

REPORT: WC1041. SUPPORTING MORE ROBUST AND COST-EFFECTIVE BIODIVERSITY SURVEILLANCE AND DATA MANAGEMENT IN THE VOLUNTARY SECTOR; 2011-2014

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1. Executive Summary

Funding to support robust and cost-effective biodiversity surveillance and data management was established in 2011 (also known as funding for biodiversity recording in the voluntary sector). The Fund had three objectives:

- To increase the quality and relevance of biodiversity data available to national and local users, and to support decision making, research and conservation planning
- To assist local groups in the provision of a more effective and efficient service to data users, including the development and piloting of new data entry and management systems, and
- To work with the voluntary sector more widely to develop more structured approaches to data collection, including the development of local pilots that support collaboration between local groups and national societies.

Between 2012 and 2014, Natural England worked with over 2,500 volunteers and experts from over 100 organisations to meet these objectives. This was delivered through five projects.

The five projects addressed the following strategic needs:

- Piloting new ways to develop more structured surveillance
- Developing more strategic methods for training delivery to build volunteer capacity
- Improving validation and verification through use of online technology
- Improving the efficiency and effectiveness of data provision and use through innovation
- Delivering administrative efficiencies through a new joint approach to Defra family funding.

The results showed the potential to greatly improve the quality and relevance of volunteer data, improve efficiencies and develop more structured approaches to data collection – though findings suggested further development would be necessary to realise improvements more widely.

Pilots showed that it was generally possible, with local co-ordination, for volunteers to collect more structured information. Volunteers successfully used habitat-based methods to collect standardised information for 11 different species groups and 3 habitats. This increased the quality and relevance of data provision in these areas, as well as collaboration between local and national groups. However, while the approach showed potential, the low number of sites visited (32) suggested that volunteer capacity within trial areas was not yet sufficient to provide a representative sample – a key requirement for many public sector users.

The shortage of volunteer capacity was anticipated and was addressed, in part, through trials of new strategic training methods. Project funding provided a strategic framework for training provision, offering 770 places on 72 courses nationwide. This addressed identification-skill gaps for difficult species groups (of greatest relevance to government policy) and resulted in a network of over 400 volunteers – who in turn submitted over 6000 records. This increased capacity and the quantity of records available for public use on the NBN Gateway. The approach also proved popular with both volunteers and recording groups and was effective at knowledge transfer and utilising new technology. The trial demonstrated that delivery of a functional framework for further strategic investment was possible, though the significant costs of continuation highlighted the need for partnership support to ensure a sustainable approach to training for difficult groups.

Capital funding encouraged innovation and provided examples of how data could be provided in new ways, less dependent on training for certain taxa. Trials, part-funded through the capital scheme, showed how automated approaches to bat recording could greatly increase availability of high quality records and engage more volunteers to boost capacity. This generated 500,000 records and recruited 400 volunteers in one year. In addition, funding to explore wider application of technological advancements in other areas showed the potential to improve standards and increase efficiencies more widely. This resulted in 11 organisations adopting online recording (to provide a sustainable approach to data management) and successful verification of 44% of trial records shared via online (demonstrating a potentially sustainable solution to quality assurance). Despite improvements through funded projects, online recording technology was found to be under-utilised by the sector. The reasons for this were complex, but results suggested that significant savings could be found, if current cultural and technological issues (identified through the trials) could be tackled and resolved.

The conclusion reached was that the fund was largely successful in meeting its aims. It increased the quality and relevance of data (through training and data mobilisation); increased efficiency of data services to users (through increased use of online recording); and developed structured surveillance approaches (that encouraged close working between local and national groups). It was also successful in securing additional funding from other sources (totalling £80,718, through the capital scheme) and delivering significant administrative savings through joint Defra-family funding totalling 2.5 FTE.

Overall the fund's greatest immediate impacts were through support for innovative use of automated recording and online recording technologies – this attracted match funding from partners and benefitted the greatest number of recipients. Longer term, more significant improvements to effectiveness and efficiency may also be possible through more strategic surveillance and training and online recording – though results suggested these areas require further development to ensure a sustainable cost-effective approach.

2. Background

Funding to support robust and cost-effective biodiversity surveillance and data management was established in 2011 (also known as funding for biodiversity recording in the voluntary sector). It was set up as part the government [Natural Environment White Paper](#) commitment to invest a further £1.2 million to support the development of the national biodiversity network and to create a new fund for biodiversity recording in the voluntary sector.

The overall aim of the fund was to support biodiversity recording in the voluntary sector, building capacity within the not-for-profit community, placing recording schemes and societies on a more sustainable footing and improving the quantity and quality of information available to the general public and key public sector users through the National Biodiversity Network (NBN) Gateway.

Defra appointed Natural England to administer the fund over a three year period from 2011-14. The fund was designed to be implemented across series of projects to improve data management, pilot new approaches to voluntary recording, increase investment in local record centres and develop skills and capacity within the recording community. The fund also aimed to increase collaboration between national and local recording groups.

The broad objectives of the fund were to:

- Increase the quality and relevance of biodiversity data available to national and local users, and to support decision making, research and conservation planning.
- Assist local groups in the provision of a more effective and efficient service to data users, including through the development and piloting of new data entry and management systems;
- Work with the voluntary sector more widely to develop more structured approaches to data collection, including the development of local pilots that support collaboration between local groups and national societies.

The specific aims were to deliver the following projects:

- Pilot structured surveillance of species recording in collaboration between Local Record Centres (LRCs) and National Schemes and Societies (NSSs) (Project 1, Budget: £88,158);
- Develop the skills and capacity within the recording community (Project 2, Budget £84,117);
- Support the development and piloting of on-line recording with emphasis on support for validation and verification and migration from existing approaches to on-line recording (Project 3, Budget: £33,596);
- Support capital investment focusing on data capture, improvements to data management, and the adoption of existing tools to deliver ecological data products to users (Project 4, Budget £67,825¹).
- Establishing a Co-ordinated approach to funding across Defra Agencies in England (Project 5 Budget: £0²)

¹ This figure relates to 2012-14 only. The first round of the capital scheme was financed in 11/12 with an additional contribution of £43,645

Each project was delivered by the Natural England Project Manager who was responsible for the fund delivery. The project was governed by a central steering group consisting of representation from Defra, Natural England, National Biodiversity Network Trust, Centre for Ecology and Hydrology, Association for Local Environmental Record Centres, Environment Agency and Forestry Commission. Separate informal steering groups were created to deal with technical issues relating to each project.

Summaries of each project are included below.

² Financial contributions to Joint LRC Agreements were financed separately by Natural England/Environment Agency and were supported through Project Management time provided by the fund.

3. Project 1: Piloting structured surveillance of species

3.1 Introduction to the pilot

Structured approaches to species surveillance are typically required to provide robust and effective data for decision making. These generally involve use of consistent replicable methodology, unbiased sampling, clear quality assurance procedures and fixed period resurvey to provide statistically valid datasets. They are particularly important for monitoring environmental change and are a key requirement for many academic users and policy makers. At present structured surveillance is limited to a relatively small number of taxa and is dependent on volunteer recorders for data provision. As a result, users have to rely on structured information from a subset of species groups – and use unstructured species to cover other areas. This can mean decision makers working with a partial picture that cannot fully address the growing list of monitoring needs, and volunteer recording in other areas being under-utilised. The large quantity of unstructured species data currently collected suggests an opportunity for targeted intervention to improve the quality and relevance of data provision. The traditional way of doing this is to develop further taxon or issue-related schemes. An alternative innovative approach is to adopt more holistic habitat-based methods. These structure recording by habitat rather than taxa and seek efficiencies and improved effectiveness through multi-group collection. Such approaches may benefit both recorders and users of the data and make it easier to extract ecologically relevant information from recording effort. The feasibility of this innovative approach is tested in this pilot.

3.2 Objectives

The objectives of project 1 were to:

- explore the feasibility of establishing and supporting recording activity by volunteer biological recorders across all relevant taxonomic groups, focussed on a local network of sites that are structured by biotopes or habitat.
- determine how this approach can be implemented in other parts of the country
- determine the potential of online recording to deliver data management efficiencies for multi-taxa and habitat attribution data collation and mobilisation.

3.3 What we were testing

Specifically the pilots sought to determine if local volunteer groups could:

- cover suitable number of sites and taxa – to provide robust, representative data
- recruit and co-ordinate sufficient numbers of suitably skilled volunteers – to provide cost-effective delivery
- build effective partnerships – to provide sustainable delivery and funding
- collect robust data – to meet the needs of decision makers and academic users
- manage collected data online – to deliver efficiencies in data management and scalable solutions, and
- provide an efficient and effective delivery model for structured surveillance co-ordination – capable of supporting future efforts.

3.4 Methods used

Two pilots were established (through competitive tender) to determine whether locally-coordinated, habitat-based, multi-taxa, surveillance provided an efficient model capable of providing robust data. Both pilots were led by Local Record Centres (LRCs) with existing links to the local volunteer recording community.

The first pilot (pilot 1) was led by Norfolk Biodiversity Information Service (NBIS). This focussed on three main habitat types: lowland heathland, lowland calcareous/acid grassland and arable margins. In this case the target taxa were: vascular plants³; invertebrates (beetles, bees, ants and wasps, butterflies), bats⁴, fungi, mosses, liverworts and lichens.

The second pilot (pilot 2) was led by Greater Manchester Ecology Unity (GMEU). This smaller trial focussed only on woodland. In this case the target taxa were: vascular plants, mammals, fungi; lichen and invertebrates (moths, beetles and flies) and birds.

Each pilot conducted five steps to complete their trial: method development; method testing; volunteer recruitment and training; volunteer co-ordination and field recording; and online data entry.

Method development focussed on compiling methods for key taxonomic groups associated with chosen habitat(s), combining these with standardised habitat attributes and adding additional volunteer instructions (such as Health & Safety advice). Where possible, methods utilised and co-located existing species group methodologies and combined these with standardised sets of habitat attributes.



example 1: integrated multi-taxa recording

The image (left) from pilot 1 shows the location of recording plots for the butterfly transect and bat recording points on the same site. This approach provided a fixed framework on sites that could allow for consistent resurvey and a framework for engagement for volunteers.

³ pilot 1 trialled the Vascular Plants Recording Scheme method currently trialled being developed by JNCC, BSBI, CEH and Plantlife

⁴ more details on the approach taken by pilot 1 is provided in example 10

Methodologies advocated by National Schemes and Societies (NSS) were used for the different species groups, where possible. These were then augmented by County Recordors (local taxonomic experts) to fill gaps, where no nationally recognised method was available. This approach ensured coverage of most key groups and a replicable method – although additional support was required in some areas (see example 2). Sections on habitat structure were added to both methods using existing habitat forms. These included Forestry Commission Interpreted Forest Types and Woodland Structure tables and ensured an approach consistent with existing surveillance data. Efficiencies from combining different component surveys were highlighted in each document to encourage volunteers to engage in multi-group recording. This included species groups that could be surveyed at the same time of year. This was tested for applicability.



example 2: innovative volunteer collection

Due to lack of skilled volunteers (able to reliably identify difficult taxonomic groups) pilot 2 had to devise innovative new ways of collecting data. Volunteers used standardised trapping methods to collect samples and sift and label samples for experts. Samples were sent to a variety of experts by mail for identification and were then entered onto the online system where they could be shared. The approach identified several new records for invertebrates associated with old woods, including several species of Lacewing which had previously been under used as indicators for these habitat types. This approach demonstrated a cost-effective alternative to full commissioned survey, providing saving to expert travel and field time.

Method testing was provided by LRC staff and local specialists for the different target species groups. These field trials ensured that the methods were replicable and capable of providing consistent standardised results. Where methods were found to provide inconsistent results (such as use of sweep netting) these methods were discounted as unsuitable for volunteers.

Volunteer recruitment and training was performed using existing local networks. Both pilots worked in partnership with other organisations and used local contacts and national organisations to build on existing pools of volunteers and expertise. Training was provided on each field methodology and was supported by specific identification courses for target taxa as needed. This was largely performed by project leads supported by existing expert volunteers from the relevant NSS.

Co-ordination of volunteers was performed by the leads for each project. This consisted largely of: arranging access to sites, sending reminders and updates, responding to queries and arranging access to equipment, working with experts to arrange record verification, and providing feedback.

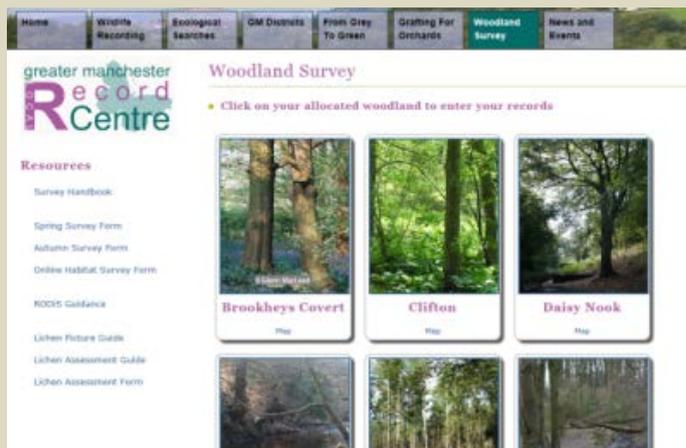
Field recording was performed over the summer of 2013 by volunteers (usually in pairs) following the standard methodology or a subset of its constituent taxonomic components.

To ensure efficient data capture all volunteer recorders were asked to use online recording to enter their structured data. This ensured that the current ability of systems to efficiently handle structured data was tested (see example 3).

Once completed survey data was sent to local verifiers to ensure quality assurance and uploaded onto the National Biodiversity Network (NBN) Gateway for public and public sector use.

example 3: integrated online recording

The image (right) shows the user interface for the pilot 2. Using this interface users were required to click on their community woodland site to access forms for each taxa and enter their own data.



3.5 Results

Analysis of effectiveness and improvement to data quality and relevance

Both pilots showed that local co-ordination can support collection of structured information across multiple taxonomic groups to a common standard. This information represented a significant improvement compared with previous data collection in both areas – which was largely unstructured. In total over 7,000 species records were collected across 32 sites to a structured methodology by 60 volunteers. This covered 11 species groups, in addition to habitat attributes for each site. Technical expertise and volunteers were provided from across 11 local organisations. This support made it possible to recruit and train 116 volunteers and provide quality assurance of the records from local experts, for most species, at limited or no additional cost. The key exception was verification of invertebrate records, this proved to be a bottleneck for pilot 1 and was limited for pilot 2. In the case of pilot 2 no recognised volunteer experts were available for the necessary specialisms (see example 2).

Despite making progress over the trial period from a low baseline of structured surveillance, the effectiveness of the data collected was impacted by coverage (small number of sites), bias (through volunteer preference), verification difficulties (particularly for invertebrates) and lack of comparable year-on-year data. Of the 70 sites targeted across the two pilots only 32 were surveyed (see Table A Appendix 1). This result in particular represents a challenge for future approaches as both projects deliberately set targets for the number of sites that they felt were achievable, rather than statistically capable of identifying change.

The main reasons for low coverage of sites were:

- ‘Volunteer drop-off’ – meaning many of the original volunteers trained did not go on to complete surveys, and
- Lack of skilled volunteers – meaning coverage was limited by individual’s capacity.

Overall the managers for both pilots believed that effectiveness of the data would increase as volunteer’s skills and confidence grew and more volunteers could be co-ordinated (to address bias and sample size). However, as the project consisted of only a single full year trial this was unproven (see section 3.).

Analysis of efficiencies and impact on feasibility

Efficiencies were sought through co-location of multiple taxa recording and habitat recording, use of single habitat-based methodologies, and use of existing online recording for ‘self-service’ data management systems. Detailed results are captured in Table A Appendix 1. Overall results from both pilots suggested that savings from using a multi-taxa habitat approach – in its current form – were relatively minor, but could be greatly increased by improved use of new technology.

The results from both pilots showed efficiencies but were limited for a number of reasons:

- cost of co-ordination investment per volunteer was significant – this was due to the high levels of skill required from each volunteers, significant training needs per volunteer, lack of available volunteers and high rates of ‘volunteer drop-off’
- multi-taxa recording by volunteers was limited – this was due, in part, to the time-consuming nature and skill requirement of existing species methods, which meant many volunteers mostly preferred to record only a single taxa, and
- online recording systems’ requirement for modification for structured use – this meant time was required to encourage use and resolve issues.

Both pilots suggested areas for improvement. These included:

- use of ‘new’ volunteers – these volunteers were found to be more willing, with support, to attempt new multi-taxa methods
- use of easier indicator-based and/or device-based methods – these increased the pool of available volunteers and helped reduce training overheads
- use of better online systems – improvements to online functionality to include structural attributes and components (habitat information).

Results from the pilots showed automated detection (pilot 1) and use of indicator methods (pilot 2) to provide the greatest evidence for savings. In both cases these approaches were found to be easily combined with existing (single-taxa) recording and popular with volunteers. In particular use of devices to monitor bats as part of pilot 1 (covered in example 10) and combining indicator plant with bird methods (in pilot 2) were especially effective. These examples provide a potential model for other groups in the future.

Use of ‘self-service’ online recording for data management showed potential for more modest efficiencies, particularly through pilot 2 – where over 60% of records were collected directly online. However, feedback from both pilots suggested that current systems were not capable of providing sufficient functionality to gather structured data without manual modification.

Analysis of costs on feasibility

To help assess future feasibility each pilot was asked to provide cost estimates based on two scenarios: an ideal funding scenario and a minimum-cost scenario. The results are shown in Table F, Appendix 2. According to the cost estimates the minimum ongoing costs for support for locally-led multi-taxa would be between £6,000-£8,750/annum/county. Additional one-off costs of £2000-£23,000 for equipment and infrastructure would also be required (variance was due to the methods employed). Comparison with the ideal model showed that costs would increase significantly if greater co-ordination and support were included –this would be necessary to cover ‘out the way’ sites and more difficult groups. When extrapolated to a national scale estimates (see Table G Appendix 2) suggest that even the minimum cost model would require significant investment to roll-out support nationally. When scaled up from county estimates, based in each county employing this model, this would amount to excess of £350,000/annum (a figure roughly equivalent to current Natural England investment in the LRC network).

Analysis of applicability in other parts of the country

In theory the local co-ordination model and methods could be used by other parts of the LRC network to improve the structure of their recording and build stronger links with National Schemes and Societies, although more work would be need to refine the methods used. The significant costs associated with volunteer support (associated with adoption of this kind of local model) suggest that such a model could not be adopted in full nationally without prioritisation over existing investment and rebalancing of funding. At present evidence of the possibility of savings on this scale have yet to be found. Savings through reduction in data management overheads provide one potential option, though the ability of new mechanisms to deliver savings of this magnitude are not yet tested.

3.6 Conclusions

Overall the pilots were moderately successful in terms of improving the effectiveness of current volunteer data provision, though less successful in achieving efficiencies through the adoption of a multi-taxa habitat-based approach.

The pilots have shown LRCs to be largely capable of establishing and supporting volunteer biological recorders across a small local habitat-based network. However, more work is needed to define the size of the network required to inform decision making and determine whether application of local, rather than nationally led approaches would be more effective and efficient. Conversations at the parallel (national) Pondnet project workshop suggest that the two approaches may not be mutually exclusive. For example local support for access permissions, verification and training and provision of equipment to support national sampling, methodology and co-ordination may provide a more optimal model.

3.7 Benefits from investment

- Identification of priority areas for potential efficiency savings – through adoption of innovative new methods for volunteer recording and technology and consequent reductions in areas such as bespoke local data management systems.
- Identification of the potential to increase the effectiveness of current recording efforts to improve relevance to decision makers, research users and conservation planners.

- Support for volunteers to collect records through standardised trapping techniques for remote (private sector) sample identification– this reduces the overall costs of survey, increases repeatability and uses the skills of different sectors.
- Encouragement of local recording communities that mentor and support new entrants and improve the overall quality and quantity of data.

Additional benefits:

- Increased provision of structured cross-taxa information for decision makers and conservation managers across 1 County and 1 Unitary Authority – including data provision for 32 sites, including 7,000 species records and a baseline for further monitoring.
- Practical models for expansion to other areas, with the ultimate goal of achieving a national product with locally relevant data products.
- Leverage of additional investment for further development of the multi-taxa concept⁵

3.8 Lessons Learnt

- More volunteers and time is needed to provide capacity to build a representative network
- High rates of volunteer drop-off need to be accounted for in project design along with support to encourage re-engagement in future years.
- Multi-year full trials are needed to determine the full impact of methods and provide comparable data (this could be provided at lower cost in future trials by re-using pilot existing methods)
- Short and sometimes unpredictable field seasons need to be accounted for in pilot design – late spring and a hot summer in 2013 provided a narrow window for survey and a lag between organised training events and survey
- Easier methods and technological solutions (as demonstrated in example 10) are required to reduce training and verification overheads
- The tested online systems are unsuitable for structured data collection without customisation – centrally available online forms for structured methods for different taxonomic groups would greatly improve efficiency of data collation and would improve consistency or approach.
- Wider partnerships are needed to increase numbers of volunteers.

4. Project 2: Developing skills and capacity

4.1 Introduction to the pilot

As mentioned in section 3, decision makers are dependent on volunteer data on species to assist their decision making. Recent drives to increase the robustness and coverage of species data are therefore likely to increase the need for skills and capacity within the sector. The capacity of the volunteer community to maintain the breadth and volume of recording across taxa has been debated in recent decades; and loss of taxonomy and systematics from mainstream education and its impact on the capacity of future generations have been identified as a key concern⁶. Despite

⁵ HLF Landscape Partnerships bid called Breaking New Ground, based in the Brecks of Norfolk and Suffolk..

⁶ House of Lords Science and Technology Select Committee (2008) Taxonomy and Systematics: follow up report <http://www.publications.parliament.uk/pa/ld200708/ldselect/ldsctech/162/162.pdf>

many initiatives aimed at encouraging new recorders in recent years, the pool of active volunteers with specialist skills is believed to be decreasing⁷. To date, initiatives have been relatively uncoordinated providing local support when there is sufficient funding, interest, or capacity, and national courses providing generic and specialist training where tutors and funds allow. The experience of bodies providing training grants has been that demand for training has been high, but that this interest does not always result in active data contributors – this is thought to be due in part to a lack of ongoing support and encouragement. Funders seeking an efficient delivery model have to tackle the fact that local training often suffers from relatively high overheads, variability in training standards and issues with coverage and attendance (particularly for less popular taxa). Equally, decision makers dependent on continuity and improvements to volunteer data recognise the need to improve quality, ensure supply and bridge taxonomic gaps. An alternative approach (tried here) is the provision of a strategic approach that provides a framework for training provision and support. This focuses on under recorded taxa to build capacity in key areas, provide greater assurance around training standards, and deliver lower relative overheads through efficiencies of scale.

4.2 Objectives

The objective of this project was to test the effectiveness of a framework approach to training provision. It sought to develop skills and capacity within the volunteer recording community by trialling a nationally co-ordinated approach to training for under-recorded taxa. This was aimed at providing a more efficient and effective approach to deliver skills training to new and existing recorders that encouraged sustained recording by volunteers and higher standards.

4.3 What we were testing

This project sought to identify whether a national framework of training provision could:

- attract nationally recognised expert trainers to cover all target taxa to increase standards;
- fill courses to improve efficiency
- provide mentoring and resources through an online community to help improve support, efficiency and sustainability, and
- ensure a greater number of the recipients of training went on to become active and valuable recorders who generate quality records.

4.4 Method

Training was provided through a national training programme called 'Biodiversity Fellows'. This was delivered by Field Studies Council (FSC) between February 2013 and February 2014. The programme involved delivery of 72 courses offering over 700 places on day/residential courses across England. These courses were supplied using a combination of FSC and partner venues for field-based and classroom-based learning with participation of expert tutors from across the recording sector.

Courses were focused on under recorded species groups thought to be of most relevant to decision makers. These were identified using a number of criteria. The criteria included the number of records on the NBN Gateway, species group diversity and the proportion of each group with designation status (listed under s41 NERC Act/Habitat Directive Annex II/IV/V). The final list

⁷ <http://www.bacoastal.co.uk/Papers/2013-NFBR-paper.pdf>

agreed by the project steering group included: beetles, lichens, true bugs, flies, mosses & liverworts, fungi, terrestrial molluscs, spiders, bees, ants, wasps, stoneworts, mites and springtails.

To ensure quality of training, expert tutors with recognised skills were identified using existing FSC networks – these included nationally recognised members of National Schemes and Societies. Tutors were recruited over the winter of 2012/13 and materials were developed in preparation for courses starting in 2013.

The list of available courses was advertised on FSC website in February 2013 and applicants were invited to express interest using online application forms. The courses were promoted to the wider recording community via a Natural England press release and through use of social media, most notably Twitter – which attracted an online following of almost 500 volunteer recorders.

Applications were assessed by the national FSC Project manager using criteria that sought to get a balance of new recorders and existing recorders, who could show a track record of recording. Course sizes were determined through a combination of past experience and conversations with tutors and were mostly limited to a maximum of 10 trainees, with some smaller (linked mostly to detailed microscopy work) and some larger (if based in the field).

Efficiencies and maximum public benefit from each course were delivered through promotion of the use of open online recording systems such as [iRecord⁸](#) and use of online training materials.

4.5 Results

Analysis of improvements to effectiveness through adoption of a strategic approach

Demonstrating the link between training and record submission was a key challenge for the project. National delivery provided greater assurance of standards of training, through use of nationally recognised tutors, though as the course only ran for one year the impact on quality of records submitted was hard to assess. The results suggested that provision of subsidised training was a large motivator for volunteers and increased their record submission. Where recorders had taken the recommended 'iRecord' route we found that over 6000 records were entered following training of which 38 were listed on the NERC s41 list (previously UK BAP species). This showed the potential of the approach and was seen as very positive – particularly as most s41 species are rare.

FSC's view on impact (based on experience with previous projects) was that it was likely to take 3-5 years to develop the skills of an individual recorder from scratch, to the point at which they could competently deal with recording for a particular taxa (such as an invertebrate group). Additional training was deemed to be required to allow recorders to reach the required level to verify records, suggesting training needed to be seen as an ongoing process to provide continuity of the volunteer service. This suggests that longer term training frameworks are required in order to be effective.

Analysis of improvement to efficiency through adoption of a strategic training approach

In order to provide a sustainable approach to training, efficiencies were sought in three areas: (i) provision of a national centrally organised programme (ii) provision of online materials, support and

⁸ iRecord was promoted with due respect to other routes (particularly County Recorders) and was not mandatory.

mentoring (iii) promotion of existing online tools to ensure efficient data sharing (iRecord) and complimentary peer-to-peer learning (iSpot).

example 4: improving training efficiency through development of Bayesian keys



FSC ran two workshops on development of online Bayesian keys. These were intended to help improve eLearning capacity by teaching attendees how to construct new keys using the iSpot online program. These tools allow users to describe a set of characters for a species then use these to make a new key. This approach showed the potential to improve identification and allow build an online community of knowledge sharing.

Results from the project showed that the Biodiversity Fellows training programme successfully delivered 770 places and 72 courses in a single year through adoption of a national approach. This exceeded their target of 52 courses provided in the original bid. This demonstrates that a national approach would deliver efficiencies of scale. In addition, the programme was successful in promotion of online data sharing to training recipients as judged through feedback from those trained.

The Biodiversity fellows programme was generally less successful in taking forward mentoring and training via online means, though demonstrated success in some areas. For example training on use of online recording was successfully delivered via use of webinar format (to include more attendees) and development of Bayesian keys (example 4) provided encouraging signs for appropriate adoption. Due to the difficulty of dealing with many of the taxonomic groups, online learning was not deemed a viable alternative to classroom training. This was particularly true for courses requiring microscopy work, which lowered capacity and increased cost per head. This conclusion was not unexpected as online mentoring and training is not how recorders currently operate; this will require time to change the existing culture.

Overall it was recognised that there was a tension between the efficiency and effectiveness of training events when considered in headline numbers. The view taken by the steering group was that the primary role of training was to boost capacity to provide *quality* data. In order to do so it was necessary to ensure class sizes remained relatively small and, in many cases, for individual recipients to attend multiple courses to acquire the desired level of training to provide quality results. This factor reduced the number of recipients and therefore impact on capacity built (in terms of number of individuals trained). However, evidence from some existing taxon recording schemes suggests that the dedication and motivation of recorders is more important than maximising the number of recorders. Encouraging confident, accurate recording by a moderate number is perhaps more effective than simply increasing the number of recorders.



example 5: boosting capacity and support through the Biodiversity Fellowship

Focus on under-recorded taxa often requires equipment and support to determine identification to species level. This can make certain species groups daunting for beginners. Despite the complex nature of the subject matter training courses for difficult groups were routinely over-subscribed. Volunteers were willing to travel an average of 100 miles and purchase field guides and equipment at their own cost. This suggested considerable personal commitment expenditure and willingness to help bridge taxonomic gaps.

Analysis of costs associated with continued provision

Despite efficiencies through adoption of a centralised approach, cost per attendee remained high at an average cost of £118. The high cost reflected the need to run small laboratory courses to cover difficult taxonomic groups. Larger field based courses were mostly cheaper per head, though were only possible during restricted field season and appropriate for certain groups.

Efficiencies through E-learning and peer-to-peer learning were promoted through use of systems such as iSpot and use of social media. However, this was not seen by project leads or expert tutors as a viable alternative for difficult groups. As a result the costs of delivery remained high.

Overall the project cost more to deliver than included in the original bid. FSC provided £7000 of their own funds to demonstrate the potential of the approach. The table shown in Table H, Appendix 2 shows a breakdown of potential costs associated with continuation of the programme. These costs are indicative only and represent best estimates. These suggest that ongoing costs for delivery of a similar programme would amount to just under one million pounds over a five year period⁹. This assumes full cover for the course costs for individuals – and would be proportionately smaller if courses are subsidised, rather than full cost. To allow for a proper evaluation costs should also be considered against the cost of previously funded training activity (that lack the standards and coherence of this approach), however, these figures are not currently available.

The overall costs of continuation could be reduced by using a mixed funding model consisting of a combination of partnership contributions and increased individual contribution. The potential maximum for viable volunteer contribution was estimated by FSC as £20/attendee/course. This was limited due to the significant additional cost of travel to volunteers.

⁹ A five year period was chosen as this reflected the timescale deemed necessary to build competent recorders capable of generating quality records required for use by decision makers and other data users.

4.6 Conclusions

The national Biodiversity Fellows programme was effective at providing means to target capacity building to address needs linked to policy and legislative priorities. However, difficulties with addressing target taxa suggest that investment would need to be continued for at least 3 years to significantly impact standards and build capacity, due to current low level of skills within the sector in these more difficult areas.

4.7 Benefits from investment

- Robust national framework/model trialled and in place to allow for further external investment to improve the effectiveness and relevance of volunteer biodiversity recording
- Alternative training approach to multiple local training courses operating with mixed standards and expertise – often supported through public funds.
- Increased national capacity to cover ‘difficult’ species groups relevant to government policy (pollinators, plant pathogens, soil health indicators)
- Creation of central register of trained volunteers – available via FSC website for targeted communications.
- Realisation of the past investment in the FSC and National Societies and Schemes to provide skill and expertise development in biodiversity.

Additional Benefits

- Partnership developed with wider recording community and national training initiatives (such as the Natural History Museum and Open University)
- Increased relevance of records available – records submitted represent a significant proportion of recent records available (for target groups) on the NBN gateway
- External partnership investment of £7000 (provided by FSC) + contribution from volunteer bodies and individuals (time and travel costs) to further develop the approach
- Effective advocacy of online recording to ensure efficient data sharing from training recipients and full public access
- Additional investment secured to take forward the Defra-funded concept through externally funded Esmée Fairbairn programme (Tomorrow’s Biodiversity).

4.8 Lessons learnt

- A national approach with local delivery, on the whole, provided a greater quality assurance for training
- Generally low level of skills mean significant training is required to enable volunteers to effectively tackle target taxa; this needs more than a single year. Cost of developing skills for difficult groups was high – which is reflected in the low number of records for difficult groups currently available to policy makers
- Single year training courses were not sufficient to effectively tackle difficult species groups
- Online training can be effective for some groups/areas, but was not (yet) capable of generating quality records
- Greater external investment (including volunteer investment) will be needed to make strategic approach to training sustainable
- Field-based training provide a cheaper alternative to classroom-based study, but are not relevant to all taxa

- Greater allowance need to be made for mentoring from tutors
- Sharing of copyrighted materials needs to be agreed with tutors prior to contract to allow for greater remote learning and wider benefits.

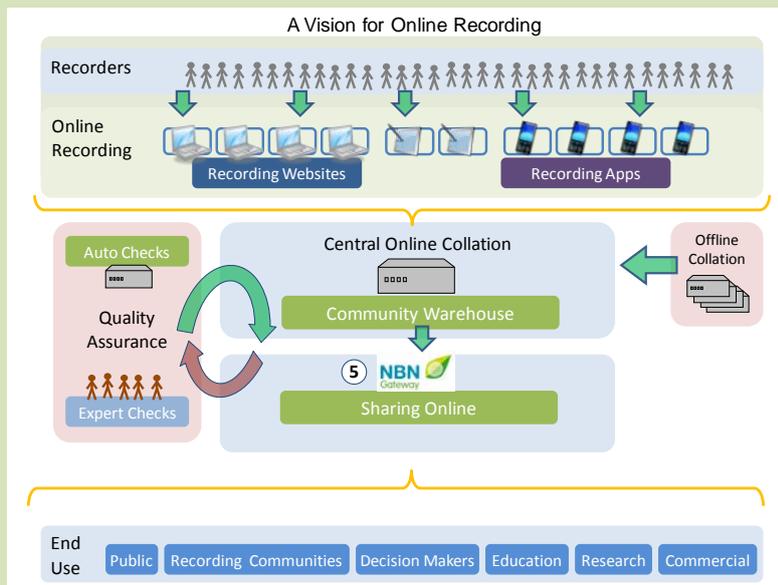
5. Project 3: Piloting the development of on-line validation and verification of biodiversity records

5.1 Introduction to the pilot

The key concern of many users of biological records is the quality of the data. Confidence that identifications are correct and that records have been collected in a consistent way are critical to their use by many decision makers. Online recording systems currently play a relatively minor role in the collection and verification of data for most species groups, but their role is predicted to grow rapidly. They have proved to be highly effective (as demonstrated by systems such as BirdTrack) when actively supported and promoted. However, the development of online recording has added to the challenge of data verification. The increase in records made possible by online recording is a challenge to the current approach verifiers; many are not used to online checking and continuous submission of records for verification. Though current approaches seek to use verifiers as carefully and effectively as possible, there can still be duplication of effort in some areas and/or gaps in local coverage in others. This leads to data quality issues or delays in data becoming more widely accessible. Improvements have been made to address the problems of data quality with the development of the [NBN Record Cleaner](#) and similar tools, but human interaction is typically required to make final verification decisions. It is also required to maintain communication with the recorders who provide the records.

In recent years the recording community have responded to the verification challenge by developing a range of online recording systems with built-in verification tools to allow experts to verify records remotely. These systems offer considerable advantages and can build strong networks between recorders and verifiers linked to location (in the case of LRCs) or taxonomic interest (in the case of NSS). However, despite these advances, verification procedures exist on different systems and do not offer standardised means of verification or effective means of sharing the verification decisions that are reached. A verifier involved with both a NSS and an LRC could potentially be asked to look at two systems to verify the same record. Alternatively a record entered locally in a system without a verifier may remain unverified and either be passed to NBN unverified or stay 'trapped' on the local system.

An alternative model (tested through this pilot) is to allow national and local experts to have access to the same tools in the same place to verify the same data. Once verified this data can then be more quickly and conveniently shared for use. This process would avoid the inefficiencies of verifiers having to access multiple systems. It also has the potential to reduce the overheads of local data management and duplication and speed up data flows.



example 6: a vision of data flow

The diagram left shows the NBN vision for online recording. This shows how (using new technology) recorders could interface with a variety of websites and apps, passing information to a central data warehouse for verification. This would allow use of set standards, linked to expert and automated QA, and ensure data is shared to a wide variety of users through the NBN Gateway.

5.2 Objectives

The objectives of Project 3 were to:

- Test the single community warehouse approach using the existing BRC Indicia warehouse, and the verification tools, as implemented through the iRecord website (<http://www.brc.ac.uk/irecord>).
- Demonstrate the best use of existing automated verification rules to reduce manual verification time
- Demonstrate how expert verifiers can work, effectively and efficiently, in tandem with automated verification technology
- Demonstrate how to build verifier networks between local and national bodies in a single warehouse
- Determine the advantages to local and national recorders of sharing data for verification and use
- Provide manual verification models that optimise the use of the skills and capacity of local and national organisations to verify data
- Identify common bottlenecks for unverified data and solutions to speed up data flow
- Demonstrate working local/national verification models and highlight changes required to existing systems to embed the model

5.3 What we were testing

The project sought to use the iRecord Community Data Warehouse (CDW) as a central verifying hub to test the concept of shared validation and verification of records. It used data and verifiers from a number of sources to determine potential efficiencies, test the ability to mobilise unverified records and identify optimal models linked to use of Record Cleaner. It also sought to gauge the feasibility of adoption of shared verification by the wider verification community. This last point was particularly important for two reasons. Firstly, the main verification challenges were thought to relate to personal user-preferences and organisational requirements of recording groups, rather

than technological issues; and secondly, significant efficiency savings would only be possible through widespread buy-in and organisational adoption.

5.4 What we did (method)

The project took two approaches to data collection. The first approach provided in-depth information on: verification practices, use of existing tools and piloting new approaches using existing data. This was performed with a subset of key organisations involved in recording and verifying biological recording data. This consisted of three national recording schemes (NSS) and two local environmental records centres (LRCs).

The second approach provided broad and shallow information. This gathered responses from a wider range of individuals and organisations involved with verification of biological recording. This approach allowed a greater number of organisations to provide feedback and helped determine how well the sample reflected the findings of the broader community.

The first approach (phase 1) involved training on the iRecord system for members of each of the chosen organisations and exchange of data for testing and completion of feedback. This determined key themes for phase 2.

Phase 2 consisted of a combination of verification of test data, in-depth interviews with a subset of recorders, and wider consultation with the broader recording community. These different approaches were used to collect views on potential efficiencies, identify case-studies, and determine advantages and challenges associated with a shared approach. The organisations selected for in depth interviews and provision of test data were: Butterfly Conservation (BC), Botanical Society of the British Isles (BSBI), Marine Biological Association (MBA), Thames Valley Environmental Records Centre (TVERC) and Worcestershire Biological Record Centre (WBRC).

In order to ensure key questions were answered, a steering group consisting of members of JNCC, NBNT, Natural England, BRC and ALERC was convened. This identified a series of key metrics which were used to measure success (see Table C, Appendix 1). NBN Gateway and other sources were used to provide baseline data, where possible, though obtaining an accurate baseline was not always possible.

5.5 Results

Analysis of improvements to verification efficiency

Efficiencies were sought in two areas. The first was through the use of automated rules to identify unusual records to prioritise manual verification; the second was through use of a single Community Data Warehouse (CDW) for online sharing and verification.

The results showed that automated verification rules were successful in flagging a large number of records – 78% of 802,459 records in the (CDW) had NBN Record Cleaner applied (were filtered using automated rules). However, evidence suggested that they were not yet working as effectively as they could, impacting overall efficiency. There were multiple reasons for this. Firstly the sensitivity of the rules meant that large numbers of records were flagged as needing manual checks by verifiers. Secondly the rules were not used by all manual verifiers for ‘auto-verification’ meaning that many specialists still wanted to look at all records, and thirdly the low volume of data for many groups made use of automated screening unnecessary. Overall it was clear that automated rules were most useful in improving the efficiency of verification for popular groups that generate lots of records.

The CDW also proved an efficient means of verifying data. This allowed users to easily upload unverified data where it could then be checked and efficiently shared. The results from trials showed, in theory at least, that reductions in manual handling of data could be made and speed of data flow increased. The trials provided useful case-studies to illustrate how a future system could work, however, a number of issues need to be addressed. Responses received from verifiers suggested that verification itself (i.e. a verifier checking a particular record) was not a significant constraint on the speed or efficiency of processing records. In the absence of a single hub (CDW), the key constraints identified were the time it takes to deal with data arriving in multiple formats from different sources, the problem of trying to verify records that were not well-evidenced and the use of multiple systems. These findings represent potential areas for improvement that could be dealt with through adoption of a centralised (CDW) verification system, though results suggest that, to deliver significant efficiencies, all users would need to use a single system.

Analysis of effectiveness and impact on data quality

The effectiveness of the Community Data Warehouse approach on improving data quality was determined using the measures identified by the steering group, see Table C Appendix 1. These judged the ability of the system to provide an effective means of: (i) getting unverified data checked (ii) getting checks performed by appropriate experts, to build confidence (iii) providing transparency of determination, for a clear audit trail and (iv) getting recent quality assured records to decision makers, for use.

Feedback from surveys confirmed that finding an effective means of checking unverified data was indeed a key problem. 74% of LRC responders stated that they did not have the expertise to fully (manually) verify their records at a local level – meaning that some records covered taxa for which they are not expert. Results from the trials conducted using LRC data as part of the pilot confirmed that it was possible for 44% of these records to be shared and verified online through the CDW (a breakdown is provided in Table M, Appendix 4) where appropriate taxon experts were available as active verifiers on the system.

Use of automated Record Cleaner rules and a central system proved successful in providing a common audit trail for decision makers. Trials also demonstrated that it was possible for data to be imported into the community warehouse from other systems to collect these attributes.

Overall the community warehouse proved effective in trials providing records of known quality for decision making, particularly with groups with active verifiers on the system. However, recruiting and supporting active verifiers on the system will be crucial to future success as only 25% of the records currently collected on the system (outside of the trial) have been verified.

Analysis of potential for efficiencies through wider role out

A major part of the project was determining the views of the recording community on the application of potential application of online approaches for verification and validation. Gaining the views of the different organisations was seen as crucial to determine the potential for wider applicability.

Feedback suggested a shared aspiration across the biological recording community for high-quality biodiversity data to be available to those who can make use of it, and a desire to make this happen. But priorities differ across the schemes, Local Record Centres and individuals. A key

issue identified was the poor relationship between many recording bodies and the National Biodiversity Network. This would need to be resolved to gain greater buy-in from some quarters.

From the perspective of individual recorders, responses to the questionnaire indicate that there is some frustration with the current situation – where recorders may be asked to supply data (sometimes the same data) to different places (and sometimes in different formats) in order for it to be available to those who can make use of it. Online systems and a CDW approach offer a way forward in this area, offering clearly efficiencies that could be gained from having one place where all a recorders' data can be sent, though it was stressed this needs to be made attractive to the recorder. Possible areas for future development are identified in section 5.8

5.6 Conclusions

The pilot showed the potential for online technology to help improve dataflow and data quality. Trials suggest that initial benefits will focus largely on verification of data from iRecord and mobilisation of unverifiable data from other systems, however, further more significant efficiencies and improvements could be delivered through a more centralised system. The lessons learnt include important intelligence regarding how this might be done

5.7 Benefits from investment

- A comprehensive review of community verification needs – including requirements for development to raise standards and increase data quality and confidence in use.
- Increased understanding of where new technology (specifically CDW) can help improve efficiency of verification, data standards and confidence.
- Promotion of existing models for efficient data sharing to ensure quality assured data.
- Prioritised list of system requirement for future CDW development is necessary to realise further efficiencies.

5.8 Lessons learnt

- Efficient and effective verification of biological records by multiple online verifiers was possible via use of a community warehouse system.
- Current delivery was effective in some areas and not in others – this largely reflected the number of active verifiers on the system suggesting more verifiers are needed for the popular groups and wider coverage of experts to cover the less charismatic groups to ensure effective data flows.
- Existing guidance for verifiers was not sufficient to ensure optimal working practices that maximise use of available technologies.
- The absence of links with other community warehouses impacted the ability of verifiers to check all online records in a single place.
- Training for recorders on how to provide supporting evidence could to have the greatest impact on reducing manual verification time
- The ability to edit site names and grid references to conform to local requirements/ national standards would widen use to more organisations concerned with validation¹⁰

¹⁰ Validation is defined by the NBN James (2011) as carrying out standardised, often automated checks on the “completeness”, accuracy of transmission and validity of the content of a record.

- The recording community was interested in adopted a shared approach to resolving issues around data flow, suggesting foundations for further work, though this would need to account for the different priorities of contributing parties.
- More work is needed to persuade all potential partners of the benefits to biological recording and conservation in sharing data more centrally.
- Unease over the flow of data from the CDW to the NBN Gateway was a concern for many responders and was seen to affect their ability and willingness to share data and realise efficiencies and improvements via the CDW route
- Improved recognition of NSS and LRC within the CDW could help improve buy in.

6. Project 4: Capital scheme

6.1 Introduction to the fund

The capital investment scheme was set up to continue to offer small amounts of funding focused on data capture and improvements to data management through supporting the adoption of existing tools to deliver ecological data to users. This fund provided continuity in best practice that was started under previous Defra-funded packages.

6.2 Objectives

The objectives of Project 4 were:

- Improvements to data capture
- Improvements to data management
- Improvements to data use
- Support for structured surveillance

6.3 What we did (method)

The capital scheme was run as three separate rounds between February 2012 and March 2014.

The first round was run from February 2012 until the end of March 2012 and focussed on equipment and training to support innovative recording of under recorded taxa.

The second round was run in January 2013 and sought to broaden its scope to include the other fund objectives, particularly improvements to data management and capture. Invitations were invited against these objectives with preference given to those that supported key legislative and policy drivers, demonstrated clear efficiencies in service delivery to reduce costs, and/or encouraged increase in structured surveillance – particularly for those with less well recorded taxa. In particular sustainable ‘sharing’ schemes were promoted, where equipment could be shared more widely to allow maximum benefit to volunteers. Following the second round an evaluation was performed to determine the funded outcomes determine priorities for the third round.

The third round altered the approach by altering levels of funding available under the scheme (to offer greater value for money) and refined guidance to reflect feedback. Due to high uptake in round two, explicit reference to support for joint-funded packages of online recording and training was dropped to allow greater focus on new approaches to supporting structured surveillance and data use.

6.4 Results

32 projects were funded through the three rounds of the capital scheme – these secured match funding of £80,718 from external sources from 2012-14. A List of all funded projects is provided in Appendix 6. A summary of key outputs and case-studies are included below.

Improvements to data capture.

Funding for improvement to data capture aimed to improve the availability and relevance of data to key local and national users. Funded activities fell under two headings. The first

Contributions towards enabling more efficient future data collection were typically smaller and supported training and support associated with uptake of new systems. For a relatively low contribution large organisations were provided with the resource and incentive necessary to make improvements to their delivery of data capture. Typically these interfaces replaced static forms or downloadable spreadsheets on existing websites and allowed users to enter and manage their own records directly to boost efficiency. In total the fund enabled 11 organisations to make these changes (9 LRCs and 2 National Schemes and Societies). Combined these systems collected over 40,333 records in 2013-14.

Improvements to data management.

Funding for improvements to data management sought to help assist local record centres and other groups to provide a more efficient and effective service to data users. Bids against this objective were largely linked to online recording. However, a small number of projects were funded to improve their existing data holdings. Funded projects included work to allow better sharing of records between West Midlands LRCs and work to improve Lancashire Environmental Record Network's provision of data to support [Morecombe Bay Limestones & Wetlands NIA](#). A further bid included work by the British Mycological Society (BMS) to update species dictionaries to allow data exchange with the NBN Gateway.



example 9: trialling efficiencies through online data management

The Bees Ants and Wasps Recording Scheme BWARS already made use of online indicia forms for engagement (see left), however, managed their data offline. Through capital scheme funding BWARS were able to investigate the feasibility of shifting from offline to online data management. The trial found that movement of BWARS data to an online platform would be mutually beneficial for decision makers and BWARS. Through the trial a third way was found that would deliver efficiencies and meet organisation's needs through new bespoke indicia systems.

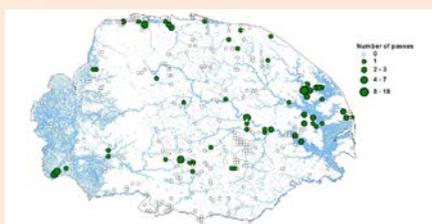
Improvements to data use

Funding for improvements in data use aimed at helping LRCs (and other local groups) provide a more efficient and effective service to users by providing cost-effective means of improving access. This area was intended to support the use of NBN web services to deliver improved data products. Due to changes in NBN web services and constraints, due to marketing exemptions only one project was successful in their bid to improve data use. This used existing NBN web services to augment local data to provide a better service to users of the RECORD data centre in Cheshire. This proved successful in providing rapid returns of

information from the NBN Gateway, however, difficulties in establishing data sharing permissions and changes to NBN web services remain a key issue making further development of this kind of system problematic.

Support for structured surveillance

Capital scheme support for structured surveillance was intended to improve the quality and relevance of records available to users and improve working between local and national groups. This was perhaps the most popular of all of the capital scheme objectives and demonstrated a growing community interest in improving the robustness of data collected. The majority of applications aimed to support capacity building to allow for more robust standardised approaches, particularly for invertebrates, mammals and lower plants. The types of project supported by the capital scheme varied enormously. These varied from use of hi-res microscope cameras, to improve web-based keys and give confidence in the identification of difficult fly species; to seed corn support for development of a new micro-moth recording scheme (see example 8). Other projects focussed on sustainable loan schemes for equipment. Projects such as the equipment loan scheme in Cumbria (example 11) and the bat pilot in Norfolk (example 10) showed the potential of local community networks to maximise the impact of small amounts of equipment.



example 10: supporting innovation

The Defra fund provided match funding to support innovative bids to improve structured surveillance for under recorded taxa. Funding for BTO established [19 Bat Monitoring Centres](#). From these centres volunteers could borrow automated SM2Bat+ detectors. These detectors were set up by over 400 volunteers in different locations and automatically triggered to record to a memory card every time a bat passed. The records collected were then fed through a computerised system to provide identification. The project managed to establish a large volunteer base to cover 448 1km squares producing over quarter of a million records.

Newson, S., Ross-Smith, V., Evans, I., Harold, R., Miller, R. & Barlow, K. (2014), Bat-monitoring: a novel approach, *British Wildlife* 25, 264-269



example 11: equipment sharing

Cumbria Biodiversity Data Centre received funding to set up an equipment loan scheme to support volunteer efforts to increase recording for more difficult groups. As part of their bid they received funding for microscopes which were then advertised on their website via a loan scheme. Records collected by volunteers for difficult species groups are now being made available through the NBN Gateway.

6.5 Conclusions

Overall the capital scheme provided a highly effective mechanism for attracting external funding to mobilise data, improve efficiencies and support innovation. The greatest benefits were achieved through improvements to data management and support for volunteers to increase structured surveillance. However, it was not found suitable of addressing shared issues such as improvements to data use and systems improvement that could be better dealt with through a centralised and consistent approach.

The success of this project is also due to the way that proposals were assessed for suitability using criteria that reflected the main purpose of the overall Defra Fund and rewarding innovation and progress with standards.

6.6 Benefits from investment

- 300,000 records shared at public access to inform decision making
- 11 organisations trained and adopted existing online recording systems to allow efficient ongoing data capture - collecting over 40,000 records online over the project period
- Over 1000 volunteers training to performance surveillance to structured methods
- £80,718 (55% of total costs) provided in match funding attracted as a result of investment
- Exemplar pilots demonstrated advantages of movement to online recording and data management
- Innovative new methods trialled with match funding to improve efficiency and effectiveness of data collection at low cost.

6.7 Lessons learnt

- Small amounts of funding for innovation proved capable of attracting considerable additional external funding
- Growing interest in structured surveillance was limited by availability of standard methods for different species groups
- Preference for bespoke local, online systems rather than generic tools could provide additional overheads.
- Potential increases to data use are curtailed by low levels of data-sharing and restrictive access permissions
- Capital scheme funding was not suitable for addressing shared/generic needs, such as improvements to web-services and could threaten adoption of a consistent approach.

7. Project 5: Establishing a co-ordinated approach to funding across Defra Agencies in England

7.1 Introduction

Natural England (NE) and the Environment Agency (EA) both provide support to the LRC network. The LRC network covers 43 record centres across England and provides data collation, management and dissemination to support local decision making. LRCs in turn provide both organisations access to records for multiple taxa as well as information on local sites and priority habitats. This information is provided as part of annual service level agreements. Prior to Defra fund investment both Natural England and Environment Agency had previously contracted these agreements separately, despite the presence of many common elements. The expiration of all Natural England multi-year agreements and 36 Environment Agency Agreements at the end of 13/14 provided an opportunity for joint working and a new approach. This was facilitated through this project. Bringing together support into single agreements aimed to simplify the process for LRCs and reduce the high transactional costs inherent in the current approach.

7.2 Objectives

The purpose of the project was to streamline agreements between the Defra Family agencies and LRCs/NSS to ensure agreements were easier operate for the recipient and removed duplication of cost and staff time. A key additional objective (in line with the aims of the fund) was to encourage greater efficiency through reduction of data management costs associated with these agreements (estimated at c£200,000/annum) and increase effectiveness of the data provided through increased support for more structured recording.

7.3 What we did (method)

In August 2012 meetings were arranged with NE, EA and Forestry Commission (FC) to determine the feasibility of establishing a joint approach to LRC funding. FC declined the invitation to join the proposed joint agreement due to lack of available funding.

Following lengthy consultation with NE & EA legal and procurement teams a flexible joint approach was agreed that would allow additional Defra bodies the potential to join at a later date. This document included shared deliverables, largely based on efficiency and effectiveness of service provision. Deliverables were worked up first with the ALERC Co-ordinator then ALERC Directors in line with the funds aims. Explicitly these included new requirements around online recording (to increase efficiency) and structured surveillance (to improve relevance and effectiveness) that were not part of former legacy funding agreements.

Agreements were negotiated centrally by the NE project manager on behalf of both organisations (to reduce duplication) using a common legal agreement. In each case deliverables were tweaked to allow for local input as part of conversations with each LRC.

Management of agreements and their deliverables was largely dealt with through LRC steering groups. To avoid duplication local representatives from each organisation were asked to alternate. However, in practice organisational reductions in both organisations meant that local attendance was limited in many cases.

7.4 Results

Efficiencies through adoption of a joint approach

The joint approach allowed greater consistency across the Defra family. It also provided a potentially efficient means for other government partners to contribute funding at little or no administrative costs. The joint approach looked to achieve efficiencies in two ways: firstly through administrative efficiencies, resulting from join-up and secondly through funded delivery efficiencies, through online recording.

The joint approach was highly successful in achieving resource savings in 2013/14 – though considerable input from legal, procurement teams and NE/EA LRC co-ordinators was required in 2012/13. Overall approximately 2.5 FTE of staff time was estimated to have been saved (compared to previous figures) in 2013/14. The majority of this saving was attributed to a shift to a national model by NE– this involved significantly reduced local staff attendance to quarterly steering group meetings and withdrawal from negotiation. This approach mirrored the approach adopted by EA and yielded the greatest savings. While the centralised approach provided resource savings for Defra bodies it was less clear whether savings were reflected by LRC partners. This was, in part, due to the fact that funding uncertainties meant both organisations required invoices to be sent separately, but was also linked to increased negotiation time needed to deal with new deliverables.

New deliverables negotiated through investment in the Defra fund were also thought to deliver efficiencies through online recording, though these were hard to define in terms of staff savings. At the outset of the project approximately one third of LRCs were offering some form of online data entry/management and a further third were planning, but were uncommitted to do so. Following negotiation all LRCs agreed to offer some form of online recording to their volunteers. Through close working with the ALERC Co-ordinator, National Biodiversity Network Trust, and use of the capital grant scheme, it was possible to provide additional support to new adopters. Through this approach it was possible to offer resources, guidance, training and sharing best practice. Combined (across the suite of Local record centres) online recording aimed to collect just short of 250,000 records in 13/14. This target was exceeded and 279,000 records were collected. Despite this achievement it should be noted that many LRCs questioned the ability of online capture alone to deliver significant efficiencies. In addition many stated that use of online recording simply increased the quantity of data that needed to be managed and could actually increase data management costs. Therefore despite high numbers it is not possible to infer direct savings in data management at this stage as these are not yet proven.

7.5 Conclusions

Adoption of a joint approach was successful in providing both administrative efficiencies and a consistent approach. The majority of savings were associated with adoption of a centralised approach to LRC management that mirrored the approach of EA. This made co-ordination between both parties easier and significantly reduced negotiation time. A return to more local co-ordination is likely to reduce these savings – though could, arguably, increase effectiveness through greater local contact.

7.6 Benefits

- Efficiency savings through adoption of a joint national approach (estimated as 2.FTE)
- Improvements to efficiency through uptake of online recording - 279,000 records collected through improved online data capture.
- Increased quantity and quality and relevance of data provided through prioritised verification and 6- monthly NBN Gateway updates.
- Significantly improved understanding of existing local surveillance, opportunities for integration and opportunities for increase local support for structured surveillance.

7.7 Lessons learnt

- To ensure a truly joint approach it would be necessary to ensure funding secured for both organisations before the beginning of the financial year.
- To reduce transactional costs associated with negotiation the potential for multi-year agreements would need to be considered.
- Significant efficiencies experienced through the new approach were only possible through adoption of a national approach by both organisations.
- Efficiencies through online data capture alone was not sufficient to make significant savings – this would require a shift to online data management.
- Shared online data management have the potential to provide significant savings for all parties – though at present no system was capable of providing an alternative to current bespoke offline systems.
- Problems with the NBN Gateway and changes to web-services suggested that, though potentially efficient, use of the NBN for storage and access did not currently provide a sufficiently reliable alternative for business use.
- Structured surveillance requirements require greater clarity as does the relationship between future roles of LRCs and National Schemes and Societies.

Appendix 1 Results

Table A. Project 1: Summary of delivery

Key metric	Performance measure	Target	Total	Pilot 1 ¹¹	Pilot 2
1. Delivery of efficiencies through partnership working & use of volunteers	Number of organisations contributing resources to the pilot ¹²	10	9	5	4
(i) organisation engagement					
(ii) volunteer recruitment	Number of volunteers signed up to deliver the pilot	100	129	29 (400)	100
(iii) volunteer action	Number of volunteers that contributed records to the pilot	65	64	14 (352)	50
2. Delivery of relevant data through representative habitat-based networks	Number of taxa covered by pilot	17	17	9	8
(i) taxonomic coverage					
(ii) coverage of sites	Number of sites covered	70	32	22	10
3. Provide training to provide quality information	Number of volunteers trained	100	116	30	86

¹¹ figures in brackets relate to Norfolk Bat Survey conducted by BTO that supplied bat data as part of this project

¹² the number of organisations listed relates to those contributing expertise, volunteers, equipment and/or training

Key metric	Performance measure	Target	Total	Pilot 1 ¹¹	Pilot 2
4. Deliver efficiencies through new approaches	Percentage of records submitted online	40%	n/a	n/a	70%
i) online recording					
ii) Single visit recording	mean number of taxa recorded / volunteer	2+ ¹³	2	1	3
5. Delivery of effective data	Number of records submitted to NBN gateway	6,000	7,000	6,000	1,000

Table B. Project 2: Summary of delivery

Key metric	Performance measure	Total
1. Delivery of efficiencies through partnership working & use of volunteers	Number of partner organisations supporting the training programme	14
	Number of volunteers registered to the training programme	580
2. Increasing capacity to deliver quality information	Number of courses provided	72
(i) Course delivery		
(ii) Course places	Number of places available	770
(ii) Course uptake	Number of attendees trained	252
(iii) Course attendance	Number of courses at capacity	90%
(iv) Course efficiency	Cost/place	£118
3. Effectiveness of training	Number of records submitted following training	8,2165 ¹⁴

¹³ No target was set but the ability to record more than one taxa/visit was integral to the approach so the target is set at 2+

¹⁴ 2,165 records were submitted from training days covering 1,241 species

	Number of s41 records submitted	36
5. Efficiencies through delivery	Number linked via social media. (twitter)	500
	Number linked via social media (facebook)	150
	Number of Resource Downloads	n/a
	Use of Online Recording	6,000

Table C. Project 3: Summary of delivery

Key metric	Performance measure	Total
1. Verification of test data	Proportion of the LRC data posted online verified by experts (TVERC)	52% (1,715 records)
	Proportion of the LRC data posted online verified by experts (WBRC)	31% (15,149 records)
	Proportion of iSpot data posted online verified by experts	4% (1927 records)
2. Verification efficiency of all iRecord data	Proportion of records directly submitted on the iRecord system verified by experts	23%
	Mean verification time for iRecord records	82 days
3. Feedback to volunteers	Number of communication messages sent by experts from the CDW to iRecord recorders	2,584
	Number of automated communication messages sent from the CDW to iRecord recorders	297,320
	Percentage of volunteers receiving automated communication messages from the CDW	59%
5. Use of Automated tools	Proportion of community warehouse records with NBN Record Cleaner rules applied	7

Table D. Project 4: Summary of delivery

Key metric	Performance measure	Total
1.Improvements to data capture	Number of records shared on NBN Gateway	359,018
2.Improvement to data management	Number of organisations enabled trained on online recording	11
3.Improvement to data use	Number of organisations enabled web services	1
4.Support for Structured surveillance	Number of training events provided aimed at structured surveillance	19
	Number of volunteers trained	c.1000
	Number of organisations provided with equipment to improve structured surveillance	23

Table E. Project 5: Summary of delivery

Key metric	Performance measure	Target	Total
1.Delivery of the joint approach	Number of joint LRC agreements	36	36
2.Uptake of online recording by LRCs	Number of LRCs offering online recording to recorders in 13/14	38	3
3. Use of online recording by LRC recorders	Number of records submitted to LRCs through online systems	227,786	280,160
4. Administrative savings	Reduction in NE/EA staff time	0.5 FTE	2.5 FTE
5. Contribution to improving data relevance through support for structured surveillance	Number of sites identified with potential to integrated structure surveillance	400	

Appendix 2 Costs

Table F. Project 1: Estimated of costs for continuity

Annual costs

Volunteer support	£3,600 ¹⁵	£10,500 ¹⁶	£6,000	£18,000
Equipment (pitfall traps, alcohol etc.)	£500	£500	£500	£500
Equipment maintenance (e.g. bat detectors)	£1,000	£1,000	£500	£500
Workshops	£2,000	£4,500	£1,750	£6,600
Travel	n/a	£1,500	n/a	£2,000
County Recorder ID	0	£1,000	0	£2,000
Total	£6,000	£18,000	£8,750	£29,600

One off/set up costs

Online recording	£3,000	£3,000	£1,000	n/a
Equipment purchase	£20,000	£20,000	£1,000	£19,200

Table G. Project 1: Estimate of National delivery

The following figures are based on simple extrapolation based on Table G. Estimates have been multiplied by the number of LRCs currently by Natural England to provide a crude indication of costs additional associated with rollout over the existed supported LRC network.

Scenario	Cost
Annual Costs	
Volunteer support	£180,000

¹⁵ Volunteer figures quoted include 1 day/month of paid support from an non-dedicated role

¹⁶ Volunteer figures quoted include 0.5 FTE of paid support from a dedicated support role

Equipment (pitfall traps, alcohol etc.)	£25,000
Equipment maintenance (e.g. bat detectors)	£50,000
Workshops	£100,000
Travel	n/a
County Recorder ID	0
Total	£355,000
One off/set up Costs	
Online recording	£3,000
Bat detector purchase	£1,000,000

Table H. Project 2 Estimated costs of continuity

Scenario	No per year	Unit Cost	Per year	5 years
Annual costs of day and residential events	50	£2,000	£100,000	£500,000
Specialist equipment for loan/hire/use on courses	n/a	n/a	£10,000	£50,000
Staff salary - project manager	n/a	n/a	£2,000	£10,000
Staff salary - project officer	n/a	n/a	£36,000	£180,000
Staff salary - technical support	n/a	n/a	£26,000	£130,000
Venue hire	n/a	n/a	£5,000	£25,000
Training and support for tutors/trainers/verifiers	4	£4,000	£16,000	£80,000
Steering group/partner meetings/verification meetings etc.	10	£200	£2,000	£10,000
Total			£197,000	£985,000
Potential charges to attendees	500	20	£10,000	£50,000
			£187,000	£935,000

Appendix 3 Summary of Findings

Table I. Project 1 Pilot Conclusions

<ul style="list-style-type: none"> + LRCs were able to co-ordinate volunteers to record multiple taxa to structured methods in the same place + LRCs were able to co-ordinate access to sites and are particularly well placed to do so for Local Wildlife Sites (LWS) + Volunteers were able and willing to collect info on 'new' groups such as beetles to standard methods for expert identification + Automated recording devices were successful in engaging large numbers of volunteers and generated significant data – see example 10 + Remote identification of volunteer invertebrate samples identification was successful and provided opportunities of future exploration – see example 2 + Existing NSS methodologies were found to be relatively easily combined to provide manuals for different habitats and results used for multiple purposes + New recorders were more inclined to do the multi-taxa work and see its value + Multi-taxa work provided a good forum for joint working bringing together the work of NSS and LRC + High uptake of online recording was possible with promotion 	<ul style="list-style-type: none"> - Site coverage was low and unlikely to be sufficient to infer change - Numbers of skilled and motivated recorders were relatively low - Site selection methods allowed bias - Significant ongoing co-ordination was found to be needed to maintain motivation and prevent loss of volunteers - Verification of invertebrate records represented a significant obstacle/bottleneck for multi-taxa approaches - Established recorders preferred to stick to single taxa methods, meaning more volunteers are needed - Lack of existing methods/easy alternatives created obstacle to volunteer recruitment and consistency - Significant dependency on a small subset of volunteers makes approach vulnerable - Available online recording were unsuitable for structured surveillance and require significant work to adapt - Willingness of volunteers to repeat year-on-year surveys for multiple taxa remains unknown.
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- + Trials were able to be successfully combined with JNCC/CEH/BSBI/Plantlife Vascular Plant trials

Table J. Project 2: Pilot Conclusions

- | | |
|--|--|
| <ul style="list-style-type: none"> + Significant volunteer interest was recorded in courses for under recorded (and often difficult) taxa | <ul style="list-style-type: none"> - Under recorded taxa are under-recorded for a reason, significant investment is needed to provide results |
| <ul style="list-style-type: none"> + Training led to a significant submission of records | <ul style="list-style-type: none"> - Levels of knowledge for many groups is low within the sector increasing the level of training needed to fill gaps |
| <ul style="list-style-type: none"> + Training was, despite their relative rarity, capable of providing s41 records for target taxa | <ul style="list-style-type: none"> - Drop-off following training was observed despite selection process |
| <ul style="list-style-type: none"> + Combining taxonomic with data use & sharing components proved successful in meeting multiple needs | <ul style="list-style-type: none"> - High investment/ volunteer will be needed to build recorders limiting numbers of potential beneficiaries |
| <ul style="list-style-type: none"> + Training was successful in promoting online recording and public sharing | <ul style="list-style-type: none"> - Experience from other FSC projects suggests that 3-5 years of courses needed to provide sufficient skills, more to verify records |
| <ul style="list-style-type: none"> + High levels of demand suggest courses may be made viable with part subsidy, though price points are not yet known. | <ul style="list-style-type: none"> - Use of electronic resources have a role to play but not a realistic substitute for field training |
| <ul style="list-style-type: none"> + Interest from professions (such as consultants/VCO reserve managers) suggest an additional audience to allow for a mixed funding model | <ul style="list-style-type: none"> - Social media can help build links online, main benefit appears to be face to face meetings with tutors and links to NSS and their willingness to support |
| <ul style="list-style-type: none"> + Successful course extension for NNR staff provides a model for partnership funding. | <ul style="list-style-type: none"> - High levels of investment required for continuation |
| <ul style="list-style-type: none"> + Development of Bayesian keys on open software (as trialled) has the potential to allow greater volunteer input into raising | |

standards online

- + Recorders were willing to travel an average of 100 miles for access to training making feasible national coverage possible
- + 'Wildlife in the cloud' course shows the potential for more use of eLearning in certain areas
- + Social media proved effective in communication and to a lesser extent building self-sustaining facebook groups

Table K. Project 3: Pilot Conclusions

- | | |
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| <ul style="list-style-type: none">+ Shared verification was possible using the community warehouse even when dealing with recorders unknown to NSS+ Use of the community warehouse showed the potential to raise standards and mobilise significant amounts of data+ The CDW provided a useful and effective means of mobilising records stuck in local systems+ Fast speed of verification and sharing with NBN Gateway (via the CDW) compared favourably with existing methods+ CDW effectiveness differed according to taxa, though was particular effective for some taxa (such as bees and flies) | <ul style="list-style-type: none">- Consultation with the wider community suggests that lack of control of data and data flow is a key issue restricts current use of the CDW- Responses to consultations suggest that for many verifiers the CDW represents 'another place to go' reducing current efficiency- Current data flows of verified data back to providers have potential to lead to duplication of data management- Large quantities of records remain unverified on the CDW for certain taxa – this number is expected to grow- Sensitivity of Record Cleaner rules currently and does not significantly assist with reducing the verification task- Capacity to include local verifiers not yet fully developed |
|--|--|

- Verifiers absent/less active for some taxa

Table L. Project 5: Conclusions

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|--|---|
| <ul style="list-style-type: none"> + Joint approach increased consistency of approach across Defra bodies (EA/NE) + Joint approach successfully incentivised adoption of online recording to boost efficiencies + Joint approach increased awareness of structured surveillance pilots and current levels of structured surveillance in each LRC area + Joint MOA increased frequency of updates for priority species to 6 monthly + Joint MOA facilitated progress with improvements to Article 17 data sets + Joint MOA collected data on current capacity, constraints and opportunity to integrate structured surveillance with existing local activity + Joint MOA provided significant resource savings | <ul style="list-style-type: none"> - Single joint documents were not possible due to differing timing of financial settlements – meaning duplicate versions of the shared template were used instead - Significant preparatory work was required to agree joint agreements due to differing legal constraints and procurement policies. - The majority of LRCs remain reliant on offline systems for data management (RECORDER) meaning efficiencies are limited to data capture only. - Problems with NBN Gateway stability impeded the ability to provide regular updates - Resource savings were not equally reflected by LRCs - Adoption of a centralised approach occurred at the expense of local relationships and input - The ability to commit to multi-year contracts reduced efficiency for all organisations |
|--|---|

Appendix 4: Verification Results

Table M. Verification success by taxonomic group

Taxonomic Group (used by NBN Gateway)	No. Records Shared	% Verified
acarine (Acari)	8	0%
alga	92	17%
amphibian	3	100%
annelid	102	0%
bird	52	0%
bony fish (Actinopterygii)	234	0%
cartilaginous fish (Chondrichthyes)	51	0%
centipede	35	0%
Centipedes & Millipedes	6	0%
chromist	174	26%
clubmoss	32	0%
coelenterate (=cnidarian)	198	1%
conifer	322	3%
crustacean	476	2%
echinoderm	106	1%
fern	448	1%
ferns & horsetails	57	0%
flowering plant	29,516	3%
fungus	3	0%
ginkgo	7	0%
harvestman (Opiliones)	10	0%
horsetail	93	0%

Taxonomic Group (used by NBN Gateway)	No. Records Shared	% Verified
insect - beetle (Coleoptera)	5,504	0%
insect - butterfly	256	0%
insect - cockroach (Dictyoptera)	8	100%
insect - dragonfly (Odonata)	190	1%
insect - earwig (Dermaptera)	491	100%
insect - hymenopteran	11829	100%
insect - lacewing (Neuroptera)	6	0%
insect - moth	14573	6%
insect - orthopteran	3480	100%
insect - scorpion fly (Mecoptera)	1	0%
insect - true bug (Hemiptera)	102	67%
insect - true fly (Diptera)	29269	3%
marine mammal	194	33%
millipede	41	0%
mollusc	362	58%
reptile	6	100%
spider (Araneae)	28	0%
sponge (Porifera)	27	0%
terrestrial mammal	22	100%
tunicate (Urochordata)	24	0%

Appendix 5: List of bio.fell events

1. **Identifying Centipedes, Millipedes and Woodlice** at Flatford Mill Field Centre (Suffolk) with Paul Lee on the 21st – 24th February 2013 (£348)*
2. **Soil Mesofauna (with particular attention to Mites and Springtails)** at Juniper Hall Field Centre (Surrey) with Felicity Crotty, Peter Shaw and Matthew Shepherd on the 28th February – 3rd March 2013 (£348)*
3. **Identifying Mosses and Liverworts** at Preston Montford Field Centre (Shropshire) with Martin Godfrey on the 1st-4th March 2013 (£341)*
4. **Lichens of Priority Habitats** at Juniper Hall Field Centre (Surrey) with David Hawksworth on the 6th April 2013 (free of charge)
5. **Identifying Freshwater Invertebrates for Biological Surveying and Recording** at Flatford Mill Field Centre with Adrian Chalkley on the 9th – 12th April 2013 (£374)*
6. **Bryophytes of Priority Habitats (Upland flushes)** at Cardingmill Valley (Shropshire) with Martin Godfrey on the 10th April 2013 (free of charge)
7. **An introduction to Seaweeds** at Slapton Ley Field Centre (Devon) with Francis Bunker on the 12th – 14th April 2013 (£250)*
8. **Earthworm Identification** at the Angela Marmont Centre (Natural History Museum, London) with Emma Sherlock and Dan Carpenter on the 13th April 2013 (free of charge)
9. **Biological recording for bio.fell or 'Wildlife in the cloud'** at Juniper Hall Field Centre (Surrey) with Martin Harvey on the 14th April 2013 (free of charge)
10. **Introduction to the Ground Beetles (*Carabidae*)** at Preston Montford Field Centre (Shropshire) with Don Stenhouse on the 13th-14th April 2013 (£150)*
11. ***Cladonia* Lichens - an Introduction** at Preston Montford Field Centre (Shropshire) with Nick Hodgetts on the 16th April 2013 (free of charge)
12. **Surveying Terrestrial Invertebrates for Biological Recording** at Flatford Mill Field Centre with Paul Lee on the 19th – 22nd April 2013 (£348)*
13. **Introduction to *Sphagnum* Mosses for Beginners** at Preston Montford Field Centre with Martin Godfrey on the 20th-21st April 2013 (£150)*
14. **Freshwater Algae** at the London Field Centre with Eileen Cox and Elliot Schubert on the 27th April 2013 (free of charge)
15. **Biological recording for bio.fell or 'Wildlife in the Cloud'** at Preston Montford Field Centre (Shropshire) with Martin Harvey on the 27th April 2013 (free of charge)
16. **Earthworm Identification** at Preston Montford Field Centre (Shropshire) with Emma Sherlock and Dan Carpenter on the 7th May 2013 (free of charge)
17. **Identifying *Andrena* Solitary Bees** at Preston Montford Field Centre (Shropshire) with Ian Cheeseborough on the 8th May 2013 (free of charge)
18. **Lichens as Ecological Indicators of Priority Habitats** at Juniper Hall Field Centre (Surrey) with David Hawksworth on the 11th May 2013 (free of charge)
19. **Identifying Lichens – a Course for Field Volunteers at an Intermediate Level:** at Juniper Hall Field Centre (Surrey) with David Hawksworth on the 12th May 2013 (free of charge)
20. **Introduction to Shieldbugs** at Preston Montford Field Centre (Shropshire) with Pete Boardman and Ian Cheeseborough on the 18th May 2013 (free of charge)
21. **Identifying *Nomada* Solitary Bees** at Preston Montford Field Centre (Shropshire) with Ian Cheeseborough on the 21st May 2013 (free of charge)

22. **Introduction to *Dolichopodidae* Flies** at Preston Montford Field Centre (Shropshire) with Nigel Jones on the 23rd May 2013 (free of charge)
23. **Bryophytes of Priority Habitats (Wood Pasture and Parkland)** at Attingham Park (Shropshire) with Martin Godfrey on the 24th May 2013 (free of charge)
24. **Flies of Priority Habitats (Coarse Woody Debris)** at Loamhole Dingle, Ironbridge (Shropshire) with Nigel Jones and Pete Boardman on the 28th May 2013 (free of charge)
25. **Lichens as Indicators of the Conservation Value and Importance of BAP Sites** at the New Forest (Hampshire) with David Hawksworth on the 8th June 2013 (free of charge).
26. **Hymenoptera of Priority BAP Habitats** at Preston Montford Field Centre (Shropshire) with Ian Cheeseborough and Nigel Jones on the 8th-9th June 2013 (£150)*
27. **Hoverflies, Soldierflies and Robberflies: an Introduction to Diptera** at Flatford Mill Field Centre (Suffolk) with Martin Harvey on the 14th-16th June 2013 (£232)*
28. **Introduction to Solitary Bees** at Preston Montford Field Centre (Shropshire) with Ian Cheeseborough on the 14th-16th June 2013 (£253)*
29. **Introduction to Spiders** at Juniper Hall Field Centre (Surrey) with Paul Lee on the 15th – 16th June 2013 (£150)*
30. **Spiders of Priority Habitats (Lowland Heath)** at Hollesley Common (Suffolk) with Paul Lee on the 17th June 2013 (free of charge)
31. **Keying out Charophytes Workshop** at the Cumbria Wildlife Trust HQ in Kendall with Nick Stewart on the 20th June 2013 (free of charge)
32. **Lichens as Indicators of the Conservation Value and Importance of BAP Sites** at Lathkill Dale (Derbyshire) with David Hawksworth on the 21st June 2013 (free of charge)
33. **Identifying Lichens** at Preston Montford Field Centre with David Hill on the 21st – 24th June 2013 (£381)*
34. **Solitary Bees and Wasps of Priority Habitats (Open mosaic habitats on previously developed land)** at the Devil's Dingle EON site (Shropshire) with Ian Cheeseborough and Nigel Jones on the 26th June 2013 (free of charge)
35. **Identifying Ants** at Preston Montford Field Centre (Shropshire) with Ian Cheeseborough on the 29th June 2013 (free of charge)
36. **Identifying Stoneworts** at Wheatfen Nature Reserve (Norfolk) with Nick Stewart on the 5th July 2013 (free of charge)
37. **BAP Molluscs and Important Aquatic Invertebrates of Priority Habitats (Reedbeds)** at Carlton Marsh (Suffolk) with Adrian Chalkley on the 6th July 2013 (free of charge)
38. **Saproxylic (Dead Wood) Beetles - What they are and how to manage for them** at Attingham Park (Shropshire) with Keith Alexander on the 11th July 2013 (free of charge)
39. **Coleoptera in Traditional Orchards** at Tiddesley Wood (Worcestershire) with Keith Alexander on the 12th July 2013 (free of charge)
40. **Identifying Solitary Wasps** at Craven Arms Discovery Centre (Shropshire) with Ian Cheeseborough on the 13th July 2013 (free of charge)
41. **Identifying Micro Moths** at Juniper Hall Field Centre (Surrey) with Dave Grundy on the 13th-14th July (£150)*
42. **Lichens as Ecological Indicators of Priority habitats** at Nettlecombe Hall Field Centre (Somerset) with Pat Wolseley on the 19th – 21st July 2013 (£250)*
43. **Identifying Leafhoppers** at Preston Montford Field Centre with Alan Stewart on the 19th – 21st July 2013 (£253)*
44. **Introduction to the Stoneworts (Charophytes)** at Slapton Ley Field Centre with Nick Stewart on the 21st July 2013 (free of charge)
45. **Identifying Micro Moths** at Flatford Mill Field Centre (Suffolk) with Dave Grundy on the 26th - 28th July 2013 (£248)*

46. **Identifying Beetles of Coastal Habitats** at Slapton Ley Field Centre (Devon) with Chris Terrell-Nield on the 2nd – 5th August 2013 (£295)*
47. **Grassland Fungi** at Preston Montford Field Centre (Shropshire) with Geoffrey Kibby on the 2nd-4th August 2013 (£250)*
48. **Introduction to Terrestrial Bugs (Heteroptera)** at Preston Montford Field Centre (Shropshire) with Tristan Bantock and Jim Flanagan on the 3rd – 4th August 2013 (£150)*
49. **Identifying Carabids of Coastal Habitats** at Slapton Ley Field Centre (Devon) with Christ Terrell-Nield on the 6th August 2013 (free of charge)
50. **Identification of Hoverflies** at Preston Montford Field Centre (Shropshire) with Roger Morris and Stuart Ball on the 09th- 12th August 2013 (£341)*
51. **Identification of the Tephritidae and Other Picture-winged Flies** at Preston Montford Field Centre (Shropshire) with Nigel Jones on the 13th August 2013 (free of charge)
52. **Introduction to Micro Moths** at Preston Montford Field Centre (Shropshire) with Dave Grundy on the 14th August 2013 (free of charge)
53. **Identifying and Recording Fungi for Beginners** at Preston Montford Field Centre (Shropshire) with Geoffrey Kibby on the 19th August 2013 (Free of charge)
54. **Getting to Grips with *Sphagnum* Mosses for Intermediates** at Preston Montford Field Centre (Shropshire) with Martin Godfrey on the 21st August 2013 (free of charge)
55. **Introduction to the Rove Beetles (*Staphylinidae*)** at Preston Montford Field Centre (Shropshire) with Don Stenhouse on the 24th August 2013 (free of charge)
56. **Identifying Harvestmen** at Preston Montford Field Centre (Shropshire) with Paul Lee on the 6th September 2013 (free of charge)
57. **Plant Galls caused by Fungi** at Juniper Hall Field Centre (Surrey) with Brian Spooner on the 7th September 2013 (free of charge).
58. **Bryophytes of Priority Habitats** at Preston Montford Field Centre (Shropshire) with Martin Godfrey on the 7th-8th September 2013 (£150)*
59. **Cranefly Identification Workshop** at Marsland (Devon) with John Kramer and Pete Boardman on the 8th September 2013 (free of charge)
60. **Introduction to the *Tipulidae*** at Preston Montford Field Centre with Pete Boardman on the 11th September 2013
61. **Beginner's Fungi** at the Angela Marmont Centre (Natural History Museum, London) with Geoffrey Kibby on 12th September 2013 (free of charge)
62. **Coleoptera Workshop - Beetles Associated with Fungi** at Preston Montford Field Centre (Shropshire) with Don Stenhouse on the 14th September 2013 (free of charge)
63. **Introduction to Terrestrial Molluscs** at Malham Tarn Field Centre (Yorkshire Dales) with Robert Cameron on the 14th September 2013 (free of charge)
64. **Leaf-mining Moths** at Preston Montford Field Centre (Shropshire) with Dave Grundy on the 17th September 2013 (free of charge)
65. **Bryophytes of Priority Habitats (Lowland Raised Mire)** at Fenn's, Whixall & Bettisfield Mosses NNR (Shropshire) with Martin Godfrey on the 18th September 2013 (free of charge)
66. **Identifying Lichens at Intermediate Level** at Flatford Mill Field Centre (Suffolk) with John Skinner on the 20th – 22nd September 2013 (£238)*
67. **Cranefly Identification Workshop** at the Angela Marmont Centre (Natural History Museum, London) with John Kramer and Pete Boardman on the 28th-29th September 2013 (free of charge)
68. **Identifying mosses and liverworts** at Flatford Mill Field Centre (Suffolk) with Robin Stevenson on the 4th-6th October 2013 (£232)*
69. **Advanced Fungi Workshop for Mycologists** at the Angela Marmont Centre on the 9th October 2013. (Free of charge)

70. **Identifying Fungi for Intermediates** at Flatford Mill Field Centre (Suffolk) with Geoffrey Kibby on 11th-13th October 2013. (£238)*
71. **Identification Workshop –*Scathophagidae* (dung flies)** at the Angela Marmont Centre with Stuart Ball on the 14th October 2013 (free of charge)
72. **Bryophytes of Priority Habitats (Arable Field Margins)** at Wollaston Farm (Shropshire) with Martin Godfrey on the 30th October 2013 (free of charge)
73. **Hemiptera Day Workshop** at Liverpool World Museum (Liverpool) with Tristan Bantock and Jim Flanagan on the 16th November 2013 (free of charge)
- 74 and 75. **iSpot Workshops** at Preston Montford – 30th November 2013 and the Open University, Milton Keynes 26th February 2014.

Appendix 6 Capital Schemes Projects

1. Training course for under-recorded species in Cornwall- Environmental Record Centre for Cornwall and the Isles of Scilly
2. Identification Support- Tachinid Recording Scheme (Dipterist Forum)
3. Identification of Lichens training -Somerset Environmental Record Centre
4. 'RoAMing for Biodiversity in the Avalon Marshes' -Somerset Wildlife Trust
5. 'Increasing volunteer recording of small mammals and insects in Norfolk' - Norfolk and Norwich Naturalist Society
6. 'Electronic Teaching Resources for teaching Diptera Identification' -Dipterist Forum
7. Training and Equipment- Riverfly Recording Scheme
8. Capacity building through 'Biodiversity Tsars' -Shropshire ecological data network
9. Strettons Area Community Wildlife Group (SACWG)
10. Mobilisation and use of Moth Data - Sussex LRC
11. Improving availability of Gloucestershire Bird Records -GCERC
12. Supporting Structured Amphibian and Reptile Recording in Shropshire -Shropshire ARG
13. Canal River Trust Recorder Project - Canal River Trust
14. Training and support for Online Recording in Cornwall - ERCCIS
15. Building Volunteer Capacity in Shropshire- Shropshire Wildlife Trust
16. Piloting Large Scale Bat Monitoring -BTO
17. Improving data use in Cheshire -RECORD
18. INNS Digitisation in Flitwick Moor & Flit Valley -Bedfordshire and Luton LRC
19. Riverfly Recording Scheme (RRS)
20. Improving Biodiversity Data Provision in Lancashire -LERN
21. Training and support for Online Recording in Hampshire - HBIC
22. Mammal Atlas- Northumbria Mammal Group
23. Equipment Loan Scheme -CDBC
24. Regional Training and support for Online Recording -WM BRC
25. Online Recording Training and capacity building -Sussex LRC
26. Online Data Management Project -BWARS
27. Online Reserve data capture and mobilisation pilot -YWT
28. Online field data capture trial-ERCISS
29. Data mobilisation and dictionary updates- BMS
30. Structured bat recording -Cheshire Bat
31. Seasearch monitoring - Sussex WT

32. Extending -Large Scale Bat Monitoring BTO
33. Micromoth Structured Surveillance Scheme -BC