

THE BIODIVERSITY DUTY REPORTING TEMPLATE: LEVEL TWO ORGANISATIONS

Report Outline

Bodies are encouraged to use the following structure for their report. This is set out in the template below, which you can either type directly into, or copy into a separate document.

- Section 1: Introductory information about your public body
- Section 2: Actions to protect biodiversity and connect people with nature
- Section 3: Mainstreaming biodiversity
- Section 4: Nature-based solutions, climate change and biodiversity
- Section 5: Public engagement and workforce development
- Section 6: Research and monitoring
- Section 7: Biodiversity highlights and challenges

Completion Notes

These completion notes offer guidance to support your public body to complete your Biodiversity Duty Report. Taken together with the associated hyperlinks, they provide suggestions on the breadth of actions that could be included in your report. They may also assist with forward planning on how biodiversity can be taken into account in future.

While they incorporate the key elements on which you may wish to report, they are not an exhaustive list and it is likely that there will be a range of additional work that your organisation carried out in support of biodiversity on which you may also wish to report. To find out more on the Biodiversity Duty see the [NatureScot website](#).



SECTION 1: INTRODUCTORY INFORMATION ABOUT YOUR PUBLIC BODY

Please describe your organisation’s role and purpose, including any particular environmental responsibilities

<p>Guidance on completing this section</p>	<p>Summarise your organisation’s role and purpose, including a brief outline of governance and management structures.</p> <p>Summarise any relevance and impacts of biodiversity to your organisation, including your role in:</p> <ul style="list-style-type: none"> • Providing public information, community learning and education around nature and the environment; • Any key environmental impacts from your operations.
<p>Text Field</p>	<p>National Museums Scotland</p> <p>National Museums Scotland’s mission is to preserve, interpret and make accessible for all, the past and present of Scotland, other nations and cultures, and the natural world.</p> <p>Our ‘Public Task’ comprises all the statutory functions, duties and responsibilities set out in our governing legislation – the National Heritage (Scotland) Act 1985, Section 2(1).</p> <p>To:</p> <ul style="list-style-type: none"> ▪ Add to and care for our collections ▪ Ensure that they are accessible to the public, through exhibitions, learning resources and by other means ▪ Ensure that research on the collections is undertaken and communicated, and to create and share knowledge about them <p>National Museums Scotland’s Public Task is also reflected in the museums' strategic plan, and includes a significant range of activities. These are practices for which we are responsible but for which there may be no specific statutory or regulatory provision:</p> <ul style="list-style-type: none"> ▪ Creating inspiring visitor experiences at our museums and elsewhere



- Developing, preserving and increasing access to the National Collections
- Strengthening and sharing collections knowledge and research
- Reaching out to people across Scotland and the world
- Transforming our digital engagement
- Valuing, supporting and developing our people and empowering them to work together in new ways
- Growing and diversifying our income

The Board of Trustees is responsible for setting our strategic direction. Our Executive Team is responsible for day-to-day operations and for the implementation of strategy. The Organizational Strategy for Sustainability 2023-2030 is directly relevant to Biodiversity.

Providing Public Information

National Museums Scotland provides information on Biodiversity to the public through a variety of ways including programming for schools, local communities, and teachers; displays and exhibitions and web-based information.

Environmental impacts of operations

We have an organisational approach to carbon management and reduction to achieve net zero by 2045. We are therefore aware there is a carbon footprint related directly to our travel to conduct fieldwork in order to gain base data and conduct biodiversity monitoring and to share results with sister organizations and experts across the world. This can have a negative impact on carbon emissions but a positive impact on biodiversity, a balance that we strive to achieve.



SECTION 2: ACTIONS TO PROTECT BIODIVERSITY AND CONNECT PEOPLE WITH NATURE

Please describe and explain any actions that your organisation has undertaken alone or as part of a partnership to benefit biodiversity directly, to tackle the main drivers of biodiversity loss, or to achieve wider outcomes for nature and people

<p>Guidance on completing this section</p>	<p>You may wish to report on activities across the breadth of your organisation, including any actions that you have undertaken on your premises.</p> <p>Please explain how these actions have benefited biodiversity, noting successes and challenges, and any plans for future or follow-up work. These might include:</p> <p>Addressing or raising awareness of some of the key drivers of biodiversity loss, which might include work or projects to tackle:</p> <ul style="list-style-type: none"> • Climate Change; • Land use change; • Pollution. <p>Enhancing biodiversity at your premises through actions in and around offices, such as:</p> <ul style="list-style-type: none"> • providing bird boxes / feeders; • creating habitat for wildlife, such as wildflower areas; • installing green roofs; • organising staff volunteering days; • sponsoring a species or habitat, or raising funds for a local wildlife trust or charity.
<p>Links to related resources</p>	<ul style="list-style-type: none"> • Guidance on the Key pressures on biodiversity. • Guidance on Buildings and biodiversity - how to make space for nature in the built environment. • Information on placemaking, open space and green infrastructure. • Examples of smaller actions that can be enacted in the office or staff homes - Biodiversity - what can you do? • Case studies: <ul style="list-style-type: none"> ○ Scottish Water Volunteering Programme



Text Field	Biodiversity Action Plans BAPs <p>We have Biodiversity Action Plans for the outdoor areas of all our sites which are in different stages of development. Typically, the focus has been on changes to mowing regimes to develop grass meadows, but also highlight the importance of fallen branches and leaves for protecting overwintering animals. As the BAPs mature we shall also broaden habitat type; for example, creating wood piles and ponds.</p> <p>National Museums Collection Centre (NMCC) – suburban setting. Use as a public engagement tool in local communities – see below in mainstreaming Biodiversity. Our site is an example of how to make space for nature in the built environment.</p> <p>National Museum of Scotland (NMoS) – city centre. Even in the centre of the city, we have a roof terrace with native plantings. Currently working together with the Royal Botanic Gardens Edinburgh to scope opportunities for introduction of bryophytes to slow run-off during heavy rains.</p> <p>National Museum of Rural Life (NMoRL) – agricultural setting. The Museum of Rural Life has some very special habitats. The Coronation Meadow has been farmed in a traditional way for decades and has never been subjected to added fertilisers. It is one of a very few such meadows remaining in the UK, and has exceptionally elevated biodiversity levels. The mature hedgerows and “dry stane dykes” offer habitat for a wide range of insects. NMoRL offers a powerful message of how Agriculture and Nature can exist in harmony.</p> <p>National Museum of Flight (NMoF) – rural/ agricultural setting. As at NMCC, altering mowing regimes positively impacts on biodiversity. Now large tracts of land around the perimeter of the site are not cut between April and October. This is a simple but very effective way of highlighting to our visitors the importance of biodiversity.</p>
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Policy

National Museums Scotland is an active partner in a number of biodiversity initiatives in Scotland. We are a member of the BBD (Better Biodiversity Data) Project Group, have representation on the SBIF (Scottish Biodiversity Forum) Advisory Board and an NBN (National Biodiversity Network) Sponsor.



SECTION 3: MAINSTREAMING BIODIVERSITY

Please outline any steps your organisation has taken to incorporate biodiversity measures into its wider policies, plans or strategies. This should include decision-making structures and staff and organisational roles and responsibilities.

<p>Guidance on completing this section</p>	<p>Outline any of your own body’s policies, plans and strategies that refer to biodiversity, or that may affect biodiversity positively or negatively, and describe how these are reflected in the structure of your organisation.</p> <p>These may include policies on managing green spaces, consideration of biodiversity in estate management, procurement policies and purchasing decisions, use of an Environmental Management System, and Sustainability and Climate Change commitments.</p> <p>Detail any areas in which your organisation has most successfully implemented mainstreaming of biodiversity, or has demonstrated leadership in a local or national context, including through working with others, or raising awareness of biodiversity or nature.</p>
<p>Links to related resources</p>	<ul style="list-style-type: none"> • Guidance on Buildings, Highways and Infrastructure - Maintenance & biodiversity, • Research on Maximising the benefits of green infrastructure in social housing. • The Place Standard tool and associated Strategic Plan 2020-2023 provides a simple framework to structure conversations about place. • Guidance on establishing a Local Nature Conservation Sites system. • Case study - Procurement by the Scottish Courts and Tribunal (SCTS) Services. • The Forest Stewardship Council global forest certification system. • Guidance on Scotland's Pollinator Strategy, projects, resources • Case studies: <ul style="list-style-type: none"> ○ Local Nature Conservation Sites systems in North Lanarkshire and Aberdeenshire. ○ A Pollinator Action Plan in Aberdeenshire
<p>Text Field</p>	



Sustainability sits at the core of our Strategic Plan 2022-2027

Strategic Aim 3:

We will be well advanced on the path to a carbon neutral footprint and a respected resource for understanding climate and biodiversity challenges.

Our exceptional collection is a rich resource for creating knowledge and understanding. The natural science collection represents 300 years of collecting, providing invaluable data sources for measuring biodiversity change over time. As well as storing samples, our team of biodiversity scientists undertakes scientific fieldwork to provide evidence-based research, which contributes to the effort around the world to better understand human impacts on the environment.

The museum has a formal Sustainable Development Group that considers environmental issues including (biodiversity loss and climate change) in a co-ordinated way across the organization. This includes Estates Operations (Heating and lighting), Public Programming, Procurement and Primary Research on questions surrounding biodiversity (including monitoring).

We have a new organizational strategy for sustainability 2023-2030.

<https://www.nms.ac.uk/media/1168785/our-organisational-strategy-for-sustainability-23-30.pdf>

In addition to a carbon management policy, public programming and research we embed sustainability in all areas of the museums operations including exhibitions and procurement. For example, we sustainably procure materials for exhibition builds and aim to recycle them for subsequent exhibitions.

We promote the natural environment and biodiversity through close working with a number of partners such as NatureScot, The Royal Botanic Gardens Edinburgh, National Biodiversity Network, and the National Trust Scotland.

NMCCThe green spaces on the grounds at the National Museums Collection Centre in Granton were previously managed in a very traditional way, grass was cut short, and nature made neat and tidy. A



growing body of research is demonstrating that although this has been a cultural norm, it is not beneficial for biodiversity. If plants are allowed to grow and flower, we can hugely increase the value of the site for wildlife. In the last couple of years, the potential for biodiversity at NMCC has been enhanced and a team composed of staff from across National Museums Scotland, has come together to improve the way in which the green space is maintained.

Working with our contractors, GP Plantscape, we have redesigned the grass cutting regime, so that we have a mixture of vegetation heights. Margins are kept short to ensure good access and security compliance across the site, and small signs added to notify visitors to NMCC of the reason for the more natural appearance. Some areas are left uncut over winter, to provide cover and hibernation sites in the cold months and we've even sown some additional Scottish wildflowers.

We've boosted our recording effort, with regular insect and plant surveys conducted by NMS staff and volunteers from external organizations such as RBGE, plus designated recording days with local naturalist groups. We host a [BIOSCAN](#) malaise trap, specifically for monitoring flying insects, and we have installed camera traps and audio recorders to capture records of the more elusive bird and mammal visitors.

We've recorded 14 different species of butterfly (including the scarce Wall butterfly above) and plenty of wonderful moths, such as [Poplar Hawkmoths](#), Orange Swifts, [Canary-shouldered Thorns](#) and the striking red and black day-flying Burnet moths. I've been delighted to find that some of these insects are breeding on our site too. We have discovered caterpillars of Painted Lady butterflies, the iconic [Cinnabar moths](#), as well as the striking caterpillars of the Grey Dagger moth and some rather eye-catching Sawfly larvae.

It turns out that our site and the surrounding area supports enough invertebrate life to sustain a variety of birds and mammals too. Our camera traps show multiple foxes visiting the site, successfully hunting small mammals in our meadow areas, and our audio recorders have detected bats (Common pipistrelles). As for birds, we've recorded 40 species visiting NMCC, including Chiffchaffs, Redwings, Song Thrush, Pied Wagtails, Bullfinches, Swallows and a Common Kestrel.



To date, at NMCC we've recorded more than 270 species on iRecord so far, and a [summary of the survey](#) is available for anyone to view. We regularly share highlights via social media under the hashtag #NMCCbiodiversit.



SECTION 4: NATURE-BASED SOLUTIONS, CLIMATE CHANGE AND BIODIVERSITY

How has your organisation integrated biodiversity into nature based solutions to the climate emergency and other socio-economic outcomes?

Guidance on completing this section	<p>Climate change is a direct driver of biodiversity loss. Some species are dying out while others are being displaced due to warmer air temperatures, extreme weather patterns, and higher sea levels. As well as being a direct driver of biodiversity loss, climate change also worsens the other drivers. For example it enables quicker spread of non-native invasive species. Combined action for biodiversity loss and climate change can be achieved through nature-based solutions.</p> <p>This reporting section provides the opportunity for your organisation to provide details on how you are supporting the positive contribution biodiversity can make to building resilience, and helping nature to mitigate and adapt to climate change.</p> <p>Nature-based solutions can play a vital role in helping us to protect and enhance biodiversity, achieve net zero targets, and improve quality of life.</p> <p>You may wish to report on a range of specific processes or activities that your organisation has undertaken, including within your buildings and workforce, and projects that you have delivered.</p> <p>Integration might include incorporating biodiversity into nature-based solutions to:</p> <ul style="list-style-type: none">• The climate emergency, for example by developing climate change strategies that include nature, investing in green infrastructure, and taking action for pollinators.• Inclusive economic growth, for example by growing nature based industries, or investing in key natural visitor attractions• Health and wellbeing, for example by improving access to nature for all
Links to related resources	<ul style="list-style-type: none">• Information on how urban nature-based solutions can help Scotland's towns and cities mitigate and adapt to climate change providing guidance and examples.• The Helping nature to adapt webpage contains useful information on making use of nature's capacity to adapt to change as one of our best tools for managing climate change impacts, including through managing native woodlands and restoring peatlands.



	<ul style="list-style-type: none">• The publication People, Place and the Climate Emergency includes examples and information on local nature-based solutions to deliver a range of socio-economic outcomes.
Text Field	<p>Climate Change and Biodiversity loss</p> <p>Recognizing that biodiversity is negatively impacted by rapid climate change, National Museums Scotland has clear goals and procedures to reduce our carbon emissions in line with Scottish Government guidelines. We openly publish this data and it forms part of our public engagement on climate change.</p> <p>Through a long-term investment plan in our estate and infrastructure we have made energy efficiencies and year on year reductions in our carbon emissions.</p> <p>Our baseline year for energy-related carbon emissions was 2012/13. We are pleased that ten years on in March 2022 our carbon emissions have been reduced by 85.6%. The total for our reporting year 2021/22 was 1867 tonnes of carbon dioxide produced from our energy use, which is our lowest emissions footprint to date and is a reduction of approximately 2,201 tonnes of carbon dioxide compared to 2019/20.</p> <p>There is more work to do, however, especially in terms of Scope 3 emissions, and we prioritise:</p> <ul style="list-style-type: none">▪ Continuing to adopt and promote energy efficiency and the use of renewable resources throughout all our operations; our electrical supplies are 100% sourced from renewable sources along with our continued push to replace carbon-based heating systems across our whole estate▪ Setting targets for minimising waste and maximising reuse and recycling opportunities▪ Reviewing our procurement processes to ensure social value is built into our activities, along with sourcing from local suppliers wherever possible▪ Ensuring the promotion of sustainable materials and services, and stopping the use of materials with harmful production and disposal processes. <p>We recognize that there is sometimes conflict between measures to reduce carbon emissions and those to enhance biodiversity. For example, the introduction of LEDs in external lighting on our sites</p>



	<p>is recognized as an energy-saving measure. However, it has also been widely reported that their use negatively impacts on flying insect numbers. In such cases we acknowledge the challenge and aim for a balanced approach.</p>
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SECTION 5: PUBLIC ENGAGEMENT AND WORKFORCE DEVELOPMENT

Public Engagement

<p>Guidance on completing this section</p>	<p>Detail communications and education activities have you undertaken to inform or engage directly or indirectly with communities, young people and the public. This might include actions to raise staff, customer and public enjoyment and understanding of, and connection with, biodiversity and nature, such as:</p> <ul style="list-style-type: none"> • Supporting volunteering; • Exhibitions and events; • School outreach; • Outdoor learning; • Citizen Science initiatives; • Provision of public education programmes; • Information hosted on your webpage; • Blogs and press releases.
<p>Links to related resources</p>	<ul style="list-style-type: none"> • Ideas on volunteering outdoors. • Stats, stories, activities and inspiration to help bring nature and landscapes to life for young people and learners through education, including Beyond your boundary: easy steps to learning in local greenspace, and the Outdoor Learning Directory is a useful source of information and resources. • Ideas on citizen science activities that can increase public enjoyment, understanding and connection with nature. • Information on how to make more use of Scotland’s outdoors as ‘Our Natural Health Service’
<p>Text Field</p>	<p>Public Programs</p> <p>School Programming</p> <p>Throughout the year our Learning and Engagement teams run a variety of programmes on biodiversity. Examples include:</p>



The Circular Economy (collaboration with Ostrero)

<https://www.nms.ac.uk/explore-our-collections/resources/the-circular-economy/>

Brilliant Bugs 2021

Through the summer holidays we created, planned and delivered small projects engaging with diverse and under-represented audiences in a country park in West Lothian and museum settings at the National Museum of Flight in East Lothian, National Museum of Rural Life in South Lanarkshire and Hawick Museum in the Scottish Borders. These projects focused on our Natural World collections specifically biodiversity themes, building on the Brilliant Bugs online resources and was funded by Museums Galleries Scotland as part of the Scottish Government's Get into Summer programme.

Exhibitions

During the past three years a number of exhibitions have focused on biodiversity, conservation and sustainability. These have included:

Rising Tide: Art and Environment in Oceania, ran from 12 August 2023 – 14 April 2024. The exhibit delved into the most important and pressing issue of our time, humanity's damaging relationship with planet Earth. This urgent issue is felt especially deeply in Australia and the Pacific Islands where sea levels are rising due to climate change and the oceans are filling with plastic. Rising Tide considered our relationship to the natural environment through contemporary responses to climate change and plastic waste by Indigenous Australian and Pacific Islander artists. Master fisherman Anthony C Guerrero's contemporary woven baskets made from plastic construction strapping found on his local beach in Guam were just one part of the exhibit. The exhibition hosted the latest version of artist George Nuku's installation, *Bottled Ocean 2123*, which imagines the state of the oceans 100 years into the future in an immersive, undersea landscape crafted from single use plastic bottles.



Monkeys! A Primate Story, our international touring exhibit, developed in-house, opened at its fifth international venue in May, 2023. It explores the fascinating world of primates and the diversity of today's apes and monkeys. It includes sections devoted to their conservation and to date has reached over 500,000 visitors.

Scotland Precious Seas

In 2021, the exhibition *Scotland's Precious Seas* showcased the beauty and diversity of our waters along with the breadth of National Museums Scotland's marine collections. The display provided insights into the valuable research taking place in our waters and how this will aid conservation efforts in years to come.

Some of the Displays, such as the Survival Gallery in Animal World, address key environmental issues, including over-fishing, deforestation, plastic waste and illegal hunting and their frequent devastating impact of biodiversity across the globe. These are updated on a periodic basis to retain relevance. In 2022 Adventure Planet was completely refreshed with a new range of activities around biodiversity past and present to engage with our younger audiences.

Hosting Events

- 1) NMS has hosted the Edinburgh Conservation Film Festival as part of the Edinburgh Science Festival since 2022 <https://www.ecff.co.uk/>. ECFF is a family-friendly festival that has a global reach on film submission. It was founded by a consortium of Scotland-based organisations (including National Museums Scotland) promoting the inclusion of science into biodiversity conservation management and policy.
- 2) Edinburgh International Science Festival. In 2021 the pale Blue Dot exhibition formed part of the programme in the Grand gallery. This featured educational stalls and art-pieces about our oceans, with a strong focus on marine biodiversity. In 2023 we featured the Experimental Life exhibition in the Grand Gallery including educational stalls and art pieces on how humans use experiments to find out about the natural world, including microscope stations and lab testing for Archaea.



- 3) Hosted a NatureScot COP15 awareness event 16 December 2022.

Staff Development

- 4) All staff across the organization receive an e-module training course in the Climate Emergency. Additional course in Sustainability are available to staff..
- 5) The Learning and Engagement Team have developed an Environmental Sustainability Toolkit to help staff and also contractors

Staff Engagement

- 6) Run foraging walks for staff in the NMCC grounds during summer 2023
- 7) Encourage staff from all departments to contribute to biological recording at NMCC
- 8) We include staff from our neighbours at NMCC, National Galleries Scotland, in our biodiversity events at the site.

Volunteering

- 9) We provide opportunities for volunteer work on our Biodiversity Action Plan at the National Museums Collections Centre. These include on site monitoring, but also processing data such as camera trap footage or sound recordings remotely.
- 10) Opportunities for volunteers with taxonomic skills. Both active and retired academics volunteer their skills at the Collection Centre, helping in many ways including retraining the next generation of biologists. Volunteer entomologists sort through the specimens collected in our monitoring traps and collecting trips around Scotland and elsewhere.

Teaching

- 11) We provide taxonomic training for students and potential volunteers so that they can be involved in biological recording and field work.



	<p>12) At National Museum of Rural Life we run a range of biodiversity programmes throughout the year. These include Spring Explorers, Tractor Tots, Willow Harvest, Growing for Sustainability and Learning for Sustainability.</p> <p>13) Family events throughout the year at the Chambers Street site such as activities to celebrate Earth Day and Insect Week.</p> <p>14) Participation in Community events such as the North Edinburgh Community Festival in May. Centres on handling objects linked to animal extinction, habitat loss and rewilding for over 200 visitors, raising awareness environmental and sustainability themes</p> <p>Digital Media</p> <p>15) Webpages, social media campaigns, and films have been produced to support and communicate the museum's Sustainability and Biodiversity public programming. This includes event listings on nms.ac.uk, social media posts on Facebook, Instagram, and Twitter / X, and films produced for distribution online and at public events.</p> <p>16) Webpages have been created to communicate the museum's commitment to and work across Sustainability and Biodiversity. This includes a dedicated Biodiversity "hub", the launch of a sustainability landing page, and the production of Explore articles and Blogs.</p>
	<p>Communicating via media</p> <p>17) May 2021, New York Times feature on the still ongoing collaborative research project, Do Not Feed the Animals</p> <p>18) August 2021, Sunday Times feature on the CryoArks project and the Scottish Wildcat</p> <p>19) September 2021, Scotsman opinion piece on the role of Museums in promoting sustainability and awareness of climate and biodiversity issues through collections, research and public programming</p> <p>20) April 2022 photo-op & release around the reopening of our Adventure Planet gallery.</p> <p>21) July 2022, scenes filmed at the National Museums Collection Centre formed part of the Channel 4 Documentary, What Killed the Whale.</p>



	<p>22) August 2022, widespread national coverage for the announcement of the acquisition by bequest of a collection of fossil birds from the Eocene period, a time when Earth’s climate was far hotter than it is today.</p> <p>23) September 2022 transmission of BBC Radio 4’s Wild Inside, exploring the anatomy of the cheetah at the National Museums Collection Centre.</p> <p>24) January 2023 January - Hosted BBC’s Winterwatch programme live from the roof of the Museum, plus several pre-recorded features to do with biodiversity throughout the series.</p> <p>25) January 2023 – story of the first recorded stranding of a short-finned pilot whale in UK waters achieved national coverage.</p> <p>26) July 2023 – pre-publicity around Rising Tide exhibition included biodiversity messaging and coverage of the involvement of local volunteers.</p> <p>27) October 2023 – announced forthcoming exhibition Wildlife Photographer of the Year.</p>
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Workforce skills and training

<p>Guidance on completing this section</p>	<p>Detail activities that have been undertaken to support the development of your workforce, particularly in relation to skills relevant to biodiversity, nature, outdoor learning and community engagement in the natural environment.</p> <p>Activities might include:</p> <ul style="list-style-type: none"> • Staff training, education and capacity building; • Hosting conferences, exhibitions and events; • Collaborative working with other organisations and sharing best practice.
<p>Text Field</p>	<p>Staff Involvement</p> <ol style="list-style-type: none"> 1) Staff across the organization are invited to participate in our biodiversity action plans at each of our sites. 2) We have an active Green Advocates Group



	<p>3) The Learning and Engagement Team developed an Environmental Sustainability Toolkit to help staff and contractors</p> <p>Hosting Conferences</p> <p>4) The NBN (National Biodiversity Network) annual conference was sponsored and hosted by NMS in November 2023. We aim to host this conference on a regular basis (previously it was held here in 2016). This National (UK) conference has a mixed audience, including biodiversity professionals, biological recorders, natural historians, policy makers and commercial environmental surveyors.</p> <p>Training</p> <p>A Climate Emergency e-learning training course is offered to all members of staff across the museums.</p>
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Identify any opportunities that are available to your staff to take part in practical actions

<p>Guidance on completing this section</p>	<p>Activities might include:</p> <ul style="list-style-type: none"> • Volunteering days, for example with environmental Non-Governmental Organisations; • Participation in staff networks that aim to deliver on or promote objectives related to biodiversity or nature; • Opportunities for secondments to other organisations working on biodiversity and conservation.
<p>Text Field</p>	<p>Our scientists are encouraged to regularly attend and contribute to national and international professional conferences promoting better understanding in the area of biodiversity. They also regularly visit other institutions such as universities, museums and research organizations to learn best practice and to forge networks and collaborations.</p> <p>Staff also volunteer their time to work with organizations such as BugLife.</p>



SECTION 6: RESEARCH AND MONITORING

Describe any research activities that your organisation has undertaken to help develop understanding and awareness of biodiversity or nature

<p>Guidance on completing this section</p>	<p>Detail relevant research activities undertaken to raise awareness and understanding of nature and biodiversity, or to understand the way in which communities engage with the natural world. Where relevant, summarise the key changes that this research has supported within your public body.</p> <p>This might include research papers, surveys or reports undertaken by your organisation.</p>
<p>Text Field</p>	<p>National Museums Scotland Scientists and Curatorial departments undertake and support research on several areas of primary research related to biodiversity, in particular taxonomic studies describing new species, monitoring activities including changing distribution records (especially across Scotland) and conservation programs such as the Scottish Wildcat. We house and update the Scottish Insect Records Index (SIRI).</p> <p>An example of a recent publication on changing range distributions:</p> <p>Horsfield, D.*, MacGowan, I.* & Strachan, I. 2023. <i>Gymnocheta lucida</i> Zimin (Diptera, Tachinidae) new to Britain with a key to males of British <i>Gymnocheta</i> species. <i>Dipterists Digest</i> 30: 218-225.</p> <p>Darwin Tree of Life (DToL)</p> <p>Foundational science programme aimed at publishing the whole genome sequences for the estimated 70,000 species of complex organism living in the UK. It is a programme co-ordinated by Wellcome Sanger laboratories (Cambridge) and we have contributed specimens to this initiative including this year two parasitic wasps from the grounds surrounding the National Museum Collections Centre.</p> <p>BioScan</p>



Surveying biodiversity at NMCC includes the BioScan programme monitoring flying insect populations in a malaise trap. We also monitor a similar trap at the Royal Botanic Gardens Edinburgh.

Taxonomic Research

The description of new species and revision of previous work lies at the heart of research into biodiversity. Undertaking this work and facilitating similar work by the wider research community forms one of the key roles of the curators of zoological sciences at NMS.

Examples of recent publications from National Museums scientists describing new species;

Alström, P., Mohammadi, Z., Donald, P.F., Nymark, M., Enbody, E.D., Irestedt, M., Elisha, E.B., Ndithia, H.K., Tieleman, B.I., Engelbrecht, D., Olsson, U., Rancilhac, L., **Stervander, M.** 2023. Integrative taxonomy reveals unrecognised species diversity in African *Corypha* larks (Aves: Alaudidae), *Zoological Journal of the Linnean Society*. <https://doi.org/10.1093/zoolinnea/zlad107>

Shaw, M.R.* 2022. Two new species of European *Microgaster* Latreille, 1804 (Hymenoptera: Braconidae, Microgastrinae), with host data on some further species. *Entomologist's Gazette* **73**: 219–232. <https://doi.org/10.31184/G00138894.734.1867>

Shaw, M.R.* and Colom, P. 2022. Notes on the three species of *Cotesia* Cameron, 1891 (Hymenoptera: Braconidae, Microgastrinae) parasitizing *Gonepteryx* [Leach, 1815] species (Lepidoptera: Pieridae) in Europe, with description of a new species from the Balearic Islands. *Entomologist's Gazette* **73**: 253–260. <https://doi.org/10.31184/G00138894.734.1872>

Tracking biodiversity

Our collection provides a rich resource for creating knowledge and understanding. In particular, our natural science collection represents almost 300 years of collecting, providing invaluable data sources for measuring biodiversity change over time.

The physical description of species (phenotyping) by taxonomists underpins all we know about



biodiversity. However, we know that this is woefully incomplete and current estimates indicate that there are at least 15 million species living on earth today, yet only 2 million are described. Recent advances in genetic techniques (DNA extraction and barcoding) have opened up our natural science collection to a range of new opportunities for understanding and monitoring biodiversity. The continued development of our Biobank over the past year is therefore key to the future growth and use of the collection.

As well as storing samples, we undertake scientific fieldwork to provide rich evidence-based research into environmental change and biodiversity loss. The work of the Natural Sciences team and the breadth of collections-generated information contributes to the effort in the UK and around the world of better understanding human impact on the environment.

In response to the pandemic we shifted survey work and monitoring of biodiversity to areas around Edinburgh. One of our most important collections of insects was made by Edward Pelham-Clinton in the 1900s with many of the biodiversity collecting sites being local. Over the past year our Invertebrates team has returned to many of Pelham-Clinton's collecting localities to re-sample them. This can be used to record how changing land use has impacted on biodiversity in our own 'backyard'.

Research on Conservation

The impact of altered diets, particularly related to animal/ human interactions (e.g. in urban environments) on animal development has been the focus of a major Wellcome Trust grant called Do Not Feed the Animals of which NMS is a collaborating partner. This is highly relevant to captive breeding programmes and the project has also been looking at animal welfare in these situations. Expertise of NMS curators and scientists has also been utilized in international studies, e.g. clouded leopard.

Some examples of recent publications in Conservation:

Jamieson, A., Carmagnini, A., Howard-McCombe, J., Doherty, S., Hirons, A., Dimopoulos, E., Lin, A.T., Allen, R., Anderson-Whymark, H., Barnett, R., Batey, C., Beglane, F., Bowden, W., Bratten, J., De Cupere, B., Drew, E., Foley, N.M., Fowler, T., Fox, A., Geigl, E.-M., Gottfredsen, A.B., Grange, T., Griffiths, D., Groß, D., Haruda, A., Hjerminde, J., Knapp, Z., Lebrasseur, O., Librado,



	<p>P., Lyons, L.A., Mainland, I., McDonnell, C., Muñoz-Fuentes, V., Nowak, C., O'Connor, T., Peters, J., Russo, I.-R.M., Ryan, H., Sheridan, A., Sinding, M.-H.S., Skoglund, P., Swali, P., Symmons, R., Thomas, G., Jensen, T.Z.T., Kitchener, A.C., Senn, H., Lawson, D., Driscoll, C., Murphy, W.J., Beaumont, M., Ottoni, C., Sykes, N., Larson, G., Frantz, L. 2023. Limited historical admixture between European wildcats and domestic cats. <i>Current Biology</i> 33: 4751-4760. https://doi.org/10.1016/j.cub.2023.08.031</p> <p>Howard-McCombe, J., Jamieson, A., Carmagnini, A., Russo, I.-R.M., Ghazali, M., Campbell, R., Driscoll, C., Murphy, W.J., Nowak, C., O'Connor, T., Tomsett, L., Lyons, L.A., Muñoz-Fuentes, V., Bruford, M.W., Kitchener, A.C., Larson, G., Frantz, L., Senn, H., Lawson, D.J. and Beaumont, M.A. 2023. Genetic swamping of the critically endangered Scottish wildcat was recent and accelerated by disease. <i>Current Biology</i> 33: 4761–4769. https://doi.org/10.1016/j.cub.2023.10.026</p> <p>MacGowan, I.* 2023. Managing Aspen stands in the Scottish Highlands for dead-wood insects. <i>Conservation Land Management</i> 20(1): 17-23.</p> <p>Yuan, J., Wang, G., Zhao, L., Kitchener, A.C., Sun, T., Chen, W., Huang, C., Wang, C., Xu, X., Wang, J., Lu, H., Xu, L., Jiangzuo, Q., Murphy, W.J., Wu, D. and Li, G. 2023. How genomic insights into the evolutionary history of clouded leopards inform their conservation. <i>Science Advances</i> 9 (40). https://doi.org/10.1126/sciadv.adh9143</p>
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What follow-up actions or monitoring have you undertaken to assess the impacts of the actions you have taken? How have you measured this? If you do not carry out any monitoring activities, please explain why.

Guidance on completing this section	<p>Where appropriate, you may wish to report on monitoring of:</p> <ul style="list-style-type: none"> • Activities relating to recording of engagement with or understanding of nature; • Your contribution in meeting national and international biodiversity targets; • Biodiversity related programmes or projects that you have delivered either alone or in partnership with others;
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	<ul style="list-style-type: none">• Implementation of relevant strategies or policies;• Organisational capability or development in relation to biodiversity or the natural world.
Links to related resources	<ul style="list-style-type: none">• Information on biodiversity data, including obtaining and sharing data from Local Records Centres Biodiversity - where to find data.• The State of Scotland's Nature report provides a useful overview.• The National Biodiversity Network provides a single hub for biodiversity data management in the UK.• Biological Recording in Scotland is a useful source of information on surveys and biodiversity data management in Scotland.
Text Field	Constant collecting from sites around Scotland as well as on our own Estate. Regular surveying data of BioScan trapping programme ultimately sent to NB, but frequently through other pathways such as iRecord.



SECTION 7: BIODIVERSITY HIGHLIGHTS AND CHALLENGES

Describe your organisation’s main achievements for biodiversity over the reporting period and what you are most proud of (this can include processes, plans, projects, partnerships, events and actions).

<p>Guidance on completing this section</p>	<p>Examples of key achievements might include:</p> <ul style="list-style-type: none"> • Leading or contributing to programmes or projects that directly support the key steps in the Scottish Biodiversity Strategy, or contribute to international Biodiversity targets; • Demonstrating national leadership or expertise in relation to biodiversity or nature; • Meeting your strategic aims in relation to biodiversity; • Completion of key projects with relevance to biodiversity or nature; • Funding achieved or delivered; • Volunteering days or time invested; • Provision of successful education or public engagement activities.
<p>Text Field</p>	<p>During the period we have demonstrated our role as a respected source of biodiversity-related information in Scotland. The natural science collections are the second largest in the UK representing a library of biodiversity that attracts researchers from around the world to conduct primary research. During the period we have introduced a Biobank to the collections, providing opportunities for sophisticated genetic approaches for biodiversity research – hopefully increasing the speed and effectiveness with which we can monitor biodiversity changes.</p> <p>We have hosted events for NatureScot and National Biodiversity Network and we also collaborated closely with a range of organizations such as the Royal Botanic Gardens Edinburgh, James Hutton Institute, and the Natural History Museum, on biodiversity monitoring programs such as BioScan.</p> <p>We contribute to landmark conservation projects such as Forth Restoration, Pine Hoverfly, and Scottish Wild Cat Conservation.</p> <p>Our work on biodiversity enhancement at our Collections Centre in Granton is a good example of how small changes in land management of an urban site can have a significant impact on biodiversity.</p>



	<p>We are pleased to be a signature to the Edinburgh Declaration on post-2020 Biodiversity.</p> <p>We have continued to provide a rich and varied programme of biodiversity themed offerings for schools and families at all our public sites. This includes acting as a host for other organizations such as the Marine Conservation Society Scottish Youth Conference in June 2023.</p> <p>The variety of our exhibitions addressing different aspects of biodiversity ranged from <i>Our Precious Seas</i> and <i>Rising Tide</i> to the international touring exhibition <i>Monkey Business</i> have enabled us to reach a broad audience</p>
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Looking ahead, what do you think will be the main challenges over the next three years?

<p>Guidance on completing this section</p>	<p>Challenges might include:</p> <ul style="list-style-type: none"> • Economic and resource pressures; • Delivery of cross-cutting actions; • Preventing further loss of habitats and species; • Effective management of invasive non-native species; • Pressures for space; • Need to meet targets; • Encouraging enhanced partnership working.
<p>Text Field</p>	<p>Biodiversity estimates currently indicate that we know 20% or less of the world’s extant species. How can we better address issues of conservation when we know but a fraction of what it is that requires conserving? Training of the next generation of taxonomists is crucial, yet there are fewer courses being offered at institutions of higher education. As a result of this gap in training, we are seeing certain groups of organism lacking experts to make accurate taxonomic identifications. Additional resource for training of taxonomists is required, and finding resources for monitoring the constantly changing biodiversity levels in an already depleted landscape will only get harder.</p> <p>If we are to halt this decline in taxonomic expertise, perhaps Citizen Science is going to become something that we must turn to more and more.</p>



Costs of Biodiversity-friendly procurement will be an increasing challenge. Avoiding products (e.g. palm-oil) that have contributed to deforestation of biodiverse forests will require increased effort.

National Museums Scotland is a key stakeholder in a proposed multi-million-pound UK Research Infrastructure initiative called DiSSCo UK (Distributed System of Scientific Collections). The aim is to digitize the UK's natural science collections to make them freely accessible to all. Without UK Government funding through UKRI this will severely challenge one of our key priorities: to make a critical part of Scotland's biodiversity data available to all.

Against this landscape of scarce resource, it is critical that we combine our resources as much as possible: striving towards greater collaborative working across all stakeholder groups. The demands for delivering on the Scottish Biodiversity Strategy and initiatives like the Better Biodiversity Data will increase over the next three years. Coming together to collaborate across Scottish research institutions around these crucial initiatives will be challenging with limited resources.