



The one-hundred-and-fourth meeting of the Joint Nature Conservation Committee to be held at 0915 hours on 8 September 2015, Natural Resources Wales, Ty Cambria, Cambria House, 29 Newport Road, Cardiff, CF24 0TP

This paper is provided to the Joint Committee for decision/discussion or information. Please refer to the minutes of the meeting for Committee's position on the paper.

To view other Joint Committee papers and minutes visit <http://www.jncc.gov.uk/page-2671>

To find out more about JNCC visit <http://www.jncc.gov.uk/page-1729>

Joint Nature Conservation Committee

JNCC terrestrial surveillance: evaluation and developing a future strategy

Paper by Lawrence Way, Niki Bunch and Anna Robinson

1. Introduction

- 1.1. This paper describes the JNCC-run terrestrial monitoring schemes, biological recording, analytical work and the development of Earth Observation. It describes the outcomes of consultation with the country nature conservation bodies, bilaterally and jointly, and identifies three key issues requiring resolution. These key issues are described as three scenarios to aid consideration of the balance of risk, benefit, opportunity and cost.

2. Surveillance and monitoring schemes

UK species surveillance schemes

- 2.1. JNCC has, with partners, funded, designed and developed long-term schemes to monitor biodiversity across the UK since 1991. This is a core activity for JNCC. It contributes directly to Objective 1 of JNCC's draft strategy: *Provide high-quality, cost-effective and accessible evidence on biodiversity, ecosystem services and natural capital*. There is no legal obligation or reporting requirement that has to be met through UK-scale surveillance/monitoring activity. The value of UK surveillance schemes is instead determined by how well they meet requirements within and across countries, the economy of scale and cost advantages of UK delivery, and the coherence of surveillance of more mobile species at this scale.
- 2.2. Species surveillance schemes are run through strategic partnerships with NGOs and research organisations, and provide substantial quantities of data very cost-effectively through the involvement of volunteer recorders. Monitoring ranges from structured surveillance schemes for birds, bats, plants and butterflies, to less structured, ad hoc recording for a wide range of other taxa (Annex 1). JNCC investment in these volunteer schemes is currently around £1.1 million per annum, with volunteer contributions in time conservatively valued in excess of £8.6 million per annum (Annex 2). After six years of work to increase the efficiency of these schemes, under their current configuration any small funding cuts will now reduce the scope of the surveillance programme significantly.
- 2.3. NGO partners and the Centre for Ecology and Hydrology (CEH) invest over £850k per annum into the species surveillance that JNCC supports. In a recent dialogue, partners indicated that surveillance activities remained important to their own strategies and plans but that their ability to invest was under pressure. They remain confident of being able to sustain or even grow volunteer contributions and are interested in exploring how greater collaboration between organisations may bring benefits. This interest may provide opportunities to rethink how strategic partnerships are configured.
- 2.4. The species surveillance schemes currently collect data contributing to UK trends for over 2700 species, a figure which will increase in the next few years

due to the recent inception of the National Plant Monitoring Scheme. Data are made accessible via the National Biodiversity Network (NBN), and contributes substantially to multiple applications at a range of scales:

- i. meeting reporting requirements at broad scales, e.g. providing indicators for country policy; enabling reporting for EU Directives;
- ii. enhancing understanding of drivers of environmental change (e.g. pollution, climate change, land use);
- iii. predicting the impacts of environmental interventions, e.g. species-related agri-environment outcomes;
- iv. providing biodiversity data for feeding into assessments of ecosystem services, natural capital/resources/assets and resilience;
- v. facilitating local actions, e.g. assisting in planning applications and site management decisions; and
- vi. contributing to decisions for emergency responses, e.g. providing inputs to modelling *Hymenoscyphus pseudoalbidus* (the pathogen responsible for ash die-back).

Use of Earth Observation for habitat surveillance

- 2.5. Since its inception, JNCC has been associated with the development of methods for terrestrial habitat surveillance (e.g. Phase 1 habitat survey, National Vegetation Classification). With the anticipated availability of Copernicus Earth Observation data and improved processing techniques, JNCC has built on remote-sensed habitat mapping methods pioneered by Wales. JNCC's principal involvement in this habitat mapping work has been through a series of projects undertaken with, and largely funded by, Defra (*Making Earth Observation Work for Biodiversity (MEOW)*). Methods developed through these projects are being trialled and used to create habitat maps of Norfolk, Northumberland, and several sites in Scotland. Detailed habitat maps are a high-value asset to the countries as they enable more effective planning, biodiversity accounting, and assessment of ecosystem services, natural capital/resources/assets and resilience. JNCC's involvement in this work, notably sharing best practice and developing methods that can be applied in all countries to enable production of maps, contributes to Objective 2 of the JNCC's draft strategy: *Facilitate joint working to deliver shared solutions in a devolved UK.*
- 2.6. Objective 3 of the JNCC strategy asserts that JNCC will *play a lead role in applying science and technology to meet new challenges and opportunities.* Current MEOW work is contributing to this by aiming to determine the potential for habitat condition changes to be detected using parameters derived from Earth Observation data. Developments in these methods could have significant benefits in habitat condition monitoring in the face of declining evidence budgets, due to their potential to help target ground-based monitoring to high-risk areas. This could help not only with detailed site condition monitoring, but also with developing a country-wide picture of the condition of habitat resources, and detecting the effects of environmental interventions (e.g. those put in place as part of agri-environment schemes).

- 2.7. Defra and the UK Space Agency's *Space for Smarter Government* programme have very recently initiated a three-year demonstration project for new ways of integrating satellite data and other data sources. This will enable more efficient data gathering and operations across a wide field of Defra's interests, including crop mapping and CAP implementation, habitat condition and natural capital assessment, and catchment management. The project will be a test-bed for an integrated 'nature map' of England. JNCC is leading or contributing to work packages within the project for areas of greatest interest across all of the countries of the UK. These include assessing habitat condition and developing a risk-based way of determining where and when to measure water quality using habitat land cover, cropping and species data. This work also provides an opportunity to establish how other UK capability, (e.g. the 'Space Applications Catapult') can develop services that will simplify the application of Earth Observation data across all the countries.

Working with countries

- 2.8. JNCC are committed to providing a *high quality, cost-effective service to our customers*, as stated in Objective 5 of the strategy. It is essential that the organisation responds to the changing needs of its principal customers. With this in mind, over the second quarter of 2015, JNCC staff have undertaken a series of bilateral meetings with all four UK countries' monitoring leads to determine:
- i. current country terrestrial evidence needs and the factors and priorities affecting these;
 - ii. which aspects of JNCC's involvement in terrestrial surveillance is of greatest value to countries;
 - iii. whether and where countries feel that JNCC's efforts could be adjusted, to maximise utility of the evidence produced.

3. Consultation with the country conservation bodies

Country approaches to conservation and evidence gathering

- 3.1. Approaches in countries are changing in nature and significance, both at the policy level, and in the planning of how evidence is collected to support policies. Each country provided JNCC with a summary of their approaches during the recent bilateral meetings; these are summarised below.
- i. In Wales, the new Environment Bill will focus on sustainable management of natural resources, and includes a requirement for NRW to prepare State of Natural Resources Reports (SoNaRR) on a periodic basis. These will be used to as an evidence source to set priorities to be delivered through Natural Resource Areas. Welsh Government have also consulted on a Nature Recovery Plan for Wales as they see biodiversity as being at the heart of natural resources management. Planning for SoNaRR is starting in September, as is an evidence task-and-finish group supporting the Nature Recovery Plan for Wales.
 - ii. In Scotland, the policy context is the Scottish Biodiversity Strategy and the more recent 2020 Challenge which sets out the desired outcomes

for 2020. SNH have developed a supporting evidence plan, which includes maintaining/enhancing natural capital as measured by the Natural Capital Asset Index.

- iii. For England, Defra is developing a 25-year plan for biodiversity, which is likely to include more emphasis on natural capital. In parallel, work has started on a biodiversity and natural capital evidence action plan, and a linked biodiversity monitoring and surveillance strategy.
 - iv. In Northern Ireland the Department of Environment will merge with the Department of Agriculture in 2016 after which there will be a period of replanning. There is strong interest in generating evidence efficiently with multiple applications in a period of reduced resources.
- 3.2. The bilateral meetings focussed on how UK evidence is best integrated and applied in each country. JNCC is now a participant in the development and implementation of country evidence plans in order to maximise the value of the shared UK evidence sources to each country through adjustment of data collection and appropriate analysis.

Country findings on UK species surveillance and analysis

- 3.3. *Value of schemes.* All four countries value UK species surveillance schemes as an efficient means of gathering important evidence. There is a range of views on the balance of effort across species and how this would need to change if resources were reduced. This is elaborated in section 4 below. Countries acknowledged that there are significant risks associated with the loss of UK species surveillance schemes. These risks relate largely to loss of influence and access to the overall evidence source. It was acknowledged that there is likely to be a tipping point below which the level of public sector (JNCC) investment in surveillance is not sufficient to maintain a partnership approach and the NGO community will determine the nature, scale and accessibility of species evidence independently. Whilst a lot of voluntary activity would continue without JNCC investment, particularly in *ad hoc* recording, the structured surveillance would degrade as the NGO sector is unlikely to find resources to cover the co-ordination costs (engagement with volunteers, training, data processing), The present levels of participation and public engagement with the results are valuable for country strategy implementation and there are risks to goodwill and strategy support depending on the nature and scale of any reduction in public sector investment in these activities.
- 3.4. *Scales and sample coverage.* Countries are keen for UK surveillance schemes to help meet needs at multiple scales, including at country level, landscape level and land parcel/site-specific level. Landscape and land parcel specific applications will come from analysis and modelling to produce contextual outputs since it is not feasible to increase sampling density sufficiently. At country levels there are persistent gaps in coverage, for example in more remote areas with poor access away from population centres, which leads to large areas with little sampling. There have been investments in the past to attempt to address this, with some success, for example country funding for NGO officers or initiatives to increase voluntary recording effort. The investments have significantly increased sampling but it is not clear if it has improved coverage or if the increases are sustained.

JNCC will need to find a collaborative solution with NGO partners across species surveillance to improve coverage.

- 3.5. *Ad hoc species recording.* All countries agreed that it was valuable to retain commitment to *ad hoc* recording as well as structured surveillance schemes. The two operate together to provide a resilient signal that has both depth and breadth and is reliant on different types of volunteer effort. Countries are keen to support the NBN strategic plan as the means to improving unstructured surveillance, and JNCC sees a particular opportunity for:
- i. increasing, streamlining and standardising the recording and collection of high-quality structured and representative data;
 - ii. accelerating biological data flow ('time to market') from recorders to users (without compromising data quality); and
 - iii. facilitating arbitration of standards to maximise the usefulness of new data, methods and technology¹.

To achieve this there may need to be some rationalisation and redirection of resources of spend in this area.

- 3.6. *Analytical capacity.* All countries agree that to get full benefits from the data there needs to be some analytical capability. Investment in analysis is in line with country strategies and JNCC's developing evidence strategy. Specifically, work relating to species assemblages has the potential to contribute to understanding natural capital/assets/resources, resilience and ecosystem health assessments, as well as providing new ways of using species data to help assess habitat condition. Countries indicated that they have limited analytical capability and that they value assistance in repurposing UK evidence sources for their use. In addition, developing analytical techniques for all countries at a UK scale offers efficiencies of scale to countries. Analytical techniques which use UK and country data assets together need to deliver outputs relevant at a country and local scale. This is one area where JNCC could continue to add value. However, there are differences of view on the relative balance of effort between analysis and maintaining schemes, and in what manner (e.g. JNCC commissioning or influencing others) the analytical work should be undertaken. This issue is described in section 4.

Country findings on innovation and application of Earth Observation to habitats

- 3.7. *Mapping.* The focus of Earth Observation application so far has been in habitat mapping, and delivery has been at a country level. Mapping approaches vary across countries, as summarised below:
- i. Scotland is creating a composite map from multiple existing data sets and is targeting new effort on addressing key gaps/weaknesses, which are largely in the uplands.
 - ii. The Habitat Map for Wales is an existing product based on remote sensing that updates previous field-based Welsh mapping.

¹ http://www.nbn.org.uk/nbn_wide/media/Documents/Publications/NBN-Strategy.pdf

- iii. England aims to develop a habitat map in the near future, and is assessing the most feasible options for achieving this. Natural England is focussing on upland mapping, aiming to refine the Welsh/MEOW methods for using remote-sensed data. Defra are planning an integrated project to demonstrate the multi-sector value of a habitat map based on MEOW methods.
 - iv. Northern Ireland will revisit plans after government agricultural and environment functions are integrated next year. They have already established how they could deliver a map by bringing together existing data sets, and would look to develop this using MEOW methods.
- 3.8. There does not appear to be demand from the countries for a UK-level detailed habitat map. JNCC's role is therefore a light-touch role in refining mapping methods to ensure they are effective and reusable, and helping countries implement methods for mapping. JNCC also has a role in helping countries share best practice in this area.
- 3.9. *Assessing habitat condition.* All countries are interested in the potential of using Earth Observation to contribute to assessing habitat condition. However, the importance/impact of a remote-sensed solution varies between countries due to different situations.
- i. In England, with a high percentage of higher quality habitat in protected sites or agreements, the site condition assessment task (integrated assessment) is large, and the priority is mitigating funding cuts with efficient methods.
 - ii. In Scotland, with a high percentage of high-quality habitat outside protected sites, the priority is to find a cost-effective way of reporting on condition (a key part of Favourable Conservation Status) that also helps to communicate the value of these natural assets. There is also interest in streamlining site condition work.
 - iii. In Northern Ireland, with much habitat outside protected sites, the interest is in an alternative to the Northern Ireland Countryside Survey, which has provided useful assessments in the past due to its high sample density.
 - iv. In Wales, there is interest in how Earth Observation condition parameters could contribute to State of Natural Resources Reporting, and how these could potentially contribute to agri-environment and site requirements.
- 3.10. As summarised in section 2 of this paper, JNCC have carried out some method development work on using Earth Observation to assess habitat condition. This is still at an early stage in knowing how successful applying Earth Observation to condition will be. The country bodies are interested in working together to see how far it can be taken and for JNCC to help pull together and lead some innovative development work in this area.
- 3.11. If the approach does work successfully across a range of habitats it will be critical that delivery of the approach is shared with other applications across the environment (for example, agriculture, forestry, water) to keep costs down. All countries are likely to review monitoring priority and synergy across the whole environment. This is currently the case in Wales, where NRW's remit

covers water and forestry as well as biodiversity, and a monitoring review is underway.

4. Key issues

How to achieve analytical capability

- 4.1. All countries agree that some analytical work is needed. Most countries value JNCC retaining some skills and commissioning flexibility. All are interested in incentivising others to innovate, whilst Defra sees analytical capability as a Research Council role and is less likely to support any commissioning. The type of capability needed is practical translation from research to repeatable, cheap-to-deploy methods that work well with the available data, and can be run as needed. The risk in assuming that this can be achieved through influence is that it is not a mainstream research function.

How best to realign UK species surveillance to improve value

- 4.2. All current UK surveillance schemes are considered valuable, although countries have slightly different views on the balance needed to ensure the most value to applications within and across countries. Addressing sample coverage improves the utility of existing effort for Wales, Scotland and Northern Ireland and to some extent England but some rebalancing or reduction in species coverage may be needed to provide the resources for this. There was also a suggestion that monitoring currently not in scope of the surveillance suite would be a useful addition, for example fish monitoring and pollinators. This would obviously require a shift in resources from countries to JNCC if added to JNCC's suite of schemes, or the dropping of some existing UK activity. Overall, no consensus has been reached over whether and how shifts in effort should occur, and this is something JNCC will need to investigate further to enhance the utility of the evidence provision.

Prioritising between UK species surveillance, analysis and Earth Observation innovation

- 4.3. There has been some within-country thinking on prioritising the shared UK evidence available through JNCC, although it is not fully resolved. Countries place different emphases on different drivers for evidence, including evidence for:
 - i. meeting statutory requirements;
 - ii. guiding management and operations;
 - iii. assessing biodiversity service provision; and
 - iv. assessing the status of biodiversity such that it contributes to understanding natural capital/assets/resources, ecosystem health or resilience.
- 4.4. Countries that prioritise iii. and iv. also particularly emphasise the need for analytical resource, including in innovative Earth Observation methods, rather than prioritising resources on continued running of surveillance schemes.

5. Future balance of effort

- 5.1. Decisions are needed on the future balance of effort within JNCC's terrestrial surveillance programme that will best support countries in meeting their needs. Three scenarios are presented in Annex 3, illustrating the benefits and risks of different approaches to the balance between investing in the current suite of surveillance schemes and investing in analysis and innovation.

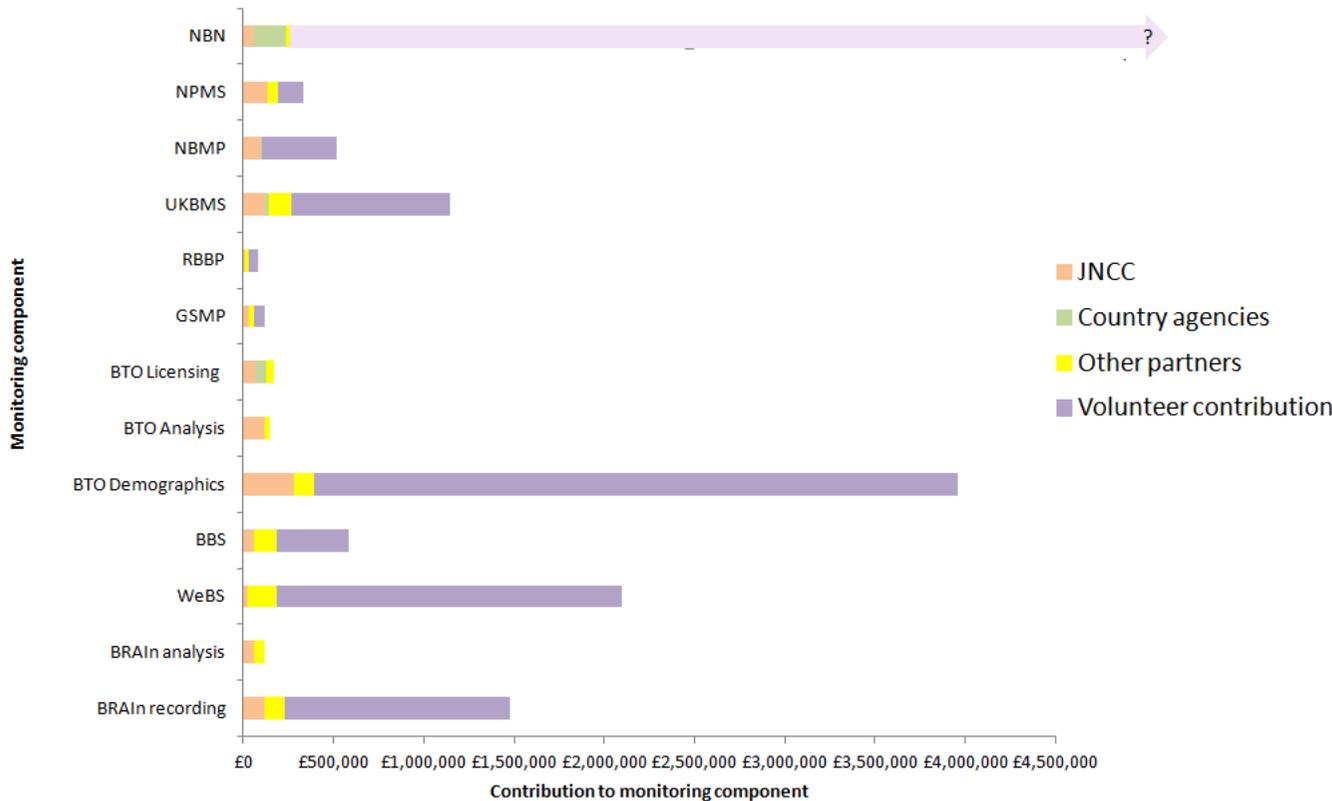
Annex 1. UK terrestrial species surveillance activities funded (at least in part) by JNCC

Surveillance scheme	Partners	Description	Applications
Wetland Bird Survey (WeBS)	BTO, JNCC, RSPB, WWT	2,651 wetlands in GB monitored up to once a month for waders and other waterbirds (figure for 2013/14). All major wetlands covered and revisited each year. Count units related to designation unit. Approximately 100 species recorded. Scheme started in 1947. Online recording and reporting has recently been developed.	<ul style="list-style-type: none"> • UK and country indicators. • Birds Directive and African Eurasian Waterbird Agreement (AEWA) reporting. • Site condition assessment. • Local use, supporting Environmental Impact Assessments and country agency casework.
Breeding Bird Survey (BBS)	BTO, JNCC, RSPB	3,355 sites in UK reported on in 2013, covering 219 species. Recorders detect birds along transects on random stratified 1km squares, and revisit same site each year. Scheme started in 1972. Online recording and reporting has recently been developed. Also produces trends for nine widespread and detectable wild mammals.	<ul style="list-style-type: none"> • UK and country indicators. • Birds Directive reporting (and contributes to reporting for two mammals under the Habitats Directive). • Local information for site management. • Sample size is sufficient to enable national analyses of impacts of pressures and interventions; has been used to show England and Wales agri-environment species outcomes.
Bird demographic monitoring: National Ringing Scheme Nest Record Scheme	JNCC, BTO	1 million birds are ringed each year of approximately 260 species, including birds from over 120 Constant Effort Survey (CES) sites and 163 Re-trapping Adults for Survival (RAS) studies. CES started in 1983, and RAS in 1998. 35-40,000 nests recorded annually in GB, covering over 150 species. Scheme started in 1939. JNCC and BTO have invested to reduce running costs long-term by replacing the ringing database and bringing in online recording, and developing analysis to provide information on multiple species efficiently.	<ul style="list-style-type: none"> • Enhanced understanding of bird populations, movements, productivity, and survival rates. • Analytical outputs based on data can help to understand pressures on species (which can feed into Birds Directive Article 12 reporting), and can inform management practices.
Monitoring of birds and the environment:	JNCC, BTO	Produces numerous analytical outputs using data collected in WeBS, BBS and demographic monitoring. BirdTrends provides the online and primary mechanism for	<ul style="list-style-type: none"> • Enhanced understanding of bird populations, movements, productivity, and survival rates. • Analytical outputs based on data can help to

Surveillance scheme	Partners	Description	Applications
Analysis and Reporting of Information on Species and Environmental Change, and Strategic Analytical Reviews		delivering information on changes in breeding populations from BBS and demographic monitoring schemes to conservation practitioners, policy makers, volunteers and other end users. Recently undertook an investigation into new concepts and analytical procedures for the surveillance and monitoring of birds at the assemblage level, and a discussion of their potential applications.	understand pressures on species (which can feed into Birds Directive Article 12 reporting), and can inform management practices.
Rare Breeding Bird Panel (RBBP)	JNCC, RSPB, BTO	Scheme collates records of rare breeding birds, including up to 76 regularly breeding species in the UK. Trends are detected for 35 species. Scheme started in 1972.	<ul style="list-style-type: none"> • UK and country indicators. • Birds Directive reporting. • Site-specific information used for conservation planning.
Goose and Swan Monitoring Programme (GSMP)	JNCC, WWT, SNH	Long-running scheme monitoring 13 goose and swan populations in the UK. Recently improved efficiency by developing online recording and reporting of results.	<ul style="list-style-type: none"> • Monitors species of international responsibility and contributes to Birds Directive and AEWA reporting. • Site condition assessment. • Adaptive management plans. • Local use, supporting Environmental Impact Assessments and country agency casework.
UK Butterfly Monitoring Scheme (UKBMS)	BC, CEH, BTO, JNCC, NRW, Defra, NE, FC, SNH	Recorders count all butterflies along approximately 1000 transect walks (self-selected) on a weekly basis throughout summer, and on over 700 random stratified 1km squares (Wider Countryside Butterfly Survey) at least twice in the summer. Same sites revisited each year. UKBMS also includes some single species surveys. Trends produced for 56 species. Some trends go back to 1976. New analytical method has recently been developed allowing joint analysis of traditional transects and WCBS sites, increasing the power to detect trends for more species at UK and country level, and across habitat types.	<ul style="list-style-type: none"> • UK and country indicators. • Habitats Directive reporting (Large Blue and Marsh Fritillary). • Detecting impacts of pressures, e.g. climate change, and level of habitat heterogeneity. • Potential for data to be used to assess policy interventions. • Some contribution to site condition reporting where samples overlap with protected sites. • Contributes to local site management.

Surveillance scheme	Partners	Description	Applications
National Bat Monitoring Programme (NBMP)	BCT, JNCC, NRW	>2200 sites monitored annually (as of 2013). Long-term trends available for 11 of the UK's 17 bat species. Scheme started in 1996. Online recording recently developed to improve efficiency.	<ul style="list-style-type: none"> • UK and country indicators. • Habitats Directive reporting (all bats are Annex IV species). • Site condition monitoring (small contribution). • Data collected through NBMP surveys can aid local planning.
National Plant Monitoring Scheme	BSBI, CEH, JNCC, Plantlife.	Scheme launched in 2015, aiming to recruit at least 600 volunteers for the first field season. Volunteers survey random stratified monads (1km ²), recording plants in quadrats and/or transects at several habitat specific plots within the monad. There are three different recording levels – entry level 'wild flower', indicator species, and inventory level.	<ul style="list-style-type: none"> • Likely to contribute to UK and country indicators. • Analysis of pressures and interventions. • Will contribute to Habitats Directive reporting.
Biological Recording Analysis and Interpretation (BRAIn)	JNCC, BRC, working with lots of schemes and societies.	This contract works with approx 85 schemes and societies to support recording, publish their data via NBN and get more value and use out of recording data, e.g. > 2500 trends have been produced from ad hoc distribution records. BRAIn contract includes a component supporting the Non Native Species Information Portal. Improving data flow processes linked to online recording, including streamlining information flows for non native species. Informing optimal sampling strategies, e.g. for rare and restricted species. Developing analysis against traits and functional groups to understand drivers of change and ecosystem function.	<ul style="list-style-type: none"> • UK and country indicators. • Potential for use of modelled trends in Habitats Directive reporting. • Analysis of data against pressures and interventions. • Non-native species strategy.
NBN	JNCC, NBN Trust, lots of schemes and societies.	JNCC's current focus within NBN is supporting the data collation function, i.e. making sure the large quantities of species data (4.5 million records) submitted annually to the NBN by volunteers are made accessible.	<ul style="list-style-type: none"> • Analysis of this data enables signals of change to be detected in a much wider group of taxa than structured surveillance schemes alone would provide, which can feed into reporting requirements. • UK and country indicators. • Informs local planning.

Annex 2. Annual financial contributions to species surveillance (including value contributed by volunteers)



Volunteer contributions are conservative estimates with large confidence intervals, including the time taken for volunteers to undertake and travel to the structured surveys. It does not include the additional value provided by volunteers leading workshops, entering data, undertaking internships, and funding their own travel.

The exact value of NBN volunteer contributions is unquantified. There are 4.5 million data submissions per year to the NBN but uncertainty over the average time contributed per record leads to very large confidence intervals. The value will be off the scale of this graph.

BRAIn recording only includes volunteer contributions from those volunteers organising the 85 schemes supported by the contract. Volunteer effort from BRAIn recording is included in the NBN unquantified contribution.

Annex 3. Scenarios for future balance of effort in JNCC’s terrestrial surveillance programme

Scenario	Benefits	Risks	Assessment
<p>1. Maintain UK surveillance schemes by reducing resources for analysis and innovation. Aim to influence others to carry out more analytic work and Earth Observation innovation.</p>	<ul style="list-style-type: none"> • The outputs of the surveillance schemes are tried and tested and they have known benefits in providing evidence on species. • Maintains goodwill of NGOs and the public. 	<ul style="list-style-type: none"> • There are applications that cannot be met solely by existing schemes. • Inflationary costs to schemes mean that they will be at risk soon even if resources were prioritised towards them. • Relying on influencing others for developmental work that is not a strong research-match means less effective analysis for countries, as well as potential cost implications for using that work. • Without development work there will be less potential for mitigating deeper evidence cuts in the future. • Unlikely to make full value of available data sources that have had prior investment, e.g. Copernicus. 	<ul style="list-style-type: none"> • A short-term amelioration of damage to existing systems that will not sustain them long, and will hamper innovation to extract greater meaning from evidence and adapt to changing demands.
<p>2. Make modest reductions to surveillance schemes. Carry on with low level of analytical work and Earth Observation innovation.</p>	<ul style="list-style-type: none"> • Some evidence outputs from surveillance schemes are retained. • Analytical resource increases benefits from the remaining schemes. • Innovation could deliver multi-scale applications of the shared surveillance assets at country, landscape and local levels. • Innovation provides amelioration of reductions in evidence, and should offer flexibility and enhanced coverage not available now. 	<ul style="list-style-type: none"> • Degraded species surveillance affects the goodwill of NGOs and public engagement. • Risks around accessibility, including the cost of access to species data. • Innovation is not certain to deliver cost-effective solutions that mitigate reductions in resources for evidence if those reductions are sustained long-term. • A relatively large amount of investment may be needed to get Earth Observation methods to a level that can 	<ul style="list-style-type: none"> • A superficially attractive compromise that is likely to lack resilience in a time of budget reductions and so not deliver.

Scenario	Benefits	Risks	Assessment
<p>3. In the short term, maintain investment in surveillance schemes, <i>and</i> invest adequately in analytical work and Earth Observation innovation, using influence over others only where it is the optimal solution.</p> <p>In the medium term, either sustain investment by accessing savings from other environment policies reusing the same evidence, or expect a decline in cost but not in utility due to success of analysis and innovation.</p>	<ul style="list-style-type: none"> • The outputs of the surveillance schemes are tried and tested and they have known benefits in providing evidence on species. • Maintains goodwill of NGOs and the public. • Invest-to-save in analytical resource significantly increases benefits from the remaining schemes, including enhanced integration with other datasets and absorbing the plant scheme data. • Innovation could deliver multi-scale applications of the shared surveillance assets at country, landscape and local levels. • Accessing other policy areas to demonstrate savings to them will enhance natural capital evidence capability and enable access to funds. • Greater resilience in evidence provision in the future. • Impetus for seeking new funding solutions (Horizon 2020 for innovation, UK Space, commercial products) consistent with revising the business model for JNCC and consistent with investments being made by governments also. 	<p>be useful.</p> <ul style="list-style-type: none"> • Requires a modest increase in resources in the short term (to achieve savings later) • Savings made in other policy areas will not be passed on to sustain this work. • Reductions to other budgets to secure resources could damage other outcomes. • Investment could be significant to yield benefit in the Earth Observation area. May be a long lead-time for savings to be realised. 	<ul style="list-style-type: none"> • A commitment to a step-change in both the development and use of evidence and an opportunity to shift the business model to one that is both better-aligned with natural capital and more sustainable.