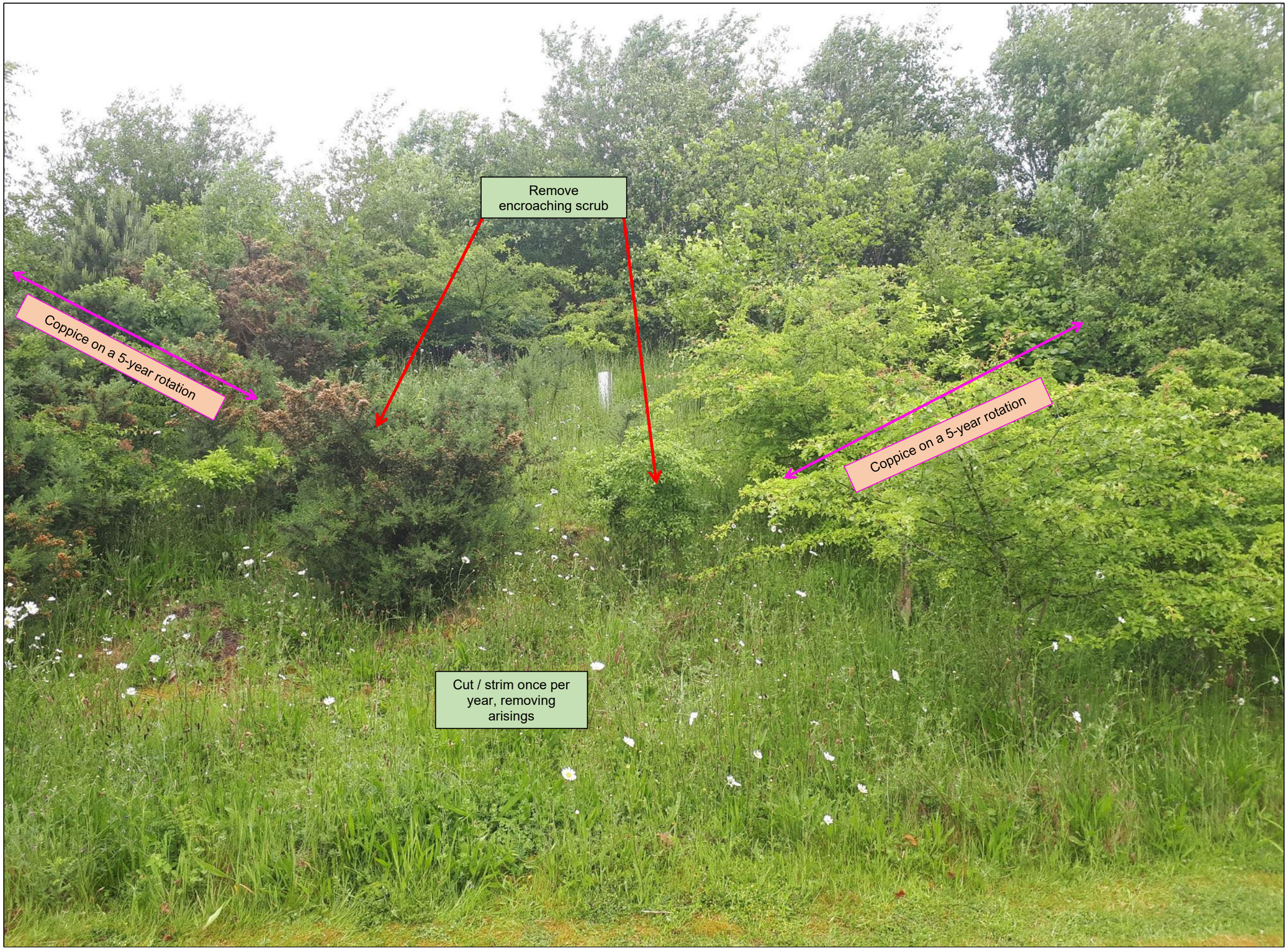


Figure 10: Illustrative woodland boundary management

Meadows Area

Meadows management

5.22 The meadows within the Campus contain a good mix of native species, and as a rule contain a high cover of flowering plants. Meadow creation from either seed sowing or green hay strewing can often result in a rather uniform sward lacking the subtle variations in species composition and abundance that give individuality to semi-natural grasslands. This is evident within the meadows present on Campus, as they contain a number of indicators of priority grassland types but lack the variability and overall species richness of the best examples of this habitat type. The next period of management for the meadows should focus on slowly developing the variability within and between communities through subtle changes in management practices from year to year, and where appropriate, the introduction of additional species into the grasslands.

5.23 This variability can be introduced through a flexible cutting date of the grasslands, which allows for different species to set seed from year to year. It is proposed that the meadows are cut from late July through August (with the exact cutting date determined by weather conditions), with a September cut being undertaken one year in every four years. Additionally leaving 15-20% of the meadows unmown each year, on rotation, would introduce structural diversity to the habitats and provide additional habitat niches. This late season cut (from late July onwards, will protect skylark which have been known to nest within the meadows area, as an additional measure cuts of the meadows will be taken once the sward is above 50cm.

5.24 Species rich grasslands are low nutrient habitats. As such, an important factor in developing and maintaining this habitat is the removal of arising after a hay cut is taken. Ideally, any arisings would be removed after being left 24 hours to allow for seed spill, but if this isn't possible then immediate removal with use of a cut-and-collect mower is acceptable. The use of artificial fertilisers and manure should be avoided on the meadows areas.

5.25 The introduction of additional native wildflower species into the meadows would be of benefit. The most appropriate method of doing this would be by introducing 'green hay' from an existing, local, species rich neutral grassland.

5.26 Should a suitable donor site(s) be available, the hay crop should be taken after flowering, but prior to seeds being dropped. The cut hay should be spread on the prepared ground within 24 hours. In order to prepare the receptor site, a cut should be taken and the grassland raked to open up bare ground for germination. Hay from the donor site can be spread at a ratio of 1:3, where hay from 1ha of cut grassland can be used as a source for 3ha of enhanced grassland.

5.27 Alternatively at a smaller scale, seed from target species could be hand collected (with permission from the landowner) from donor sites to be broadcast on the receptor site. Target species could include species such as meadow vetchling *Lathyrus pratensis*, cowslip *Primula veris*, bulbous buttercup *Ranunculus bulbosus* and field scabious *Knautia arvensis*.

5.28 Yellow-rattle seed could be introduced to the vigorously growing swards, such as NG4 and NG5, in order to reduce the competitiveness of grasses. Yellow rattle is a hemi-parasitic plant which attaches itself to grass roots and weakens them resulting in less vigorous growth and as such can be a useful tool.

Pond P2 Management

5.29 Management of this waterbody should focus maintaining the mosaic of habitats present within this area, whilst ensuring optimal conditions for the rare tubular water-dropwort to thrive. Tubular water-dropwort's key requirement is open areas with relatively high light levels. A reduction in management and increased nutrient levels will lead to colonisation by tall wetland plants which could lead to tubular water-dropwort being shaded out and the reduction in bare soil for germination[10]. At present Pond P2c, where tubular water-dropwort is recorded, is heavily shaded by young willow shrub, which in the long term is likely to shade out this species. As such, initial management works should focus on coppicing the willow trees present on the southern and south-eastern banks of the pond in order to increase light levels. This is likely to result in increased growth of marginal vegetation within the pond, which could also shade out the species and so yearly strimming of the margins in autumn will be required to reduce the competitiveness of the tall marginal vegetation.

5.30 Conversely, it would be beneficial to increase the cover of tall marginal vegetation around the margins of P2b, as a means of limiting the abundance of the invasive plant New Zealand pygmyweed. This could be achieved by translocating rhizomes of common reed, lesser reed-mace or reed sweet-grass (or similar) into the pond in late winter /early spring.

Hedgerow management

5.31 The existing hedgerow resource across the Campus are currently in good condition with reasonably tall, wide structures and bushy growth down to ground level. The sympathetic management of hedgerows provides an opportunity to maximise their value as foraging, shelter and breeding habitat for wildlife. Ongoing management should seek to ensure that hedgerows provide a continuous linear habitat corridor. Management should provide and maintain a dense hedgerow with bushy, vigorous growth to ground level.

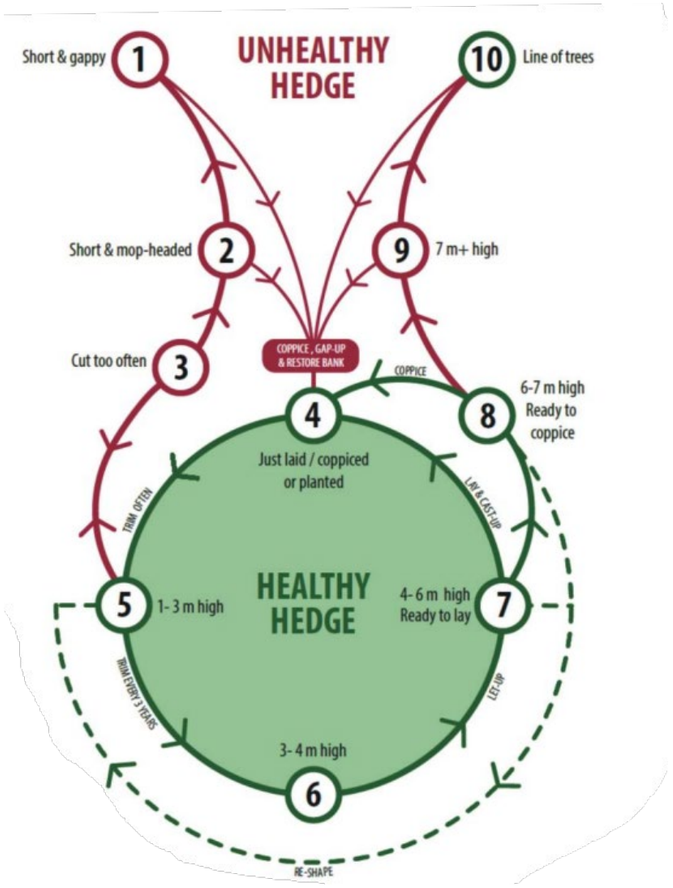
5.32 In the long term, as the hedgerows mature, the resource could be enhanced through long-term favourable management, with the aim of maximising their biodiversity value. To achieve this, hedgerows should be taken through a Hedgerow Management Cycle (HMC; see figure 11 below)[11]. The ten steps of the HMC are shown below. The cycle shows a healthy green core and two unhealthy red offshoots. The aim should be to keep the hedge in the green part (steps 3 to 8), periodically laying or coppicing it, with trimming at appropriate intervals in between. If the hedge is not permitted to go through this cycle, it will either, if cut too often, become short and gappy (steps 1 – 3) or, if neglected, develop into a line of trees (steps 8 to 10).

5.33 At present, the native hedgerows on campus are at stage 5 of the cycle and as such management should focus on trimming approximately every three years. In order to ensure that the hedgerows provide a continual flowering and fruiting resource, hedgerow trimming should be done on rotation with one third of the hedgerows trimmed each year.

[10] Stroh, P. Walker, K; Smith, S. Jefferson, R. Pinches, C. & Blackstock, T. (2019). Grassland plants of the British and Irish lowlands: Ecology Threat and management. BSBI.

[11] The Hedge Management Cycle (HMC). Art work by Will Field. Management Cycle concept developed by Nigel Adams. Hedgelink UK

Figure 11: Hedgerow Management Cycle.



Mature Elm Standards

5.34 Four mature elm trees (T1 – T4) were noted within hedgerow H5 and a single mature wych elm (T6) was noted in front of the Tech Hub. Natural resistance to Dutch elm disease has not been noted within the native UK species and as such these trees are likely have avoided infection rather than resistant. Mature elms are the food plant for a number of butterfly and moth species, including the light emerald *Campaea margaritata* moth and declining species such as the white letter hairstreak *Satyrium w-album* butterfly.

5.35 The university arborists should monitor these elm specimens for signs of infection and appropriate action taken to limit its spread should any infection become apparent. A number of hybrid elms have been cultivated and are recommended Butterfly Conservation which are resistant to Dutch elm disease, such as Sapporo Autumn Gold Elm *Ulmus davidiana var. japonica × U. pumila.*[12] These cultivars are also host plants for associated elm invertebrates and any additional tree planting within the campus should consider including them as part of the planting mix.

Campus Area

Graduates Court

5.36 The northern woodland W4, present behind Graduates Court, is a densely planted woodland with a closed canopy. Although the predominance of non-native trees limits its biodiversity value overall, improvements to the structure of the woodland will maximise its value. Thinning of the canopy trees, selective removal of some of the conifers, along with selective coppicing of the boundary shrubs would all be of benefit.

5.37 The Campus is relatively isolated from any significant areas of mature woodland, as such it is anticipated that specialist native woodland ground flora plants are unlikely to colonise any newly created woodland habitats naturally. As such, woodland ground flora introductions could be undertaken. In order to maximise the chance of success, ground layer introductions should be made in areas with sufficient canopy shade. Given its relative age, woodland W4 provides the best option for this intervention within the Campus. This will provide significant enhancement to this more established woodland and provide a seed source for hand collection of seeds for the Trim Trail woodlands in future when they mature to a closed canopy woodland.

5.38 In line with principles outlined within Francis & Morton (2001)[13], introductions can be made in targeted areas where conditions are most suitable, i.e. shaded areas with deep leaf litter, where they can effectively establish and spread. As such introductions could take place in as little as 10% of woodland W4.

5.39 Species are to be introduced in late winter / early spring as some seeds require vernalisation to break dormancy. A mix of both grasses and wildflowers should be used; as an example, the following species could be included within the mix:

Common name	Scientific name	Common name	Scientific name
Wood anemone	*Anemone nemorosa*	False brome	*Brachypodium sylvaticum*
Ramsons	*Allium ursinum*	Remote sedge	*Carex remota*
Hedge bedstraw	*Galium album*	Betony	*Betonica officinalis*
Woodruff	*Galium odoratum*	Dog's mercury	*Mercurialis perennis*
Bluebell	*Hyacinthoides non-scripta*	Primrose	*Primula vulgaris*
Hairy St John's-wort	*Hypericum hirsutum*	Wood speedwell	*Veronica montana*

Pond P1

5.40 The previous BAP noted that pond P1 was the most botanically rich waterbody within the Campus, and previous surveys on the pond noted that it supported a population of water vole (see below for details). However, at present, botanical richness is noticeably reduced within P1; the waterbody now features an almost single-species stand of lesser reed-mace with no open water present.

5.41 While dense marginal and emergent vegetation is an important resource for a wide range of species, including birds and both terrestrial and aquatic invertebrates, areas of open water are important in that they provide an area for display for breeding amphibians and additional habitat for invertebrates.

5.42 Management through the next BAP period should focus on maintaining a mixture of deeper open water at around 40% with a fringe of tall marginal vegetation and if possible shorter marginal vegetation.

Lakes

5.43 The two lakes and in particular lake L2 are perhaps the most biodiverse areas of the central Campus area. The mix of open water, marginal vegetation, wet grassy margins and notable species provide a good diversity of habitats. Management through the next BAP period should focus on maintaining this balance with enhancements possible in a couple of key areas.

[12] Butterfly Conservation (2014) Disease-resistant elm cultivars. Butterfly Conservation trials report, 4th revision

[13] Francis, J. L. & Morton, A. (2001). Enhancement of amenity-woodland field layers in Milton Keynes. British Wildlife. 12 (4): 244-251

5.44 Although a useful tool for controlling invasive species and filamentous algae within the lakes, the use of pond dye should be used only when strictly necessary. Both lakes were lacking in the diversity of sub-merged and to a lesser extent floating aquatic plants and the introduction of these groups would be beneficial. Suitable additions would be submerged aquatics: rigid hornwort *Ceratophyllum demersum*, curled pondweed *Potamogeton crispus,* broadleaved pondweed *Potamogeton natans*, common water-crowfoot *Ranunculus aquatilis* and water violet *Hottonia palustris*. The latter two species also have additional amenity interest as they produce striking floral displays once established.

5.45 The tall marginal vegetation within the lakes should be monitored and action taken if this becomes too extensive, with a minimum 40% open water recommended. The wet grassy margins of the lakes should continue to be managed as they are currently, with an annual cut to maintain a short grassy sward and to limit encroachment from tall marginal vegetation.

Fauna Specific Protection and Enhancement

5.46 The main threats to biodiversity come from habitat loss, fragmentation and degradation. As the University is committed to a program of biodiversity protection and enhancement these are unlikely to occur at the Campus. However, there are specific instances where activities at the University may cause a species-specific issue.

5.47 These are outlined for each species / group below.

Water vole

5.48 The main threat to water vole at the campus is degradation of habitat. Water vole require permanent open water which they use to move around their territory and to escape predators.

5.49 Pond 1 has become fully vegetated and is drying out and therefore may no longer be suitable to support water vole, last recorded there in 2015. As such, management of pond P1 is required to increase the area of open water and to manage the bankside and emergent vegetation.

5.50 Water vole are legally protected under the Wildlife and Countryside Act 1981 (as amended) and are a S41 and LBAP species. Their legal protection refers to:

- Killing, injuring or capturing;
- Damage or destruction to a place of shelter of protection;
- Disturbance of an animal when occupying a place of shelter or protection; and/or
- Obstruction of access to a place of shelter of protection.

5.51 As such, management works may need to be designed and planned to avoid disturbance or damage to water voles and their burrows which would be a breach of the Wildlife and Countryside Act 1981 (as amended). Therefore, before any management activities are undertaken, water vole surveys should be undertaken by suitably experienced ecologists, to determine if they are still present or likely to be absent.

5.52 Habitat enhancement recommendations have been provided within the habitats section for Pond 1 and these will benefit a wide range of species including water vole. However, due to their legal protection, which may influence how habitat management and enhancement works are undertaken, it is recommended that updated surveys for water vole are

undertaken before any pond management is carried out. See also the great crested newt section, below.

Water vole

Birds

5.53 All wild bird species are protected by the Wildlife and Countryside Act 1981 (as amended) and this protection refers to:

- Capturing, killing or injuring birds; and/or
- Damaging, destroying or removing nests (while in use or being built) or eggs.

5.54 Additional protection is given to species listed under Schedule 1 of the WCA, to add additional protection from:

- Disturbing a bird while building a nest or on or near a nest with eggs or dependant young; and/or
- Disturbing the dependant young.

5.55 Schedule one species were reported in the data search (Quail *Coturnix coturnix,* Barn owl *Tyto alba*, Kingfisher *Alcedo atthis*). However, these were either species that were recorded on Campus but would be unlikely to breed on Campus (such as fieldfare) or have only been recorded offsite and are also unlikely to breed onsite due to lack of suitable conditions (including quail, barn owl and kingfisher).

5.56 The main threat to birds at the campus would be from vegetation management during the period while birds are nesting. This period is often quoted as March to August (inclusive) but several species can nest and breed outside of this period.

5.57 To avoid any potential impacts, vegetation clearance management should be avoided during March to August, inclusive. If this cannot be avoided, then vegetation should be carefully checked by a suitably experienced ecologist prior to clearance. If nests are found, then they should be buffered from any works until chicks have fledged.

5.58 Management of the meadow areas has significant potential to impact nesting skylark where meadow cutting is recommended during the nesting period. Skylark prefer to nest on the ground within short vegetation and will avoid areas of vegetation taller than 50cm. The meadows area will provide suitable nesting habitat for skylark through the early part of the breeding season, and it is possible that a second brood may be attempted later in the season if suitable habitat structure exists. In order to mitigate for this meadow management will involve a late season cut (from late July) with a cut taken only once the sward is 50cm or higher.

5.59 The habitat management measures recommended in this BAP will likely benefit a range of bird species. To further enhance the Campus for bird species, a nest box scheme should also

be established. This should begin by identifying and mapping all existing bird boxes on Campus. These boxes should be cleaned where accessible, repaired if damaged, and replaced if not repairable. This should be done outside of the nesting season to avoid disturbing any nesting attempts. These boxes should also be formally monitored on an annual basis to determine use. The bird box scheme should include boxes suitable for a range of species, by including boxes of different styles and entrance hole sizes. These should include:

- Boxes with 25 and 28mm entrance holes for smaller passerine species;
- Boxes with 32mm entrance holes specifically for house sparrow;
- Boxes with 45mm entrance holes for starlings;
- Open fronted boxes for species such as robin and wren; and
- Specialist swift boxes and house martin nest cups.

5.60 Boxes for most species should be between 2m and 4m from the ground, on trees. Boxes for house sparrow, swift and house martin should be at the eaves of buildings.

5.61 Boxes should be facing between north and east unless the location where they will be mounted will be shaded from the sun during the day.

5.62 House sparrow, starling, swift and house martin will nest in loose colonies so boxes for these species should be installed in groups of three and around 50cm between each box. Where swift boxes are installed, the use of audio playback of swift calls will attract swifts to the boxes and encourage their use.

Example of bird boxes from http://www.vivarapro.co.uk/Products

Skylark

Invertebrates

5.63 The main threats to invertebrate species are from habitat loss, degradation and fragmentation.

5.64 Retention and enhancement of the existing habitats to encourage floral species diversity will benefit the invertebrate species on Campus.

5.65 Actions that encourage diversity in habitats including plants and tree species diversity, encourage structural diversity within those habitats, and add diversity of age including deadwood resources will benefit the invertebrate species at the Campus.

5.66 The larval food plants for the species recorded on Campus and in the surrounding area include:

- Tree and woody shrub species including beech, hazel, hornbeam, blackthorn, hawthorn, rowan, elm, willow, ash, ivy, elder, birch, lime, apple, sweet chestnut, sessile oak and pedunculate oak; and
- Grass and forb species including common grasses, cock's-foot and Yorkshire fog, common nettle, docks, burdocks, ragwort, clover, vetch and dandelion.

5.67 Increasing the occurrence of the above species at the Campus will also benefit the invertebrate species known to be present.

Bats

5.68 On Campus, the main threats to bats would be damage to or loss of roosts due to building and/or tree works, and habitat degradation/fragmentation due to changes in artificial lighting and alteration of commuting routes.

5.69 At present there are no known roosts at the Campus, but this does not mean that roosts are absent. There is also no information on which areas of the campus bats use for commuting and foraging. It may be beneficial to carry out bat surveys and bat box checks to inform management.

5.70 Where building or trees works are required, where new artificial lighting will be installed, or where existing lighting will be changed, the potential impacts to bats should be considered early in the process and an ecologist contacted for advice.

5.71 All UK bat species are protected under the Conservation of Habitats and Species Regulations 2017 (as amended) and the

Wildlife and Countryside Act 1981 (as amended). The protection of bats refers to:

- Capture;
- Killing or injuring;
- Disturbance while in a roost;
- Obstruction of access to a roost;
- Damage to a roost; and/or
- Destruction of a roost.

5.72 Bat boxes are present at the Campus, but no information is available to show if these are being used. A bat box scheme should be established to initially document the location of all bat boxes at the Campus and then to repair, replace and monitor these; as bats are a protected species, activities that could cause disturbance of a bat will have to be undertaken under the supervision of a licenced bat worker.

5.73 Increasing the number of bat boxes at the Campus will benefit bat species. Bat boxes can be installed on mature trees, onto buildings or can be mounted on poles where mature trees or buildings are not present.

5.74 Bat boxes are best situated away from artificial lighting and on or near linear habitat features such as hedgerows or other linear vegetation features.

5.75 Bat boxes with an open bottom design are preferred as these require less maintenance/cleaning as droppings do not build up and also, they can often be inspected from the ground without the need for ladders, using binoculars and a torch (by a licenced bat worker only).

5.76 Suitable open bottomed boxes include:

- Vivara Pro Beaumaris WoodStone® Bat Box Mid
- Vivara Pro Chillon Low Profile WoodStone® Bat Box
- Vivara Pro Beaumaris Green WoodStone® Bat Box Midi

5.77 The habitat management actions recommended in this action plan that encourage increasing habitat, flora and structural diversity will benefit the invertebrate communities at the Campus, which in turn will enhance the range and quantity of insect prey available to bats.

Example of open bottomed bat boxes from http://www.vivarapro.co.uk/Bats

Noctule bat

<u>Hedgehog</u>

5.78 The main threats to hedgehog at the Campus are from killing or injuring individual animals during management works, especially when they enter hibernation during the colder months.

5.79 Hedgehogs will nest all year round and have different nests for different purposes. Day nests will be used during the active season and will be made in rough grassland, leaf or other vegetation piles. Breeding nests will be more substantial and often built in areas with more structural support that will hold together their nesting material such as dense scrub, log piles or compost heaps.

5.80 Hedgehogs hibernate from October/November to March/April. They will hibernate in dense vegetation, within log piles, and in compost heaps – anywhere that offers dark and cold stable conditions.

5.81 Any clearance of the above habitat/features should consider the presence of hedgehogs.

5.82 Methods to reduce the potential impacts on hedgehogs include:

- cutting areas slowly;
- cutting areas in two passes with a high cut then a low cut; and
- cutting areas from the inside out or from one side to another and not from the outside in.

5.83 Clearance or management of more structured habitat like scrub is best undertaken in autumn – a time between the breeding period and hibernation period which should also avoid breeding birds.

5.84 These methods will increase the likelihood of spotting a hedgehog and also give them an opportunity to disperse away from the area.

5.85 If found during works, hedgehog should be left and not subjected to further disturbance. Works should move to another area and only return only if the hedgehog is no longer present.

5.86 In addition to the above, providing hedgehog houses across the Campus in areas that hedgehog are known to use, will provide safe and secure nesting locations that will not be impacted by vegetation clearance works at any time during the year.

5.87 Areas of open water also pose a threat if there is no suitable escape route if hedgehogs fall in. Bricks or sandbags can be used to create exit ramps to provide a safe way for hedgehogs to escape a pond or lake where banks are steep or have vertical drops. Escape routes should be at least 20cm wide and no steeper than a 30° angle.

5.88 Habitat fragmentation is one of the biggest threats to hedgehog, where habitat is present but access to these habitats is impeded. In general, the Campus provides excellent connectivity for hedgehogs as fences and walls are

not a common boundary feature, with hedgerows being preferred. Where fences or walls are present or where they are constructed in future, hedgehog access points should deally be created; a 13cm x 13cm gap will allow hedgehogs access into an area. Once created, these gaps should be checked annually to ensure they remain open and are not blocked by debris or vegetation.

Example of a hedgehog highway with sign encouraging it to be kept clear from https://www.hedgehogstreet.org/

5.89 Details on how to build a hedgehog house can be found here:

- https://www.rspb.org.uk/get-involved/activities/nature-on-your-doorstep/garden-activities/build-a-hedgehog-house/

5.90 Alternatively, hedgehog houses are available to purchase from wildlife suppliers such as:

- https://www.wildcare.co.uk/ or
- https://www.nhbs.com/

Example of hedgehog houses

Amphibians

5.91 The records that exist for amphibians do not create a clear picture of their distribution across the Campus, how they use the Campus or their breeding status at each of the water bodies. It may be beneficial to carry out amphibian surveys to inform management.

5.92 Until information exists to prove otherwise, a precautionary approach should be taken to assume the amphibians recorded at the Campus use all suitable habitat and are breeding in the ponds and lakes.

5.93 Amphibians spend most of their lifecycle on land and return to water to breed in the Spring. Adults return to land after breeding and will hibernate in colder months on land.

5.94 At the Campus, the biggest threats to amphibians will be vegetation clearance during the hibernation period (between November and February, inclusive) or works to the ponds during the breeding period (approximately March to June, inclusive).

5.95 Amphibians hibernate in cool and humid but frost-free locations. This may be in rock or log piles, in loose soil or compost heaps. It is therefore recommended that works during the hibernation period that will remove or disturb areas of vegetation or suitable features such as rubble/log piles are avoided. These activities would be best undertaken in the autumn months when animals have not started hibernating and are still mobile.

5.96 Amphibians are also vulnerable during the breeding period in spring and summer where vulnerable eggs and young are present within water bodies. Some individuals may also over winter within water bodies. Therefore, vegetation management within ponds should avoid the breeding period. Where vegetation management/removal is undertaken at other times of year, the material should be left on the bankside overnight to allow any animals that have been removed in the process, to return to the pond.

5.97 Before any details habitat enhancement for amphibians is undertaken their distribution and breeding status across the Campus should be determined and formal survey to determine this should be undertaken.

5.98 Enhancement measure that can be undertaken include:

- managing ponds to ensure open water and suitable egg laying plants are present (for example water mint *Metha aquatica* and brooklime *Veronica beccabunga* ;
- improvement of terrestrial habitat around water bodies;
- building hibernacula in suitable habitat adjacent or near to breeding ponds to provide suitable hibernation features.

5.99 Hibernacula can be created below ground or above ground (where the soils are impermeable and may flood) by creating a collection of logs, deadwood, bricks and rocks that are loosely filled with soil and leaf litter (see Figure 12 overleaf). These should be either partly covered in turf or top soiled and allowed to naturally vegetate. Hibernacula should be positioned within 200m of a water body as long as suitable habitat connects the two areas.

5.100 Great crested newt has not previously been recorded at the site, but are present in the surrounding area and therefore their presence should not be discounted.

5.101 Great crested newt are protected under the Conservation of Habitats and Species Regulations 2017 (as amended) and the Wildlife and Countryside Act 1981 (as amended). The protection of bats refers to:

- Capture;
- Killing or injuring;
- Disturbance while in a resting place;
- Obstruction of access to a resting place;

Great crested newt in terrestrial habitat

- Damage to a resting place; and/or
- Destruction of a resting place.

5.102 Due to their legal protection any survey works undertaken for amphibians at the site should be undertaken by an ecologist licenced to undertake great created newt surveys.

5.103 In addition, if great crested newt are encountered during works onsite these should stop immediately and a suitably qualified ecologist contacted.

Great crested newt captured in an aquatic funnel trap

Great crested newt in terrestrial habitat

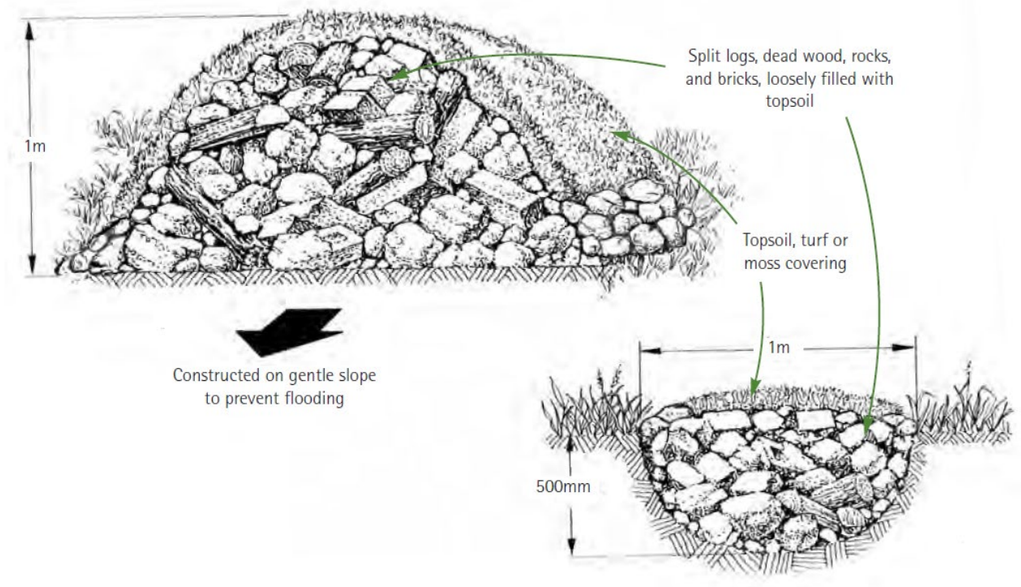


Figure 12: Example hibernacula

Modified from the Great Crested Newt Conservation Handbook

Objective 2: Create New Habitat for Wildlife

5.104 To further enhance the Campus for biodiversity, opportunities exist to provide additional resources for wildlife by maximising the suitability of the space available. The following measures should be considered for implementation as part of the BAP to create new habitats:

New Ponds

5.105 One of the most effective ways of increasing biodiversity is the creation of new ponds. Farm ponds were once a common feature of the rural landscape. However, changes in land management, particularly how farmers keep livestock watered, has reduced the need for field ponds which has resulted in the majority of ponds to become degraded, through overshading and drying out.

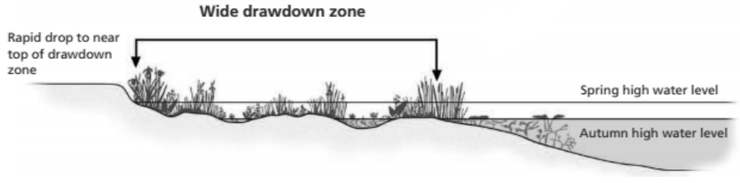
5.106 Although a good variety of standing water habitat is present within the Campus, it is considered that the creation of two to three small ponds within grassland NG8 would provide potential steppingstone habitat between the existing ponds P1 and P2.

5.107 The Freshwater Habitats Trust's 'million ponds' project established that the most important principles in creating a new pond are: a clean water source, allowing the pond to colonise naturally and limiting disturbance[14].

5.108 Citing any new pond creation within grassland NG8, away from existing footpaths would ensure that existing water inputs would be of good quality and that the waterbodies would not be subject to excessive disturbance. It is acknowledged that leaving the ponds to colonise naturally might be at odds with the wider recreational uses of the green spaces. If multiple ponds are created an appropriate action might be provide a mixture of planted and self-colonising ponds.

5.109 When creating new ponds, the most important consideration beyond the location is the pond profile. The first 10cm of water depth is the most important habitat for pond plants and invertebrates and provides optimal conditions for amphibians. The edges of the ponds should be scalloped with large areas of the bank angled at less than 1:20 (3°) which will grade into an expanse of seasonally wet mud that may attract a further variety of invertebrates and plants, which will, in turn, attract other fauna including birds and other mammals. These drawdown zones should undulate towards the deeper water at the centre of the ponds creating pools, spits and marshy areas around the pond edge (see figure 13 below).

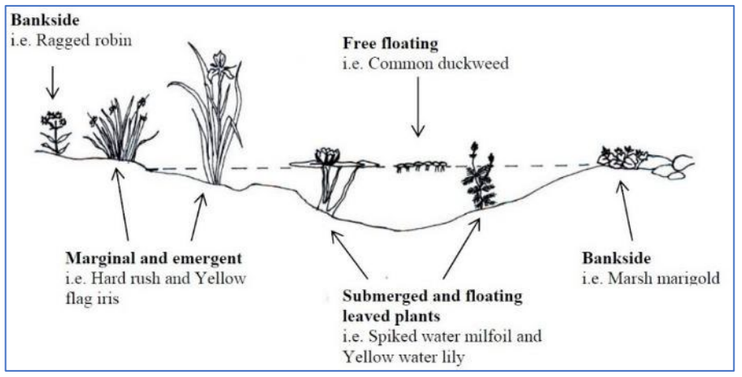
Figure 13: Broad undulating drawdown zones (from the Million Ponds project pond design manual)



5.110 The core depth of each pond should be between 1 and 1.5m. Ideally a number of the ponds should dry-down to little or no water in late summer. Ponds that hold water until late summer will allow most amphibian complete their aquatic life cycles, whilst also reducing the potential for fish colonisation. Figure 14 below provides a basic layout and profile for created ponds.

Figure 14: Pond shape and profile

Figure 15: Pond Planting Zones



Taken from The Habitat Creation Guide for Lowland Derbyshire, Derbyshire Wildlife Trust

5.111 Although it is desirable to allow natural colonisation, if there is a necessity to ensure rapid vegetation establishment and cover then a consideration of different planting zones is required. There are four planting zones within a pond: bankside; marginal and emergent; submerged and floating leaved.

- Bankside – marshy plants found further away from the water, e.g. ragged robin, greater bird's-foot trefoil and marsh marigold.
- Marginal and emergent – plants which are very wet tolerant and can stand in water at the margins of the water body, e.g. yellow iris, common reed and reed sweet-grass
- Submerged and floating leaved – plants that are rooted under the water around the fringes of the water body and sometimes have floating leaves, e.g. yellow water lily, broad-leaved pondweed & spiked water-milfoil

5.112 These are explained in Figure 15. Generally, it is not necessary to plant free-floating species as these will colonise naturally.

5.113 The campus already has a good variety of marginal and bankside species associated the existing waterbodies and it is considered that the translocation or seed harvesting of selected species could be undertaken to vegetate any created ponds. However, translocations of rhizomes should not be undertaken from waterbodies with an existing invasive species burden, such as pond P2.

Lakes

5.114 The lakes currently offer few opportunities for waterfowl (including ducks and geese) to roost and/or loaf safely, as the majority of the margins are very near to footpaths and thus susceptible to disturbance by foot traffic.

5.115 Rafts are a means to provide waterbirds with island habitat in sites with expansive areas of open, deep water. These rafts can improve waterbird breeding success; firstly, by offering areas safe from risk of predation from terrestrial species, and secondly by providing refuges that are a safe distance from possible disturbance from people and pets.

5.116 A small number of floating rafts could be distributed on lake L2 and potentially lake L1. Standard rafts are typically made of pressure treated softwood and are usually 3m square (see Figure 16 below). Their design often includes shelters for

[14] https://freshwaterhabitats.org.uk/projects/million-ponds/pond-creation-toolkit/

chicks and an accompanying re-retry ramp. Buoyancy is provided by two high-density polystyrene blocks. The raft is anchored to concrete blocks via a chain attached to a marker buoy. The surface is covered with gravel and rocks, and any plant growth is removed each winter. Positioning rafts in proximity to the existing tall marginal vegetation will provide additional cover for birds utilising the rafts

Figure 16: Example of a wildfowl raft

from https://www.buttercupfarm.co.uk/

Bee Bank

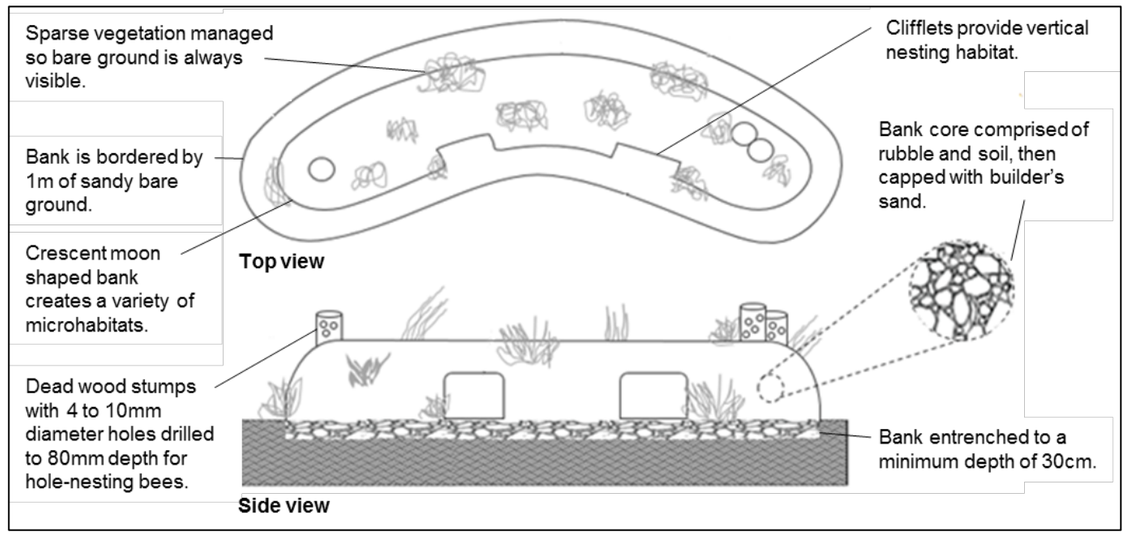
5.117 Bee banks are a potential habitat creation measure, which could increase the available habitat for solitary bees within the Campus. Bee banks are constructed in a crescent moon shape using rubble, soil, and sand, positioned in a sunny area, sheltered from the prevailing wind and near to a source of pollen and nectar, such as a wildflower meadow (see Figure 17, overleaf). The crescent moon shape maximises surface area, traps warmth and creates a variety of microhabitats that will benefit many invertebrates. Potential locations for any proposed bee bank would be the work area within woodland W1 and/or in proximity to pond P2.

5.118 A trench of at least 300mm depth should be dug to create the bank footprint. Turf should be removed to a depth of 150mm from up to 1m distance around the bank in order to prevent turf regrowth and create a border of bare ground. The up-side down placed turf, along with rubble, can be used to build the core strip of the bank which is topped with soil.

5.119 The bank should then be capped with appropriate material at sufficient depth that allows bees to burrow. Ideal capping material, such as sand (particularly builder's sand) and sub-soil, is low in nutrients with grains of a non-uniform size, which is spread unevenly to a minimum depth of 30cm to create a variety of conditions. Compacted sand should also be used to cover the bank's border to suppress weed growth and provide additional nesting bee habitat.

5.120 A number of clifflets should be incorporated into the bank to create vertical nesting habitat. Additional habitat for hole-nesting bees and other insects can be installed, such as bundles of bamboo canes, common reed stems or herbaceous perennial stems, as well as dead wood stumps with holes drilled to 80mm depth at 4-10mm diameter.

Figure 17: Bee Bank Detail



Objective 3: Continue to Establish Ecological Baseline and Implement Monitoring Strategy

5.121 An important step to protecting existing biodiversity resources at the campus is to identify what is present.

5.122 The updated habitat surveys undertaken by FPCR have provided updated information on the habitat distribution and condition. However, habitat surveys can only generally provide a preliminary assessment of the potential of habitats to support particular fauna. Additionally, while the biodiversity records supplied by LERN provide a snapshot of what species have previously been recorded at the Campus, they do not represent the results of targeted or structured survey effort and are likely to be from casual observations only.

5.123 Therefore, a formal, citizen science led programme of biological recording at the campus should be established. Initially it is recommended that the following species groups are targeted:

- Amphibians (led by licenced ecologists);
- Bats (including bat box monitoring, led by licenced bat workers);
- Birds (breeding and wintering) (including bird box monitoring outside of nesting season);
- Invertebrates – conspicuous groups such as butterfly, moth and bees;
- Water vole (led by suitably experienced ecologists);
- Other mammals such as hedgehog;
- Flowering plants.

5.124 Students and staff of the University together with the links that the University already have with external wildlife organisations are likely to represent a pool of people with species survey and identification skills that can assist in these surveys. Alternatively local ecological consultancies and species specialists could be commissioned to undertake species surveys, especially where surveys need to be led by surveyors with relevant survey licences from Natural England (e.g. for great crested newt surveys, bat box checks).

5.125 An excellent way of providing public engagement in the campus and establishing a snapshot of species within the site, is to run a BioBlitz event. A BioBlitz would bring together staff, students, the general public and wildlife experts and is a great way of breaking down barriers to engagement with science and raising awareness of the role of biological recording. It also gives the public an opportunity to contribute to a genuine scientific survey[15]. A guide to setting up a bioblitz event for the campus is provided within the footnote at the bottom of the page.

5.126 As well as formal surveys, staff, students and other users of the Campus should be encouraged to collect and submit casual records of species recorded on Campus (as well as offsite!). It is suggested that a single system for biological recording at the Campus should be established to pool all recorded observations and allow observations to be easily reported. For example, iNaturalist (https://www.inaturalist.org/) can be accessed via an online portal or through a mobile phone app to create new observations in the field and accurately geolocate these. If a project is set up on iNaturalist, for a specific survey or for general biological recording across the Campus then species records can easily be downloaded from there for analysis and mapping.

5.127 Changes to the species present at the Campus and their distribution can be used as an indicator of the effectiveness of the habitat management activities proposed in this BAP.

5.128 A species survey and monitoring report should be created with species distribution maps on an annual basis (or as regularly as possible) to observe changes in species presence/absence, distribution, and population sizes. This will help to determine the impact of the actions recommended in this BAP.

5.129 As habitats develop more slowly, habitat surveys and monitoring should only occur every 5 years.

5.130 Involving student with species monitoring would provide an opportunity for them to gain practical species survey and identification skills for those looking to pursue a career focussed around British wildlife and ecology.

5.131 Links to the Biology department and courses such as the Ecology and Conservation BSc can be used to find staff and students that could assist with the surveys and monitoring activities.

[15]Guide to running a bioblitz 2.0 (https://www.bnhc.org.uk/wp-content/uploads/2014/04/BioBlitz-Guide-2013.pdf)

6.0 LONG-TERM HABITAT MANAGEMENT RECOMMENDATIONS

6.1 This Section of the BAP aims to provide practical habitat management prescriptions for the implementation of the recommendations described in the previous sections.

6.2 This plan has adopted a tabular format as much as possible for ease of use/reference. It seeks to provide a checklist of works to be carried out for the effective management of the various habitats to be enhanced and/or created, covering three steps:

- What has to be done;
- How it has to be done; and
- When it has to be done.

6.3 These management recommendations have been provided to assist with the aims of the 10-year BAP and advise how habitat creation and management measures can be delivered to achieve the actions, objectives and targets set out in the BAP.

FEATURE & LOCATION	OUTLINE MANAGEMENT RECOMMENDATIONS	RECOMMENDED LOCATIONS
General campus wide principles	• Cease fertiliser applications for all planting with the exception of future ornamental planting within landscaped areas. Where fertilisers are used, they should be applied locally to those plants they are considered necessary for. • Cease generic herbicide use. Herbicides to be used only where deemed necessary. • Phase out use of peat prior to 2030 ban. • Increase diversity of deadwood habitats	Campus wide
New development areas	To maximise biodiversity opportunities in new developments the following should be considered in the design: • Green/biodiverse wall features • Green/brown roofs • Rooftop gardens with native planting • Maximise native species planting vs ornamental/non-native species • Replace any tree loss on a two-for-one basis • Wildlife friendly lighting design • Integrated bat and bird boxes These provisions are additional to, and do not substitute for, Biodiversity Net Gain requirements. EHU will ensure full legislative compliance.	Areas of new development
Woodlands W1 / W3	<u>Initial management</u> Remove canes and tree guards (recycle these where possible) Remove recently planted trees from glade NG1, replant removed trees in appropriate location. <u>Yearly management</u> Yearly mowing / strimming of glades, clearings and scalloped edges from mid-July (with late June- August acceptable), once sward is taller than 50cm (to protect ground nesting birds). Grassland cut to around 50mm, removing arisings after they have dried (minimum 48 hours) to reduce soil nutrients. Once every four years, cut the grassland in September to allow late flowering species to set seed. <u>Periodic management: 7–10-year cycle</u> *Tree health and woodland structure*: Selective thinning and ring barking will be undertaken to allow for continued growth of a	Woodland W1 and W3 Grasslands NG1-3 + localised scalloped edges

FEATURE & LOCATION	OUTLINE MANAGEMENT RECOMMENDATIONS	RECOMMENDED LOCATIONS
	healthy tree group. In late summer, mark roughly 5% of trees, selecting poorly grown, diseased or crowded trees for ring-barking or felling. Ring-bark roughly one third of the marked trees near the base of the trunk where it is safe to have standing dead-wood. Fell two-thirds of the marked trees and reuse wood for deadwood habitat. *Coppicing to create dynamic open spaces and margins:* Coppicing as required but no more than 10% of understorey shrubs per cycle focusing on margins and patches within the interior wood from 10 to 20m in diameter. Brash arisings from coppicing may be: built into dead hedges through the scrub; used to surround cut stools to protect them from deer browse (1-2m wide rings); or chipped and spread thinly through the scrub areas. Coppiced areas may be completely or partly re-coppiced in the subsequent cycle in a random pattern. Subsequent treatments may repeat, overlap or extend that of previous cycles or be in completely new areas. Pruning and tree works must be undertaken in early autumn (September/October) to avoid the bird nesting season. All tree works must be undertaken to BS 3993 - 2010 by a qualified tree surgeon with the correct environmental permits for works to be undertaken in place.	
Woodland W4	<u>Periodic management: 7–10-year cycle</u> *Tree health and woodland structure*: Selective thinning and ring barking will be undertaken to allow for continued growth of a healthy tree group. In late summer, mark roughly 5% of trees, selecting poorly grown, diseased or crowded trees for ring-barking or felling. Ring-bark roughly one third of the marked trees near the base of the trunk where it is safe to have standing dead-wood. Fell two-thirds of the marked trees and reuse wood for deadwood habitat. *Coppicing to create dynamic open spaces and margins:*	Woodland W4

FEATURE & LOCATION	OUTLINE MANAGEMENT RECOMMENDATIONS	RECOMMENDED LOCATIONS
	Coppicing as required but no more than 10% of understorey shrubs per cycle focusing on margins within the interior wood from 10 to 20m in diameter. Brash arisings from coppicing may be: built into dead hedges through the scrub; used to surround cut stools to protect them from deer browse (1-2m wide rings); or chipped and spread thinly through the scrub areas. Pruning and tree works must be undertaken in early autumn (September/October) to avoid the bird nesting season. All tree works must be undertaken to BS 3993 - 2010 by a qualified tree surgeon. <u>Native woodland Ground flora Introduction</u> Sowing of an appropriate woodland ground flora mixture (Such as All things rural woodland edge mix, or similar) in late winter / early spring. Introductions will be made in 10-20% of the woodland selecting areas with continuous canopy cover and dense leaf litter.	
Scrub Sc1 management	<u>Initial management</u> Remove canes and tree guards. <u>Yearly management</u> Yearly mowing / strimming of glades, clearings and scalloped edges from mid-July (with late June- August acceptable) to around 50mm, removing arisings after they have dried (minimum 48 hours) to reduce soil nutrients. Once every four years cut the grassland in September to allow late flowering species to set seed. <u>Periodic management: 5-year cycle</u> Coppice 10 % of scrub within each parcel, cutting a mix of random individuals and small blocks of scrub, ensuring a mix of open and dense scrub is always present, along with permanent open areas. Treated areas may be completely or partly re-treated in subsequent years in a random pattern. Subsequent treatments may repeat, overlap or extend that of previous years or be in completely new areas. Brash arisings from coppicing should not be left lying in loose heaps. Brash may be: Built into tight piles or dead hedges through the scrub Used to surround cut stools to protect them from deer browse (c. 1m radius) Chipped and spread thinly through the scrub areas.	Scrub Sc1
Meadows Management	i) No artificial or organic manures to be applied. No herbicides to be applied with the exception of spot treatment of any undesirable species; ii) Mow after flowering from mid-July (mid-July to August acceptable), once sward is taller than 50cm (to protect ground nesting birds). Mow grassland to around 50mm, removing arisings after they have dried (minimum 48 hours) to reduce soil nutrients. leave 15-20% of grassland unmown every year on rotation. Once every four years cut the grassland in September to allow late flowering species to set seed. iii) Ensure no cuts of the grassland are undertaken from mid-spring until after flowering in late summer. All operations will be carried out using machinery appropriate to the task, cylinder, rotary or mulch mowers. Mowing operation will only be carried out during appropriate weather conditions avoiding sustained periods of rain, or heavy frost, snow, and waterlogging; Additional management options for specific issues: <u>Vigorous growth limiting flowering plant diversity</u> If growth is vigorous (i.e. grass 'collapsing' due to lushness prior to cutting) or palatable/productive grasses are identified as dominating the sward (over 50%): i) undertake a second yearly cut of the re-growth in late autumn and /or again in spring if needed (to around 50mm) to remove excess growth and take away arisings. ii) If habitat shows continued vigorous grass growth after 1-2 years introduce yellow rattle seed: 1) Cut in Aug/Sept and chain harrow the grassland three times in immediate succession and in a different direction each time. 2) Broadcast yellow rattle seed at a rate of 2.5kg/ha, then roll immediately with a flat roller. 3) If there is sufficient grass growth following sowing, take another cut before the end of year removing arisings. <u>Increase wildflower diversity</u> i) Cut in September/October. Rake or harrow the grassland to expose >50% bare earth. ii) Broadcast an appropriate 100% wildflower mix or green hay from a local donor site.	Meadows NG4-8
Pond P1	<u>Objectives</u> • Increase the open water within the pond • Increase the floral diversity of the pond • Maintain / achieve optimal water vole habitat (as far as possible without reprofiling bank edges)	Pond P1

FEATURE & LOCATION	OUTLINE MANAGEMENT RECOMMENDATIONS	RECOMMENDED LOCATIONS
	Bankside vegetation It is not anticipated that the north-western and south-western bank side vegetation will need regular maintenance. However, it anticipated that the open north-eastern and south-eastern banks would benefit from an occasional cut to maintain increase the species diversity: • vegetation cutting would be undertaken on a 2-year rotational program with 50% of the open bank edge will be cut in any one year and only if considered to be necessary; • bank side and top vegetation will only be cut / strimmed in the late summer between mid-July and mid-September. • vegetation will not be cut to less than 10cm; • maintenance will only be undertaken using hand tools or light machinery appropriate to the size of the task (to prevent damage to burrows); and • arisings should be removed at least 3m away from the toe of the bank but the ground must not be agitated with mechanical rakes in gathering these Bankside vegetation should be maintained at a level with 10% or less scrub overshading the pond edges or 3m back from the toe of the bank to not hamper herbaceous vegetation growth. To achieve this: • scrub should be managed on a 3-year rotational basis or as necessary to achieve the desired levels; • any scrub management should be removed using hand operated tools; • scrub should not be chipped within onto the banks or bank tops; and • any brash should not be placed within 3m of the toe of the bank although this could be used to create general wildlife habitat outside of this area. Consideration for potential impacts to nesting birds and other protected wildlife will be given as part of any habitat management operation. Emergent and aquatic vegetation Pond Management Management of emergent and marginal vegetation will be undertaken to maintain the pond with no more that 60% submerged or floating or emergent vegetation coverage and therefore leaving at least 40% open water within the waterbody. Marginal vegetation should be no less than 0.5m wide on each bank. • vegetation management within the pond will be undertaken on a 3-to-5-year rotation (as necessary)	

FEATURE & LOCATION	OUTLINE MANAGEMENT RECOMMENDATIONS	RECOMMENDED LOCATIONS
	• confine vegetation clearance works to the centre of the pond leaving at least 50cm fringe of marginal plants along each bank; • works will be undertaken November to March (outside of the breeding season); • due to access constraints it is envisaged that vegetation removal will need to be undertaken manually; & • arisings will not be placed within 2m of the top of the bank. See also Amphibian management recommendations	
Pond P2	Objectives • Reduce shading within the waterbodies to maintain and expand population of tubular water-dropwort. • Increase marginal vegetation cover within P2b to reduce abundance of New Zealand pygmyweed. • Maintain open water within the pond Reduce shading Existing willows present on the south and southeast bank of P2c will be coppiced on a 3 year cycle in over to avoid over shading of habitat, to benefit tubular water dropwort: • Location of tubular water dropwort should be marked prior to works and operatives will undertake works without trampling known locations. • any scrub management should be removed using hand operated tools; • scrub should not be chipped within onto the banks or bank tops; and • any brash should not be placed within 3m of the toe of the bank although this could be used to create general wildlife habitat outside of this area. Increase marginal vegetation around P2b The translocation of the rhizomes of existing populations common reed, reed mace or lesser reedmace, should be undertaken from on-site water bodies into the bare margins of P2b. This should be undertaken in late winter early spring, where existing rhizomes should be dug out from the donor site in 30cm lengths. These should then be planted to 5cm depth, when sufficient water levels are present in P2b. Maintain open water The ponds will be managed to maintain at least 40% open water within the waterbodies, with vegetation removed manually. See also Amphibian management recommendations	

FEATURE & LOCATION	OUTLINE MANAGEMENT RECOMMENDATIONS	RECOMMENDED LOCATIONS
Lakes L1 and L2	<u>Yearly Management of wet grassland margins</u> We grassland margin will only be cut / strimmed once per year between mid-August and mid-September to maintain species diversity. Vegetation will not be cut to less than 10cm maintenance will only be undertaken and arisings should be removed <u>Maintain open water</u> The ponds will be managed to maintain at least 40% open water within the waterbodies, with vegetation removed manually. <u>Increase diversity of submerged aquatic species</u> Plant submerged plants at a density of 1 bunch/m^2 of surface water area *Potamogeton crispus* Curled Pondweed *Myriophyllum spicatum* Spiked Water-milfoil *Callitriche stagnalis* Common Water-starwort *Ranunculus aquatilis* Common Water-crowfoot *Ceratophyllum demersum* Rigid hornwort *Potamogeton natans* Broadleaved pondweed *Hottonia palustris* Water violet Management of nearby habitats will be free from fertilizer input to prevent eutrophication of the ponds. The ponds will be monitored for the establishment of duckweed and this will be removed where it becomes prevalent Monitor for presence of fish and remove if necessary. See also Amphibian management recommendations	L1 and L2
Deadwood Piles	i) Deadwood piles should be placed at the interface between woodland/scrub and grassland habitats, avoiding north facing areas. ii) The logs should be left in contact with the ground in dappled shade and built into a compact pile to maintain humidity. Stakes should be driven into the ground either side of the log pile to prevent the pile from collapsing. Larger diameter logs (at least 100mm thick) with bark are of most value, particularly hard wood like ash, oak and beech, whereas freshly cut willow and poplar may re-sprout. Twigs, stems and shrub off-cuttings may also be added. Climbers may be allowed to grow thinly over the dead wood pile for stabilisation and moisture. Full sun will dry and heat the wood, supporting little life, whereas dense shade will promote the growth of fungi but may be too cool for insects.	
Native Hedgerow management	Cut a third of the hedge resource cut each year - the exception being any hedges where for road safety reasons there is a need for annual trimming to maintain a height of 1.5m for road safety purposes.	
	The hedges should then be mechanically trimmed to gradually develop a flat topped A-shape to a height of 2.5m.	
Amenity Grassland - Enhancement	Within less formal areas of the Campus the existing amenity grassland could be enhanced to provide a 'flowing lawn' <u>a) Grassland Creation</u> i) Ground preparation. Cut existing grassland in September/October, removing arisings. Rake or harrow the grassland to expose >50% bare earth. ii) Sowing of a flowering lawn mixture (Such as Emorsgate Seeds EL1F or similar), avoiding frosts. <u>b) Management.</u> To provide the formal appearance desired, the management of the flowering lawn grassland will include the following: i) All operations will be carried out using machinery appropriate to the task, cylinder, rotary or mulch mowers. Mowing operation will only be carried out during appropriate weather conditions avoiding sustained periods of rain, or heavy frost, snow, and waterlogging; ii) The frequency of cuts shall remain flexible in order to accommodate growth rates and weather conditions, but with the most important principle being that cutting will be suspended for a minimum eight-week period during May-June to allow for a suitable flowering period. Outside of this eight-week period, the grassland can be cut once per month through the growing season. If grass growth proves to be vigorous, the frequency of cutting could be increased to two times per month. iii) All arisings would be removed within a 48-hour period	
Pond Creation	Pond Creation Dig the pond in autumn. Final pond dimensions should be between 8-16m^2, with a central area 1-1.5m deep, with shelving sides and extensive shallow margins and scalloped edges. Seal the pond with puddle clay to the required water depth. Leave to fill naturally with rain water. If the pond is holding water at the time of excavation then lining the waterbody with puddle clay may not be required. <u>Planting</u> Best practice is to let the water body colonise naturally. However, where plants will be introduced, it is recommended that bankside vegetation is seeded with an appropriate, locally sourced, seed mix. Marginal and emergent vegetation can also be seeded if the water levels are not too high. Factors to consider when seeding pond margins include: • Sow in still wind conditions and bulk the seed with sand to make sowing easier	Within Grassland NG8

	• Ensure soil is saturated but not flooded. • Avoid sowing in low points or depressions. • Sow during April or May when daytime temperatures are in the range 10-25C and nights are frost free. • For bankside vegetation that includes reeds and large marginal species sow 20-125 viable seeds per square metre. • Do not apply any fertiliser or topsoil dressing. Submerged and free floating plants are best introduced as young plants or cuttings. Likewise, marginal and emergent plants may be best introduced as rhizomes if water levels are too high for effective seeding. Where introducing plants in this way the following factors will be taken into consideration: • Pot grown plants or plugs will be planted out in April or May when frosts have passed. • Plants can be obtained from a reputable supplier or can be grown in advance from seeds or cuttings. All material will be locally sourced. • Many wetland plants (e.g. reeds) spread via rhizomes and can be planted by transplanting the rhizomes. • Avoid incidental introduction of invasive non-native species with imported material. • Do not apply any fertiliser or introduce topsoil. • Areas dominated by common read will be created through habitats, this will be done by transplanting rhizomes from an appropriate local source in February to march; or Maintain ponds free of scrub by cutting or hand pulling developing scrub Monitor for the presence of fish and if present take action to remove Remove litter, where applicable.	

Species Group	OUTLINE MANAGEMENT RECOMMENDATIONS	RECOMMENDED LOCATIONS
Birds	Vegetation clearance Avoid vegetation clearance between March and August when possible If not possible, clear small areas slowly checking for nests Mowing of meadows Skylark may nest in the meadow areas Cutting during March and August should only be undertaken on areas longer than 50cm Bird box scheme	Whole Campus

Species Group	OUTLINE MANAGEMENT RECOMMENDATIONS	RECOMMENDED LOCATIONS
	Identify locations of all existing bird boxes Clean, repair and replace (outside of nesting season) Install a range of new bird boxes across the campus Monitor and record use	
Water vole	Survey Determine the presence or likely absence of water vole in pond P1 Pond management See Pond P1 management Monitor Repeat water vole surveys to determine impact of monitoring	Pond 1
Bats	Building and tree works Carefully consider the potential presence of bats and how planned works may impact these species Consider impacts of changes to lighting at the Campus Bat box scheme Identify locations of all existing bat boxes Clean, repair and replace (by licenced bat worker) Install a range of new bat boxes across the campus Monitor and record use	Whole Campus
Hedgehog	Vegetation clearance Avoid vegetation clearance during hibernation period All vegetation clearance should consider the potential presence of hedgehog nests and use methods to encourage dispersal Hedgehog houses Create hedgehog houses across campus to provide safe refuges. This will also reduce potential impacts of vegetation clearance Water hazards Ramped areas to allow hedgehogs that enter water bodies to escape Identify walls, fences and gates etc that exclude hedgehogs from areas of suitable habitat and modify these to allow access Survey and Monitoring Continue the existing survey and monitoring but also extend this to more location including into the meadow areas to determine presence/absence in this part of the campus.	Whole Campus
Amphibians	Vegetation clearance Avoid clearance of terrestrial habitat during hibernation period when amphibians are most vulnerable to disturbance. Avoid clearance of submerged and emergent vegetation during the breeding period (approx. March to June) Survey	Waterbodies and surrounding habitats

Species Group	OUTLINE MANAGEMENT RECOMMENDATIONS	RECOMMENDED LOCATIONS
	Survey existing water bodies for amphibians to determine presence, absence, and breeding status (by licenced ecologist). Hibernacula Create hibernacula for amphibians near to water features, prioritise near any breeding populations.	

7.0 APPENDIX A: BOTANICAL SURVEY 2022 SPECIES LISTS

Eastern Area: Woodland / Trim Trail Area

Woodland W1

English name	*Latin name*	Abundance (DAFOR)
Canopy Species		
Grey willow	*Salix cinerea*	F
Silver birch	*Betula pendula*	F
Goat willow	*Salix caprea*	F
Gorse	*Ulex europaeus*	LF
Hazel	*Corylus avellana*	O
Scots pine	*Pinus sylvestris*	O
Broom	*Cytisus scoparius*	O
Alder	*Alnus glutinosa*	O
Blackthorn	*Prunus spinosa*	O
Pedunculate oak	*Quercus robur*	O
Guelder-rose	*Viburnum opulus*	O
Grey x eared willow	*Salix x multinervis*	R
Bird cherry	*Prunus padus*	R
Wild cherry	*Prunus avium*	R
Hawthorn	*Crataegus monogyna*	R
Holly	*Ilex aquifolium*	R
Dogwood	*Cornus sanguinea*	R
Aspen	*Populus tremula*	R
Eared willow	*Salix aurita*	R
Rowan	*Sorbus aucuparia*	R
Alder buckthorn	*Frangula alnus*	R
Ground flora		
Oxeye daisy	*Leucanthemum vulgare*	A
Yarrow	*Achillea millefolium*	F
Yorkshire-fog	*Holcus lanatus*	F
Common knapweed	*Centaurea nigra*	F
Great willowherb	*Epilobium hirsutum*	LF
Field horsetail	*Equisetum arvense*	LF
Soft-rush	*Juncus effusus*	O
Tall fescue	*Schedonorus arundinaceus*	O
Creeping buttercup	*Ranunculus repens*	O
Bramble	*Rubus fruticosus agg.*	O
Cock's-foot	*Dactylis glomerata*	O
Crested dog's-tail	*Cynosurus cristatus*	O
Meadow buttercup	*Ranunculus acris*	O
Red clover	*Trifolium pratense*	O
Common bird's-foot-trefoil	*Lotus corniculatus*	O
Water avens	*Geum rivale*	R
Cat's-ear	*Hypochaeris radicata*	R
Selfheal	*Prunella vulgaris*	R
Common nettle	*Urtica dioica*	R
Broad-leaved dock	*Rumex obtusifolius*	R
Reed canary-grass	*Phalaris arundinacea*	R
White campion	*Silene latifolia*	R
Male-fern	*Dryopteris filix-mas*	R
Hop trefoil	*Trifolium campestre*	R
Alsike clover	*Trifolium hybridum*	R
Scalloped edges		
Oxeye daisy	*Leucanthemum vulgare*	A
Common knapweed	*Centaurea nigra*	F
Common vetch	*Vicia sativa*	O
Common bird's-foot-trefoil	*Lotus corniculatus*	O
Cat's-ear	*Hypochaeris radicata*	O
Hairy sedge	*Carex hirta*	O
Bee orchid	*Ophrys apifera*	R
Water avens	*Geum rivale*	R

Semi-improved neutral grassland

English name	*Latin name*	Abundance		
		NG1	NG2	NG3
Red Fescue	*Festuca rubra*	A	F	A
Sweet Vernal-grass	*Anthoxanthum odoratum*	F	F	O
Common Knapweed	*Centaurea nigra*	F	LF	O
Oxeye Daisy	*Leucanthemum vulgare*	F	O	O
Yarrow	*Achillea millefolium*	F	R	R
Field Horsetail	*Equisetum arvense*	LF		F
Ribwort Plantain	*Plantago lanceolata*	O	A	F
White Clover	*Trifolium repens*	O	F	O
Yorkshire-fog	*Holcus lanatus*	O	O	F
Common Vetch	*Vicia sativa*	O	R	O
Lesser Trefoil	*Trifolium dubium*	O		F
Common Bird's-foot-trefoil	*Lotus corniculatus*	O		
Southern Marsh-orchid	*Dactylorhiza praetermissa*	O 10+		
Perforate St John's-wort	*Hypericum perforatum*	O-F	R	R
Hairy Tare	*Ervilla hirsuta*	R	R	R
Meadowsweet	*Filipendula ulmaria*	R		R
Red Clover	*Trifolium pratense*	R		
Common spotted x southern marsh-orchid	Dactylorhiza x grandis	R		
Rough Meadow-grass	*Poa trivialis*		R	
Kidney Vetch	*Anthyllis vulneraria*		R	

English name	*Latin name*	Abundance		
		NG1	NG2	NG3
Cat's-ear	*Hypochaeris radicata*			R
Field Forget-me-not	*Myosotis arvensis*			R

Amenity Grassland – A1

English name	*Latin name*	Abundance
Red Fescue	*Festuca rubra*	F
Lesser Trefoil	*Trifolium dubium*	F
Springy Turf-moss	*Rhytidiadelphus squarrosus*	F
Perennial Rye-grass	*Lolium perenne*	O
Annual Meadow-grass	*Poa annua*	O
Yorkshire-fog	*Holcus lanatus*	O
Daisy	*Bellis perennis*	O
White Clover	*Trifolium repens*	O
Creeping Bent	*Agrostis stolonifera*	O
Crested Dog's-tail	*Cynosurus cristatus*	O
Yarrow	*Achillea millefolium*	O
Common Vetch	*Vicia sativa*	R
Ribwort Plantain	*Plantago lanceolata*	R
Selfheal	*Prunella vulgaris*	R
Dandelion	*Taraxacum officinale agg.*	R
Greater Plantain	*Plantago major*	R
Common Ragwort	*Jacobaea vulgaris*	R
Sweet Vernal-grass	*Anthoxanthum odoratum*	R
Tall Fescue	*Schedonorus arundinaceus*	R
Bee Orchid	*Ophrys apifera*	R
Smooth Meadow-grass	*Poa pratensis*	R
Oxeye Daisy	*Leucanthemum vulgare*	R
Cut-leaved crane's-bill	*Geranium dissectum*	R
Common Bird's-foot-trefoil	*Lotus corniculatus*	R

Meadows

Semi-improved neutral grassland

English name	*Latin name*	Abundance					
		NG3	NG4	NG4a	NG5	NG7	NG8/8a
Red Fescue	*Festuca rubra*	A	O	O	O	A	F
Ribwort Plantain	*Plantago lanceolata*	F	F	F	F	F	F
Yorkshire-fog	*Holcus lanatus*	F	F	F	F	F	O
White Clover	*Trifolium repens*	F	R	R	F	F	O
Lesser Trefoil	*Trifolium dubium*	F	R	R	O	R	F
Oxeye Daisy	*Leucanthemum vulgare*	F	R	R		O	F
Sweet Vernal-grass	*Anthoxanthum odoratum*	LF	R	R	O	F	F
Creeping Bent	*Agrostis stolonifera*	LF			R	R	LF
Common Knapweed	*Centaurea nigra*	O	A	A	O F	F	F
Common Vetch	*Vicia sativa*	O	O	O	R	F	R
Cock's-foot	*Dactylis glomerata*	O	O F	F	R	R	R
Creeping Buttercup	*Ranunculus repens*	O	R	R	R	R	O
Field Horsetail	*Equisetum arvense*	O	R	R		R	R
Rough Meadow-grass	*Poa trivialis*	R	O	O	R	O	R
Cat's-ear	*Hypochaeris radicata*	R	R	R	R	R	R
Dandelion	*Taraxacum officinale agg.*	R	R	R	R	R	
Hairy Tare	*Ervilla hirsuta*	R	R	R		O F	O
Meadow Buttercup	*Ranunculus acris*	R	R	R		R	O
Yarrow	*Achillea millefolium*	R			O	O	R
Crested Dog's-tail	*Cynosurus cristatus*	R			R		R
Common Ragwort	*Jacobaea vulgaris*	R				R	
Meadowsweet	*Filipendula ulmaria*	R					R
Compact Rush	*Juncus conglomeratus*	R					R
Common Bird's-foot-trefoil	*Lotus corniculatus var. sativus*	R					R
Soft-rush	*Juncus effusus*	R					
Broad-leaved Dock	*Rumex obtusifolius*	R					
Creeping Thistle	*Cirsium arvense*	R LF		F			
Tall Fescue	*Schedonorus arundinaceus*		F	F			R
False Oat-grass	*Arrhenatherum elatius*		R	R			O
Smooth Meadow-grass	*Poa pratensis*		R	R			R
White Campion	*Silene latifolia*		R	R			
Cow Parsley	*Anthriscus sylvestris*		R	R			
Fox-and-cubs	*Pilosella aurantiaca*			LF			
Rough horsetail	*Equisetum hyemale*			LF			
Daisy	*Bellis perennis*			R	R		
Common Mouse-ear	*Cerastium fontanum*			R			
Red Campion	*Silene dioica*			R			
Beaked Hawk's-beard	*Crepis vesicaria*			R			
Common Sorrel	*Rumex acetosa*			R			
A melilot	*Melilotus sp. [ident]*			R			
Perennial Rye-grass	*Lolium perenne*				F		O
Springy Turf-moss	*Rhytidiadelphus squarrosus*				F		
Southern Marsh-orchid	*Dactylorhiza praetermissa*				R	R	R
Common Bird's-foot-trefoil	*Lotus corniculatus*					R	O
Perforate St John's-wort	*Hypericum perforatum*					R	R
Hybrid rye-grass	*Schedonorus x Lolium [ident]*						R
Hard Rush	*Juncus inflexus*						R
Changing forget-me-not	*Myosotis discolor*						R
Soft-brome	*Bromus hordeaceus*						R

English name	*Latin name*	Abundance						
		NG3	NG4	NG4a	NG5	NG7	NG8/8a	
Planted Trees							8	8a
Goat willow	*Salix caprea*						R	F
Hawthorn	*Crataegus monogyna*							LF
Blackthorn	*Prunus spinosa*							O
Pedunculate oak	*Quercus robur*						R	O
Downy birch	*Betula pubescens*						R	O
Hazel	*Corylus avellana*							R
Buckthorn	*Rhamnus cathartica*							R
Scots pine	*Pinus sylvestris*						R	R
Beech	Fagus sylvatica						R	

Woodland W2

English name	*Latin name*	Abundance
Canopy		
Grey willow	*Salix cinerea*	F
Goat willow	*Salix caprea*	F
Downy birch	*Betula pubescens*	O
Rowan	*Sorbus aucuparia*	R
Pedunculate oak	*Quercus robur*	R
Hazel	*Corylus avellana*	R
Blackthorn	*Prunus spinosa*	R
Scots pine	*Pinus sylvestris*	R
Hawthorn	*Crataegus monogyna*	R
Gorse	*Ulex europaeus*	R
Ground Flora		
Red fescue	*Festuca rubra*	F
Yorkshire-fog	*Holcus lanatus*	F
Tall fescue	*Schedonorus arundinaceus*	F
field horsetail	*Equisetum arvense*	F
Creeping buttercup	*Ranunculus repens*	O
Soft-rush	*Juncus effusus*	O

Woodland W3

English name	*Latin name*	Abundance
Canopy		
Goat willow	*Salix caprea*	LF
Gorse	*Ulex europaeus*	LF
Silver birch	*Betula pendula*	LF
Broom	*Cytisus scoparius*	O
Hazel	*Corylus avellana*	O
Buckthorn	*Rhamnus cathartica*	O
Blackthorn	*Prunus spinosa*	O
Dog rose	*Rosa canina*	R
Rowan	*Sorbus aucuparia*	R
Grey willow	*Salix cinerea*	R
Pedunculate oak	*Quercus robur*	R
Scots pine	*Pinus sylvestris*	R
Guelder-rose	*Viburnum opulus*	R
Beech	*Fagus sylvatica*	R
Wild cherry	*Prunus avium*	R
Ground Flora		
Lesser trefoil	*Trifolium dubium*	F
Yorkshire-fog	*Holcus lanatus*	F
Oxeye daisy	*Leucanthemum vulgare*	F
Common vetch	*Vicia sativa*	F
Red fescue	*Festuca rubra*	F
Ribwort plantain	*Plantago lanceolata*	F
Hairy tare	*Ervilla hirsuta*	F
Tall fescue	*Schedonorus arundinaceus*	F
Common fleabane	*Pulicaria dysenterica*	LF
Common knapweed	*Centaurea nigra*	O
Cock's-foot	*Dactylis glomerata*	O
Creeping buttercup	*Ranunculus repens*	O
Kidney vetch	*Anthyllis vulneraria*	R
Great willowherb	*Epilobium hirsutum*	R
Jointed rush	*Juncus articulatus*	R
Creeping thistle	*Cirsium arvense*	R
Common ragwort	*Jacobaea vulgaris*	R
Cat's-ear	*Hypochaeris radicata*	R
Field horsetail	*Equisetum arvense*	R
Southern marsh-orchid	*Dactylorhiza praetermissa*	R
Colt's-foot	*Tussilago farfara*	R
Bee orchid	*Ophrys apifera*	R 8

Mixed Scrub Sc1

English name	*Latin name*	Abundance
Canopy		
Hawthorn	*Crataegus monogyna*	F
Dog rose	*Rosa canina*	O
Blackthorn	*Prunus spinosa*	O
Downy birch	*Betula pubescens*	O
Gorse	*Ulex europaeus*	O-LA
Goat willow	*Salix caprea*	R
Rowan	*Sorbus aucuparia*	R
Hazel	*Corylus avellana*	R

English name	*Latin name*	Abundance
Pedunculate oak	*Quercus robur*	R
Scots pine	*Pinus sylvestris*	R
Grey willow	*Salix cinerea*	R
Ground Flora		
Red fescue	*Festuca rubra*	A
Oxeye daisy	*Leucanthemum vulgare*	F
Tall fescue	*Schedonorus arundinaceus*	F
Yarrow	*Achillea millefolium*	O
Creeping buttercup	*Ranunculus repens*	O
Rough meadow-grass	*Poa trivialis*	O
Sweet vernal-grass	*Anthoxanthum odoratum*	O
Ribwort plantain	*Plantago lanceolata*	O
Perennial sow-thistle	*Sonchus arvensis*	R
Hairy tare	*Ervilla hirsuta*	R
Crested dog's-tail	*Cynosurus cristatus*	R
Red campion	*Silene dioica*	R

Pond P2

English name	*Latin name*	Abundance
Pond P2c		
Field horsetail	*Equisetum arvense*	F
A willowherb	*Epilobium sp. [ident]*	LA
New Zealand pigmyweed	*Crassula helmsii*	LA
Common spike-rush	*Eleocharis palustris*	LF
Lesser pond-sedge	*Carex acutiformis*	LF
Galingale	*Cyperus longus*	LF
Rough horsetail	*Equisetum hyemale*	LF
Reed sweet-grass	*Glyceria maxima*	LF
Yellow iris	*Iris pseudacorus*	O
Creeping bent	*Agrostis stolonifera*	O
Siberian Iris	*Iris sibirica*	R
Tubular water-dropwort	*Oenanthe fistulosa*	R
Common reed	*Phragmites australis*	R
Ponds P2a&b		
Common reed	*Phragmites australis*	A
Reed sweet-grass	*Glyceria maxima*	LF
New Zealand pigmyweed	*Crassula helmsii*	LF
Reed-mace	*Typha latifolia*	O
Galingale	*Cyperus longus*	R
Willow Scrub		
Grey willow	*Salix cinerea*	F
Goat willow	*Salix caprea*	O
Hybrid willow (osier x grey)	*Salix viminalis x cinerea = S. x holosericea*	R
White willow	*Salix alba*	R
Osier	*Salix viminalis*	R

Amenity Grassland

English name	*Latin name*	Abundance	
		A2	A3
Perennial Rye-grass	*Lolium perenne*	D	O
Annual Meadow-grass	*Poa annua*	O	R
Red Fescue	*Festuca rubra*	R	F
Lesser Trefoil	*Trifolium dubium*	R	F
Yorkshire-fog	*Holcus lanatus*	R	O
Daisy	*Bellis perennis*	R	O
Common Vetch	*Vicia sativa*	R	O
White Clover	*Trifolium repens*	R	R
Ribwort Plantain	*Plantago lanceolata*	R	R
Selfheal	*Prunella vulgaris*	R	R
Dandelion	*Taraxacum officinale agg.*	R	R
Greater Plantain	*Plantago major*	R	R
Common Ragwort	*Jacobaea vulgaris*	R	R
Common stork's-bill	*Erodium cicutarium*	R	
Dove's-foot Crane's-bill	*Geranium molle*	R	
Field pansy	*Viola arvensis*	R	
Field forget-me-not	*Myosotis arvensis*	R	
Creeping Bent	*Agrostis stolonifera*		LF
Springy Turf-moss	*Rhytidiadelphus squarrosus*		R
Crested Dog's-tail	*Cynosurus cristatus*		R
Yarrow	*Achillea millefolium*		R
Sweet Vernal-grass	*Anthoxanthum odoratum*		R
Tall Fescue	*Schedonorus arundinaceus*		R
Slender trefoil	*Trifolium micranthum*		R
Bee Orchid	*Ophrys apifera*		R 5

Hedgerows

English name	*Latin name*
Sycamore	*Acer pseudoplatanus*
Hazel	*Corylus avellana*
Hawthorn	*Crataegus monogyna*
Holly	*Ilex aquifolium*
Garden privet	*Ligustrum ovalifolium*
Apple	*Malus domestica*
Blackthorn	*Prunus spinosa*
Dog rose	*Rosa canina*
Japanese-rose	*Rosa rugosa*

English name	*Latin name*
Rowan	*Sorbus aucuparia*
Lilac	*Syringa vulgaris*
Wych elm	*Ulmus glabra*
English elm	*Ulmus procera*
Guelder-rose	*Viburnum opulus*

Campus

Northern Woodland W4

English name	*Latin name*	Abundance
Canopy		
American lime	*Tilia americana [ident]*	F
Silver birch	*Betula pendula*	F
Grey alder	*Alnus incana*	LF
Aspen	*Populus tremula*	LF
Pedunculate oak	*Quercus robur*	O
Sycamore	*Acer pseudoplatanus*	O
Monterey pine	*Pinus radiata*	R
Crack-willow	*Salix x fragilis*	R
Goat willow	*Salix caprea*	R
Wild cherry	*Prunus avium*	R
Wellingtonia	*Sequoiadendron giganteum*	R
Purple sycamore	*Acer pseudoplatanus f. purpureum*	R
White poplar	*Populus alba*	R
Italian alder	*Alnus cordata*	R
Pin oak	*Quercus plaustris*	R
Douglas fir	*Pseudotsuga menziesii*	R
Hornbeam	*Carpinus betulus*	R
Black pine	*Pinus nigra*	R
Understorey		
Bird cherry	*Prunus padus*	F
Red-berried elder	*Sambucus racemosa*	LF
Beech	*Fagus sylvatica*	LF
Wych elm	*Ulmus glabra*	R
Barberry	*Berberis vulgaris*	R
Pedunculate oak	*Quercus robur*	R
Yew	*Taxus baccata*	R
Lawson's cypress	*Cupressus lawsoniana*	R
Hazel	*Corylus avellana*	R
Tutsan	*Hypericum androsaemum*	R
Hawthorn	*Crataegus monogyna*	R
Garden privet	*Ligustrum ovalifolium*	R
Turkish hazel	*Corylus colurna*	R
Purple elder	*Sambucus nigra f. porphyrophylla*	R
Holly	*Ilex aquifolium*	R
Black mulberry	*Morus nigra*	R
Apple	*Malus domestica*	R
Rhododendron	*Rhodendron ponticum*	R
Butcher's-broom	*Ruscus aculeatus*	R
Highclare Holly	*Ilex x altaclerensis*	R
Rowan	*Sorbus aucuparia*	R
Ground flora		
Common nettle	*Urtica dioica*	A
Cleavers	*Galium aparine*	F
Bramble	*Rubus fruticosus agg.*	LF
Hybrid bluebell	*Hyacinthoides x massartiana*	O
Common ivy	*Hedera helix*	O
Pendulous sedge	*Carex pendula*	O-F
White poplar	*Populus alba*	R
Dandelion	*Taraxacum officinale agg.*	R
Herb-robert	*Geranium robertianum*	R
Garlic mustard	*Alliaria petiolata*	R
Daisy	*Bellis perennis*	R
Rough meadow-grass	*Poa trivialis*	R
Wood forget-me-not	*Myosotis sylvatica*	R
Spear thistle	*Cirsium vulgare*	R
Common chickweed	*Stellaria media*	R
Male-fern	*Dryopteris filix-mas*	R
Ivy-leaved speedwell	*Veronica hederifolia*	R
Three-cornered leek	*Allium triquetrum*	R
Green alkanet	*Pentaglottis semervirens*	R
Prickly sow-thistle	*Sonchus asper*	R
Meadow buttercup	*Ranunculus acris*	R
Bracken	*Pteridium aquilinum*	R
Variegated yellow archangel	*Lamiastrum galeobdolon subsp. argentatum*	R

Pond P3

English name	*Latin name*	Abundance
Marginal vegetation		
Pendulous sedge	*Carex pendula*	F
Ostrich-fern	*Matteuccia struthiopteris*	LF
Wood spurge	*Euphorbia amygdaloides*	O
Giant rhubarb	*Gunnera tinctoria*	R
A sheild-fern	*Polystichum sp.*	R
White wood-rush	*Luzula luzuliodes*	R

English name	*Latin name*	Abundance
Sensitive fern	*Onoclea sensibilis*	R
Common bistort	*Bistorta officinalis*	R
Aquatic vegetation		
Marsh cinquefoil	*Comarum palustre*	LF
Creeping-jenny	*Lysimachia nummularia*	LF
Yellow iris	*Iris pseudacorus*	O
Clustered dock	*Rumex conglomeratus*	R
Common club-rush	*Schoenoplectus lacustris*	R
Yellow water-lily	*Nuphar lutea*	R

Graduates Court Trees

English name	*Latin name*
Indian Horse-chestnut	*Aesculus indica*
Monkey-puzzle	*Araucaria araucana*
Norway maple	*Acer platanoides*
Dawn redwood	*Metasequoia glyptostroboides*
Holm oak	*Quercus ilex*
Scots pine	*Pinus sylvestris*
Rauli	*Nothofagus alpina*
Himalayan birch	*Betula utilis*
Wilson's honeysuckle	*Lonicera nitida*
Rowan	*Sorbus aucuparia*
Downy birch	*Betula pubescens*
Beech	*Fagus sylvatica*
Turkey oak	*Quercus cerris*
Lime	*Tilia x europaea*

Southern Woodland W5

English name	*Latin name*	Abundance
Canopy		
Ash	*Fraxinus excelsior*	F
Scots pine	*Pinus sylvestris*	O
Silver birch	*Betula pendula*	O
Wild cherry	*Prunus avium*	R
False-acacia	*Robinia pseudoacacia*	R
Lime	*Tilia x europaea*	R
Copper beech	*Fagus sylvatica 'Purpurea'*	R
Sweet chestnut	*Castanea sativa*	R
Ash	*Fraxinus excelsior*	R
Field maple	*Acer campestre*	R
Understorey		
Holly	*Ilex aquifolium*	F
Snowberry	*Symphoricarpos albus*	LF
David viburnum	*Viburnum davidii*	LF
Rhododendron	*Rhodendron ponticum*	O
Himalayan honeysuckle	*Leycesteria formosa*	O
Lilac	*Syringa vulgaris*	R
Lawson's cypress	*Cupressus lawsoniana*	R
Garden privet	*Ligustrum ovalifolium*	R
Hawthorn	*Crataegus monogyna*	R
Bridewort	*Spiraea sp.*	R
Tutsan	*Hypericum androsaemum*	R
Laburnum	*Laburnum anagyroides*	R
Goat willow	*Salix caprea*	R
Field maple	*Acer campestre*	R
Dog rose	*Rosa canina*	R
Wych elm	*Ulmus glabra*	R
Hydrangea	*Hydrangea macrophylla*	R
Ground Flora		
Great wood-rush	*Luzula sylvatica*	LF
Bramble	*Rubus fruticosus agg.*	LF
Common ivy	*Hedera helix*	LF
White wood-rush	*Luzula nivea*	LF
Chinese bramble	*Rubus tricolor*	LF
Hybrid bluebell	*Hyacinthoides x massartiana*	O
Pendulous sedge	*Carex pendula*	O
Rough meadow-grass	*Poa trivialis*	O
Foxglove	*Digitalis purpurea*	R
Ash	*Fraxinus excelsior*	R
Hellebore	*Helleborus spp.*	R
Fringecups	*Tellima grandiflora*	R
Columbine	*Aquilegia vulgaris var. stellata*	R
Male-fern	*Dryopteris filix-mas*	R
Garden solomun's-seal	*Polygonatum x hybridum*	R
Wild teasel	*Dipsacus fullonum*	R
Great willowherb	*Epilobium hirsutum*	R
French crane's-bill	*Geranium endressii*	R

Southern Woodland W6

English name	*Latin name*	Abundance
Canopy		
Pedunculate oak	*Quercus robur*	LF
Holly	*Ilex aquifolium*	O
Beech	*Fagus sylvatica*	O
Scots pine	*Pinus sylvestris*	R
Sycamore	*Acer pseudoplatanus*	R

English name	*Latin name*	Abundance
Himalayan birch	*Betula utilis*	R
Aspen	*Populus tremula*	R
Cockspurthorn	*Crataegus crus-galli*	R
Wild cherry	*Prunus avium*	R
Understorey		
Bird cherry	*Prunus padus*	O
Rhododendron	*Rhodendron ponticum*	O
Hydrangea	*Hydrangea macrophylla*	O
Oregon grape	*Mahonia aquifolium*	O
Bird cherry	*Prunus padus 'Colorata'*	R
Hazel	*Corylus avellana*	R
Broom	*Cytisus scoparius*	R
Laburnum	*Laburnum anagyroides*	R
Firethorn	*Pyracantha coccinea*	R
Hawthorn	*Crataegus monogyna*	R
Beech	*Fagus sylvatica*	R
Ground flora		
Red fescue	*Festuca rubra*	A
Hybrid bluebell	*Hyacinthoides x massartiana*	F
Yorkshire-fog	*Holcus lanatus*	F
Common ivy	*Hedera helix*	LF
Ash	*Fraxinus excelsior*	R
Sycamore	*Acer pseudoplatanus*	R
Bramble	*Rubus fruticosus agg.*	R
Common ragwort	*Jacobaea vulgaris*	R
Greater periwinkle	*Vinca major*	R
Montbretia	*Crocosmia x crocosmiiflora*	R
Dandelion	*Taraxacum officinale agg.*	R
Bamboo	*Chimonobambusa sp.*	R
Great willowherb	*Epilobium hirsutum*	R
Common nettle	*Urtica dioica*	R
Common knapweed	*Centaurea nigra*	R
Common vetch	*Vicia sativa*	R

Southern Woodland W7

English name	*Latin name*	Abundance
Canopy		
Scots pine	*Pinus sylvestris*	F
Ash	*Fraxinus excelsior*	F
Aspen	*Populus tremula*	F
Pedunculate oak	*Quercus robur*	R
Wild cherry	*Prunus avium*	R
Understorey		
Aspen	*Populus tremula*	F
Yew	*Taxus baccata*	O
Hazel	*Corylus avellana*	O
Hawthorn	*Crataegus monogyna*	O
Cherry laurel	*Prunus laurocerasus*	O F
Hazel	*Corylus avellana*	R
Laburnum	*Laburnum anagyroides*	R
Ground flora		
A cotoneaster	*Cotoneaster dammeri / x suecicus [ident]*	LA
Herb-robert	*Geranium robertianum*	O
Dandelion	*Taraxacum officinale agg.*	R
Pedunculate oak	*Quercus robur*	R
Common ivy	*Hedera helix*	R
Ash	*Fraxinus excelsior*	R
Aspen	*Populus tremula*	R
Hybrid bluebell	*Hyacinthoides x massartiana*	R

Rock Garden

English name	*Latin name*
Trees	
Smooth japanese maple	*Acer palmatum 'Areum'*
Smooth japanese maple	*Acer palmatum 'Atropurpureum'*
Hornbeam	*Carpinus betulus*
A cedar	*Cedrus spp.*
Leyland cypress	*Cupressus × leylandii*
Lawson's cypress	*Cupressus lawsoniana*
Beech	*Fagus sylvatica*
Beech	*Fagus sylvatica*
Ash	*Fraxinus excelsior*
Honey locust-tree	*Gleditsia triacanthos*
Chinese tulip-tree	*Liriodendron chinense*
Monterey pine	*Pinus radiata*
Scots pine	*Pinus sylvestris*
Red oak	*Quercus rubra*
Under storey Shrubs	
Turkish hazel	*Corylus colurna*
Holly	*Ilex aquifolium*
Highclare Holly	*Ilex x altaclerensis*
Wilson's honeysuckle	*Lonicera nitidea*
Rhododendron	*Rhodendron ponticum*
Crack-willow	*Salix x fragilis*
Ground flora	
Lady-fern	*Athyrium filix-femina*

English name	*Latin name*
Common bistort	*Bistorta officinalis*
Pendulous sedge	*Carex pendula*
Lily-of-the-valley	*Convallaria majalis*
Pampas-grass	*Cortaderia selloana*
Indian rhubarb	*Darmera peltata*
Male-fern	*Dryopteris filix-mas*
French crane's-bill	*Geranium endressii*
Giant rhubarb	*Gunnera tinctoria*
Hellebore	*Helleborus spp.*
Plantain lilies	*Hosta spp.*
Hybrid bluebell	*Hyacinthoides x massartiana*
Yellow iris	*Iris pseudacorus*
White wood-rush	*Luzula luzuloides*
Great wood-rush	*Luzula sylvatica*
Ostrich-fern	*Matteuccia struthiopteris*
Garden solomun's-seal	*Polygonatum x hybridum*
Soft shield-fern	*Polystichum setiferum*
Chinese rodgersia	*Rodgersia aesculifolia*
Clustered dock	*Rumex conglomeratus*

Rock Garden Beech Wood

English name	*Latin name*	Abundance
Canopy		
Beech	*Fagus sylvatica*	F
Sessile oak	*Quercus petraea*	R
Silver birch	*Betula pendula*	R
Sycamore	*Acer pseudoplatanus*	R
Understorey		
Rhododendron	*Rhodendron ponticum*	O
Yew	*Taxus baccata*	R
Holly	*Ilex aquifolium*	R
Cockspurthorn	*Crataegus crus-galli*	R
Ground flora		
Red fescue	*Festuca rubra*	A
Perennial rye-grass	*Lolium perenne*	F
Hybrid bluebell	*Hyacinthoides x massartiana*	F
Annual Meadow-grass	*Poa annua*	F
Three-cornered leek	*Allium triquetrum*	O
Creeping buttercup	*Ranunculus repens*	O
Red campion	*Silene dioica*	R
Betony	*Betonica officinalis*	R
Ground elder	*Aegopodium podagraria*	R
Common nettle	*Urtica dioica*	R

Durning Centre Carpark - Dune Helleborine Area

English name	*Latin name*	Abundance
Canopy		
Downy birch	*Betula pubescens*	F
Silver birch	*Betula pendula*	O
Wild cherry	*Prunus avium*	R
Understorey		
Laburnum	*Laburnum anagyroides*	R
Tutsan	*Hypericum androsaemum*	R
Ground Flora		
Dune helleborine	*Epipactis dunensis*	c.15
Rough meadow-grass	*Poa trivialis*	F
Bramble	*Rubus fruticosus agg.*	LF
Creeping bent	*Agrostis stolonifera*	LF
Common ragwort	*Jacobaea vulgaris*	O
Creeping thistle	*Cirsium arvense*	O
Common nettle	*Urtica dioica*	R
David viburnum	*Viburnum davidii*	R
Common vetch	*Vicia sativa*	R
Barren brome	*Anisantha sterilis*	R
Daisy	*Bellis perennis*	R
Cleavers	*Galium aparine*	R
Oxeye daisy	*Leucanthemum vulgare*	R
Selfheal	*Prunella vulgaris*	R
Common ivy	*Hedera helix*	R
Ground elder	*Aegopodium podagraria*	R
Himalayan cotoneaster	*Cotoneaster simonsii*	R
Common nettle	*Urtica dioica*	R

Pond P1

English name	*Latin name*	Abundance
South Bank		
White willow	*Salix alba*	3 pollards
Chinese bramble	*Rubus tricolor*	A
Oxeye daisy	*Leucanthemum vulgare*	O
Red campion	*Silene dioica*	O
Hedge bedstraw	*Galium album*	R
Alder	*Alnus glutinosa*	R
Imperforate St John's-wort	*Hypericum maculatum*	R
Male-fern	*Dryopteris filix-mas*	R
Common knapweed	*Centaurea nigra*	R
Ash	*Fraxinus excelsior*	R
Sycamore	*Acer pseudoplatanus*	R
Aquatic vegetation		

English name	*Latin name*	Abundance
Lesser reed-mace	*Typha angustifolia*	D
Yellow iris	*Iris pseudacorus*	LF
Great willowherb	*Epilobium hirsutum*	R
East Bank		
False oat-grass	*Arrhenatherum elatius*	F
Red fescue	*Festuca rubra*	F
Ribwort plantain	*Plantago lanceolata*	F
Bramble	*Rubus fruticosus agg.*	O
Oxeye daisy	*Leucanthemum vulgare*	O
Cock's-foot	*Dactylis glomerata*	O
Common vetch	*Vicia sativa*	O
Chinese bramble	*Rubus tricolor*	O
Lesser trefoil	*Trifolium dubium*	O
Field horsetail	*Equisetum arvense*	O
Ragged-robin	*Silene flos-cuculi*	R
Ground elder	*Aegopodium podagraria*	R
Garden lady's-mantle	*Alchemilla mollis*	R
Soft-rush	*Juncus effusus*	R
Greater bird's-foot-trefoil	*Lotus pedunculatus*	R
Field forget-me-not	*Myosotis arvensis*	R
Common mouse-ear	*Cerastium fontanum*	R
Field wood-rush	*Luzula campestris*	R
Sheep's sorrel	*Rumex acetosella*	R
Cow parsley	*Anthriscus sylvestris*	R

Lake L1

English name	*Latin name*	Abundance
Aquatic / Marginal vegetation		
Lesser pond-sedge	*Carex acutiformis*	LA
Common reed	*Phragmites australis*	LF
Yellow iris	*Iris pseudacorus*	LF
Lesser reed-mace	*Typha angustifolia*	LF
Grey club-rush	*Schoenoplectus tabernaemontani*	LF
Giant rhubarb	*Gunnera tinctoria*	O
Branched bur-reed	*Sparganium erectum*	O
Bogbean	*Menyanthes trifoliata*	R
Grey club-rush (Variegated)	*Schoenoplectus tabernaemontani var. albescens*	R
Purple-loosestrife	*Lythrum salicaria*	R
Marsh-marigold	*Caltha palustris*	R
White wood-rush	*Luzula nivea*	R
Common club-rush	*Schoenoplectus lacustris*	R
Spiked water-milfoil	*Myriophyllum spicatum*	R
Beach		
Hare's-foot clover	*Trifolium arvense*	R
Marram	*Ammophila arenaria*	R
Annual pearlwort	*Sagina apetala*	R

Lake L2

English name	*Latin name*	Abundance
Aquatic / Marginal vegetation – Main Lake		
Spiked water-milfoil	*Myriophyllum spicatum*	F
Pendulous sedge	*Carex pendula*	F
Common reed	*Phragmites australis*	LF
Branched bur-reed	*Sparganium erectum*	LF
Bogbean	*Menyanthes trifoliata*	LF
Grey club-rush	*Schoenoplectus tabernaemontani*	LF
Lesser reed-mace	*Typha angustifolia*	LF
Common bistort	*Bistorta officinalis*	LF
Lesser pond-sedge	*Carex acutiformis*	LF
Indian Rhrubarb	*Darmera peltata*	LF
Yellow iris	*Iris pseudacorus*	O
Marsh-marigold	*Caltha palustris*	O
Giant rhubarb	*Gunnera tinctoria*	O
Southern marsh-orchid	*Dactylorhiza praetermissa*	R
Red fescue	*Festuca rubra*	R
Bramble	*Rubus fruticosus agg.*	R
White water-lily	*Nymphaea alba*	R
Dotted loosestrife	*Lysimachia punctata*	R
Tufted-sedge	*Carex elata*	R
Rough horsetail	*Equisetum hyemale*	R
Monkeyflower	*Erythranthe guttata*	R
Great willowherb	*Epilobium hirsutum*	R
Giant meadowsweet	*Filipendula camtschatica*	R
Meadowsweet	*Filipendula ulmaria*	R
True fox-sedge	*Carex vulpina*	R
Sensitive-fern	*Onoclea sensibilis*	R
Plantain lilies	*Hosta spp.*	R
Grey willow	*Salix cinerea*	R
L2a – Raised pond		
Fringed water-lily	*Nymphoides peltata*	LF
Filamentous algae	*Chlorophyta spp.*	F
Spiked water-milfoil	*Myriophyllum spicatum*	O
unbranched bur-reed	*Sparganium emersum*	R
Lesser reed-mace	*Typha angustifolia*	R
L2b – Reed Filter bed		
Common reed	*Phragmites australis*	A

English name	*Latin name*	Abundance
Bamboo	*Chimonobambusa sp.*	LF
Pendulous sedge	*Carex pendula*	O
Giant rhubarb	*Gunnera tinctoria*	R
Marsh-marigold	*Caltha palustris*	R
Yellow iris	*Iris pseudacorus*	R

Woodland Court Trees (CT1)

English name	*Latin name*	Abundance
Canopy		
Pedunculate Oak	*Quercus robur*	F
Beech	*Fagus sylvatica*	F
Silver birch	*Betula pendula*	LF
Scots pine	*Pinus sylvestris*	O
Sycamore	*Acer pseudoplatanus*	O
Downy birch	*Betula pubescens*	O
Lombardy poplar	*Populus nigra 'Italica'*	R
Holly	*Ilex aquifolium*	R
Horse chestnut	*Aesculus hippocastanum*	R
Understorey		
Buckthorn	*Rhamnus cathartica*	R
Scots pine	*Pinus sylvestris*	R
Horse chestnut	*Aesculus hippocastanum*	R
Elder	*Sambucus nigra*	R
Yew	*Taxus baccata*	R
Ground Flora		
Red fescue	*Festuca rubra*	A
White clover	*Trifolium repens*	O
Creeping buttercup	*Ranunculus repens*	O
Horse chestnut	*Aesculus hippocastanum*	R
Bramble	*Rubus fruticosus agg.*	R
Dandelion	*Taraxacum officinale agg.*	R
Hedge bedstraw	*Galium album*	R
Rowan	*Sorbus aucuparia*	R
Firethorn	*Pyracantha coccinea*	R
Creeping thistle	*Cirsium arvense*	R
Wood avens	*Geum urbanum*	R
Broad-leaved dock	*Rumex obtusifolius*	R
Greater stitchwort	*Stellaria holostea*	R
Red campion	*Silene dioica*	R
Cut-leaved crane's-bill	*Geranium dissectum*	R
Hedge woundwort	*Stachys sylvatica*	R
Ash	*Fraxinus excelsior*	R
Coral bells	*Heuchera sp. [ident]*	R

English name	*Latin name*	Abundance
Barren brome	*Anisantha sterilis*	R

Forest Court Trees (CT2)

English name	*Latin name*	Abundance
Canopy		
Wild cherry	*Prunus avium*	LF
Beech	*Fagus sylvatica*	O
Horse chestnut	*Aesculus hippocastanum*	O
Scots pine	*Pinus sylvestris*	O
Ash	*Fraxinus excelsior*	R
Crack-willow	*Salix x fragilis*	R
Sycamore	*Acer pseudoplatanus*	R
Understorey		
Holly	*Ilex aquifolium*	O
Rowan	*Sorbus aucuparia*	R
Horse chestnut	*Aesculus hippocastanum*	R
Elder	*Sambucus nigra*	R
Downy birch	*Betula pubescens*	R
Ground Flora		
Bramble	*Rubus fruticosus agg.*	A
Common nettle	*Urtica dioica*	LF
Rosebay willowherb	*Chamaenerion angustifolium*	LF
Cleavers	*Galium aparine*	O
Hybrid bluebell	*Hyacinthoides x massartiana*	R
Ripgut brome	*Anisantha rigida*	R
Red fescue	*Festuca rubra*	R
Herb-robert	*Geranium robertianum*	R
Ash	*Fraxinus excelsior*	R
False oat-grass	*Arrhenatherum elatius*	R
Wild cherry	*Prunus avium*	R
Montbretia	*Crocosmia x crocosmiiflora*	R

Campus Planting Beds

English name	*Latin name*
Bear's breeches	*Acanthus mollis*
Japanese maple	*Acer palmatum*
Three-cornered leek	*Allium triquetrum*
Globe allium	*Allium 'Globemaster'*
Hart's-tongue	*Asplenium scolopendrium*
Astilbe	*Astilbe x arendsii*
Lady-fern	*Athyrium filix-femina*
Chinese barberry	*Berberis julianae*
Elephant's ears	*Bergenia cordifolia*

English name	*Latin name*
Butterfly-bush	*Buddleja davidii*
Mexican orange blossom	*Choisya ternata*
lily-of-the-valley	*Convallaria majalis*
Pampas-grass	*Cortaderia selloana*
Montbretia	*Crocosmia x crocosmiiflora*
Indian rhubarb	*Darmera peltata*
Ornamental buckler-fern	*Dryopteris sp.*
Escallonia	*Escallonia sp.*
Evergreen spindle	*Euonymus japonicus*
Wood spurge	*Euphorbia amygdaloides*
Mediterranean spurge	*Euphorbia characias*
Fig	*Ficus carica*
Geranium	*Geranium spp.*
Hellebore	*Helleborus spp.*
Coral bells	*Heuchera sp. [ident]*
Plantain lilies	*Hosta spp.*
Hydrangea	*Hydrangea macrophylla*
Rose-of-Sharon	*Hypericum calycinum*
Rose-of-Sharon	*Hypericum calycinum*
Siberian Iris	*Iris sibirica*
Lavender	*Lavandula angustifolia*
Wilson's honeysuckle	*Lonicera nitida*
White wood-rush	*Luzula luzuloides*
Oregon grape	*Mahonia aquifolium*
Ostrich fern	*Matteuccia struthiopteris*
Daffodil	*Narcissus spp.*
Royal fern	*Osmunda regalis*
Virginia creeper	*Parthenocissus quinquefolia*
Garden bistort	*Persicaria bistorta 'Superba'*
Jerusalem Sage	*Phlomis fruticosa*
New zealand Flax	*Phormium tenax*
Red Tip Photinia	*Photinia × fraseri*
Shrubby cinquefoil	*Potentilla fruticosa [var]*
Firethorn	*Pyracantha coccinea*
Rhododendron	*Rhodendron ponticum*
Staghorn sumac	*Rhus typhina*
Flowering currant	*Ribes sanguineum*
Japanese-rose	*Rosa rugosa*
Sheep's sorrel	*Rumex acetosella*
Procumbent pearlwort	*Sagina procumbens*
London pride	*Saxifraga x urbium*
Pale yellow-eyed grass	*Sisyrinchium striatum*
Skimmia	*Skimmia japonica*
Giant feather-grass	*Stipa gigantea*

English name	*Latin name*
Lilac	*Syringa vulgaris*
Hebe	*Veronica sect. Hebe spp.*
David viburnum	*Viburnum davidii*
Japanese snowball	*Viburnum plicatum*
Greater periwinkle	*Vinca major*
Lesser-periwinkle	*Vinca minor*
Wisteria	*Wisteria sp.*

Campus Trees

English name	*Latin name*
Field maple	*Acer campestre*
Norway maple	*Acer platanoides*
Sycamore	*Acer pseudoplatanus*
Horse chestnut	*Aesculus hippocastanum*
Alder	*Alnus glutinosa*
Shadbush	*Amelanchier sp.*
Boxleaf azara	*Azara microphylla*
Paper birch	*Betula papyrifera*
Silver birch	*Betula pendula*
Downy birch	*Betula pubescens*
Himalayan birch	*Betula utilis*
Hornbeam	*Carpinus betulus*
Sweet chestnut	*Castanea sativa*
Strawberry dogwood	*Cornus capitata*
Dogwood	*Cornus sanguinea*
Dove-tree	*Davidia involucrata*
Beech	*Fagus sylvatica*
Copper Beech	*Fagus sylvatica 'Purpurea'*
Ash	*Fraxinus excelsior*
Ginkgo	*Ginkgo biloba*
Southern magnolia	*Magnolia grandiflora*
Crab apple	*Malus sylvestris*
Medlar	*Mespilus germanica*
Dawn-redwood	*Metasequoia glyptostroboides*
Corsican pine	*Pinus nigra subsp. laricio*
Monterey pine	*Pinus radiata*
Scots pine	*Pinus sylvestris*
London-plane	*Platanus occidentalis x orientalis = P. x hispanica*
Aspen	*Populus tremula*
Wild plum	*Prunus domestica*
Portugal laurel	*Prunus lusitanica*
Jananese cherry	*Prunus serrulata*
Willow-leaved pear	*Pyrus salicifolia*

English name	*Latin name*
Red oak	*Quercus rubra*
Osier	*Salix viminalis*
Whitebeam	*Sorbus anglica*
Rowan	*Sorbus aucuparia*
Swedish whitebeam	*Sorbus intermedia*
Yew	*Taxus baccata*
Lime	*Tilia x europaea*

8.0 APPENDIX B: BIOLOGICAL RECORDS SEARCH RESULTS

8.1 The following species have relevant legal protection under the Conservation of Habitats and Species Regulations 2017 (as amended) (CHSR) and the Wildlife and Countryside Act 1981 (as amended) (WCA). In addition, their status as Species of Principal Importance from Section 41 of the National Environment and Rural Communities Act 2006 (S41) and Lancashire Biodiversity Action Plan species is also shown.

Taxon group	Species name	Year	CHSR	WCA	S41	LBAP
Bats	Common Pipistrelle *Pipistrellus pipistrellus*	2016	Y	Y		Y
	Noctule Bat *Nyctalus noctula*	2016	Y	Y	Y	Y
Terrestrial mammal	Water vole *Arvicola amphibius*	2015		Y	Y	Y

8.2 The following species are listed as Species of Principal Importance under Section 41 of the National Environment and Rural Communities Act 2006 (S41). Their status as Lancashire Biodiversity Action Plan species is also shown together with any other conservation designations including Birds of Conservation Concern (BoCC) (Red and Amber status) and the Red List for Great Britain vulnerable status (RLGB.V)

Taxon group	Species name	Year	S41	LBAP	Other designations
Amphibian	Common toad *Bufo bufo*	2010	Y	Y	
Bird	Corn bunting *Emberiza calandra*	2010	Y	Y	BoCC.R
	House sparrow *Passer domesticus*	2017	Y	Y	BoCC.R
	Lapwing *Vanellus vanellus*	2017	Y	Y	BoCC.R
	Linnet *Linaria cannabina*	2010	Y	Y	BoCC.R
	Skylark *Alauda arvensis*	2017	Y	Y	BoCC.R
	Dunnock *Prunella modularis*	2010	Y	Y	BoCC.A
	Reed bunting *Emberiza schoeniclus*	2017	Y	Y	
Flowering plant	Tubular water-dropwort *Oenanthe fistulosa*	2017	Y	Y	RLGB.V
Terrestrial mammal	Brown hare *Lepus europaeus*	2016	Y	Y	
	Hedgehog *Erinaceus europaeus*	2017	Y	Y	
Flowering plant	Cornflower *Centaurea cyanus*	2016	Y		
Insect - moth	Ghost moth *Hepialus humuli*	2015	Y		
	Rosy rustic *Hydraecia micacea*	2016	Y		

8.3 The following species are as priority species in the Lancashire Biodiversity Action Plan together with any other any other conservation designations including Birds of Conservation Concern (BoCC) (Red and Amber status) and nationally rare (NR) (occurring in less than 15 10km x 10km grid squares) and nationally scarce (NS) (occurring in between 16-100 15 10km x 10km grid squares).

Taxon group	Species name	Year	LBAP	Other designations
Bird	Herring gull *Larus argentatus*	2018	Y	BoCC.R
	Song thrush *Turdus philomelos*	2016	Y	BoCC.R
	Swift *Apus apus*	2010	Y	BoCC.R
	Black-headed gull *Chroicocephalus ridibundus*	2018	Y	BoCC.A
	Kestrel *Falco tinnunculus*	2016	Y	BoCC.A
	Lesser black-backed gull *Larus fuscus*	2017	Y	BoCC.A
	Oystercatcher *Haematopus ostralegus*	2016	Y	BoCC.A
	Golden plover *Pluvialis apricaria*	2010	Y	
	Grey heron *Ardea Cinerea*	2010	Y	
Flowering plant	Dune helleborine *Epipactis dunensis*	2017	Y	NR
	Touch-me-not balsam *Impatiens noli-tangere*	2010	Y	NS
	Bird's-foot *Ornithopus perpusillus*	2003	Y	
	Buckthorn *Rhamnus cathartica*	2016	Y	
	Greater pond-sedge *Carex riparia*	2010	Y	
	Ramping fumitory *Fumaria capreolata subsp. babingtonii*	2005	Y	
Horsetail	Rough horsetail *Equisetum hyemale*	2017	Y	
Amphibian	Common frog *Rana temporaria*	2017	Y	

8.4 The following species are species with other conservation designations including Birds of Conservation Concern (BoCC) (Red and Amber status) and Red List for Great Britain near threatened (NT), endangered (E) vulnerable (V), data deficient (DD) species, and nationally scarce (NS) (occurring in between 16-100 15 10km x 10km grid squares).

Taxon group	Species name	Year	Other designations
Bird	Greenfinch *Chloris chloris*	2018	BoCC.R
	House Martin *Delichon urbicum*	2017	BoCC.R
	Fieldfare *Turdus pilaris*	2018	BoCC.R
	Mistle thrush *Turdus viscivorus*	2010	BoCC.R
	Mallard *Anas platyrhynchos*	2018	BoCC.A
	Moorhen *Gallinula chloropus*	2018	BoCC.A
	Common Gull *Larus canus*	2016	BoCC.A
	Grey Wagtail *Motacilla cinerea*	2018	BoCC.A
	Stock dove *Columba Oenas*	2010	BoCC.A
	Woodpigeon *Columba Palumbus*	2010	BoCC.A
	Wren *Troglodytes troglodytes*	2010	BoCC.A
Insect – Beetle	Alder Leaf Beetle *Agelastica alni*	2018	RLGB.DD
Flowering plant	Corn Chamomile *Anthemis arvensis*	2016	RLGB.E
	Galingale *Cyperus longus*	2010	RLGB.Lr(NT), NS
	Field Woundwort *Stachys arvensis*	2010	RLGB.Lr(NT)
	Wild Pansy *Viola tricolor*	2010	RLGB.Lr(NT)
	Corn Marigold *Glebionis segetum*	2014	RLGB.V

Taxon group	Species name	Year	Other designations
	Corn Spurrey *Spergula arvensis*	2010	RLGB.V
	Medlar *Mespilus germanica*	2010	NS

8.1 The following species are all other species recorded within the Campus.

Taxon group	Species name	Year
Amphibian	Smooth Newt *Lissotriton vulgaris*	2017
Bird	Buzzard *Buteo buteo*	2017
	Goldfinch *Carduelis carduelis*	2010
	Blue Tit *Cyanistes caeruleus*	2018
	Coot *Fulica atra*	2018
	Pied Wagtail *Motacilla alba subsp. yarrellii*	2016
	Swallow *Hirundo rustica*	2010
Fern	Royal Fern *Osmunda regalis*	2014
	Soft Shield-fern *Polystichum setiferum*	2016
Flowering plant	Traveller's-joy *Clematis vitalba*	2010
	Broad-leaved Helleborine *Epipactis helleborine*	2015
	Sun Spurge *Euphorbia helioscopia*	2010
	Petty Spurge *Euphorbia peplus*	2014
	Alder Buckthorn *Frangula alnus*	2016
	Snowdrop *Galanthus nivalis*	2007
	Small-flowered Crane's-bill *Geranium pusillum*	2014
	Trailing St John's-wort *Hypericum humifusum*	2010
	Bogbean *Menyanthes trifoliata*	2010
	Greater Spearwort *Ranunculus lingua*	2016
	Common Club-rush *Schoenoplectus lacustris*	2014
	Small-leaved Lime *Tilia cordata*	2016
	Slender Trefoil *Trifolium micranthum*	2016
Insect – Butterfly	Brimstone *Gonepteryx rhamni*	2018
	Speckled Wood *Pararge aegeria*	2017
	Comma *Polygonia c-album*	2010
Moss	Pretty Nodding-moss *Pohlia lescuriana*	2003

Invasive and non-native species

8.2 The following species have previously been recorded within the campus that are legal designation under the Wildlife and Countryside Act 1981 (as amended) (WCA) as species that cannot be caused to grow in the wild.

Taxon group	Species name	Year
Flowering plant	New Zealand pigmyweed *Crassula helmsii*	2016
	Montbretia *Crocosmia pottsii x aurea = C. x crocosmiiflora*	2010
	Canadian waterweed *Elodea canadensis*	2016
	Japanese knotweed *Fallopia japonica*	2007
	Curly waterweed *Lagarosiphon major*	2016
	Variegated Yellow archangel *Lamiastrum galeobdolon subsp. argentatum*	2010
	Rhododendron ponticum *Rhododendron ponticum*	2010
	Japanese rose *Rosa rugosa*	2010

Species offsite

8.3 The following species have been recorded offsite and have relevant legal protection under the Conservation of Habitats and Species Regulations 2017 (as amended) (CHSR) and the Wildlife and Countryside Act 1981 (as amended) (WCA). In addition, their status as Species of Principal Importance from Section 41 of the National Environment and Rural Communities Act 2006 (S41) and Lancashire Biodiversity Action Plan species is also shown.

Taxon group	Species name	Year	Distance	CHSR	WCA	Other designations
Amphibian	Great crested newt *Triturus cristatus*	2016	<2.1km	Y	Y	S41 LBAP
Mammal	Brown long-eared bat *Plecotus auritus*	2018	<120m	Y	Y	S41 LBAP
	Daubenton's bat *Myotis daubentonii*	2012	<1.1km	Y	Y	LBAP
	Whiskered bat *Myotis mystacinus*	2002	<2.1km	Y	Y	LBAP
	Eurasian red squirrel *Sciurus vulgaris*	2021	<100m		Y	S41 LBAP
Bird	Quail *Coturnix coturnix*	1999	<3.5km		S1	LBAP BoCC.A
	Barn owl *Tyto alba*	1999	<2.1km		S1	
	Kingfisher *Alcedo atthis*	1999	<3.5km		S1	

8.4 The following species are all other offsite species with a conservation designation.

Taxon group	Species name	Year	Distance	Other designations
Bird	Curlew *Numenius arquata*	2000	<3.5km	S41 LBAP BoCC.R
	Grey Partridge *Perdix perdix*	2012	<1.4km	S41 LBAP BoCC.R
	Spotted Flycatcher *Muscicapa striata*	2004	<2.1km	S41 LBAP BoCC.R
	Starling *Sturnus vulgaris*	2020	<410m	S41 LBAP BoCC.R
	Tree Sparrow *Passer montanus*	2020	<1km	S41 LBAP BoCC.R

Taxon group	Species name	Year	Distance	Other designations
	Turtle Dove *Streptopelia turtur*	1999	<3.5km	S41 LBAP BoCC.R
	Willow Tit *Poecile montana*	2017	<1.4km	S41 LBAP BoCC.R
	Yellow Wagtail *Motacilla flava*	2005	<2.1km	S41 LBAP BoCC.R
	Yellowhammer *Emberiza citrinella*	2020	<610m	S41 LBAP BoCC.R
	Bullfinch *Pyrrhula pyrrhula*	2017	<290m	S41 LBAP BoCC.A
	Lesser Redpoll *Acanthis cabaret*	1999	<2.1km	S41
	Meadow Pipit *Anthus pratensis*	1999	<2.1km	LBAP BoCC.A
	Pink-footed Goose *Anser brachyrhynchus*	2019	<1.7km	LBAP BoCC.A
	Shelduck *Tadorna tadorna*	1999	<3.5km	LBAP BoCC.A
	Snipe *Gallinago gallinago*	2005	<3.7km	LBAP BoCC.A
	Willow Warbler *Phylloscopus trochilus*	1999	<2.1km	LBAP BoCC.A
	Raven *Corvus corax*	2020	<1km	LBAP
	Woodcock Scolopax rusticola	1999	<3.1km	BoCC.R
	Sparrowhawk *Accipiter nisus*	2005	<1.6km	BoCC.A
	Tawny Owl *Strix aluco*	1999	<2.1km	BoCC.A
Moth	Figure of Eight Diloba caeruleocephala	1999	<1.7km	S41 LBAP
	Beaded Chestnut *Agrochola lychnidis*	1999	<1.7km	S41
	Centre-barred Sallow *Atethmia centrago*	2005	<1.7km	S41
	Cinnabar *Tyria jacobaeae*	2020	<700m	S41
	Dark-barred Twin-spot Carpet *Xanthorhoe ferrugata*	2005	<2.4km	S41
	Dot Moth *Melanchra persicariae*	2005	<2.4km	S41
	Dusky Brocade *Apamea remissa*	2005	<2.4km	S41
	Green-brindled Crescent *Allophyes oxyacanthae*	1999	<1.7km	S41
	Grey Dagger *Acronicta psi*	2005	<1.7km	S41
	Mottled Rustic *Caradrina morpheus*	2010	<1.7km	S41
	Mouse Moth *Amphipyra tragopoginis*	2005	<1.7km	S41
	Oak Hook-tip *Watsonalla binaria*	2000	<2.1km	S41
	Rustic *Hoplodrina blanda*	2010	<120m	S41
	Sallow *Cirrhia icteritia*	2010	<120m	S41
	Shaded Broad-bar *Scotopteryx chenopodiata*	2005	<1.7km	S41
	Small Phoenix *Ecliptopera silaceata*	2009	<1.1km	S41
	Small Square-spot *Diarsia rubi*	2009	<1.1km	S41
	White Ermine *Spilosoma lubricipeda*	2010	<2.9km	S41
Spider	*Araeoncus humilis*	1987	<200m	LBAP

Annexes

Document Control

Version	Date	Change Author	Summary of Changes
ISC Biodiversity Action Plan V1.0	2022		Creation of new document
ISC Biodiversity Action Plan V1.1	April 2026	Head of Sustainability	Updates to dates for peat removal in compost and removal of section around dune Helleborine due to Central Campus development being completed Some minor amends to wording for clarification

End matter

Title	Biodiversity Action Plan
Policy Owner	Grounds Manager
Approved by	Institutional Sustainability Committee
Name and Role of Approver	Dr Jo Wright, Chief Student and Governance Officer
Date of Approval	May 2026
Date for Review	May 2027