



**Terrestrial Surveillance Development and Analysis (TSDA) Strategy
2022 to 2027**

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Contents

| | |
|---|---|
| 1. Introduction..... | 2 |
| 2. Vision for TSDA to 2027 | 2 |
| 2.1 Challenge 1: Adapting to new requirements for evidence..... | 3 |
| 2.2 Challenge 2: Exploiting new data streams | 4 |
| 2.3 Challenge 3: Developing a volunteer-centred approach to the evolution of TEPoP schemes | 5 |
| 3 Strategic alignment of TSDA within partner organisations..... | 6 |
| 3.1 JNCC | 6 |
| 3.2 UKCEH | 6 |
| 3.3 BTO | 7 |

1. Introduction

The Terrestrial Surveillance Development and Analysis (TSDA) partnership is a collaborative research project established in 2017, formed of the UK Centre of Ecology and Hydrology (UKCEH), the British Trust for Ornithology (BTO), and the Joint Nature Conservation Committee (JNCC). The existing partnership was renewed in 2022. TSDA aims to work innovatively to support the development of current and future UK terrestrial biodiversity schemes and the analyses of their data, to enable schemes to effectively engage citizen scientists to contribute to our understanding of UK nature recovery. TSDA specifically focuses on working with schemes within the UK Terrestrial Surveillance Partnership of Partnerships (TEPoP), namely the:

- Avian Demographics Schemes
- Breeding Birds Survey
- Goose and Swan Monitoring Programme
- National Bat Monitoring Programme
- National Plant Monitoring Scheme
- UK Butterfly Monitoring Scheme
- UK Pollinator Monitoring Scheme
- Wetland Birds Survey
- National schemes and societies supported by the Biological Records Centre
- Rare Breeding Birds Panel

Within this document “structured” data refers to data collected by the first eight more standardised schemes on this list, whereas the last two support the collection of “unstructured” or “less structured” data, which is collected in a more opportunistic manner.

As the TSDA partnership, we aim to:

- collaborate to identify and understand the challenges for, barriers to and interests of the TEPoP schemes;
- co-design practical solutions to these challenges;
- innovate in developing analysis using TEPoP scheme data to better understand environmental change and the impacts of management interventions on biodiversity.

A focus for 2022 to 2027 will be on ensuring impact from the outputs of the partnership through communication and, where relevant, effectively supporting their implementation.

2. Vision for TSDA to 2027

The importance of “bending the curve” of biodiversity loss is increasingly recognised to ensure a “nature positive” future. Having good data and evidence about how the environment is changing is a high priority to understand the success of actions taken

to mitigate losses. The sector faces significant challenges to obtaining, collating and analysing environmental data from disparate sources to build up a picture of how ecosystems are changing. Many projects and organisations across the UK are working on these challenges; TSDA focuses specifically on exploring the contributions of TEPoP schemes (though potentially in conjunction with other monitoring efforts or data sources) to finding UK solutions and answers.

Data collected by citizen scientists through TEPoP schemes represent some of the most long-term, frequently updated, consistently collected data that we have on biodiversity across the UK. However, there remain key data gaps that hinder our understanding of the state of nature, and how it is changing. By identifying these gaps, the network of volunteers (“citizen scientists”) supported through TEPoP schemes, which form a highly engaged community, has the potential to improve our understanding through development of new and existing schemes.

The TSDA partnership have developed a vision for 2027 which is:

"To support the portfolio of TEPoP Schemes in providing evidence to support a nature positive future, by adding value to existing data through cross-scheme analysis and by developing analytical and volunteer capacity."

To reach this vision, the partnership has identified three overarching challenges to work on during 2022 to 2027. Associated with each challenge, we have developed aims and ambitions demonstrating where the TSDA partnership hope to have explored or developed the TEPoP schemes by 2027. The depth to which each of these areas will be explored has some dependency on levels of funding available to the partnership over the five-year period.

2.1 Challenge 1: Adapting to new requirements for evidence

The requirement for environmental evidence is changing. The way data are collected (e.g. the design of structured schemes or unevenness of unstructured recording across space and across land uses) can make it difficult to address new demands on the data for local reporting or exploring the impact of drivers of change. This requires us to both seek ways to fill critical data gaps (e.g. by nudging data collection towards priority areas or to areas with insufficient coverage), and to further develop and apply analytical approaches to describe and provide solutions for the gaps that remain. In addition, there is an increasing requirement to provide more comprehensive ecosystem metrics.

Our aim for TSDA is to better understand and communicate the potential applications and limitations of TEPoP schemes, and where possible support improvements to schemes and their data to enhance their application in relevant analyses of biodiversity.

By 2027, our objectives are that:

- We will be more adept at assessing information content, helping to guide the way schemes can evolve to address any data gaps, both statistically and through improving coverage.

- We will have improved representation and reduced sampling biases in TEPoP schemes, where this matters for evaluating species trends.
- We will more consistently and openly communicate both the strengths of the TEPoP schemes as data sources, as well as their biases to data users.
- We will be better able to use scheme data:
 - for assessments of progress towards national, medium-term targets aiming to bend the curve of biodiversity loss;
 - to estimate and predict the impacts of interventions;
 - to respond to the need for increasingly devolved and regional information products on biodiversity by producing relevant products appropriate to these scales.
- We will draw on a broader taxonomic range of evidence and on information from a wide range of metrics (i.e. community metrics, such as diversity, turnover and similarity, not just species trends) to better understand biodiversity change and the full impacts of its drivers.

2.2 Challenge 2: Exploiting new data streams

Traditionally we have regarded volunteer-collected data as coming from either structured or unstructured schemes. Technology is changing this because it permits new forms of data to be collected (e.g. passive acoustic sensors with automated identification; eDNA; Earth observation) and supports new data collection practices (e.g. reporting on effort recording to give semi-structured data). As citizen science expands across society, the amount of data being collected is increasing at an extraordinary pace, alongside developments in the ways we can analyse it. Hence, it is important to review whether new data is being collected in a maximally useful way, and how this can be directed.

Our aim for TSDA is to understand the possibilities, opportunities and feasibility of potential development of new and existing species surveillance schemes, in relation to contributions from new technologies, recording additional parameters or species, and newly developed analytical methods.

By 2027, our objectives are that:

- We will facilitate and encourage adoption of standards and controlled vocabularies by TEPoP schemes to enable better use/re-use of data.
- We will scope the potential contribution for new technologies to contribute to and complement TEPoP schemes (e.g. improving spatial, temporal or taxonomic coverage; or through co-location to enhance metrics from existing data). Where opportunities exist for beneficial development for TEPoP schemes, we will develop plans towards implementation and integration of these new technologies.
- We will investigate the potential for existing or new surveillance schemes to record additional taxa and/or environmental attributes (e.g. adding effort recording, semi-structured recording; structured recording to unstructured recording schemes; or habitat data) in line with evidence priorities. Where

opportunities exist for beneficial development, we will develop a plan towards integrating new parameters into TEPoP schemes.

- We will explore the potential for analytical developments such as Integrated Distribution/Population Models (IDM/IPMs) to add value to existing data streams from existing TEPoP schemes as well as how data can be segregated through metadata.
- We will support TEPoP partners, where appropriate, to pilot add-on schemes. We will evaluate the impact of these add-ons on data products and on volunteer motivations. We will address the risk of lack of scheme input by involving key schemes at the beginning of the process and develop pilots (geographically restricted or constrained in other ways) as proof of concept prior to wider roll-out.
- We will explore the impact of incorporating expert knowledge into analyses.

2.3 Challenge 3: Developing a volunteer-centred approach to the evolution of TEPoP schemes

The current activity of TEPoP schemes relies upon volunteer participation, and evolution in these schemes requires consideration of their behaviour and motivation. Previously in TSDA, we mostly included the volunteer perspectives implicitly within work areas, rather than directly consulting, co-designing or piloting with them. Between 2022 and 2027, we will need to consider the needs, motivations and behaviour of volunteers front-and-centre to ensure translation from recommendations into practice. This will require a deliberative approach to engagement with volunteers as individuals or via scheme organisers. We will use social science approaches to engage with volunteers, enabling us to take an evidence-based approach to evaluation.

Our aim for TSDA is to ensure any potential scheme developments, including those explored through Challenges 1 and 2, enhance rather than impede schemes from the volunteer's perspective. These scheme developments include those to augment the data captured, and also those aimed at enhancing volunteer engagement with both new and existing volunteers.

By 2027, our objectives are that:

- We will understand the impact of automated, personalised feedback on volunteer retention and engagement in at least two TEPoP schemes, with roll out of this supported where funding allows.
- Working with volunteers, we will have considered and evaluated the risks and benefits of integrating new technologies, or recording new parameters or species with TEPoP schemes, to help to prioritise which areas to pursue the development of.
- We will be able to better define biases in datasets by taking a more individual-based approach to considering biases in recording.
- We will ensure that TSDA has enabled sharing of best practice for enhancing nature connectedness of volunteers; identifying how to build this into normal practice of TEPoP schemes.

- We expect to develop pilots of different effort recording approaches, working with different TEPoP partners or geographic communities (e.g. Local Environment Record Centres), and to evaluate their impact on volunteers, and to share best practice across TEPoP.

3 Strategic alignment of TSDA within partner organisations

3.1 JNCC

Participation within, and support of the TSDA Partnership provides a key mechanism for delivery towards objectives set out in the [JNCC Terrestrial Biodiversity Evidence Strategy 2020](#), including:

- Growing a diverse network of skilled volunteers invested in biological recording
- Ensuring relevant evolution of surveillance schemes
- Evaluating and applying new technologies
- Enhancing data openness and accessibility
- Encouraging and supporting less-structured UK biological recording
- Exploring opportunities to fill evidence gaps through existing surveys
- Proposing, designing and implementing new surveys
- Producing and understanding biodiversity status and trend information
- Processing data into data products
- Building predictive tools to aid decision making
- Informing operational use

The JNCC Terrestrial Biodiversity Evidence Strategy was developed through consultation with, and signed off by, representatives from across the Country Nature Conservation Bodies (CNCBs) and Defra.

3.2 UKCEH

Participation within, and support of the TSDA Partnership supports work towards the [UKCEH Strategy 2025](#) “for people and nature to prosper”, including themes:

- Enhancing biodiversity to safeguard and enhance environmental health and resilience; Restoration for long-term recovery and resilience to deliver sustainable landscapes.
- Through our science we provide the knowledge, data and insights that researchers, UK and devolved governments, and businesses need to create a productive, resilient and healthy environment.
- The work of the TSDA Partnership also supports UKCEH’s direct involvement in some of the long-term surveillance schemes and through the support for the Biological Records Centre, and exemplifies UKCEH’s commitment to excellence in public engagement with research.

3.3 BTO

Working as part of the TSDA Partnership supports the running of our long-term biodiversity surveillance schemes undertaken through the JNCC–BTO partnership.

It also closely allies with the current BTO Strategic Plan 2021-23 by:

- “Enabling the delivery of high quality, impartial and impactful science” and strengthening our core UK monitoring schemes.
- Helping us to “share data information and knowledge...inspiring and empowering people with an understanding of birds”, where we work to increase the accessibility of information from local to national scales.
- “Enthusiasing and encouraging existing and new members, enabling more people to learn and grow through participation and environmental discovery” including overcoming barriers to participation and surveys and scheme.
- Increasing our impact by strengthening our links to policy and environmental decision-makers, maximising the value of our schemes to address emerging needs and support nature’s recovery and increase our profile with key audiences.