Environment (Wales) Act 2016 Part 1 – Section 6: The Biodiversity and Resilience of Ecosystems Duty - 2022 Report

1. Introduction and Context

Prifysgol Bangor University is a Higher Education Institution delivering undergraduate and postgraduate level education as well as undertaking world-leading research across a range of disciplines. The University falls into Group 2 in the Description of Organisation Relative to Biodiversity in Table 1 of the Section 6 reporting guidance document[1].

Bangor University has around 10,000 students and over 2,000 members of staff, and offers courses spanning the Arts, Humanities and Sciences through over 300 undergraduate and 100 postgraduate taught programmes. In addition to traditional teaching, the University also undertakes outreach work, extensive research, scientific consultancy, numerous off-site activities, fieldwork, and all the operational professional services supporting these activities.

The University estate covers more than 880 hectares of land, primarily within the county of Gwynedd, with additional locations in Menai Bridge (Ynys Mon) and Wrexham.

Sites within Bangor, Menai Bridge and Wrexham house the vast majority of university buildings, with some areas of parkland, trees, urban woodlands, and other planted areas also found here. In addition to those built/developed areas, the University land holdings includes:

- Treborth Botanic Garden, covering approximately 29.3 hectares, located to the south-west of Bangor City, between the Menai Suspension Bridge and Britannia Bridge, and incorporates an area of SSSI.
- Henfaes Research Centre, Henfaes Ffridd and the Centre for Hill and Upland Management. These cover a combined total of approximately 267.5 hectares and located in the vicinity of Abergwyngregyn, Gwynedd, and towards Llanfairfechan, Conwy.

  The land which makes up Henfaes Ffridd and the Centre for Hill and Upland Management are located within the boundary of Snowdonia National Park.

- The University also holds grazing rights over 495 hectares of common land located between Abergwyngregyn, Gwynedd and Llanfairfechan, Conwy. This land is located on the Carneddau mountain range.

The enhancement of biodiversity is a key element of Bangor University's mission to be a sustainable University. The importance of sustainability is recognised as one of the strategic enablers of success within our updated strategic plan: Strategy 2030.

The University has an Environmental Policy and a Biodiversity Action Plan is currently being updated. The latter defines our priority areas for biodiversity action, sets targets for enhancing biodiversity and ensure biodiversity is included in decision making regarding estate management.

The key objectives within the proposed Biodiversity Action Plan include:

- Compliance with legal and other obligations
- Protect and enhance biodiversity within the university estate

[1] Environment (Wales) Act 2016 Part 1 - Guidance for Section 6 – The Biodiversity and Resilience of Ecosystems Duty – Reporting Guidance; OGL, 2019.

- Avoid use of environmentally harmful substances, materials, and processes
- Use native planting and develop suitable habitats for native wildlife
- Include biodiversity within decisions regarding investment, procurement, planning and design, new construction, servicing, and maintenance
- Create new green space and ensure ecological connectivity
- Use biodiversity to promote health and wellbeing
- Minimise and mitigate negative impacts of university operation on the environment
- Raise awareness of biodiversity conservation internally & externally
- Develop links with relevant external organisations
- Monitor biodiversity of the estate through species and habitat surveys

The University also monitors and manages aspects of biodiversity as a part of its ISO14001:2015 accredited Environmental Management System. In line with the requirements of the ISO14001:2015 standard, this means that the ultimate responsibility for delivery of objectives and targets, including those related to biodiversity, rests with the Vice-Chancellor and University Executive Body.

There are currently three targets within the Environmental Management System concerned with biodiversity:

a) Develop an amenity grassland management plan
b) Increase unimproved grassland/wildflower meadow areas across the University estate to support campaigns such as the Wildlife Trust's '30 by 30'
c) Update and approve the University Biodiversity Action Plan

As part of the Environmental Management System, progress on biodiversity is reported annually to the Sustainability Strategy Group through the Annual Environment Report and Annual Management Review. This is then reported to the Vice-Chancellor and Executive by the Chair, and publicly published on our website.

2. Highlights, Key Outcomes & Issues

The University has a large land holding which supports extensive biodiversity which we are working proactively to protect and enhance by implementing the following actions and measures:

- Ongoing Biodiversity targets within our ISO14001:2015 accredited Environmental Management System
- Biodiversity as a key theme within the University's Environment Policy
- Annual reporting on environmental performance, including on biodiversity
- Trialing alternative approaches to weed management
- Expanding wildflower coverage and trailing reduced-mowing regimes
- On-site composting and reuse of all biomass generated from grounds maintenance and landscaping
- Year-round programme of biodiversity & ecosystem themed events for students, staff and public

- Maintaining the Healing Garden at Fron Heulog used by Headway Gwynedd, the Brain Injury Foundation and students for growing fruit and vegetables
- Biodiversity surveys conducted by staff, students & volunteers
- Conducting world-leading research on topics related to enhancing biodiversity and creating resilient ecosystems

Our actions for biodiversity have delivered positive outcomes in the following ways so far:

Benefits for health

- Gardening sessions for health and wellbeing for staff
- HEFCW funding for health and wellbeing staff and student activities including biodiversity awareness walks
- Therapeutic gardening courses for Treborth Botanic Garden staff
- A student-led garden in the heart of Upper Bangor, working in partnership with Headway Gwynedd – the Brain Injury Foundation

Social cohesion

- Regular garden volunteering at Treborth Botanic Garden and the Healing Garden
- Citizen science events for the community – e.g., fungus foray, rake your own meadow hay sessions
- Development of a Welsh Herbal Garden, celebrating Welsh flora, and Welsh history/culture

Economic outputs / funding commitments for projects:

- Wildlife pond restoration
- Botanical conservation nursery – to propagate rare native Welsh species including:
  - *Cotoneaster cambricus*
  - *Salvia pratensis*
  - S*orbus arvonicola*
  - Rare lichen (*Biatoridium monasteriense*) – Treborth Botanic Garden is growing the wych elm, this grows from cuttings from the original Rhydymain elms
- Biodiversity interpretation
- Way markers, information boards, audio guides for nature mindfulness trails
- Providing opportunities for people to get in touch with and appreciate nature
- Biodiversity internships
- Biodiversity officer roles for up to two students per year

Cost savings

- Mowing certain sites less frequently
- Leaving more timber in situ for log piles rather than paying to remove

Long-term benefits of habitat preservation/restoration

- Wildflower meadows species diversity increasing due to grazing – current action and ongoing research

Key enabling factors:

- Excellent communication with students, staff, and the general public through multiple channels
- Dedicated expert staff in multiple teams, including from Treborth Botanic Garden, Henfaes Research Centre and the Grounds and Landscape team, in addition to academic staff working in the fields of biodiversity, conservation and ecology
- Strong working partnerships with local and national organisations including:
  - Royal Society for the Protection of Birds
  - Plantlife – The Wild Plant Conservation Charity
  - Cofnod – North Wales Environmental Information Service
  - North Wales Wildlife Trust
  - British Trust for Ornithology
  - North Wales Mammal Group
- Significant support from volunteers

Noted barriers/areas for improvement:

- Staff and volunteer time to scope and visualize large- and small-scale improvements and strategies for the future
- Costing those improvements and ideas so they can be adequately resourced and thereafter funded to delivery, and throughout the on-going maintenance
- There are opportunities and challenges for space across the university's estate during this period where the institution is developing its estate strategy for the next decade, or more
- This estate strategy offers the prospect of developing new ideas, such as green walls and green roofs as well as embedding urban greenery into design
- Increasing volunteer and staff resources for improving biodiversity through single 'build' initiatives, ongoing area management for enhancing flora and wildlife
- Developing 30x30 into a real win for nature, for the students, staff, and the wider community, through creating a variety of sites that encourage greater local biodiversity
- Develop improved systems to evaluate current biodiversity which can then evaluate and monitor improvements and changes brought about through initiatives, campaigns and new techniques

3. Action Report

Embedding Biodiversity Action

The university has a Biodiversity Coordinator and, for the wider environmental agenda, a Campus Environmental Performance Team which oversees the implementation of the Environmental Management System. Both drive environmental improvements across the university, with the Biodiversity Coordinator taking the lead on many biodiversity related actions.

Promoting and enhancing biodiversity is one of eleven areas outlined in the university's Environmental Policy. Biodiversity and healthy ecosystems also fall within the objectives of the University's Strategy 2030: Sustainability Statement, which is the guiding document for the university's Sustainability Strategy Group (SSG). The SSG is the institutions high-level lead on sustainability and biodiversity and oversees

the embedment of sustainability work streams within the university's operations and its high-level decision making.

As previously testified, biodiversity has formed a part of the university's environmental performance reporting for many years and will continue to be a key theme of our commitment of continual improvement in environmental management.

Awareness, Training & Involvement

Treborth Botanic Garden is the 'Rose Window' to the university's biodiversity commitment and activities. Staff and volunteers at the Garden have an extensive, year-round programme of events, including seminars and engagement activities that are open to the public as well as university students and staff.

Between August 2019 and October 2022 Treborth Botanic Garden hosted many events related to biodiversity, ecology, and conservation. Event themes included:

- The importance of protection specific species
- Seminars explaining biodiversity and conservation related research at Bangor University
- Events encouraging people to enjoy and connect with nature
- Events demonstrating how people can support their own health & wellbeing

Examples of biodiversity/ecology/conservation events included:

- Guided wildlife and seasonal nature walks
- Wildlife Surveying - taster days
- The Great Garden Bird Watch
- Wild Science Days
- Wildflower Meadow Days
- Variety of specialist nature-workshops with local organisations
- Lichens and mosses identification course
- Wildflowers of North Wales (Goronwy Wyn – BSBI Botanist)
- Gardening for Wellbeing course
- The Botany of Christmas
- Bioblitz events
- Getting to know plants – introduction to the plant kingdom and lower plants (lichens, bryophytes)
- Plant Conservation – wildflower meadow creation and management and introduction to beekeeping
- Plant Pollinators – bee conservation
- Shoreline surveys
- Hedgehog conservation workshops (tunnels, monitoring, supplementary feeding)
- Rare plant workshops (on and offsite) with local organisations

In addition to talks and events aimed at engaging people with the natural world, Treborth Botanic Garden also provides a range of training and skill building workshops for students, staff, and the public. These workshops have included:

- Identification of Fungi
- Habitat surveys
- Invertebrate identification and surveying
- Wildlife gardening & composting
- Creating hibernacula
- Tree & bulb planting
- Creating wildflower meadows
- Plant propagation
- Gardening for Climate Change

The expert staff from Treborth Botanic Garden also provide training and updates on biodiversity issues to University staff and students and include:

- Staff gardening sessions for university staff (part of the health and wellbeing funding and staff development initiatives)
- Practical training for 1 year placement students (mowing, brush cutting/strimming) which teaches best practice using machinery in a conservation area

Volunteering is strongly supported at Treborth Botanic Garden, with two volunteering days every week. Volunteering days are open to the public, university students and staff, promoting knowledge of biodiversity as well as the health and wellbeing benefits of involvement with and enjoyment of nature.

Bangor University's Students' Union places great emphasis on volunteering and currently there are six student societies and four volunteering groups (Students' Union Volunteering Opportunities) within the university, which are actively involved in biodiversity and conservation work, both across the university's estate and in the wider community.

The Students' Union activities include:

- Supporting Menter Mon's – Monitoring Water Voles initiative
- Supporting the Amphibian and Reptile Conservation group in monitoring welsh amphibians and reptiles
- Working closely with the North West Wales Amphibian & Reptile Group, giving members the opportunity to participate in hands on conservation work with our native species through the Bangor Students' Union Herpetological Society
- Running regular moth traps and land watches for cetaceans, BioBlitzs and WeBS counts through the Bangor University Ornithological Society
- Academic talks from forestry and environmental professionals, providing a valuable insight into the working world of forestry in the Bangor Forestry Students Association
- Undertaking dolphin landwatches on Anglesey through Bangor University's Zoological Society
- Working with Keep Wales Tidy on litter picks in Llanberis and regular beach cleans
- Conservation, land management and apple tree planting at a local donkey sanctuary
- Tree Planting with Elwy Working Woods in neglected local woodlands

Section 7 Special Species and Habitats

Numerous biodiversity surveys of sites across the university's estate are undertaken by university staff and volunteers (students, staff & public). Regular surveys include:

- Macromoths (400 species recorded over 30 years of survey data)
- Unimproved grassland surveys (annually)
- Orchid surveys (annually)
- Red Squirrel monitoring (monthly)
- Wildlife pond water monitoring for aquatic flora and fauna
- Dormouse activity monitoring

Details of some sighted species can be found on the Treborth Botanic Garden 'Wildlife' webpage.

Red Squirrel (*Sciurus vulgaris*)

There is a documented population of red squirrels at Treborth Botanic Garden. The university has a working partnership with the Red Squirrel Trust Wales for the conservation of red squirrels (and pine martens) on the university's estate and to promote their expansion across north Wales. Treborth is considered an important buffer zone for the established red squirrel population on Anglesey because of its location across the Menai Strait in Gwynedd and close to both the connecting bridges.

Brown hare (*Lepus europaeus*)

Previously recorded on site but not recently reported.

West European Hedgehog (*Erinaceus europaeus*)

Sightings of hedgehogs across the university's estate were once common, however only a small number of sightings have been reported recently. 'Hedgehog houses' have been installed around Treborth Botanic Garden as part of efforts to support and protect the species and encourage an expansion of their numbers.

In June 2020, the university joined the Hedgehog Friendly Campus initiative to gain accreditation for a safer and more friendly place for hedgehogs to thrive. The initiative has three stages: bronze, silver and gold, each stage consisting of initiatives to complete to spread awareness and to get more people involved in the campaign.

The team achieved a bronze award in January 2021 and since then the group have continued to work hard to achieve their silver accreditation. This was awarded in recognition of the numerous litter picks carried out, online fundraisers, hedgehog house building workshops and effective communication towards making the campus a greener space. The group are now working towards their gold initiative which they hope to have completed by December 2022 through more community engagement and communication to spread awareness and information for people to learn about hedgehogs and how to protect them.

Noctule Bat (*Nyctalus noctula*) - Regularly detected

Common Pipistrelle (*Pipistrellus pipistrellus*) - Uncertain status due to easy confusion with other species, several confirmed recent detections.

Soprano pipistrelle (*Pipistrellus pygmaeus*) - Uncertain status due to easy confusion with other species, several confirmed recent detections.

Brown long-eared Bat (*Plecotus auritus*) - A few recorded detections.

Bat boxes and tiles have been installed in many buildings across the university's estate, to support and protect local bat populations. As part of the development of the St Mary's Student Village a house-style building was constructed specifically for the benefit of bats detected in the area during the ecological survey.

Otter (*Lutra lutra*)

Reported sightings of otter along shores of the Menai Straits have been on the increase, including records of otter spraint. To protect the otters and encourage their continued use of the area, the shoreline area is being left deliberately undisturbed.

Polecat (*Mustela putorius*)

Individuals were recorded from live trapping in 2005, with some individuals also recorded as casualties of vehicles between 2005-2010. Sightings are still reported but are not regular.

Areas of lowland woodland habitat and old boundary walls are being protected at Treborth Botanic Garden specifically for the purposes of protecting and encouraging polecats.

Conservation efforts for polecats also fall within the remit of the university's partnership with Red Squirrel Trust Wales.

Lesser-spotted Woodpecker (*Dendrocopus minor subsp. Comminutus*)

Occasionally sighted visiting species.

Slow worm (*Anguis fragilis*)

Slow worms have been recorded on the university's estate. Treborth Botanic Garden has installed Hibernacula specifically for slow worms to seek shelter and safe hibernation.

Wild cotoneaster (*Cotoneaster cambricus*)

Wild cotoneaster is the rarest plant in Britain. Although not located on the university's estate, Treborth Botanic Garden are working in partnership with National Botanic Garden of Wales, Millennium Seed Bank and Chester Zoo on a project to conserve the Wild Cotoneaster on the Great Orme in Llandudno.

Management of Protected Sites (Henfaes Research Centre and surrounding area)

The University's two parcels of land at Abergwyngregyn, Gwynedd, constituting approximately 221.5 hectares, are within the boundary of Snowdonia National Park; Henfaes Ffridd and the Centre for Hill and Upland Management (previously noted in section 1, Introduction & Context).

The Centre for Hill and Upland Management includes the sessile oak woodland statutory conservation feature within the Coedydd Aber Site of Special Scientific Interest (SSSI), National Nature Reserve (NNR) and Special Area of Conservation (SAC). The feature is the largest contiguous extent of this habitat type along the north Wales coast.

In total, 94.5 hectares of university owned land falls within the Coedydd Aber SSSI/SAC and 87.5 hectares within the National Nature Reserve.

The Woodland canopy comprises Sessile Oak (*Quercus petraea*) and Downy Birch (*Betula pubescens*) with transitions to Common Ash (*Fraxinus excelsior*) woodland and extensive areas of Alder (*Alnus glutinosa*) woodland along the valley floor. A rich lower-plant flora exists within the woodland, including the rare mosses *Fissidens rufulus* and *Philonotis rigida*, and the lichens *Degelia plumbea* and *Lobaria amplissima*. The lichen assemblage is one of the most interesting in north Wales, with over a hundred species recorded.

The woodland breeding bird assemblage is also an SSSI/NNR feature within the site. The site also contains a number of Scheduled Ancient Monuments.

Henfaes Ffridd in Llanfairfechan is an enclosed grazing ffridd, containing unimproved and semi-improved acid grassland, with smaller areas of agriculturally improved grassland. Much of the site is designated a Scheduled Ancient Monument comprising a Romano-British field system.

Henfaes Research Centre at Abergwyngregyn (Aber) is a lowland site comprising a number of experimental plots containing broadleaf tree species, arable crop species trials, plus additional areas of agriculturally improved and semi-improved grassland fields with hedgerow boundaries. The extensive broadleaf component and management regime supports extensive small mammal populations. The site is adjacent to the Lafan Sands SSSI, which attracts large numbers of Eurasian Oystercatchers, and has the Conwy Bay SAC to the north (the second most important site for wading birds in Wales), with Morfa Aber (west) and Morfa Madryn (east) Local Nature Reserves. The latter has a significant Lapwing population, and the coastal fields are managed sympathetically with this in mind.

The sites have are managed in accordance with the requirements of the agri-environment schemes, Tir Gofal (2000-2013) and Glastir (Entry & Advanced schemes from 2014-present). The sites contain habitats and species itemised under the Section 42 list of habitats and species of principal importance in Wales. Land managed under the Glastir scheme includes 96.26 hectares of grazed pasture, 3.2 hectares of hay-meadow, 42.35 hectares of woodland light grazing, 3.58 hectares of woodland stock exclusion and 17.77 hectares of woodland pasture.

There is also 9.23 hectares of grassland managed for Chough (*Pyrrhocorax pyrrhocorax*), 4.58 hectares for adult Curlew (*Numenius arquata*) and 11.35 hectares for Ring Ouzel (*Turdus torquatus*).

Grazing rights for 1850 sheep are also held on the Aber and Llanfairfechan Common which comprises part of the Carneddau SSSI/SAC. Following legal advice, the Aber & Llanfairfechan Graziers Association formed a limited company (of which the University is shareholder) to implement a grazing plan supported initially by the Snowdonia National Park and latterly through Natural Resources Wales to restore and maintain sensitive habitats on 2,800 hectares of the SAC and common land. This is subject to a Section 15 agreement under the Countryside Act 1968 and the graziers participate in a Glastir Commons agreement.

Management of Protected Sites (Treborth Botanic Garden)

Treborth Botanic Garden is located along the Menai Straits, between Pont Menai, the Menai Suspension Bridge, and Pont Britannia Bridge. The Garden is comprised of a range of habitat types and land under a range of special designations.

The woodlands at Treborth Botanic Garden cover approximately 16 hectares, at altitudes ranging from High Water Mark to 40 metres above sea level. The site is notable for the extent of shoreline (1.5km) directly fringed with high canopy forest, an uncommon landscape feature in Wales.

Approximately one third of the Botanic Garden woodland is a SSSI, with just over one hectare regarded as Ancient Woodland comprising Sessile Oak (*Quercus petraea*) and Common Ash (*Fraxinus excelsior*). This area of woodland appears on the first edition (1837) of the Ordnance Survey maps of the area and contains a moderately rich woodland flora including Early Purple Orchid (*Orchis mascula*), Wild Spindle (*Euonymus europaeus*), Primrose (*Primula vulgaris*), Sweet Woodruff (*Galium odoratum*), Dog's Mercury (*Mercurialis perennis*), Wood Anemone (*Anemone vulgaris*), Bluebell (*Hyacinthoides non-scripta*), Great Wood Rush (*Luzula sylvatica*) and Soft Shield Fern (*Polystichum setiferum*). From a conservation point of view, this ancient woodland is without doubt the most natural and valuable woodland feature on the Treborth Botanic Garden site.

The remainder of the SSSI is situated in close proximity to the Menai Strait on steeply sloping ground. Canopy trees are diverse and include native species, such as Sessile Oak (*Q. petraea*), and introduced species including Beech (*Fagus sylvatica*) and Turkey Oak (*Quercus cerris*). Additional native species of interest include Whitebeam (*Sorbus sp*.) and Elm (*Ulmus glabra*). Towards high-tide level there are colonies of carnivorous Butterwort (*Pinguicula vulgaris*) and many Soft Shield Ferns and Bryophytes are abundant, including *Hookeria lucens*.

The University and staff at the Botanic Garden manage the SSSI at Treborth working in partnership with Natural Resources Wales.

Beyond the SSSI there are another 7 hectares of woodland within the boundary of the Botanic Garden, representing at least 6 distinct plant communities. The most southerly element is a distinct stand of mature ash growing on a limestone outcrop at the western end of the cultivated garden comprising mature trees several of which are estimated to be 175 years old. The multi-trunked nature of some trees creates crotches which accommodate a specialised invertebrate fauna including a notably scarce beetle, (*Prionocyphon longicornis*). The field layer includes a valuable transplant population of Herb Paris (*Paris quadrifolia*) which forms part of the Botanic Garden's conservation collection.

Over 400 species of macro fungi have been recorded in the woodlands including at least 10 locally scarce species. Invertebrates can be found within the woodland with over 400 species of moths recorded, including indicators of old growth oak forest such as Brussels Lace (*Cleorodes lichenaria*), nationally scarce species such as Blomer's Rivulet (*Discoloxia blomeri*) and a small population of White-letter Hairstreak butterfly (*Strymonidia w-album*). Purple Hairstreak butterflies can be seen in the oak canopy during July and August and a rare fly (*Paraclusia tigrina*) occurs on rotting beech trunks – this insect is a Red Data Book species occurring in less than 10 sites in the UK. Two Nationally Notable (Category B) species of water beetles occur in a spring in the woodland 80m east of the Britannia Bridge.

Up to 6 pairs of grey heron (*Ardea cinerea*) breed annually in Strait-side trees and shelduck (*Tadorna tadorna*) breed annually along the wooded bank of the Strait.

The overall breeding bird list for the woodlands stands at 33 species.

Landscape & Habitat Management (Pesticides, Herbicides & Planting)

In recent years, the Campus Services' Grounds & Landscape team have been trialing alternative approaches to managing weeds, in an effort to reduce the use of glyphosate and similar weed killer. This has included the use of acetic acid and weed burners as well as alternative management regimes that do not rely on weed removal. Alternative management approaches include reduced mowing, both in terms of frequency and extent, to allow areas to become wilder, encouraging and supporting a greater range of plant and animal biodiversity.

At Treborth Botanic Garden, herbicides are no longer used for the purposes of keeping paths clear of weeds. Whilst the use of herbicides on paths continues at other sites, it is possible that the university could institute a policy where use is less or even eliminated in future.

Further management changes have included the removal of some traditionally lawned areas (or parts thereof) and replaced with herbaceous planting or wildflowers. This approach provides more varied habitats which support a greater number and variety of animal species, as well as reducing the use of fossil fuels to power mowing machinery.

There are several areas on campus that have been converted from grassed lawn to wildflower meadows. Perennial wildflower meadows at Treborth Botanic Garden contain over 150 species of wildflower. Green hay from the Botanic Garden is available for use across campus for the expansion of wildflower meadow areas.

The wildflower area outside the Environment Centre Wales building, on Deiniol Road, also contains 'insect hotels' to support and encourage insects, and associated signs to inform students, staff, and the public about the importance of wildflowers and supporting insects as part of a healthy functioning ecosystem. The wildflower area is also known to support a large variety of fungi, bees, flies, beetles, spiders, moths, butterflies, reptiles, amphibians, small mammals, bats, and birds.

University staff, students and the public are encouraged to make use of these outdoor areas for breaks, having lunch and as meeting spaces to help support good mental and physical wellbeing.

There are plans to further increase wildflower coverage in coming years. The Grounds and Landscape team are taking an experimental approach to introducing new wildflower areas, to determine both the most suitable locations and the best seed mixes.

Other areas have specifically designed mowing regimes to help support and encourage certain plant species. In 2019, bee orchids were identified in a grassed area on campus – a management and mowing schedule has been developed to help protect the orchids, whilst also keeping the surrounding grass area neat. This involves identifying areas where the bee orchids are growing and mowing around these areas during the times that the orchids are sending up stems, flowering and going to seed.

There are information signs under many trees where mowing is being altered and/or reduced, to inform people that the changes are being implemented for the benefit of biodiversity. Without adequate

communication it is possible that changes to mowing could be misinterpreted as cost-cutting or a reduction in service rather than as a deliberate strategy.

Tree planting is an ongoing activity at Bangor University. This includes an orchard of 140 native Welsh apple trees planted on the university's Ffriddoedd site around student residential halls, tree planting behind Thoday building and in front of Deiniol building on the science site, and cherry trees planted around Pontio Arts and Innovation Centre. The trees will provide habitat for a range of wildlife and support and encourage pollinating insects and the orchard is an example of how food can be produced locally.

There is a further orchard of rare and special native Welsh fruit trees, including apple trees, cherry trees, and plum trees, at Treborth Botanic Garden. As an educational facility, Treborth Botanic Garden established the orchard to teach people about native Welsh fruit trees. Treborth Botanic Garden has also planted new hedgerows to serve as wildlife corridors, connecting habitat areas.

Non-native Species

The university's main involvement with the management of non-native species has been in the control of Japanese Knotweed (*Fallopia japonica*). There have been four separate instances/areas of Japanese Knotweed identified on the university estate in recent years. Of these, two occurrences are confirmed as having been fully eradicated and one site seems to have been eradicated although monitoring is ongoing to ensure no resurgence occurs. In the remaining site, management and removal is ongoing.

Treborth Botanical Garden also has issues with the non-native plants, particularly Rhododendron (*Rhododendron ponticum*) and Cherry laurel (*Prunus laurocerasus*), in the area of woodland along the Welsh Coastal Path, Menai Strait side of the site, and removal and management of these invasive species is also ongoing.

Resource Management

Grass clippings and plant cuttings are composted on-site, with the resulting compost being used by the Grounds and Landscape team to fill some of the containerised plant displays that are found across the estate, and as a soil amendment in planted beds. The student Healing Garden at Fron Heulog, which is run and managed by the student volunteering project 'Headway Healing Garden' also utilises compost and woody & chipped material on-site for topping paths, suppressing weeds, and mulching fruiting shrubs and trees.

The university holds two exemption permits issued by Natural Resources Wales for aerobic composting, and exemptions for spreading of bio waste on non-agricultural land and burning of waste (untreated wood and vegetation).

Where limbs fall or are removed from trees, the Grounds team work to ensure that these are left at the base of the tree from which they originated for a time before being removed for composting, chipping, or removal. This allows any wildlife resident within the limb to migrate out and not being unintentionally displaced by immediate removal of the limb.

Evidence, Research and Knowledge Sharing

Bangor University has a reputation as a world-leader in the field of research and more than 90% of the research undertaken in the Environmental Sciences was 'world-leading' as published in the 2021 Research Excellent Framework results.

Within our Schools of Natural Sciences and Ocean Sciences there is significant focus on research into the importance of biodiversity within Wales and globally, as well as into best approaches to maintain and enhance biodiversity and ecosystems.

Between 2019 and 2021, researchers at Bangor University contributed 820 scientific publications on biodiversity, habitats, ecosystems, and ecosystem services, disseminating new knowledge internationally. Research highlights include:

- Microplastics alter multiple biological processes of marine benthic fauna - *Science of the Total Environment* - 2022
- Variation in root morphology amongst tree species influences soil hydraulic conductivity and macroporosity – *Geoderma* - 2022
- Lakes in Hot Water: The Impacts of a Changing Climate on Aquatic Ecosystems – *BioScience* - 2022
- Trawl impacts on the relative status of biotic communities of seabed sedimentary habitats in 24 regions worldwide - *Proceedings of the National Academy of Sciences of the USA* - 2022
- Blue carbon as a natural climate solution - *Nature Reviews Earth and Environment* - 2021
- Novel insights into marine fish biodiversity across a pronounced environmental gradient using replicated environmental DNA analyses - *Environmental DNA* - 2021
- Ecosystems monitoring powered by environmental genomics: a review of current strategies with an implementation roadmap - *Molecular Ecology* - 2021
- Effects of Climate Change on Peatland Reservoirs: A DOC Perspective - *Global Biogeochemical Cycles* - 2021
- The flows of nature to people, and of people to nature: applying movement concepts to ecosystem services – *Land* - 2021
- Ecosystem service and dis-service impacts of increasing tree cover on agricultural land by land-sparing and land-sharing in the Welsh uplands - *Ecosystem Services* - 2021
- Hedgerow effects on CO2 emissions are regulated by soil type and season: implications for carbon flux dynamics in livestock-grazed pasture – *Geoderma* - 2021
- Ensembles of ecosystem service models can improve accuracy and indicate uncertainty - *Science of the Total Environment* - 2020
- Ecological community dynamics: 20 years of moth sampling reveals the importance of generalists for community stability - *Basic and Applied Ecology* - 2020
- A Potential Approach for Enhancing Carbon Sequestration During Peatland Restoration Using Low-Cost, Phenolic-Rich Biomass Supplements - *Frontiers in Environmental Science* - 2020
- Different bottom trawl fisheries have a differential impact on the status of the North Sea seafloor habitats - *ICES Journal of Marine Science* - 2020
- Moving from biodiversity offsets to a target-based approach for ecological compensation - *Conservation Letters* - 2020

- Choosing best practices for managing impacts of trawl fishing on seabed habitats and biota - *Fish and Fisheries* - 2020
- A framework linking ecosystem services and human well-being: Saltmarsh as a case study - *People and Nature* - 2019
- Mapping the consequences of artificial light at night for intertidal ecosystems - *Science of the Total Environment* - 2019
- Net Gain: Seeking better outcomes for local people when mitigating biodiversity loss from development - *One Earth* - 2019
- Impact of long-term nitrogen deposition on the response of dune grassland ecosystems to elevated summer ozone - *Environmental Pollution* - 2019

Ecological Surveys and Planning Consent

As previously discussed, the university undertakes a large range of biodiversity surveys across its sites, strongly supported by volunteers. These surveys include macromoth surveys, unimproved grassland surveys, orchid surveys, red squirrel monitoring, pond surveys, dormouse monitoring.

Bangor University does not remove trees as a matter of course, only in emergency cases where a tree poses a significant risk. Additionally, when tree cutting is required, this is only undertaken out of nesting seasons, unless in an absolute emergency. Tree management, including removal and cutting, is always supported by a detailed ecological survey to confirm no birds, bats or other wildlife reside in the tree.

When the university undertakes major construction projects these are always supported by a full ecological survey. The ecological survey for the development of the St Mary's Student Village identified bats residing in buildings on the site. As a result of this, all new buildings constructed on the site had bat roosting boxes installed and a building in the style of a house was constructed on the site specifically for the purposes of bat roosting.

4. Review of Section 6 Duty

In line with our ISO14001:2015 Environmental Management System, Bangor University produces an Environment Report annually, covering environmental performance over the previous academic year (August-July).

The university's Strategy 2030 - Sustainability Strategy outlines a new institutional vision for the management of the university. It further embeds the consideration and awareness of biodiversity and ecosystems in strategic planning and decision-making processes. This will be achieved through close working with in-house experts and learning from best practice and examples of others as required.

Section 6 of the Environment (Wales) Act duty is described as:

> The Biodiversity and Resilience of Ecosystems Duty (the Section 6 duty) set out in the Environment (Wales) Act 2016 requires that public authorities [including the university] must seek to maintain and enhance biodiversity in the exercise of functions in relation to Wales, and in so doing promote the resilience of ecosystems, so far as consistent with the proper exercise of those functions.

Bangor University will continue to ensure we are meeting those duties by:

- Maintaining and enhancing biodiversity across its estate
- Influencing future generations to be aware of their impact on the environment
- Communicating the university's commitments and policies on enhancing biodiversity to students, staff, and the wider community
- Continuing to engage with students, staff, and the wider community on ecological and environmental issues
- Raising awareness and the importance of biodiversity through campaigns
- Enhancing and improving understanding of our local habitats and species, including through surveys and data collection
- Continuing to educate and promote understanding and appreciation of the natural environment and its biodiversity

Appreciation

The University would like to thank everyone who has contributed to the compilation of this report, particularly staff from:

- Treborth Botanic Garden
- Campus Environmental Performance Team
- Grounds and Landscape Team
- Henfaes Research Centre
- Campus Services
- Students' Union