Finding out more about how bats use your woodland

(This document is targeted at non-professionals in bat works)

Introduction

Trees and woodlands are very important habitats for all UK bat species. All UK bats are reliant in some way on woodland habitats, either for roosting, for foraging or for much needed cover as they move between key sites. Some bat species will use woodlands all year round for roosting (breeding and hibernating) and for foraging. These woodland specialists include the rare barbastelle and even rarer Bechstein's bat, found only in the southern part of England.

Woodlands are hard to survey for bats. As well as accessibility issues for surveyors and the risks inherent in carrying out surveys in a cluttered environment in the dark, detecting bats in woodland can be challenging. Some bat species, like the brown long-eared bat have quiet echolocation calls, so unless they fly within just a few metres of a detector's microphone, they will be missed. In addition, some bats will forage high up in the canopy within the interior of woodland. Others move their roost sites regularly, which can provide further challenges. However, recent technological advances have led to the development of more sensitive, versatile equipment at a lower cost, making large-scale monitoring schemes for woodland bats achievable.

All 17 species of bats found breeding in the UK and their roosts are protected under the Conservation of Habitats and Species Regulations 2017 and the Wildlife and Countryside Act 1981 (amended). Further information about our UK bat species can be found on the Bat Conservation Trust (BCT) website https://www.bats.org.uk/about-bats. This guidance is to help you consider how best you might survey woodlands for bats.

Barbastelle bat
© Hugh Clark

Brown long-eared bat
©John Altringham

Natterer's bat
© Hugh Clark

Noctule bat
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Surveying for bats

This might be using your own expertise or trained members of staff or volunteers with the relevant knowledge, expertise and, where necessary, licences.

Manual Bat Activity Survey

If you think your woodland is likely to support bats you are likely to want to find out which species are present. A manual bat activity survey can be carried out to identify some of the species present, as they commute or forage. This type of survey involves walking along a route through the woodland using a handheld detector and recorder. Along the way the surveyor observes and records bats as they fly through the woodland. This type of surveying helps to inform:

- Whether bats are present within the woodland
- Which bat species (or species groups) are using the woodland, and
- Where the main areas of bat activity are amongst those areas surveyed.

Transect survey protocol

Bat Conservation Trust (BCT) and Forest Research (FR) are currently working on a collaborative project called Putting UK Woodland bats on the map - https://www.forestry.gov.uk/fr/beeh-amwkud. This project is trialling an acoustic survey methodology that will enable population trends to be determined for bats using woodlands. It relies upon the woodland transect survey protocol recommended by a Defra commissioned study (Scott et al. 2014). If it meets your requirements, then use the survey protocol below, when carrying out a walked transect survey through your woodland.

In order for a transect survey to yield sufficient information, the transect should ideally be carried out in woods that are at least 4ha in area. Where individual woodlands of this size are not present, the transect could alternatively be routed through several smaller interconnected blocks of woodland.

The predetermined route should go through a range of different woodland habitats, such as edge habitat, ponds, clearing, coppice, high forest, areas with cluttered understory, woodland tracks, rides and, where safe to do so, woodland interiors. Ideally, the route should be circular so you finish the survey where you started, but this is not essential. However, no part of the route should be repeated nor should it come within 100 m of another part of the route.

Each transect route should take 90 minutes to complete at a slow, steady walking pace. As a guide, a slow walking pace of 3 km/hour would require a transect route that is around 3 km long. The route should be divided into six, ten minute walk sections, with the end of each walk section followed by a five-minute point count, during which, the surveyor stands in one place while recording any bat activity. Each transect survey should start with a walked section, as opposed to starting with a five-minute point count.

Mapping the transect route

The transect route should be pre-determined in advance and point counts should include a range of habitat features.

Use a GPS to take a reading of each point location and record this on a form and mark the final route as accurately as possible on a map, making sure the starting location is marked on the map, then

assign a number to each walked section and point count location from one to six. If the transect route is circular, the start and end location will coincide with point 6.

To help map the transect route, the following can be used:

- Street Map (www.streetmap.co.uk)
- Ordnance Survey get-a-map (www.getamap.ordnancesurveyleisure.co.uk/)
- Google Maps – (https://www.google.co.uk/maps)
- Magic Map (www.natureonthemap.naturalengland.org.uk/MagicMap.aspx)
- Ordnance Survey maps are generally available from public libraries. The 'Explorer' series of OS maps covers most of the country with maps at a scale of 1:25,000. This is the best scale to use for mapping a transect route.

Static Survey

To learn about how bats are affected by long-term woodland management practices and how they are using the different habitats within a woodland, (which includes woodland interiors that are not accessible to surveyors using transect only method), it is suggested that long term monitoring should be carried out. The best way to do this is to use stationary broadband detectors. Most models can be positioned within the wood and set to record for many nights, reducing surveyor effort and health and safety risks.

A recent, successful Heritage Lottery funded bat monitoring project at Swanton Novers NNR used full spectrum, real time static detectors. Full spectrum detectors are the best option when surveying a woodland for bats as they can continuously record all frequencies (capturing a wider range of bat calls), while retaining the clear details of the call structure, so that detailed call analysis with call recognition software can be used. Many modern detectors can be left out to record over many consecutive nights, while more advanced detectors can run off a 12 volt battery and record over many weeks. The detectors can be configured to start and stop recording at specific times and be left at sites not usually surveyed, enhancing our insight into how bats use different areas of a woodland.

Selection of monitoring points

To collect bat data in a woodland using static detectors, suitable monitoring points will need to be selected. These should be chosen to include a representative cross-section of habitats within the woodland. At Swanton Novers NNR, an 84ha ancient deciduous woodland in Norfolk, 40 monitoring points were selected. These were distributed across the woodland, taking account of the variation within the wood e.g. ensuring coverage of both dry and wet areas of woodland, as well as areas under different management regimes. The detectors were located 20 meters from the compartment edges (to avoid sampling transitional habitats). The points were positioned at least 100 meters apart from other monitoring points to maximise independence between each location. In order to compare bat activity in the rides with activity in the compartment interiors, ride monitoring points were also be selected.

To get a better representation of bat activity in a woodland, it is recommended that in any future monitoring involving the use of stationary broadband detectors these should be placed within the interior of woodland compartments. The Swanton Novers project dataset showed that a notable amount of bat activity was recorded at the interior monitoring points and most bat species used the woodland interiors, even edge species like the common pipistrelle. This highlights the importance of

the interior to many bats. Surveying in woodland interior is something that has often been overlooked in the past and as a result this has not been standard practice up until now.

Depending on the species likely to be in your woodland, the woodland type and what you are trying to learn, there is the possibility that you may need to deploy two detectors at each or some of the monitoring points, one at ground level and one up in the canopy (Froidevaux et al., 2014). The Swanton Novers study confirmed that there was significantly greater level of bat activity recorded on the canopy detectors that were sited 10m up in the canopy, when compared to the ground level detectors which were placed on a pole 2.5m off the ground. A similar pattern was observed with the following individual species: barbastelle, common and soprano pipistrelles. Monitoring at ground level only should indicate the bat species present but if knowledge about a specific species use, or where management could change the amount of canopy available, then at height monitoring should be considered. The need for at height monitoring can be decided on a case by case basis.

Monitoring points should be randomly located within different woodland habitat types to remove the possibility of the person selecting them on the basis of personal preference e.g. only picking trees that they though looked good for bats. Where woodlands contain recognisably different blocks of habitat, for example coppice woodland and high forest, it may be more appropriate to randomly locate a similar number of recording points in each habitat type. This aspect of survey design is termed randomised stratification. It reduces the risk of the surveyor introducing personal bias to the data (choosing survey locations based on personal preconceptions), whilst ensuring that the data is representative of the woodland as a whole.

However, the choice of monitoring points, their location, the final sampling size, the number of nights of recording and the type of survey needed will vary with each site, depending upon the individual characteristics of each woodland. Therefore, a preliminary assessment and a list of the questions you would like answered as appropriate for each woodland is where you need to start. Discussing this with a bat expert or ecologist would be highly recommended at this stage.

Surveying regime

Surveying effort will be dependent on surveyor availability. Ideally monitoring should commence in April and continue until September. If possible monitoring through the autumn and winter months should also be considered, as some bat species are active throughout the winter if nights are sufficiently mild. Each monitoring point should ideally be sampled at least two times during each field survey season, though this will be dependent on the number of sampling points used.

The detector's power consumption and type of batteries used will determine how many consecutive nights of recordings is possible but, ideally, more than one night of recording is recommended , since extending the duration over which the recording is made will increase the amount of data collected. The Swanton project was able to achieve two nights of recordings per deployment using standard D 10000mAh rechargeable batteries in SM2 bat detectors.

A full night of monitoring is recommended to ensure that bat activity is representative of the entire time that they are active, rather than just detecting peaks of activity e.g. upon emergence or returning to roost (Froidevaux et al., 2014). Detectors should therefore be set to record 1 hour before sunset until 1 hour after sunrise to sample all bat activity and if possible be set to record on trigger setting.

Bat Detectors

With technology evolving rapidly there is a range of bat detectors on the market. For a walked transect survey, suitable hand held detectors can cost between £200 and £1500. For more detailed, longer term research projects, full spectrum static detectors can cost between £900 and £2000. The cost will therefore determine the number of detectors you can use and your sample size.

As well as piloting the woodland transect protocol suggested by Scott et al. (2014) the Putting UK Woodland bats on the map project is also comparing and trailing other survey methodologies. The use of different models of static detector will allow the project to compare different detector models in the field. The detectors are:

- An industry-standard full spectrum static detector
- A 'next-generation' low-cost full spectrum acoustic sensor

These detectors will be set up at the same point count locations to test if the low cost sensor currently being developed are capable of picking up the bat species that the well-established industry standard detector is recording. This will allow the usability, sensitivity and recording quality of the low cost sensor to be tested and hence determine if they can be used to detect bats in a woodland environment.

Low cost sensors are also being piloted through the British Bat Survey to learn more about their detection distances for different species, at different heights, in different habitats and at different angles. If the results show that the low cost sensors are capable of detecting bats, then these low-cost acoustic sensors could enable future wide-scale citizen science monitoring (including in woodlands) to be carried out under the National Bat Monitoring Programme. Further information and updates about the British Bat Survey can be found here http://www.bats.org.uk/pages/british_bat_survey.html.

Call Analysis

In general, calls recorded on detectors are saved on a SD card as a WAV file. Each deployment or transect survey can yield large amounts of data. It is recommended that an external hard drive is purchased and all the data is downloaded directly to the hard drive after each deployment or transect. A strict filing labelling system should be used prior to the survey starting to reduce the risk of data becoming lost or assigned to the wrong date or location.

Once downloaded, the data will need to be analysed through call analysis software in order to identify to species. Call analysis software will allow you listen to the calls recorded and will also provide a sonogram viewer so you can look closely at the call shape and the parameters to help with identification. Training courses are provided by BCT on call analysis and more information can be found on http://www.bats.org.uk/pages/training.html.

Below is a list of some of the call analysis software currently available:

- BatSound (£250)
- BatScan (£25)
- Adobe Audition (£17.50/month)
- SonoBat (£250)
- SonoChiro (£800/year)
- Kaleidoscope Pro (£800)
- Audacity (free)
- Wavesurfer (free)

Further reading

Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edition) https://www.bats.org.uk/news/2016/02/bat-surveys-for-professional-ecologists-good-practice-guidelines-3rd-edition.

BS8596: Surveying for Bats in trees and woodland – Micro Guide for non-specialists. https://shop.bsigroup.com/forms/Bat-Microguide--BS-8596--BSI-Group/

Guidance on managing woodlands with bats in England https://www.forestry.gov.uk/pdf/england-protectedspecies-bats.pdf/$FILE/england-protectedspecies-bats.pdf

Woodland management for bats https://cdn.bats.org.uk/pdf/Our%20Work/WoodlandManagementForBats_web.pdf?mtime=20181101151521

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Froidevaux, J.S., Zellweger, F., Bollmann, K. and Obrist, M.K., 2014. Optimizing passive acoustic sampling of bats in forests. Ecology and evolution, 4(24), pp.4690-4700.

Scott C. & Altringham, J.D. (2014) Developing effective methods for the systematic surveillance of bats in woodlands in the UK including Barlow K. & Briggs P. Potential development of woodland monitoring based on the woodland bat survey and monitoring protocol. (Report to Defra WC1015).