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An assessment of the biodiversity information needs of the UK's environmental public bodies

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Summary

Terrestrial Surveillance Development and Analysis (TSDA) is a project that is funded and undertaken by a partnership comprised of the Joint Nature Conservation Committee (JNCC), the Centre for Ecology & Hydrology (CEH) and the British Trust for Ornithology (BTO). To begin the TSDA project, we undertook an assessment of the UK's environmental public bodies' needs for biodiversity information to help direct the research in the TSDA project. The needs assessment was conducted by circulating a questionnaire to key contacts in ten UK environmental public bodies. These people consulted within their organisation and returned the questionnaire. This was followed by a one-hour semi-structured conversation with each of the key contacts. The results of the questionnaires and conversations were synthesised to provide a summary of the UK's environmental public bodies' needs for biodiversity information.

The following main points emerged from the assessment.

- The UK's public environmental bodies use biodiversity information for statutory reporting, and for operational and strategic needs.
- Overall, there was confidence in the current biodiversity surveillance (most of which is through JNCC Surveillance Schemes and undertaken by volunteers), which helps organisations to meet their reporting obligations and some of their operational needs.
- Strategic needs are regarded as increasingly important. Biodiversity information is needed to meet and assess the specific policies in each country.
- A widely identified need was a more comprehensive assessment of ecosystem health or condition than is currently available.
- There is a need for simple indicators linked to ecosystem properties (including ecosystem function, services, resilience and condition), and to understand how the biodiversity elements link to ecosystem properties.
- There is a need for suitable monitoring data to assess the impact of conservation and policy interventions.
- The need to increase both spatial and taxonomic coverage was recognised, accepting that there can be limitations on what is achievable.
- The decision to use statistical outputs is through professional judgement assessing the accuracy and uncertainty of the outputs, along with the risks and benefits of using them for decision-making.

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1 Needs assessment

1.1 Aims of the biodiversity needs assessment

Terrestrial Surveillance Development and Analysis (TSDA) is a project funded and undertaken by a partnership comprised of the Joint Nature Conservation Committee (JNCC). the Centre for Ecology & Hydrology (CEH) and the British Trust for Ornithology (BTO).

The aim of the project is to support the development of the JNCC Terrestrial Surveillance Schemes and to undertake analysis that cuts across the schemes. It is important that this development and analysis is set in the context of the needs of public sector bodies (Country Nature Conservation Bodies (CNCBs), devolved administrations etc; see Section 1.2). Therefore, in the first year of the TSDA project, it was valuable to undertake an assessment of the needs for biodiversity evidence in the CNCBs and related public-sector bodies.

Specifically, the aims for this needs assessment were:

- 1. To ensure that we have a clear understanding of the needs of public environmental bodies, so that we can:
 - a. justify specific pieces of work in the TSDA project as meeting the needs of these stakeholders;
 - b. direct specific pieces of work within the project so that they align with their needs:
 - c. identify any important gaps where the TSDA project will not specifically meet their needs.
- 2. To provide evidence that we understand the needs of public environmental bodies.

1.2 Scope of the needs assessment

The scope of this needs assessment was the government departments, devolved administrations, public bodies and agencies with a remit for biodiversity within the UK (listed in Table 1). Hereafter we refer to these as 'environmental public bodies' in the UK.

Status	Name of public body	Abbreviation
		used in this
		report
Government departments	Department for Environment, Food & Rural Affairs (Wildlife Team)	Defra
Devolved administrations	Welsh Government	WG
	Scottish Government	SG*
Non-ministerial department	Forestry Commission	FC**
Executive agency	Animal and Plant Health Agency	APHA
Non-departmental Agencies and other public bodies	Northern Ireland Environment Ágency, an executive agency in Department of Agriculture, Environment and Rural Affairs (Northern Ireland)	NIEA
	Environment Agency	EA
	Natural England	NE
	Natural Resources Wales	NRW
	Scottish Natural Heritage	SNH
Executive non-departmental public body of the Scottish Government	Scottish Environment Protection Agency	SEPA
Statutory advisor	Joint Nature Conservation Committee	JNCC

Table 1. The names of the government departments, devolved administrations, public bodies and agencies (collectively termed 'environmental public bodies' in this report) that were invited to nortiningto in this poods accompant

SG delegated responsibility for this needs assessment to SNH.

** Including representation from Forestry Commission Scotland, Forestry Commission England and NRW.

1.3 Methods for the needs assessment

Within the TSDA Partnership we discussed the appropriate methods for undertaking a needs assessment. We wanted to ensure that the approach was both efficient (both for the stakeholders and those in the TSDA project) and sufficient to adequately understand the needs of the different stakeholders.

After discussion in the TSDA project team, we decided that the best approach was to design a questionnaire for circulation to a contact in each organisation, then follow this with a semistructured conversation based on the answers provided. We then synthesised this information, pointing to evidence from the questionnaires, to provide the overall needs assessment.

1.3.1 Questionnaire

The questionnaire was designed by initial consultation within the TSDA Partnership. The first draft was presented at the Terrestrial Evidence Partnership of Partnerships (TEPoP) meeting in October 2017¹. Feedback was received verbally, and via email from two people. We then adapted the questionnaire, placing less emphasis on closed questions and more emphasis on open questions.

Most questions in the questionnaire (Appendix 1) were a pair of questions: first asking people to answer a preference question (placing a score on a dichotomous scale) and then an open question asking for comments on their score. In some ways the preference scoring was a false dichotomy since many situations required a both/and instead of either/or answer, and we chose to use a six-point scale (i.e. there was no middle selection). We designed the questionnaire in this way because we observed in trials that it helped to elicit a clear response to the open question (because people felt challenged to make a single preference choice, and thus were prompted to explain why the answer was more complicated).

We circulated the questionnaire to one key contact in each of the 12 organisations in December 2017. This contact was selected by JNCC and was usually a biodiversity evidence lead (or equivalent) or a delegated member of staff.

1.3.2 Consultation within organisations

Each contact was requested to consult with relevant staff within their organisation and collate responses. There was variation in the experience and specific role of the different contacts within their organisation, and variation in the way each person chose to consult. This means that the extent to which each response captures the breadth of views in that organisation may vary. Questionnaires were returned prior to a telephone discussion.

1.3.3 Follow-up conversations

The questionnaires were followed by a one-hour telephone conversation with each contact, conducted by Michael Pocock in January 2018. This was a structured conversation based upon the responses given in the questionnaire. Specifically, the interviewer sought to gain an understanding of the context of the answers, and give interviewees opportunity to reflect

¹ TEPoP is a collaborative forum for organisations working in partnership with the JNCC on the following monitoring schemes and projects: UK Butterfly Monitoring Scheme, National Bat Monitoring Programme, Breeding Bird Survey, Wetland Bird Survey, Avian Demographic Scheme, National Plant Monitoring Scheme, Goose and Swan Monitoring Programme, Pollinator Monitoring and Research Partnership, Biological Recording Verification and Interpretation, and TSDA, alongside Environmental Public Bodies.

upon, clarify and expand upon their answers to the questionnaire. The conversation was directed to specific areas of interest including conflicting answers within the questionnaire, and differences with related organisations.

1.3.4 Synthesis

The author of this report then synthesised the responses to provide an overall needs assessment. He mapped key concepts mentioned by the respondents and collated them into themes, with relationships between themes. He then reviewed these themes with cross-reference back to the original questionnaires. This approach was therefore similar to the best practice of using coding and synthesising concepts via coding maps when analysing interviews or focus groups in the social sciences².

The aim of the synthesis was to collate the responses into themes of importance and, where appropriate, to highlight areas of similarity and difference between organisations – i.e. to provide an overview needs assessment of the sector. During the synthesis, focus was given to issues that were raised, and care was taken not to make too much inference from individuals not raising a specific issue. It was understood that subsequent discussions with individual stakeholders may be useful if there are issues to be elucidated. The structure of the synthesis was guided by, but not restricted to, the format of the questionnaire.

Of course, any synthesis is, by its nature, incomplete. The synthesis was backed up by reference to the questionnaire responses by specific organisations, but was also informed by detail given in the structured conversations.

1.3.5 Review

This report was then circulated among the contacts in each organisation to ensure that there was no factual misrepresentation of the organisations.

1.3.6 Next steps

This report was produced as an assessment of the needs of environmental public bodies. This will be used, in collaboration with the TSDA Partnership, to help shape the work of the TSDA project in conjunction with assessment of data availability and modelling approaches currently being undertaken.

1.4 Results

All those invited to participate did so (except for Scottish Government, who gave responsibility to SNH), and so we had full representation from all the organisations selected to be contacted. The questionnaires as received are provided in Appendix 2.

Each person consulted in their organisation. However, people consulted and collated results in different ways. The breadth of consultation varied due to individual contexts. Although someone's mention of a particular issue was taken to be an indication that it was important to their organisation, absence of a mention was not taken as proof that the issue was unimportant.

² Young, *et al.* A methodological guide to using and reporting on interviews in conservation science research. *Methods Ecol Evol.* 2018;9:10–19. <u>https://doi.org/10.1111/2041-210X.12828.</u>

Our synthesis of the results sought to draw out key issues of importance and, where relevant, to highlight areas of apparent similarity and difference across these organisations. The synthesis is provided in Section 3.

2 Key messages from the needs assessment

The needs assessment is synthesised in Section 3. The key messages are highlighted here.

- The UK's public environmental bodies use biodiversity information for statutory reporting, operational needs (e.g. planning advice and regulation) and for strategic needs (influencing policy-making and assessing the impact of policy). Although strategic needs are not day-to-day priorities for the business of most organisations, they are regarded as increasingly important.
- The Country Nature Conservation Bodies (CNCBs) and devolved administrations expressed their needs in different terms, influenced by the wording of their key policies. Even though the specific policies vary across the four nations of the UK, the biodiversity information required to meet the needs and assess these policies is broadly similar.
- Many biodiversity needs (especially statutory reporting and operational needs) are adequately met with the available biodiversity information (e.g. from JNCC Surveillance Schemes). Some needs could be met with a reasonable increase in recording (e.g. by volunteers), but others are unlikely to be met without substantial (and hence unlikely) increases in effort and resources.
- There was an overarching interest in providing a more comprehensive assessment of ecosystem health or condition, rather than solely the status of particular species groups in their own right. Being comprehensive would avoid any potential biases arising from relying on a small subset of species.
- Alongside the desire for more comprehensive assessment, summary metrics are desirable when they can be shown to provide a robust and meaningful indication of ecological status, function and resilience.
- It was felt that we currently lack a good understanding of how biodiversity 'elements' link to ecosystem properties, including function, resilience and condition. Better understanding of this link could help us adopt better indicators.
- An important need is to assess the impact of interventions (e.g. the impact of policy on biodiversity via changing management). This is more important than improving taxonomic, spatial or habitat coverage per se, although the two are interlinked. Increased or more-informed spatial coverage and spatial resolution may be necessary to assess the impact of interventions.
- There was a recognised need for improved taxonomic and spatial coverage, but the
 respondents were realistic about the feasibilities of achieving this, recognising the
 benefits and limitations of each. While increased taxonomic coverage was regarded as
 helping to provide a broader perspective of ecosystem health, there was a tendency to
 view improved spatial coverage for currently well-represented groups as providing the
 most cost-efficient and tractable increase in evidence.
- Statistical outputs (e.g. indicators, evaluation of interventions, or scenario models) must be representative, transparent and their uncertainty should be described. These are subject to professional judgement and risk assessment (considering the costs and risks of inaction versus action) to decide whether they are of suitable quality to support decision-making.

3 Synthesis of the needs assessment

Below is the synthesis of the needs assessments. This seeks to provide an overall synthesis of the issues raised in the questionnaire responses and the subsequent conversations.

Note that evidence for these statements can be found in the questionnaire response from the relevant organisation (Appendix 2). However, *references to organisations (in square brackets) should not be taken as a comprehensive list of organisations supporting each statement, nor should such references be used in isolation as evidence of an organisation's policy position.* The aim of this is to provide an evidence-based synthesis of the needs across the environmental public bodies. The order in which organisation's initials are presented is arbitrary. In general, the number of sets of initials has a bearing on the strength in which a statement was supported by responses from the questionnaires.

3.1 Needs for biodiversity information

- 1. Biodiversity information is needed to provide a sound evidence base for decisionmaking [SEPA, JNCC, NRW, NE, NIEA]. As discussed below, this covers operational needs (e.g. providing advice which is typically at the local level, especially for individual sites), statutory reporting requirements and strategic needs.
- 2. Operational needs are essential to the day-to-day running of most of these organisations, while statutory reporting is delegated to several of these organisations. However, for several there is a step change towards focussing on strategic priorities [NE, JNCC, NIEA, NRW]. This includes a move from focussing on individual species/taxa towards greater consideration of a comprehensive measure of ecosystem health/condition and function from which metrics can be determined to account for ecosystem services, human well-being, and resilience. This move fits with broader-scale policy changes (based on issues of the wider countryside, not just 'special' places and species).
- 3. Research may be required where current knowledge is lacking, e.g. to inform surveillance development through identifying how we monitor and what we monitor (which could be linked to knowledge about drivers of change) [NRW].
- 4. Despite this shift in emphasis from specific needs to general measures, this does not usually require different data, just repurposing existing data.
- 5. Overall, most respondents stated that statutory reporting and operational needs are of greater priority than long-term strategic needs, simply because they are the day-to-day requirement of the business. However, it seems that the step change towards focus on the strategic needs would require further research on how surveillance data can inform these strategic needs.
- 6. The JNCC Surveillance Schemes are very important in providing biodiversity information, particularly to support statutory reporting and strategic needs [NE, Defra, SNH, FC, NRW, NIEA]. Although most of the JNCC Surveillance Schemes are not able to routinely provide data to support site-based operational needs, recording via the Biological Records Centre [Defra], Local Records Centres (for some organisations) [EA], and WeBS counts for specific estuaries or coastal regions [NRW] can so do.
- 7. Overall, minimum levels of information will need to be achieved before we have adequate evidence, and if something is deemed to be important then we would want it to reach this minimum level.

3.2 Essential needs: operational needs and statutory reporting

8. Operational needs are the day-to-day requirements of most organisations and so these were described as essential by several people. Statutory reporting is not a

day-to-day requirement, but there is a mandated requirement to report on some species and habitats under country-level, national, EU and international commitments, so this reporting is an essential requirement of some organisations. The species and habitats that need to be reported upon at these different levels are often termed 'priority' species and habitats. There is variation in monitoring coverage across these priority species & habitats, with some currently sufficiently well-monitored, some having monitoring needs identified (but not yet met) and others requiring further research. However, there are relatively few priority species, and statutory reporting is only one of the organisations' needs for biodiversity information. [NIEA, SEPA, JNCC, SNH, NRW, FC, Defra]

- 9. Statutory reporting typically occurs on a five-six year cycle [SEPA, NRW, WG, JNCC, SNH, NIEA].
- 10. Reporting also has a role in communicating to stakeholders by providing a longterm context, and reporting more recent progress against targets [Defra, WG, NIEA]. It requires simple messages, but since they must be defensible, they cannot be simplistic [Defra].
- 11. Many organisations have a need to provide advice. To fulfil this need there is typically a requirement for data on species/habitat presence, or modelled data, e.g. modelled species distributions as typically derived from presence data [SEPA, NRW]. These data are required for impact assessment for major planning decisions, licensing and issuing of permits [SEPA, SNH, NRW, NIEA, EA], provision of data and advice for local decision-making [NE, SEPA], and supporting local habitat management decisions [FC, NE]. It is important that data are quality assured, available at fine-scale resolution (at least site-level) and available in real-time [NE, FC, NIEA, APHA].

3.3 Strategic needs

- 12. Increasingly, for many of the organisations, there is greater focus on the strategic role of biodiversity information, which is to inform policy decision-making and delivery [JNCC, NE, Defra, NRW, WG, SNH]. This has three important implications (each of which are discussed below):
 - a. The need for a broader understanding of ecological state, and so to link this to ecosystem function;
 - b. The need to evaluate interventions (i.e. policy changes than affect large areas);
 - c. The need for a more comprehensive/balanced set of metrics/indicators.
- 13. This should be set in the context of drivers and causes (or pressure-state-impact), so that changes in the environmental/biodiversity state can be understood in terms of the drivers of these changes, and the impact on whole-ecosystem properties (e.g. ecosystem services or resilience) [SEPA, Defra, NIEA, EA].
- 14. It is important to note that there needs to be an understanding of the likely future state of the environment (derived from a vision for the future and/or predicted scenarios), so that action can be targeted [FC, NE]. This is consistent with aspects of statutory reporting, e.g. the Habitats Directive requires assessment of 'future prospects' [NRW].
- 15. This links to many policies which are broadly similar in direction although have different emphases across the four countries. A few examples include the emphasis on well-being of future generations [WG], natural capital accounting [NE, SNH], 'one planet prosperity' [SEPA] and the 'going for growth' strategy [NIEA].

3.3.1 The need to assess ecological state (and changes in state)

- 16. A fundamental metric of ecological state is the distribution of species and habitats. Knowledge of distributions was often not stated as an important priority but this is probably because it is a step on the way to its use for other priorities (e.g. trends or assessing impacts). Also, there may be limited urgency for improvement in the knowledge of species and habitat distributions either the information is already deemed to be sufficient, or the data are insufficient and volunteer recorders are unlikely to be able to improve them to a level sufficient for their use [NRW]. However, there is a need to assess the stock and location of some key habitats (such as carbon-rich soils), which are poorly known in upland and other underrecorded regions [SNH, FC, NRW, Defra, NIEA]. Habitat location is important to inform about landscape connectivity [Defra].
- 17. There is a need to provide a better assessment of ecosystem 'health' or 'condition'. Assessment of ecosystem health needs to be based on a broader-scale and more comprehensive assessment of species, including the composition of ecological communities, compared to current measures [NIEA, JNCC, NE, WG, SEPA, NE, FC]. Currently, assessment of 'health' is dependent upon a few well-recorded 'charismatic' taxonomic groups, but expanding these to provide a more balanced set of indicators by including under-represented, but functionally important, taxonomic groups would be valuable [FC, NE, NRW]. This includes measures of soil health, e.g. using microbes [NE, NIEA].
- 18. There is a need to assess habitat condition [SEPA]. This may require new metrics of condition that are not directly dependent upon species presence, e.g. presence of dung, vegetation height, wetness etc. [NE, NIEA].
- 19. It is important to have a good assessment of trends in species and habitats [NIEA, Defra, WG, JNCC, NE, SNH]. This needs to be unbiased and fully informative of ecosystem 'health'. One of the concerns was the limited taxonomic coverage, another was limited spatial coverage (some regions, or some 'special' sites receiving disproportionate coverage) potentially leading to a biased assessment of health [NRW, Defra, JNCC, APHA]. In general, there seemed to be an undefined concern, rather than a clear definition of what we should be aiming for in gaining unbiased taxonomic coverage, although there should be a focus on assessment of taxa important to ecosystem function [Defra].

3.3.2 Taxonomic, spatial and habitat coverage for assessing ecological state

- 20. The purpose of increasing coverage should be aimed at the most likely beneficial outcomes. This is particularly where coverage is reasonable but not yet at a level that is adequate for the biodiversity needs of the organisations (taxonomic, spatial or by habitat), and hence where relatively small increases in effort would have greatest benefits on the information gained.
- 21. It was recognised that there is often a trade-off between increasing taxonomic coverage and increasing spatial coverage. Any attempt to increase coverage should not be at the risk of jeopardising the current coverage (unless, maybe where coverage far exceeds the minimum requirement) [NRW, NE]. The cost of a substantial increase in coverage would be difficult to justify [FC, EA] and it was recognised that the reliance on volunteers means that many of the challenges about uneven spatial coverage are unlikely to be easily addressed [NIEA, NRW].
- 22. Opinions were mixed as to whether increasing spatial or increasing taxonomic coverage was most important (bearing in mind the purpose of increasing coverage will often be to bring as much as possible above a minimum adequate level). However, between these two, the general opinion was that increasing spatial coverage was most important. This is because it seems more feasible to increase

spatial coverage of a reasonably well-recorded taxon than to bring recording of a less-well recorded taxon to an adequate level [NRW].

- 23. The need of the spatial resolution of information varied across organisations and across purposes for the information. However, many organisations identified the value of information at the scale of catchments, or similar regions where the drivers of change (and policies to influence those drivers) are relatively consistent [NRW, JNCC, SEPA, FC, EA, NE]. There will be variation in ecological function of habitats across the UK [NIEA]. There is an aspiration for Area Statements in Wales, including assessment of biodiversity for policy creation [NRW], but, in reality, information is insufficient to be broken down to Wales or Scotland [SNH, NRW].
- 24. It was recognised that there is a correlation between coverage gaps in habitats and regions, so in some cases filling regional gaps in coverage will help fill habitat gaps in coverage [NRW, JNCC, SNH]. In general, information on fine-scale habitats is not needed, but broad distinctions are sufficient [JNCC], although it may be useful to define habitats in ways other than plant composition [NE, EA].
- 25. Some specific gaps were identified in our information on biodiversity status: tree abundance and distribution [JNCC, FC], pollinators [SEPA, NIEA, Defra, WG, JNCC, SNH], invasive non-native species [SEPA, NIEA, SNH, FC, EA, Defra], diseases of trees and fisheries [SNH, FC, NE], under-represented species (including indicator groups e.g. bryophytes and lichens) [SEPA, Defra, FC]. Also, there are gaps in our understanding of the ecology of species of concern [NE, SNH, EA].

3.3.3 The need to understand drivers of change and their impacts

- 26. It is important for environmental public bodies to understand why biodiversity is changing, i.e. linking recorded changes in biodiversity status to the drivers of change [Defra, SEPA, NIEA, EA]. To achieve this, it will be valuable to link biodiversity information to other data sources, e.g. land use change [NE, EA] and social/economic data [NE].
- 27. Organisations identified specific drivers of biodiversity change that were of concern and needed to be evaluated: climate change (including the impact of habitat connectivity) [SEPA, Defra, WG, FC], invasive non-native species [Defra, WG, NE], air pollution (including diffuse and point-source, i.e. agricultural, nitrogen pollution) [SEPA, NIEA, Defra, NRW, NE], floods, droughts and flood mitigation measures [NE, JNCC] and water quality [NE, EA, JNCC]. (See also the need to evaluate interventions, below, for discussion about policy being a driver of change.)
- 28. Understanding the impacts of drivers of change will help to inform mitigation measures and to target action (including restoration) [NE, EA, SEPA, SNH, FC].

3.3.4 The need for metrics of change and to understand how they relate to ecosystem attributes

- 29. There is a research need to identify metrics of biodiversity status that can be used for indicators of change, natural capital accounting and to assess regulatory compliance [NE, NRW, SEPA]. Indicators need to be applicable at multiple scales (from national to local) and can include indicators of negative condition (e.g. invasive non-native species) [NRW].
- 30. There appears to be conflict between the environmental public bodies' need for simple indicators of change and their desire for a more comprehensive assessment of ecosystem health. This is why they stated a desire to have a 'balanced set' of indicators and need to understand what components of biodiversity should be monitored [NE, NRW].

- 31. Past experience demonstrates the importance of having a clear rationale for the choice of indicator. This is well demonstrated by measures of freshwater status which are based on ecological status and the presence of indicator species, coming from research several decades ago [EA, SEPA]. However, there is currently no equivalent general measure of terrestrial status, and the measurement of status under the Habitats Directive relates to the status of particular species and habitats only.
- 32. Metrics are also needed for ecosystem properties, such as ecosystem function, ecosystem services and resilience, and to provide early warning of undesirable change [NRW, NIEA, NE, Defra]. There is therefore a need to understand how biodiversity elements link to attributes such as ecosystem health/condition [Defra, WG, EA, JNCC, NE], ecosystem process and function [NIEA, Defra, WG, NE, EA, JNCC], resilience [FC, NIEA, NE, NRW, Defra], ecosystem services [Defra, FC, EA], and human health and well-being [NIEA, NRW, NE] and wealth [NIEA]. The key research needs are to understand what is the value of species and habitats, and what components are the most important contributors [Defra, JNCC].

3.3.5 The need to evaluate and develop future interventions

- 33. An important use of biodiversity information should be the evaluation of interventions on species, habitats and ecosystems, to provide evidence to assess the impact of policy changes and assess progress towards meeting policy objectives [JNCC, WG, NE, EA, SEPA, Defra, NE, FC, NIEA].
- 34. Important policy interventions whose impact on biodiversity and ecosystems need to be assessed include: agri-environment schemes [NIEA, NRW, NE], habitat management and site designations [NE, SEPA], conservation policy [NRW] and habitat creation and restoration [FC, NE].
- 35. There was a need to assess impacts of infrastructure developments, e.g. those associated with renewable energy [NRW, NIEA]. This was coupled with a need to undertake spatial mapping of habitat sensitivity.
- 36. Most environmental public bodies considered that the balance of their need was to report past changes, but predicting future changes was very important to some [APHA, FC, SEPA].
- 37. Scenario modelling was felt to have a valuable role in predicting future changes [NIEA, NE] and predicting the impact of interventions [Defra], especially on key species [NRW]. This depends on a good understanding of the drivers of change (see above). Scenario modelling was considered valuable when considering complex situations, such as interacting drivers [SEPA]. There are concerns though, because scenario modelling can give a false impression of precision [NE] and it needs validating, e.g. with hindcasting [NIEA, APHA], although being able to model the past is no guarantee of predicting the future [APHA].
- 38. Predicting future changes can support decisions when developing future interventions.

3.4 Statistical implications about biodiversity monitoring information

- 39. Overall, organisations usually took a risk-based approach to the assessment of, and use of, biodiversity information.
- 40. Few organisations had any formal requirements for statistical criteria (e.g. the statistical power, levels of significance etc.) before biodiversity monitoring information could be used. (An exception was where the body undertook its own monitoring and needed to assess sample size for sufficient statistical power [EA].)

- 41. This should not be confused with the process to undertake statistical analysis. This process must adhere to principles of transparency, scientific rigor and lack of bias. There may be formalised processes in place for some statistical reporting.
- 42. The lack of formal requirements for statistical criteria is due to the environmental public bodies using the best available information and assessing whether its performance is 'sufficient'. The definition of 'sufficient' performance and reliability is based upon the use to which the information is put, statistical uncertainty, and assessment of the cost and risk of the decisions resulting from use of the information (balancing the cost/risk of action versus inaction). Typically, such decisions are made in the light of expert opinion or professional judgement [FC, JNCC, NE, SEPA, EA, WG, NIEA].
- 43. 'No change' (in a statistical sense) is the lack of ability to detect a change it does not necessarily mean that the measure is stable [NRW].
- 44. When providing statistical outputs, there is concern about the potential for bias, e.g. by reporting from a biased set of locations, bias towards a particular region, or inferring ecosystem impacts from an unrepresentative set of species [Defra, APHA, JNCC, NRW]. The information in statistical outputs needs to be transparent and representative, and should support simple messages derived from the outputs, so that it can withstand scrutiny [Defra].
- 45. Data supporting these statistics must be quality assured in an appropriate way [APHA].

3.5 New issues

- 46. There are several new opportunities for biodiversity monitoring that are being explored, particularly:
 - a. eDNA for aquatic species and microbial analysis for soil health and water quality [SEPA, Defra, NRW, EA, NE]
 - b. remote sensing, from drones to satellites, with emphasis on producing analysis-ready products and efficiently assessing novel measures of ecosystem health [SEPA, NIEA, Defra, NRW, NE, SNH]
 - c. citizen science: gaining maximum benefit from the potential for mass participation activities, although quality assurance of data is often a bottleneck [NE, SNH, FC, NIEA, APHA]
 - d. remote monitoring, e.g. acoustic monitoring of bats and camera trapping [APHA, Defra].
 - e. Co-location of sampling, either by coordinating across recording schemes, or asking surveyors to record related organisms [WG, FC].
 - f. Improvements in modelling, e.g. improved species distribution modelling, integration of multiple data types and down-scaling coarse to fine resolution data [WG, NE]. Also integrating biodiversity data with other data sources (e.g. economic and social data) to provide better understanding of impacts and benefits [NE, WG, SEPA]. A specific example for this is around flooding [JNCC].

4 The current policy context

47. It is important to recognise that this needs assessment took place within a specific policy context at the end of 2017. The relevant policies, as discussed by respondents, are listed in Table 2. This is not intended to be a comprehensive list of relevant policies and strategies, but it describes the policy context as discussed by respondents.

this report.			
Country	Policy / strategy / reporting	Link	Mentions
England	25 Year Environment Plan	https://www.gov.uk/government/publications/	Defra,
		25-year-environment-plan	JNCC, NE
	Biodiversity 2020: A	https://www.gov.uk/government/publications/	FC, EA,
	strategy for England's	biodiversity-2020-a-strategy-for-england-s-	SNH
	wildlife and ecosystem	wildlife-and-ecosystem-services	
	services (2011)		
	England Peat Strategy	Forthcoming in 2018	Defra
Northern	Going for Growth - a	https://www.daera-ni.gov.uk/articles/going-	NIEA
Ireland	strategic action plan	growth-strategic-action-plan	
Scotland	2020 Challenge for	http://www.gov.scot/Publications/2013/06/553	FC, SEPA
	Scotland's Biodiversity - A	8	
	Strategy for the	—	
	conservation and		
	enhancement of		
	biodiversity in Scotland		
	Planning Bill (Scotland)	http://www.parliament.scot/parliamentarybusi	SEPA
	2017 (relevant to carbon	ness/Bills/106768.aspx	0
	rich soils)		
	SEPA Regulatory Strategy	https://www.sepa.org.uk/media/219427/one-	SEPA
	(One Planet Prosperity)	planet-prosperity-our-regulatory-strategy.pdf	0
	State of the Environment	https://www.environment.gov.scot/our-	-
	reporting	environment/state-of-the-environment/2014-	
	lopolaig	state-of-the-environment-report/	
	The Scottish Forestry	http://scotland forestry gov uk/supporting/stra	FC
	Strategy	tegy-policy-quidance/forestry-strategy	10
Wales	Well-being of Future	http://gov wales/topics/people-and-	FC
vvaics	Generations (Wales) Act	communities/people/future-generations-	10
	2015	act/2lang_en	
	Environment (Wales) Act	http://gov.wales/topics/environmentcountrysid	FC NRW
	2016	e/consmanagement/natural-resources-	WG
	(including: Sustainable	management/environment-act/2lang-en	~~~
	Management of Natural	https://paturalresources.wales/evidence-and-	
	Resources: Area	data/research-and-reports/the-state-of-	
	Statements: and State of	natural-resources-report-assessment-of-the-	
	Natural Resources	sustainable-management-of-natural-	
	reporting (SoNaRR)	resources/2lang-en	
	National Nature Recovery	http://gov wales/topics/environmentcountrysid	FC
	Plan	e/consmanagement/conservationbiodiversity/	10
	i idii	?lang=en	
	Natural Resources Policy	http://gov wales/topics/environmentcountrysid	-
		e/consmanagement/natural-resources-	
		management/natural-resources-	
		policy/?lang=en	
	Action Plan for Pollinators	http://gov wales/topics/environmentcountrysid	WG
	(2013)	e/consmanagement/conservationbiodiversity/	ne
	(2010)	action-plan-for-pollinators/?lang=en	
UK	UK Forest Standard	https://www.forestry.gov.uk/ukfs	FC
ÖN	Natural Environment and	https://www.legislation.gov.uk/ukpga/2006/16	FC
	Rural Communities (NFRC)	/contents	. 0
	Act 2006	<u>, contonto</u>	
	Natural Capital Reporting	https://www.gov.uk/government/groups/patur	
	Hatara Sapita Reporting	al-capital-committee	
FU	Habitats Directive (1992)	http://ec.europa.eu/environment/pature/logisl	
20	(Article 17 reporting)	ation/babitatsdirective/index_en_htm	
	Water Framework Directive	http://ec.europa.eu/environment/water/water-	FA SEDA
		framework/index_en_html	LA, JEFA
	(2000)		

Table 2.	Policies and strategies discussed by respondents for the needs assessment summarised in
this repo	rt.

Global	Convention on Biological Diversity, especially the	https://www.cbd.int/sp/targets/
	Aichi Biodiversity Targets United Nations Sustainable Development Goals	https://sustainabledevelopment.un.org/

5 Acknowledgements

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Appendix 1: Survey questionnaire

Biodiversity evidence needs assessment for country agencies/administrations

This assessment is being conducted by the BTO/CEH/JNCC Terrestrial Surveillance Development and Analysis (TSDA) partnership. We are interested in **establishing the terrestrial biodiversity evidence needs** of UK country nature conservation bodies, devolved administrations and other government agencies.

What is the point of this assessment?

JNCC partnership surveillance schemes (listed in box 1) undertake surveying and monitoring of biodiversity. These provide biodiversity evidence used by government. The TSDA partnership is addressing two broad questions:

- 1. Can these schemes be supported **to develop** in order to make the evidence a better fit-for-purpose?
- 2. Can we guide the **analysis** of data from these schemes in order to better fulfil requirements?

Clearly, a pre-requisite to this work is understanding what the evidence needs for government agencies are, and what the gaps are. This needs assessment aims to ensure that we had a good understanding of your needs and gain an overview of similarities and differences across agencies.

How the assessment will be conducted

We have distributed the questionnaire to evidence/monitoring leads in government agencies and devolved administrations. They will circulate the questionnaire to key staff in their organization, collate responses and then be interviewed by the TSDA partnership. The phone interviews will allow the key points and nuances to be discussed and recorded. TSDA will then collate responses from across the UK and will circulate back to the evidence/monitoring leads.

Points to consider when answering the questions

- 1. When we say 'terrestrial', we mean 'non-marine', and so we are including 'freshwater'.
- 2. When we say 'biodiversity', we mean species, habitats and ecosystems.
- 3. When asking about the future, we assume that the **resource** for current data delivery **remains the same**; in the context of our project we are asking about future developments and improvements. (Prioritising current data delivery is also an important question, but falls outside of the remit here. You may choose to mention this challenge where it is particularly relevant.)
- 4. When we say 'your evidence needs' we mean current needs and those projected into the foreseeable future.
- 5. Throughout this questionnaire, we are keen for you to consider real-world trade-offs (rather than the ideal of more and better of everything!) so that we can understand your priorities.

Dec 2017, Michael Pocock (on behalf of the TSDA Partnership) michael.pocock@ceh.ac.uk

Box 1. JNCC works in partnerships to support the following terrestrial and freshwater surveillance

- Breeding Bird Survey
- Wetland Bird Survey
- Goose and Swan Monitoring
 Programme
- National Bird Ringing Schemes
- Nest Record Scheme
- National Bat Monitoring Programme
- BBS and Waterways Breeding Bird Survey – Mammal Data
- UK Butterfly Monitoring Scheme
- National Plant Monitoring Scheme
- Rare Breeding Birds Panel
- National schemes and societies recording a range of taxa, supported through the Biological Records Centre

1. Your details

Name	
Organisation	
Role	
Brief description of role (in respect to	
biodiversity monitoring)	
Over what geographic region/country do your	
answers relate to?	
For what taxa do your answers relate to?	
For interviewees: briefly describe any	
consultations that you undertook in your	
organisation	

2. What are your terrestrial biodiversity evidence needs?

In this section, we are interested in your evidence needs (in terrestrial and freshwater biodiversity monitoring and surveillance).

2.1 Why do you require biodiversity information?

Information on biodiversity is of most					Information on biodiversity is of most				Neither
importance for reporting against				imp	importance for longer term strategic planning				
current/immediate needs				and	researd	ch			
Strongly agree	0	0	0		\circ	0	0	Strongly agree	Ο.

Can you comment on your different uses for the data. What is the impact of not having this information at the appropriate scale or temporal resolution you require?

2.2. How stable have past priorities been in driving these information

requirements?

Key priorities relying on these data have	Key priorities have been stable over the past				
changed over the past 5-10 years	5-10 years				
Strongly agree 🔘 🔘 🔘	O O Strongly agree	Ο.			

Briefly, if your priorities have changed, what are the key ways in which they have changed?

How much has this been within your control (driven by or influenced by your organization, rather than imposed upon you from external bodies)?

2.3 What questions do you need biodiversity information to answer?

mormation is mostly needed for survey,	mormation is mostly needed for research.	NUTURE
monitoring and surveillance of biodiversity	(To answer the questions 'why?' or 'how?' or	
status. (To answer the questions 'how	'what?', e.g. the impact of management	
much?' or 'where?', e.g. current distribution,	interventions, natural changes or gradients.)	
trends in abundance)		
Strongly agree 🔘 🔘 🔘	O O O Strongly agree	Ο.
What particular aspects or details of these are p	particularly important for you?	

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	2.4 Over what time-frame do you nee	d to answer questions?				
	Information is most important for showing	Information is most important for informing	Neither			
	past/current changes in biodiversity	projections into the future (e.g. future				
scenarios of change)						
	Strongly agree 🔍 🔍 🔿	O O Strongly agree	Ο.			
	Please give specific examples of the time frame needs to be updated:	s that are relevant to you and how often informa	tion			

2.5 Future projections

We would like to know what sorts of issues it would be useful to address in our analysis and modelling of future projections.

Firstly, imagine you could go back 5-10 years and were able to make projections about biodiversity change. Are there specific issues where you wish you had information then to help with making decisions or giving advice?

Secondly, are there new and emerging policies which will create new evidence needs in the future? (Of course, Brexit makes the future policy landscape very uncertain – there is no need to discuss these uncertainties here.)

3. What are the gaps in your evidence needs?

In the TSDA partnership we will be undertaking tasks to support the development of the JNCC partnership surveillance schemes. The developments could be enhancements in statistical analysis, data coverage, methods of collection or other activities. For us to be informed to undertake this work, we need to have a good understanding of your needs and gaps in evidence.

There are different reasons for there being a gap in an evidence need. We will consider: taxonomic coverage, spatial coverage, statistical coverage. These are inter-related, but they are also different. Through the following 5 questions we are seeking to understand the specific evidence gaps.

3.1 Different types of evidence

Considering your (and your organisation's) terrestrial & freshwater biodiversity evidence needs, how well are they being met? (Collating responses from different organisations will allow us to identify country-specific gaps and needs.)

	Evidence	There are	There	Not	Rank the
	need is	some	are	relevant to	gaps, with
	well met	gaps	major	me/my	1 = most
			gaps	organisation	critical gap
Distribution: knowing where	0	0	0	0	
species/habitats occur					
Abundance: knowing how many/much	0	0	0	0	
of a species/habitat is present					J.

Trend in distribution/abundance:	0	0	0	0	
knowing how it has changed over time					
Ecosystem function/service: knowing	0	0	0	0	
the functional impact of biodiversity					
Trend in ecosystem function/service:	0	0	0	0	
knowing how the functional impact of					I
biodiversity has changed over time					
Drivers of change: knowing	0	0	0	0	
environmental mechanisms					P
underpinning changes					
Resilience: knowing that the	0	0	0	0	
species/habitat/function will be at a					
certain level in the medium-term					
future.					

Please give specific examples of the gaps you have:

3.2 Trade-offs between spatial and temporal coverage

Often resource is limited, so that it is difficult to increase taxonomic coverage (i.e. sufficient information on more species or more taxonomic groups) and increase spatial coverage (i.e. sufficient information from more regions) at the same time.

It is most useful to increase taxon	It is most useful to increase spatial coverage					
coverage to fill gaps in my evidence needs		to fill gaps in my evidence needs				
Strongly agree	0	0	0	0	Strongly agree	Ο.

Please describe specific needs and trade-offs between spatial and taxonomic coverage:

3.3 Taxonomic coverage

Biodiversity information can be required at a range of taxonomic levels and for different sets of taxa:

- 'Special' species (i.e. species of conservation concern, designated species etc.)
- More common/widespread species
- Indicators of 'ecosystem health'
- > Specific guilds
- Species providing ecosystem services
- Species from currently **under-represented** taxonomic groups
- Condition (of habitats)

What are the important gaps in taxonomic coverage for your evidence needs? Please describe specific gaps, including reference to the taxonomic levels list above:

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3.4 Spatial resolution

Biodiversity information can be required and provided (if the data are available) at a range of spatial resolutions:

- ≻ UK
- Country
- Catchment/landscape area
- > 10km grid cell
- Fine-resolution grid cell (2km or 1km or 100m)
- ≻ Site

What are the important gaps in spatial coverage for your evidence needs? Please describe specific spatial gaps, especially with reference to the spatial resolutions listed above:

3.5 Spatial gaps in coverage

Data can often be 'cut' in different ways (e.g. at smaller spatial scales, or at finer habitat categories), and there is a trade-off between these in providing high quality biodiversity information.

How important are your evidence needs in:

Improving information from currently under-represented regions?							
Unimportant (0 0	0	0	\circ	Extremely important		
Improving information from currently under-represented habitats?							
Unimportant 🤇		0	0	0	Extremely important		

Please describe specific gaps for your evidence needs with regards to information at smaller spatial scales versus for specific habitats.

3.6 Statistical coverage

Statistical analysis of data produces estimates. When using data and undertaking analyses there is often a trade-off between different aspects of statistical coverage such as:

- Accuracy (how well it represents 'reality')
- Precision (variability of the estimates)
- Statistical **significance** ('P values')
- Statistical power (the ability to identify effects that are real)
- Effect size (how the estimate relates to ecological meaning)
- Bias (consistent errors, e.g. based on biased sampling)
- Qualitative scoring (e.g. declining, stable, increasing)

Do you have set statistical standards below which information is not useful to you? (Are these written down and expressed quantitatively?)

What is the interplay between these issues of statistical coverage? How do these standards vary according to different uses of the data? How do issues of statistical coverage influence your decision-making (including considering the risks of making a wrong decision)?

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Please comment on the statistical requirements of your biodiversity needs, with reference to the statistical terms above.

4. Ways of meeting your evidence needs

4.1 Where do the JNCC partnership surveillance schemes meet your evidence needs well?

Finally, we wanted to conclude by allowing you to describe where the JNCC partnership surveillance schemes already provide information that supports your evidence needs. Although we are thinking about improvements and developments, we want to ensure that we understand where the information is working well.

4.2 New approaches

It would be helpful to know of 'new' approaches that you are using or investigating to support your terrestrial biodiversity monitoring and surveillance needs. This could be new approaches of working with volunteers, uses of professionals, or new technologies.

Thank you for your thoughts. We will interview key contacts within each organisation after they have collated responses from within their organisation. We will then collate these responses, taking account of similarities and differences across the organisations, for a short report which will guide the work during the 5 year TSDA partnership project.

Appendix 2: Questionnaire responses

This appendix provides the questionnaires as filled in by the respondents. We note that they were consulted because of their responsibility in their organisation, and most people undertook a consultation with some others within their organisation. However, their written responses should not be taken as categorically representing their organisation's views. These written responses were followed up with a one-hour telephone conversation to ensure that their written responses were properly understood to be synthesised in this report.

These responses are available to download as a supplemental document from the report webpage: <u>http://jncc.defra.gov.uk/page-7651</u>.

Note that the response from Defra and Welsh Government was not released due to the organisations' internal publication requirements. However, the respondent/s from Defra/WG played a full role in the evidence gathering and review of the report and their input was fully incorporated into the main report.