



JNCC Terrestrial Biodiversity Evidence Strategy

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Our vision is to provide an evidence base on biodiversity that will meet the needs of current and future generations for understanding and improving the environment.

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1. Introduction

This document sets out a strategy to guide the Joint Nature Conservation Committee's (JNCC) provision of UK terrestrial biodiversity evidence (including freshwater and coastal areas) through survey and analysis. This strategy supersedes the previous UK Terrestrial Biodiversity Surveillance Strategy¹, is complementary to the UK Marine Biodiversity Monitoring Strategy² and is closely aligned with the JNCC strategy 2017–2020³. The development of this new strategy is timely because in recent years the thinking about ecosystems, ecosystem services and natural capital has developed and consequently the evidence we provide needs to evolve alongside this. In addition, technological advances now allow the collection of more and new types of data, and we need to adapt to take advantage of these opportunities.

This strategy was developed by the Review Programme Board. The Review Programme Board has representation from each Country Nature Conservation Body (CNCB), Defra and the devolved administrations, two independent academic members, as well as members of JNCC. The Review Programme Board was established in February 2018 with the purpose of formulating and agreeing this strategy, whilst developing support for a fit-for-purpose JNCC terrestrial evidence portfolio, and an understanding of its value to the CNCBs, Defra, devolved administrations and surveillance partnerships⁴.

Biodiversity data and evidence are collected by a wide range of organisations in the UK including CNCBs, non-governmental organisations (NGOs), businesses, the research

¹ <https://jncc.gov.uk/our-work/the-uk-terrestrial-biodiversity-surveillance-strategy/>

² <https://jncc.gov.uk/our-work/uk-marine-biodiversity-monitoring-programme/>

³ <https://hub.jncc.gov.uk/assets/ccb9f624-7121-4c32-aefa-e0579d7eaaa1>

⁴ http://archive.jncc.gov.uk/pdf/JNCC1801_Terrestrialevidencereviewpart1.pdf

community and many individual volunteers. JNCC's contributions to this have been through supporting national structured species surveillance schemes and wider biological recording. More recently we have invested in new monitoring approaches and building our capacity to analyse and use data.

This strategy acts as a framework outlining the diverse ways in which JNCC could effectively contribute to UK and country evidence bases on biodiversity, but it does not prioritise the actions. Each year an implementation plan for the strategy will be developed based on current and evolving UK and country requirements. This document will more explicitly set out JNCC strategic priorities for each year and in the longer term, their targets and success measures, and will outline funding mechanisms. This approach reflects JNCC's strengths in being responsive and flexible to changes in evidence requirements in a shifting political landscape across the UK countries, whilst also continuing to support long-running biodiversity surveillance.

i) Our remit and purpose

JNCC is the public body that advises the UK government and devolved administrations on nature conservation in the UK and internationally. JNCC's UK remit and functions are set out in the Natural Environment and Rural Communities Act 2006⁵:

- Advise Government on the development and implementation of policies for, or affecting, nature conservation in the UK and internationally;
- Provide advice and disseminate knowledge on nature conservation issues affecting the UK and internationally;
- Create common standards throughout the UK for nature conservation, including monitoring, research, and the analysis of results;
- Commission or support research that is deemed relevant to these functions.

Our strengths, enabling effective delivery of these functions, are:

- We are uniquely positioned at the interface between science and policy, working across the four countries of the UK and internationally.
- We have worked in partnership with NGOs and academics for over 25 years, to deliver high quality, robust information on biodiversity to meet policy needs and engage with the general public through volunteering.
- We are forward-looking and responsive to challenges and the opportunities of change, in relation to evolving policy and monitoring questions and the effective application of new technologies to answer them.
- We have a successful track record of convening CNCBs across the UK alongside the research community to collaborate on initiatives, encouraging developments and efficiencies for all.
- We have experience in generating biodiversity evidence for policy where knowledge gaps exist by identifying and implementing the most cost-effective methods; be this analysis of existing data sets in novel combinations, developing new recording methods for existing surveillance schemes, or establishing completely new partnership surveillance schemes.
- We employ experts in analytical, technical and legislative areas, enabling innovation and the ability to set standards in numerous aspects of biological recording and research.

ii) Our evidence portfolio

The key goal of the JNCC terrestrial evidence portfolio is the provision of policy and delivery relevant information for sustaining biodiversity and ecosystems. This goal is set out as the

⁵ <http://www.legislation.gov.uk/ukpga/2006/16/contents>

first strategic outcome of the JNCC Strategy 2017-2020⁶: “*High quality evidence on biodiversity and ecosystems to inform decisions affecting the environment.*” The goal of sustaining biodiversity and ecosystems is not new; however there is increasing urgency to inform decisive action in the decade ahead, in response to the global climate emergency and biodiversity crisis. This has shifted the focus to ensuring that the decisions that are made today are able to improve the environment for future generations, and this provides new challenges for JNCC evidence provision. Providing for future generations includes a need to understand how the environment is changing; how ecosystems provide services, and how environmental pressures and management interventions influence these ecosystems and the biodiversity within them.

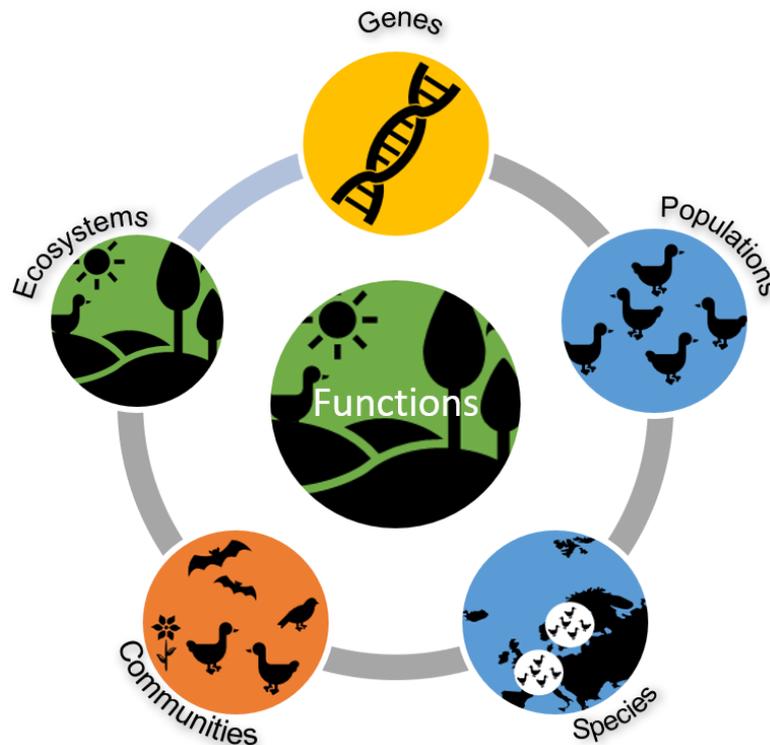
The current JNCC terrestrial evidence portfolio consists of long-standing partnerships to deliver eight structured biodiversity surveillance schemes, as well as supporting over 80 recording schemes collecting less-structured data. The vast majority of these data are collected by volunteers, contributing a wealth of taxonomic expertise across the UK for a relatively modest investment. This approach provides a high density of sample points and a long time-series with strong leverage of co-investment from NGOs, research bodies and from the volunteers themselves. JNCC investment provides the necessary resource to coordinate and support the volunteers, as well as investing in analysis of the resulting data. The long time series of data collected has been used for a variety of purposes: to generate biodiversity indicators; for official statistics; to understand the impacts of pressures and management on species; for reporting on biodiversity status; and for valuing ecosystem services and natural capital.

Increasingly, the terrestrial evidence portfolio includes exploration of new ways to integrate species data with other data sources, for example from earth observation, country-specific monitoring data sets or data collected by other organisations. This enables new analyses and greater ecological understanding at multiple scales and in multiple countries. This new strategy builds on the strength of working with volunteers to collect data, whilst assessing the need for additional development and analysis for UK countries.

⁶ <https://hub.jncc.gov.uk/assets/ccb9f624-7121-4c32-aefa-e0579d7eaaa1>

2. Types of biodiversity evidence

UK biodiversity is multifaceted, and hence we need to generate evidence on many different aspects of biodiversity change if we are to understand and manage it. These include:



Genes

Within-species genetic diversity

Methods for collecting and analysing genetic data are becoming increasingly available. These methods can be used to detect the presence of species, which provides information about community composition. They can also enable an assessment of within-species genetic diversity, which can influence the viability and adaptability of populations, community structure, and ecosystem functioning. Understanding genetic diversity therefore helps to predict and manage risks to biodiversity and ecosystems, and also forms part of international biodiversity reporting commitments.

Whilst genetic diversity is recognised as a key component of biological diversity, it has not formed a part of any broad-scale surveys in JNCC's evidence portfolio to date. DNA sample collection may not require a high level of technical expertise, so this may be feasible by volunteers, though the associated analytical infrastructure for samples is still required. We envisage a potential role for volunteer networks in collecting data in response to a specific need for evidence, likely collected through short-term campaigns with allocated funding. For example, a snap-shot view of genetic diversity in host plant species could be valuable to understand their potential resilience to a newly introduced pest or pathogen. This would be a novel area of evidence generation for JNCC in terrestrial ecosystems, though building on our existing expertise in developing volunteer surveys and in environmental DNA. We will also consider the integration of genetic analysis from other studies alongside the species information generated within the evidence portfolio.

Populations

Local populations of species

Understanding population dynamics at site or broader scales can assist in targeting interventions more effectively and in preventing species loss. When building an understanding of how species are faring on particular sites, a good knowledge of the population dynamics can be key; this can be achieved in a number of ways, including through building understanding of demographic data. Site-based indices of population abundance and trends can allow early intervention to prevent species loss and a better picture of the importance of particular sites for a species.

Site-based indices of species abundance and trends are already produced by a number of structured schemes, alongside some demographic data, which is particularly detailed for many bird species. These include measures of abundance, population growth rates, survival and productivity metrics. We will build on this work to provide more standardised methods for surveying local population abundance and trends, and will also assess how to utilise further the demographic information collected by schemes.

Species

Status and trends of species distribution and abundance

Information on species distribution and abundance is a mainstay in understanding biodiversity, and facilitates public engagement and reporting on national and international targets, as well as understanding large scale changes in the environment. There is a need for more comprehensive species coverage (taxonomically and geographically), particularly where greater taxonomic coverage would give a fuller picture of environmental change (for example on pollinators). This will provide more of the building blocks for understanding communities and functions.

We will lean on our strengths of working in partnerships and with volunteers to monitor species distribution, abundance and trends, and will use innovative methods (e.g. new techniques, technologies and engaging new volunteers) to fill knowledge gaps.

Communities

A group of species occurring together, forming characteristic groups within ecosystems

Information on communities focuses on the species interactions that occur in a particular place and time. Understanding the complex systems produced by these species interactions can provide new insights into how the environment is changing, and how environmental pressures are causing change. For instance, there have been recent concerns over whether common species are becoming more dominant in communities, potentially alongside losses of specialised species and ecosystem resilience. Diversity of communities provides another important measure of biodiversity.

We will develop conceptual frameworks and analytical methods to understand community change. This will include multi-taxon analyses of species interactions, potentially using data from new technologies, for example from DNA. Whilst most of the opportunities will require new analytical work, some may lead to modifications to field data collection, such as collecting more spatially-explicit information on species interactions, in order to maximise the information gained.

Ecosystem distribution and structure

Combination of communities and their abiotic environment

Ecosystems are formed by the complex of communities and their non-living environment interacting as a functional unit. They include what are often referred to as 'broad habitats'. Many policy decisions are effective at an ecosystem level, e.g. decisions affecting grazing will alter the grassland ecosystem. This strong relationship with decision-making means that the ecosystem is an important facet for evidence provision.

We will work to integrate species data alongside data on communities and the physical environment in order to provide new metrics on change in ecosystem distribution and structure. There are significant opportunities available through combining species data with EO-derived parameters to develop new understanding of condition and change within ecosystems.

Ecosystem functions

Ecosystem function arising from genes, species, populations or communities

In recent years there has been increasing focus on the need to monitor ecosystem functions (often referred to as assessing the 'health' of the ecosystem), and understand the mechanisms underpinning ecosystem functionality. Changes in ecosystem functions are indicative of the potential changes in the ongoing survival of the ecosystem components, and healthy ecosystem functioning is key to the sustainable provision of ecosystem services. Typical functions include primary production, carbon sequestration, water protection and nutrient cycling.

We will continue to work on analytical methods that develop the monitoring and understanding of ecosystem function. The breadth of taxonomic coverage provided by the terrestrial evidence portfolio allows for analytical opportunities that can normally only be met at small scales. We will particularly focus on those aspects of function that can be used alongside other data to assess ecosystem service provision.

3. Supporting evidence collection, processing and use

The previous section sets out the types of evidence that we are interested in generating. Some of this evidence can be created through continued effort in the areas within which we currently excel, and other types will require new activity in order to fulfil new requirements. This section sets out the four headline activity areas in which we intend to work:

- Developing capacity in biodiversity recording
- Data collection
- Data processing, analysis and synthesis
- Data use

The table below sets out our objectives within these areas, how we currently work towards the objectives, and our future ambitions in terms of how we want to work.

Develop capacity in biodiversity recording

To support and develop the biodiversity recording community

Objective	Our current role	Our future ambitions
<p>To grow a diverse network of skilled volunteers invested in biological recording</p> <p><i>We rely on a network of thousands of highly skilled volunteers to deliver some of the best biodiversity data in the world, but our partnerships do not reach everyone. We want to grow and support this network so that more people can benefit from enjoying, studying and engaging with the natural environment through our schemes, and so that our schemes will produce more data. This will mean that we can do more, and that our schemes will give back more to society. Support includes training, which can be a powerful method for motivating and empowering people.</i></p>	<p>We work in partnerships to engage with volunteers interested in a range of activities associated with biological recording, who have a range of skills, particularly in taxonomic identification. We work with partners to develop online guidance and training resources for volunteer recorders, to enhance their skills and increase the quality of data they collect.</p>	<ul style="list-style-type: none"> • We will continue working with partners to understand current and future volunteer motivations to encourage continued involvement in schemes, and recruitment of new volunteers. • We will create opportunities to engage with a wider range of volunteers with different backgrounds and interests, to encourage awareness of and engagement with biodiversity recording and the natural environment. For example, we could consider how to engage more volunteers in analysis and interpretation of data. • We and our partners will identify and promote new opportunities to provide training for volunteers, continue to incentivise and encourage new volunteers, improve data quality, and fill survey gaps.
<p>To ensure relevant evolution of surveillance schemes</p> <p><i>Many surveillance schemes have a long history and legacy, which brings benefits of long time series and strong volunteer networks. However, evolving technology and research means that some elements of schemes may need to adapt to remain relevant.</i></p>	<p>We work closely with partners in the recording and research community to ensure the collection and analysis of data that meet volunteer, research and government needs. We aim to ensure schemes are well-designed and structured, so they can be analysed in numerous ways to answer a range of policy questions as they arise.</p>	<ul style="list-style-type: none"> • We will work with partners to evolve current scheme parameters to ensure they are relevant to stakeholder requirements. For example, if refining or increasing the habitat information that volunteers collect allows us to interpret data more effectively, we could modify schemes to accommodate this.
<p>To evaluate and apply new technologies</p> <p><i>There is a large range of new technologies (e.g. DNA, earth observation, automated acoustic surveys, social media, artificial intelligence) that could enhance the</i></p>	<p>We collaborate closely with the recording and research community to identify opportunities from new technology, and work in partnerships to implement new options for collecting</p>	<ul style="list-style-type: none"> • We will further explore the feasibility of integrating new technology for monitoring within partnership recording schemes, to enhance the information collected by volunteers.

<p><i>efficiency of existing systems or provide novel biodiversity information. However, there are challenges in identifying opportunities at the right time, getting new technology operational, and receiving buy-in from the recording community.</i></p>	<p>and using data. Current active areas of work involve earth observation data, DNA and acoustic surveys.</p>	<ul style="list-style-type: none"> • We will lead in setting standards for sharing and applying data generated by new technologies. • We will act as a liaison both within the UK and internationally, to share understanding of how others are applying new methods and technologies for monitoring and surveillance, where this function is not already being provided elsewhere.
<p>To enhance data openness and accessibility</p> <p><i>The data we collect and use has great potential to have benefits to the environment, society and wider economy. We cannot realise its full potential unless data is findable, accessible, interoperable and reusable. Challenges to creating open data include having technical systems in place to collect, verify, store and make data available; and working with the volunteers and organisations who help collect these data to capitalise on its value and encourage appropriate interpretation.</i></p>	<p>We champion open data from all partnership schemes, and JNCC support for these schemes is contingent on making data available, enhancing their value. We also work with other data holders to increase data access to a wider audience. Both in-house and with partners, we develop methods and tools to process and analyse data to make it more accessible and ready-for-use, and ensure it is shared with those who require it.</p>	<ul style="list-style-type: none"> • We will invest in systems to create, store and disseminate open data. • We will work closely with more organisations to encourage and support more open access to data holdings. • We will ensure any new data collected supported by JNCC will be open and accessible, as a condition of co-funding. • We will work with partners to input to the development of international data standards. • We will enhance our capacity and capabilities in data tool development within JNCC to increase the range of products available for efficient open data use and interpretation.
<p>To expand and consolidate the network of stakeholders in biodiversity evidence generation</p> <p><i>By working together, we can achieve more than by working alone. However, to build these opportunities, we need to understand the needs and aspirations of our stakeholders, including government, devolved administrations, CNCBs, NGOs, academia and research organisations.</i></p>	<p>We work with government, devolved administrations, CNCBs, recording and research communities, and academia. We are currently very well placed to network with a broad range of organisations across the UK to identify opportunities for collaborations where they arise. We collaborate with a range of initiatives such as the National Biodiversity Network, the UK Environmental Observation Framework and the Scottish Biodiversity Information Forum, who work to improve coordination of observational evidence of the natural environment. We</p>	<ul style="list-style-type: none"> • We will seek new contacts with shared interests, particularly in academia, research and business, and especially those with compatible goals who may also be able to contribute additional skills, knowledge and resources. • We will identify benefits of new partnerships to government and country agencies and ensure they complement our current work. • We will continue to work at the interface between policy and the recording community, identifying opportunities to engage with additional organisations where they arise, and working to align their and government's needs for data collection at country and UK scales.

	recognise the value of the work undertaken by these initiatives, and that collaboration is of mutual benefit to all.	
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Data collection <i>To sustain and increase the availability of high-quality data on biodiversity</i>		
Objective	Our current role	Our future ambitions
<p>To guarantee and increase access to taxonomically and geographically broad, long time-series of structured biological records</p> <p><i>To understand and respond to a wide range of environmental drivers, we need robust, taxonomically broad, geographically comprehensive and long-term information on biodiversity.</i></p>	<p>The JNCC partnerships with NGOs and research organisations currently mobilize thousands of volunteers to collect this type of information, through co-funding and co-design. Protecting these resources is a challenge under financial pressures. We have worked to maximise scheme efficiencies but note that there are remaining pressures and that the schemes would benefit from additional resources to fund further developments.</p>	<ul style="list-style-type: none"> • We will seek innovative ways to secure and develop the future of partnership schemes and the data they generate, by exploring new funding streams.
<p>To encourage and support less-structured UK biological recording</p> <p><i>There is a large community of biodiversity recorders in the UK. Many participate in structured surveys but others undertake more ad hoc, less-structured recording. This recording is valuable for building volunteer taxonomic identification skills, and for collecting data on species for which it is not practical to have a structured survey. In addition, these data can often be analysed to provide information on trends and distribution for species where we would otherwise have evidence gaps.</i></p>	<p>JNCC supports broad biological recording for over 80 taxonomic groups through its support of the Biological Records Centre, so is well connected to, and supports the activities of a huge number of biological recorders.</p>	<ul style="list-style-type: none"> • We will continue to support a broad range of taxonomic recording groups. • We will work with partners to develop analytical methods enabling us to integrate less-structured biological recording data with data from our structured surveys, to build a more complete evidence base. • We will work in partnerships with recording schemes and societies to encourage more structured recording for taxa for which this does not currently occur, where feasible. • We will work with recording schemes and societies to target additional recording effort in such a way as to maximise its value for analyses and understanding change.

		<ul style="list-style-type: none"> • We will investigate new ways to mobilise less-structured biodiversity data from other sources, where they might contribute to the evidence base.
<p>To explore opportunities to fill evidence gaps through existing surveys</p> <p><i>As new needs of conservation and government emerge, there is a challenge to find effective ways to fill these needs with existing resources. There are also challenges in understanding how data collection, analysis and policy interlink, and what the priority gaps are. The existing JNCC portfolio of schemes has strengths in well-established partnerships and networks of highly skilled volunteers which may offer cost-efficient solutions to meet new challenges. Similarly, other existing monitoring and surveillance initiatives outside the JNCC portfolio may offer opportunities to fill gaps in the biodiversity evidence base. However, it must be acknowledged that there will be limits to filling gaps in taxonomic and geographic coverage, and there must be a good case for investing funds in gap filling.</i></p>	<p>We are adaptable, forward looking and well placed at the interface between science and policy to lead in highlighting and prioritising gaps at UK and country levels. By identifying and promoting these gaps, we can mobilize the existing network of people and organisations who have the skills, interest and aptitude for collecting, analysing and interpreting new information about biodiversity. We have a strong history in working with existing partnerships to fill gaps. For example, we have worked in partnership to develop and incorporate the Wider Countryside Butterfly Survey into the UK Butterfly Monitoring Scheme, to gauge the changing abundance of widespread butterflies across the UK countryside, not just in particular sites of interest.</p>	<ul style="list-style-type: none"> • We will work closely with country agencies and government to identify specific knowledge gaps currently impeding understanding, at multiple scales. • We will continue to explore opportunities to fill evidence gaps through data collection from existing schemes. Particular gaps include understanding genetic diversity, communities of species, and ecosystem functioning, and standardising habitat recording for ground-truthing earth observation data. • Within JNCC and in new and current partnerships, we will work on exploring and developing analytical skills and techniques to efficiently use existing data to fill key gaps in understanding, where this is appropriate. • We will work to understand where schemes that are not a part of our current portfolio can help to fill gaps; will ensure that this is built into our advocacy; and will assist these monitoring initiatives to be integrated into the evidence collation.
<p>To propose, design and implement new surveys</p> <p><i>Where evidence needs cannot be met through surveys or other data sources, new surveys may be required. New surveys require investment and must have a convincing business case in terms of the benefits they provide. They must be scientifically robust, provide evidence across the UK and feed in to internal conservation.</i></p>	<p>We have expertise in building partnerships and scheme design, which have, for example, recently enabled us to establish the National Plant Monitoring Scheme and its partnership, in response to a requirement for more evidence about the status of UK plants and their habitats.</p>	<ul style="list-style-type: none"> • We will use our proven expertise to lead in proposing, designing and implementing new surveys where there is a clear need, for example if they generate new evidence on genetic diversity or ecosystem functioning. This will be achieved by building new partnerships, attracting new funding and reaching new volunteers. • We will ensure any new schemes established produce data that can be analysed to answer a range of policy-relevant questions.

Data processing, analysis and synthesis

To contribute to understanding biodiversity change and predictions

Objective	Our current role	Our future ambitions
<p>To produce and understand biodiversity status and trend information</p> <p><i>Biodiversity status and trend information help society understand how biodiversity is changing, and how it may be responding to pressures, policy and intervention.</i></p>	<p>We work with partners to produce a wide range of data products such as published population indices and trends, but there are gaps, for example around measures of ecosystem resilience and functioning.</p>	<ul style="list-style-type: none"> • We will lead in applying innovative analytical methods to produce information about status and trends in new ways, making the most of existing scheme data and integrating information from new data sources such as earth observation and functional traits. • We will work in partnerships and within JNCC on analyses to understand the drivers of change of biodiversity trends.
<p>To process data into data products</p> <p><i>Raw data can be challenging to access and use. Processing the data into data products and visualisations makes these data more accessible, providing a cost-effective way to meet evidence needs. There are challenges in understanding which methods for data processing will work and how they can be applied.</i></p>	<p>We work with partners who process raw data from volunteer surveys into useful metrics. We also process raw satellite data from the Copernicus Programme, in order to provide analysis ready datasets. We undertake novel work to develop new data products, such as habitat condition data from earth observation.</p>	<ul style="list-style-type: none"> • We will increase our analytical capacity to lead at the interface between science, policy and delivery in identification and application of cost-effective methods to turn data into data products. Currently, there is a particular need to provide data products on communities and functions. Increasing our analytical capacity will also enable us to contribute analytical expertise to more work within current and future partnerships. • We will continue to work with partners to process annual raw data from schemes to produce useful output metrics. • We will develop tools in house and in partnership, to help visualise data and facilitate its application in decision making, for example in the context of ecosystem and functional metrics. • We will ensure data products are openly available and free to access.
<p>To build predictive tools to aid decision making</p>	<p>We work in partnerships with external organisations to take advantage of new modelling and statistical methods, applying these to develop predictive</p>	<ul style="list-style-type: none"> • We will increase and strengthen our in-house analytical skills to expand the development of predictive tools to aid decision-making.

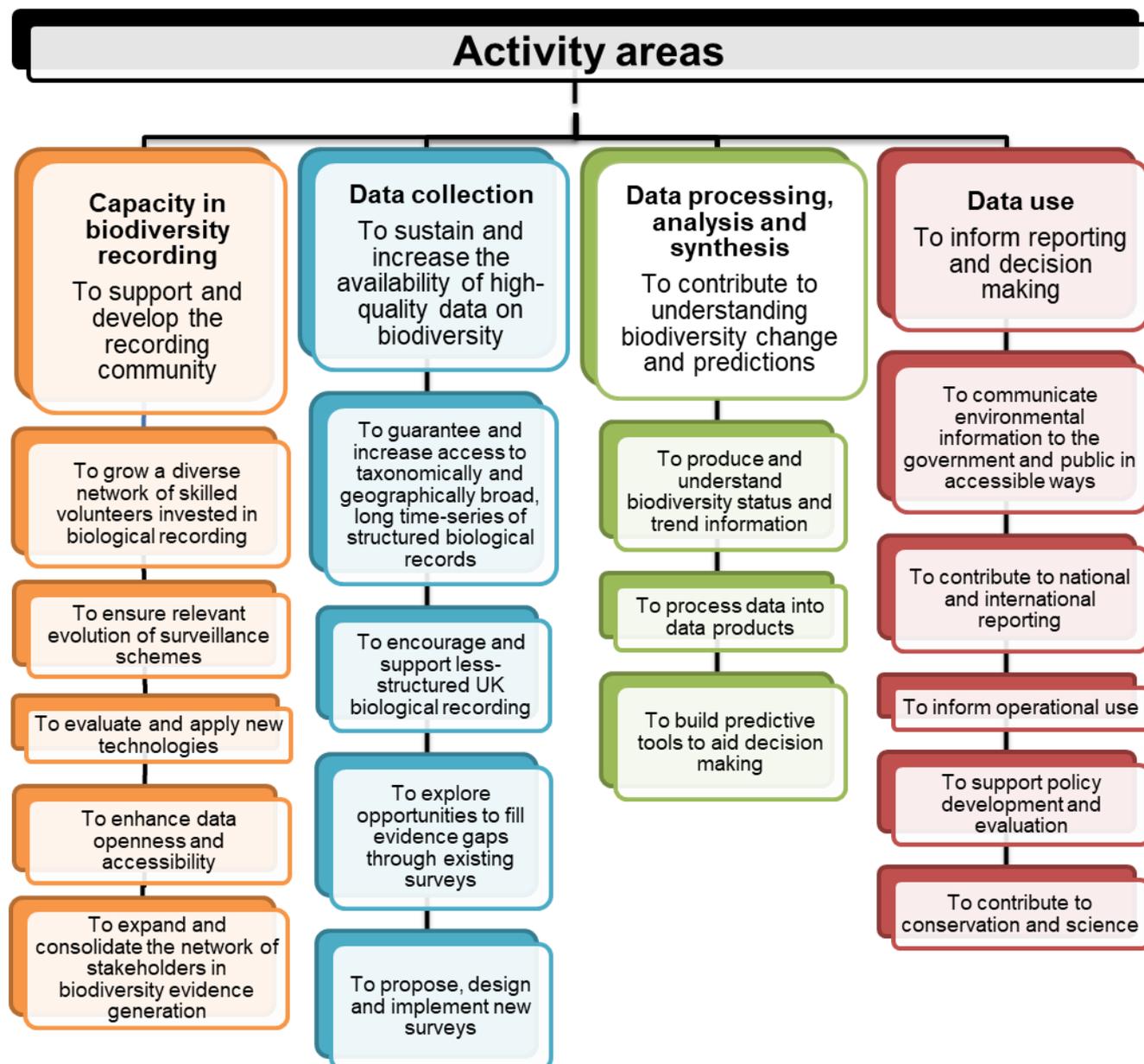
<p><i>Uncertainty exists in how current and future policies will impact biodiversity at a range of scales. There is a need to predict these impacts to aid decision making.</i></p>	<p>tools at a range of spatial and temporal scales, supporting evidence-based policy development.</p>	
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Data use <i>To inform reporting and decision making</i>		
Objective	Our current role	Our future ambitions
<p>To communicate environmental information to the government and public in accessible ways</p> <p><i>Ineffective presentation and communication of large volumes of data can lead to information being underutilized, misunderstood or misused. Effective communication from reliable and trustworthy sources can inform and empower strategic decision making in the government, public and private sectors and the general public.</i></p>	<p>Our partnerships generate data that directly underlie products such as Official Statistics on biodiversity. We support the development and maintenance of scheme websites and publications, which disseminate outputs in an accessible format to a wide audience. We participate in and lead numerous forums involving government and other stakeholders to discuss and advise on biological evidence.</p>	<ul style="list-style-type: none"> • We will explore and evaluate new methods to communicate environmental information generated through partnership surveillance to volunteers, stakeholders and the general public. • We will make use of the latest developments in communication, utilising tools such as social media to provide information in bespoke and fit-for-purpose ways. • We will clearly articulate the level of certainty of our data products, wherever possible, to help aid their interpretation.
<p>To contribute to national and international reporting</p> <p><i>Reporting on biodiversity allows society to keep track on the state of the environment, the impacts of policy and the effectiveness of conservation measures. There are a large range of biodiversity reporting needs for public bodies and government, including Country, UK and international indicators. Filling gaps in existing and emerging national and international reporting poses a real challenge.</i></p>	<p>We support species surveillance providing the UK with an exceptional understanding of a range of taxa, within a global context. We directly contribute data to indicators at multiple scales and we publish the UK Biodiversity Indicators. Data from schemes also provides data for international biodiversity reporting.</p>	<ul style="list-style-type: none"> • We will evaluate the coverage of our schemes to ensure they have flexibility to contribute to the reporting needs of today and tomorrow.
<p>To inform operational use</p>	<p>We work with government and our partners to use information on</p>	<ul style="list-style-type: none"> • We will continue to work closely with scheme partners to identify where data can be used to answer new

<p><i>Biodiversity information is needed by government and land managers for operational use, for example informing site management and issuing licences. This information is often needed on a site level, which can be a challenge for scheme data which is typically designed to give a national picture of biodiversity.</i></p>	<p>biodiversity to provide the context for operational work (for example informing national guidance). We particularly look for opportunities to apply scheme data to these questions. Partnership data has to date informed a range of management decisions, such as setting evidence-based shooting quotas for geese in Scotland, informing guidelines on hedge cutting to avoid nest disturbance, and informing local site management for wetland birds.</p>	<p>questions on operational use, and where the development of new methods or tools alongside the data may aid ongoing operational needs.</p> <ul style="list-style-type: none"> • We will work with current and new partners to evaluate whether additions to schemes may allow additional data recording or application relevant to local management.
<p>To support policy development and evaluation</p> <p><i>We face large challenges around biodiversity and to make a positive impact, there is a need to support policy development and evaluation with reliable evidence. Evidence may be needed at multiple scales from international to country to local.</i></p>	<p>We currently undertake work that both directly and indirectly influences a range of policy areas including plant health, air quality and protected sites and species.</p>	<ul style="list-style-type: none"> • We will use our biodiversity expertise to look for opportunities to support country specific requirements, and to produce accessible evidence-based products to advise government and devolved administrations on country, UK and international policy.
<p>To contribute to conservation and science</p> <p><i>Whilst the main focus of JNCC evidence is in supporting government needs, there is significant value to be realised through provision of terrestrial evidence to a wide range of audiences. This can be achieved in part through making the data and data products easily available. As well as achieving additional value from the evidence, engaging in work with other partners can help in motivating more volunteers to engage with surveys and in developing the data products that are produced.</i></p>	<p>We are committed to the provision of open access, high-quality biodiversity evidence, and are increasingly exploring new opportunities to apply and integrate data from our surveillance schemes into new initiatives.</p>	<ul style="list-style-type: none"> • We will seek to become project partners in a range of research and conservation projects that might gain from use of partnership scheme evidence, as well as providing support for a wider range of appropriate projects. • We will work in partnership with conservation and research organisations in the UK and internationally. • We will ensure that research undertaken utilising JNCC evidence is published in an accessible form.

4. Summary

Technological developments and emerging evidence requirements mean that it is time for JNCC to evolve new work areas and skills. We will make this transition smoothly, building on our existing strengths, whilst continuing to deliver the high-quality data and data products which are highly valued for policy and conservation. We will deliver biodiversity data at a range of geographical and ecological scales, including information on genetic diversity, populations, species, communities, and ecosystem structure, distribution and functions. We will achieve this by working towards the objectives in different activity areas summarised below.



JNCC will achieve these objectives by working in new and current partnerships and enhancing our capacity to develop and apply innovative analytical techniques, whilst working closely with CNCBs and governments to understand evidence requirements. We are committed to delivering long term evidence so will maintain our existing portfolio of species

surveillance schemes but acknowledge that these may need to evolve with emerging evidence requirements for policy and delivery. With this in mind, each year we will develop an implementation plan outlining the priority work for the terrestrial evidence portfolio in the short and long term, and how this work meets the objectives outlined in this strategy.

5. Version history

V0.1 Drafted by Julie Day with input from Chris Cheffings for the Review Board

V0.2 Feedback from the board to redraft the strategy

- 07/05/2019 Verbal input from Gwawr Jones and Paul Robinson (Senior EO/Natural Capital specialists)
- 13/05/2019 Verbal input from Emma Wright and James Hutchison (Senior analysts)
- 17/05/2019 Verbal input from Charlotte Amos, Anna Robinson and Paul Woodcock (Evidence specialists)
- 14/07/2019 Verbal input from Chris Cheffings and Lawrence Way (Ecosystem Analysis team leaders)
- 13/08/2019 Final draft V0.2 by Julie Day with input from Chris Cheffings

V0.3 19/8/2019 Feedback from the board to redraft the strategy

- Written feedback from board members supplied via email after the meeting
- Circulated to partner organisations 22/8/2019
- Written feedback supplied from BTO
- Niki Newton and Chris Cheffings assimilated comments and redrafted
- 7/10/2019 Circulated to Ecosystems Analysis team and partner organisations for comment
- Feedback from Julie Day, Anna Robinson, David Roy (CEH), and from the TEPoP annual meeting (11/9/2019)

V0.4 21/10/2019 Circulated by email to Review Board

- Strategy signed off subject to minor revisions from Board members

V0.5 07/11/2019 Signed off strategy completed