

# UK Terrestrial Evidence Partnership of Partnerships 2024 Festival:

## Terrestrial Biodiversity Monitoring Questions and Answers

The questions answered in this document were asked at the events:

[Counting species: what can monitoring tell us about UK nature recovery?](#) and

[Spotlight on Terrestrial Surveillance Development and Analysis](#)

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### Glossary of abbreviations

Abbreviation	Name or Description
<b>AI</b>	Artificial Intelligence
<b>BBS</b>	Breeding Bird Survey
<b>BSBI</b>	Botanical Society of Britain and Ireland
<b>BTO</b>	British Trust for Ornithology
<b>entoLIVE</b> webinar series	A programme of virtual talks exploring the science of insects and other invertebrates
<b>ERAMMP</b>	Environment and Rural Affairs Monitoring & Modelling Programme (Wales)
<b>FIT Count</b>	Flower-Insect Timed Count
<b>GIS</b>	Geographic Information System
<b>HPAI</b>	High Pathogenicity Avian Influenza
<b>JNCC</b>	Joint Nature Conservation Committee
<b>LandSpAES</b>	Landscape-scale species monitoring of agri-environment schemes
<b>NBN</b>	National Biodiversity Network
<b>NBMP</b>	National Bat Monitoring Programme
<b>NCEA</b>	Natural Capital and Ecosystem Assessment
<b>NC-UK Programme</b>	National Capability for UK Challenges Programme “Understanding the UK Environment”
<b>NGO</b>	Non-government organisation
<b>NPMS</b>	National Plant Monitoring Scheme
<b>TSDA</b>	Terrestrial Surveillance Development and Analysis
<b>UKCEH</b>	UK Centre for Ecology and Hydrology

Abbreviation	Name or Description
UKTEPoP	UK Terrestrial Evidence Partnership of Partnerships
UKPoMS	UK Pollinator Monitoring Scheme
UKBMS	UK Butterfly Monitoring Scheme

**1. The taxonomic scope is limited - no fungi/soil biodiversity. What scope is there to support other recording schemes to systematically collect data in a way that they contribute/complement these metrics and fill taxonomic or functional gaps**

It's important to recognise the different roles of "Atlas" schemes which aim to map out changing **distributions** of species over time, compared to monitoring schemes that monitor relative changes in **population** over time i.e. species abundance change. Many of the [monitoring schemes](#) collaborating within the UK Terrestrial Evidence Partnership of Partnerships ([UKTEPoP](#)) monitor relative population changes over time- these do not cover fungi or soil biodiversity. However, [schemes and societies supported by the Biological Records Centre](#) (part of UKTEPoP) do already support distributional recording for these taxonomic groups.

Beyond recording schemes, there are national-level structured surveys that include some elements of soil monitoring, for example under the [NCEA](#) in England; and the [ERAMMP](#) programme in Wales. Monitoring soils using citizen science can be more difficult than other species monitoring from an access perspective, as it involves destructively digging holes in land rather than just walking across land.

It is increasingly possible, especially with use of GIS, to integrate data from across taxonomic groups, which should certainly be encouraged to build up a more complete picture.

The [UK Pollinator Monitoring Scheme](#) (UKPoMS) is also [expanding the taxonomic scope](#) of smaller insect groups sampled in pan traps that can be identified using DNA barcoding.

This [entoLIVE webinar](#) gives an excellent overview of the major soil biodiversity monitoring projects currently being undertaken in the UK and globally.

**2. These schemes help act as proxies for wider change - what species proxies do the panel feel are still missing?**

Rather than just a focus on species, it is important to understand how the abundance of functionally important groups of species may be changing. The [State of Nature](#) and [UK Biodiversity Indicators](#) do this in part using composite or multi-species trends in occupancy. Research is now starting to use more creative combinations of national-level structured monitoring datasets to understand patterns of functional change or impacts of change in one trophic level on another, as seen [here](#) for blue tits and moths. The UK Pollinator Monitoring Scheme (pan traps) and [Rothamsted Insect Survey](#) (suction samples) offer another distributed (though smaller) network of monitoring sites to look at broader patterns of insect biomass or family-level abundance.

**3. Has it been challenging to engage volunteers for the UKPoMS squares? I noticed on your website that quite a few, especially in Wales and Northern Ireland, are "available". What kind of strategies have you used to help engage volunteers?**

Yes, it has been challenging to engage volunteers for the 1 km square surveys in particular, given the resources available under UKPoMS. Part of the challenge is that the squares are in 'fixed' locations, determined by the randomised stratification and overlapping of [ERAMMP](#) squares in Wales, and [National Plant Monitoring Scheme](#) (NPMS) squares in England, Scotland and Northern Ireland. The best overall strategy has been to recruit volunteers at local level or engage with interested individuals who approach UKPoMS via the website or email by giving detailed information on the nature of the survey square, and then offering a full day of 1–1 training and mentoring on their chosen square. Suggesting volunteers pair up can also work well. Follow-up support is critical, and the sharing of species lists based on what each volunteer has sampled on their square to keep them interested. Many volunteers have been with the scheme since its start. Others have had to drop out due to the physical demands of some of the landscapes involved. Luckily, UKPoMS is able to fund one or two paid part-time surveyors in each country to fill the gaps, as well as to provide training and support those volunteers.

**4. How do we reconcile our need to share & access data to inform nature's recovery, with the need for organisations to protect their own business models? Public funds seem increasingly unreliable.**

Data from across monitoring schemes are already openly available to enable use in a variety of analyses, and we welcome greater use of the data within research. For more information on data from different schemes, please use the following links: [UKBMS](#), [NPMS](#), [PoMS](#), [NBMP](#), [Bird schemes](#). For birds, we are actively increasing access to our data by releasing datasets of, for example, [Atlases](#) and more recently the [Breeding Bird Survey](#) (BBS) to wider use and to increase impact.

Balancing data access and protecting business is an important consideration, although there isn't necessarily an insurmountable conflict between the two. Some thoughts around overcoming challenges in this area were discussed in a [paper led by BTO](#). The value for money achieved in the terms of the value of effort leveraged through citizen science monitoring schemes is a powerful argument for their continued funding.

Ideally, we need to expand and strengthen the range of income sources and have in place strong business models to underpin data collection and data management costs. Government funding, from across government bodies and countries, is crucial here, as is the volunteer time and funding non-governmental organisations (NGOs) can bring. However, developers and others impacting nature recovery need to contribute too. All of this is vital to ensure the data can continue to be collected, managed, analysed and made available long term and support is in place long term for the volunteers contributing data.

As well as national organisations and national schemes, it's important to recognise the role played by Local Biological/Environmental Record Centres. They play a significant role in consolidating and verifying data across the full range of taxonomic groups. They also do a lot to promote biological recording to new audiences, as well as providing data to inform planning decisions and agri-environment schemes.

**5. How well do our UK schemes embed/link into European schemes?**

Data collected through the [UK Butterfly Monitoring Scheme](#) (UKBMS) is fully integrated with butterfly monitoring in other countries throughout Europe, via the [European Butterfly Monitoring Scheme](#). The method used is the same throughout, contributing to the development of butterfly indices (and monitoring of change) for Europe as a whole.

For bird monitoring schemes, British and Irish monitoring is well embedded, with BTO key partners in both the [European Bird Census Council](#) and the [European Union of Bird Ringing Schemes](#) with our data contributing in a wide variety of ways: BBS data, for example, contribute to Europe-wide indicators through The [Pan-European Common Birds Monitoring Scheme](#) and bird ringing data contribute HPAI (Avian Influenza) risk planning through the [Bird Flu Radar tool](#).

UKPoMS has informed the set-up of an [identical scheme in the Republic of Ireland](#) (which has the added inclusion of transect walks), contributing overall to the All-Ireland Pollinator Plan. The Flower-Insect timed (FIT) Count app is now operating in 5-6 EU member states including Portugal and Germany. More broadly, UKPoMS has fed into the [recent recommendations](#) for an EU Pollinator Monitoring Scheme due to be implemented from 2026 onwards. It is important to note that the metrics and methods used in each scheme or country should be tailored to what is required to meet any key biodiversity indicators or legally binding targets for nature recovery in that country.

## **6. We have used this wealth of data to tell us about long-term biodiversity decline. What are the opportunities to focus more on short-term changes, which is what most land managers or policymakers are interested in?**

In terms of monitoring short-term changes, the annual UK Biodiversity Indicators, developed using species data from monitoring schemes, do draw out short-term changes for several taxa. Birds are reported on annually on both short and long-term changes in numbers, which are also available through the [Trends Explorer](#).

Measuring short-term (over 1–3 years) changes at more local scales, especially to answer applied hypotheses relating to farm-level land management changes, may require a different approach or sampling framework to that used by the national schemes. This is especially true for insects with short generation times and highly fluctuating populations. Aside from many research project datasets in particular landscapes, the [LandSpAES](#) project (Natural England and UKCEH/ BTO) addressed this to some extent, but has not yet reported on change over time.

In terms of management to support change in the short term, this is challenging and often there are no quick fixes. The causes of long-term declines for most species are a combination of many factors including changes in land management, habitat fragmentation and isolation plus climate. Reversing declines is a daunting prospect, but there are plenty of examples (e.g. Large Blue butterfly) where small beginnings have resulted in long-term positive outcomes. The key is to begin with short-term initiatives but always have your eye on the long-term goal. The important thing is long-term commitment and continuity of habitat management and habitat creation. This of course requires continuity of funding and support, which is increasingly challenging.

## **7. How can these data sets best be used for regional reporting e.g. statutory State of UK National Park reporting?**

This is an area we are actively working on, for example, developing methods and workflows to [integrate data sources](#), which has been supported through the [Terrestrial Surveillance Development and Analysis](#) (TSDA) Partnership. We can also make our data available at more local scales to [support planning decisions](#) and by supporting regional initiatives, such as the [Tracking the Impact](#) study in the Chilterns National Landscape. Tracking the Impact was the subject of a [recent TEPoP event](#).

The most limiting factor in answering this question is likely to be the degree of replication or size of a given site/ sampling network at regional scale.

JNCC recently published a [guidance report](#) reviewing ways to monitor biodiversity at different scales, which captures many considerations relating to this question.

## **8. Can we use species surveillance schemes to tell us more about the state of our habitats?**

Yes, in several ways. The National Plant Monitoring Scheme was developed to help us understand the health of habitats through an improved understanding of the presence and abundance of plant species. The scheme steers volunteers to recording positive and negative indicator species, specific to the habitat being surveyed.

UKPoMS already collects some data on local-scale habitat context and floral resource availability with each survey, and ways to incorporate these data into models of insect trends over time are being explored. Other monitoring schemes also collect a [variety of habitat data](#), alongside species data.

Existing recording can be used to track habitats and land-use change, at least at [broad scales](#). The TSDA Partnership currently has a paper in review setting out a framework to help species surveillance schemes design effective habitat monitoring protocols depending on the aims in question.

## **9. How does species monitoring inform the state of nature as a whole?**

Various monitoring and recording schemes have provided the crucial evidence for the various [State of Nature](#) reports. Some taxonomic groups and habitats are less well covered, but increasingly more schemes are developing and contributing to the breadth and depth of knowledge. Few countries can match the UK for the amount of biological data across a diverse range of taxonomic groups, so we are well placed to assess the state of nature.

## **10. What priorities do you see for generating robust trends at the regional/devolved country level?**

Important here is developing methods to better integrate different data sources and integrating national monitoring methods with more local initiatives - so the former achieve better coverage and the latter get valuable comparative context (see question 7).

The key is to develop sufficient monitoring sites with a good geographical spread. Randomised sampling is of course best, but some level of stratified sampling to ensure coverage of all habitats may also be needed. Considering butterfly transect monitoring, there are already national indices for all butterfly species at devolved country level. Subject to sufficient funding, it would easily be possible to generate robust regional indices and trend analysis for areas such as South-east England and for certain other regions of England that have very high concentrations of transect monitored sites.

Similar principles apply across taxa- the higher the density of data in a region, the more feasible it is to generate regional trends. For birds, trends for many species in UK countries and English regions are [already available](#).

The NBMP [reports annually](#) on trends in UK bat species, with trends provided per country where data allows.

The NPMS and PoMS are newer schemes. Due to this, the immediate priority for PoMS is to get peer-reviewed published methods for UK trends. Producing country-level trends is also a high priority - this will be constrained by smaller sample sizes, but we think that some trends will be possible. We are consulting on what trends and statistics would be most useful at UK and country level. A similar situation applies for NPMS, and this scheme has focused to date on developing [indicator plant species trends per habitat type](#) across the UK.

**11. The panel have spoken about data impact. The NBN Atlas exists to maximise the impact of biodiversity data by making it accessible - but it's not easy to track that wider use and impact. What changes would you like to see to capture impact?**

Stronger flows of information from those using the data to those generating the data would help to assess impact. However, some data products derived from schemes (e.g. [UK Biodiversity Indicators](#)) have impact across a wide range of audiences, so capturing the breadth of this impact can be challenging. Initiatives to document case studies or user stories may be one way of achieving this.

Within the [Environmental Information Data Centre](#) that hosts all [raw data generated on UKPoMS](#), the number of views and downloads can be tracked, and people wanting to use the data in any further research do often get in touch.

**12. Is there a way that via the available partnerships we can host sessions for volunteers to explain how their contributions (on a range of schemes) is vital to influencing policy and action?**

This is a really important thing to do, both for informing volunteers, but also motivating them to contribute in the first place. Most schemes undertake some form of volunteer engagement. For example, BTO tries to do this in a range of ways, both online and through in-person events at regional and national level. The UKPoMS team is hopeful there will be appetite for a full UKPoMS volunteer conference at the 10-year mark. Resources to do more volunteer engagement are always welcome!

Given the importance of feedback to volunteers, we are currently [exploring ways to do this effectively](#) through TSDA.

**13. I'm programme manager for a species recovery partnership in Wales (Natur am Byth!). We cover some very remote areas with low volunteer sign up on schemes. Is there a way we can receive 'target squares' that we can promote for coverage?**

This is a very helpful link and a great idea - please get in touch with the scheme coordinators to discuss further. We can share precise locations of nearby 1km squares that are available.

BTO have been trying to increase scheme coverage in different ways, for example through providing a list of unsurveyed BBS squares to the [Tracking the Impact](#) project in the Chilterns National Landscape Area. These squares were randomly selected as part of the national programme, so not only do they provide unbiased coverage of the local area; by following the same method, the extra monitoring can also contribute at national level. Another example is the popular "[Upland Rovers](#)" Breeding Bird Survey initiative, where we have highlighted squares in otherwise poorly covered areas to new audiences, such as mountain hikers.

**14. Have the data reliability checks been in place the whole time citizen science has been happening? If not, when were they introduced?**

It depends how you define citizen science! The JNCC funded monitoring schemes all have validation checks built into the design from the start. BSBI recording (e.g. for PlantAtlas 2020) has always involved expert checking and validation of records.

Since citizen science efforts stretch back more than a century (the ringing scheme started in 1909, the heronries census in 1928), and in these cases, no, the reliability checks haven't always been in place. Data verification is clearly important and evolving all the time. Initially



this would have involved manual checks of data, but with increasingly online entry of data there are opportunities to validate data on entry, reducing (but not eliminating) the need for subsequent verification. It will continue to be an area of active development, and, looking forward, AI algorithms may offer opportunities to do this in a more informed, targeted and effective fashion.

UKPoMS would hope to build in more access to AI to identify target flowers on FIT Counts for example, or maybe one day to help identify some of the observed insects on FIT Counts to genus or species level (if not done by volunteers).

**15. Do we have a central database which shows spatially the volunteer uptake of monitoring schemes across the UK? (maybe at county level?) - possibly could use it to identify patches where there is lower survey coverage across taxa**

No, but it seems like a useful idea. The TSDA Partnership did undertake a [“gap analysis”](#) exploring scheme coverage across both taxa and space.

UKCEH is aiming to improve our ability to bring different schemes and sites together under our new [NC-UK programme](#).

**16. Good to see that data flows from citizen science are increasing – what’s driving this?**

This is partly driven by the diversity of ways people can now play a role in citizen science. There is now a whole spectrum of options, with different entry options and requirements. For example, to participate in UKPoMS surveys, volunteers do not necessarily need individual species level identification skills. There has also been investment in technology to assist recording such as apps so volunteers can submit records quickly and easily. Development of tools such as the [Targeting Revisits maps](#) can help to focus efforts where the records can make a big difference for analyses.

We will continue to promote wider citizen engagement both to widen the diversity of participation but also engender greater awareness of environmental change. By participating in monitoring, recorders not only create better data to monitor environmental change, but they are also likely to develop a greater personal awareness of those changes and hence be more willing to engage with actions to mitigate them.

**17. Are new technologies encouraging a new demographic to engage?**

The [National Bat Monitoring Programme](#) has been trialling using new [passive acoustic monitoring techniques in urban areas](#) which has been bringing in new audiences to monitoring. We do not have as much evidence as we would like to say that new technologies are encouraging new demographics, but we would like to explore this further. We do see different demographics involved in different schemes, and it is an area that UKTEPoP are working on collectively to [ensure monitoring schemes are inclusive](#).

**18. What role do we see for such schemes and TSDA to support agri-environmental scheme development across the devolved nations?**

BBS data have been used in analyses in England and Wales (e.g. LandSpAES project) to look at associations between agri-environmental schemes and changes in bird populations. For these analyses, we need enough overlap in the species data and information about where agri-environmental schemes are being implemented. We do also use professional surveyors to gather data to answer these questions, especially for looking at the effectiveness of specific interventions, as these need to target field data collection around where these interventions are being targeted.

**19. You have talked about getting more high-resolution data through new technologies – will this help?**

Some technologies such as passive acoustic monitoring record data at a high temporal resolution. The limitation is in the number of sample sites at which we can deploy this technology. Going forward, this is something to consider - how can we best complement more traditional monitoring with the newer sensors to help to answer key questions. A key challenge, for all monitoring schemes, will be how to integrate data from an increasingly wide range of data sources to gain the most complete, or helpful, picture of biodiversity and environmental change. This forms a key component of the TSDA programme, for example in determining [species distribution change](#).

**20. Can data from surveillance monitoring be used to ask questions of how we might change policies, or specific interventions under them, to achieve desired outcomes?**

It's important to reflect on the quantity of data available, and how well we can advise policy at relevant resolutions. The TSDA partnership is very interested to discuss whether scheme data might be able to answer policy questions of interest.

Unstructured data on honeybees have previously been used to [demonstrate the impacts of neonicotinoids](#), which contributed to steering policy.

The [Biodiversity Pathways](#) project is currently exploring how biodiversity data might help us to understand the impacts of future policy.

**21. Species richness declines at the same rate in protected and unprotected areas. Might this be caused by the impact of decline in the unprotected area radiating into the protected area?**

It is probably due to the spatial scale of the main drivers of change affecting these populations - where these drivers of change are more dispersed across the landscape (e.g. climate change, pesticides and widespread pollution). If these drivers are impacting populations significantly, these effects will be seen inside and outside protected areas - these sites aren't immune to these changes.