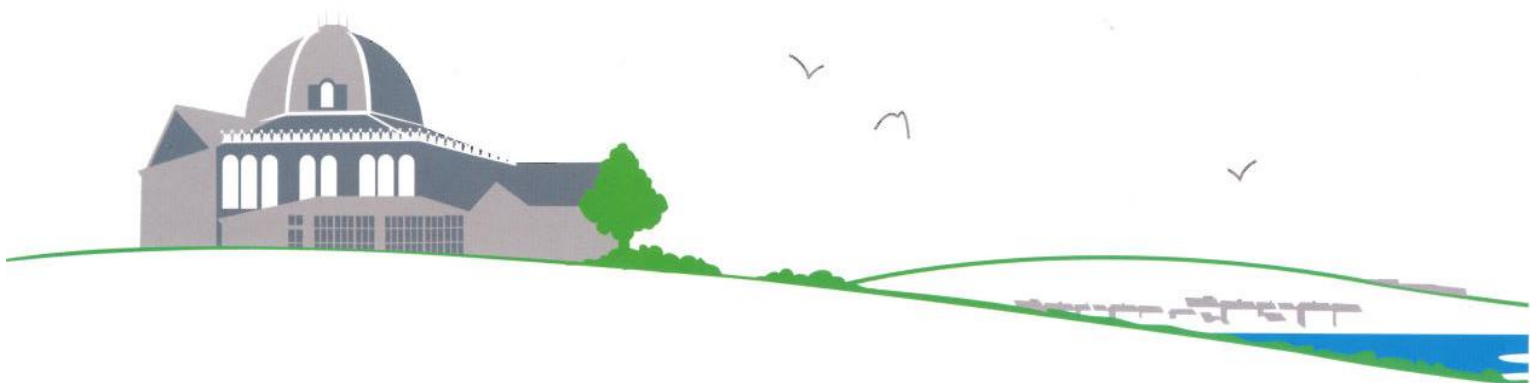




# STATE OF BATS WITHIN CANNOCK CHASE AONB AND SURROUNDS

## REPORT FOR CANNOCK CHASE AONB PARTNERSHIP



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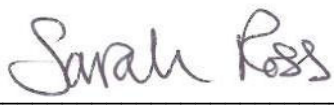
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March 2021

This project has been undertaken in accordance with PAA policies and procedures on quality assurance.

Signed: 

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## EXECUTIVE SUMMARY

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Penny Anderson Associates Ltd (consultant ecologists) were commissioned by Staffordshire County Council on behalf of Cannock Chase AONB Partnership to carry out a desk-based review of existing bat records for the AONB and surrounding areas. The objectives were to compile a picture of the distribution of each bat species, highlight key findings, identify gaps in knowledge and flag any conservation issues.

Data on all bat species were sought from relevant organisations and individuals for the area of the AONB and its surrounding 2km. Additional records for rare species were also sought for up to 10km from the AONB boundary. Numbers of records for each species were quantified, any clear habitat associations highlighted and their distribution mapped. A total of 2409 records were collated, of which 947 records were for the AONB itself.

Staffordshire County supports a total of 12 bat species and all 12 were found to occur within the study search area (including the 2km and 10km zones). In the AONB itself, a total of nine bat species were reported: common and soprano pipistrelle, Natterer's bat, whiskered bat, Brandt's bat, Daubenton's bat, Leisler's bat, noctule and brown long-eared bat. There are records of Nathusius' pipistrelle and serotine from the surrounding 2km zone, and for lesser horseshoe within 10km (and just beyond). Brown long-eared bats have the most records within the AONB, with soprano pipistrelle and common pipistrelle next, respectively.

Overall, the numbers of species compare well to the 12 confirmed from Staffordshire. Cannock Chase AONB covers 2% of the county area and supports a bat fauna containing 75% of the bat species present in the county – in essence a rich and diverse bat fauna is present for this relatively small area of land. This reflects the diversity and overall good quality of the habitats already present in the AONB.

In terms of habitat associations, the absence of records does not equate to an absence of bats so there are limitations on the interpretation of biological records of the type used in this study. Absences could relate, for example, to a lack of survey effort in more inaccessible areas such as forestry or heathlands. Bats have been found in most Broad Habitats within the AONB. However, some habitats are associated with more bat records, and semi-natural habitats, such as neutral grassland and broadleaved woodland, top the list for the most bat records while plantation woodland is third, though it accounts for 32% of the AONB area. Over half of the bat records were within neutral grassland and broadleaved woodland habitats alone.

Comparing records of bats per unit of habitat (records per hectare), the habitats with the most bat records were rivers and streams, followed by neutral grassland, and parkland and wood pasture. Coniferous woodland is ranked 12th, behind bare ground, poor semi-improved grassland, standing open water and canals, inland rock, broadleaved woodland, improved grassland, acid grassland and fen, and marsh and swamp. Other habitats of interest for the Chase, such as heathland, had low numbers, possibly due to lack of sampling.

Soprano pipistrelle, noctule, brown long-eared bat and lesser horseshoe bat have been selected as 'flagship species' for the AONB, on the basis of their UK Priority Species status and their presence locally. These four bats have a range of specific habitat requirements that are relevant to Staffordshire's bats in general. Management recommendations are linked to each of these species, but if carried out would likely benefit all bat species within the AONB, as well as other biodiversity. Key management themes relate to increases in habitat connectivity and quality. Habitat actions will help bats and other wildlife of the Chase adjust to changes in climate and boost population numbers.

Data gaps have been identified for species and habitats, with curiosity around the lack of records in heathland and from quarry sites, and the low proportion of records in conifer plantation relative to area. Nathusius' bat and serotine bats seem likely to occur within the AONB but have yet to be recorded, while lesser horseshoe bat presence also seems possible given the types of habitats present at the edges of the Chase. Also, because of the type of records collated, populations of bats cannot currently be established, but it would be useful to understand more about what population levels are and whether the AONB can support greater numbers of bats. This study makes recommendations for further surveys to address data gaps and provides outline approaches and some links to relevant studies and organisations.

# 1. INTRODUCTION

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## 1.1 In this section:

- Background to the project;
- Policy drivers for the study;
- Purpose of the study; and
- Bat biology, ecology and legal status.

## Background

## 1.2 Cannock Chase has an important landscape, and the Cannock Chase Area of Outstanding Natural Beauty (AONB) was designated in 1958. The AONB is the smallest in mainland England, covering just 26 square miles (or 6,866 hectares). The landscape and scenic qualities of the AONB are summarised (Cannock Chase AONB Management Plan 2019) as:

*'A largely intact landscape, particularly in its heathland and wood pasture, providing a historical and spatial continuity of scale, openness, semi-natural land cover, public ownership and access which is in marked contrast to the more urban and fragmented landscapes that surround it'.*

## 1.3 Across the varied landscape of the AONB, central large, elevated blocks of heathland and woodland contrast with the fringing countryside of small-scale farms, thick hedgerows and narrow lanes.

## 1.4 The Cannock Chase AONB Management Plan (2019) states that the Chase is home to five species of bat. Bats are viewed as a 'key species' within Policy WN2 of the Management Plan, and an associated action requires monitoring and reporting of the conservation status and needs of key species.

*Policy WN2 - Policy WN2: A coordinated approach across landholdings will be taken to monitor and undertake actions to enhance the conservation status of populations of key species and their habitats, taking particular account of threats such as disturbance and pollution.*

*Associated Action - A2: Monitor and report on the conservation status and needs of key species and their habitats in the AONB, including where they occur outside the SAC, and implement actions to address identified threats and opportunities.*

## Purpose of the Study

## 1.5 The reported bat diversity of five species for the AONB<sup>1</sup> seems low given the habitat and landscape quality of the Chase and the existence of twelve species across Staffordshire<sup>2</sup>. Furthermore, there is a perception that little is known about bats across the AONB. This is emphasised by the absence of records across large areas.

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<sup>1</sup> Source - Cannock Chase SSSI citation

<sup>2</sup> <https://www.staffsbats.co.uk/bats-in-staffs>

- 1.6 The purpose of this study is to examine the status of bats within Cannock Chase AONB, and in its immediate surrounds. This will be achieved through desk study of existing records of bats - obtained from a range of sources and collated into a Geographic Information Systems (GIS) database for mapping and analysis. The study will aid understanding of bat distribution across the AONB and inform any protection and conservation approaches in the future.
- 1.7 Outputs will include a report containing the following:
- distribution map for each bat species (and accompanying GIS database);
  - key findings;
  - knowledge gaps;
  - conservation issues; and
  - ideas for future actions.

## Bat Habitats and Life Cycle

- 1.8 Bats are unique and remarkable animals which can be hard to identify because they fly only at night and rest in small, remote and inaccessible places. British bats feed entirely on insects and have developed a complex sonar system, known as echolocation, which enables them to find prey and navigate around their environment at night. They are very small animals (ranging from 3 to 30g) and many look superficially very similar, especially in flight. Common pipistrelles (*Pipistrellus pipistrellus*) have been recorded as living for 16 years, and Daubenton's bat (*Myotis daubentonii*) and greater horseshoe bat (*Rhinolophus ferrumequinum*) for up to 30 years, but all species more typically survive just four to five years in the wild (Deitz *et al.* 2007).
- 1.9 Habitat requirements for bats vary widely, both on an individual and species level, although certain features, such as woodland, parkland, traditional pasture, marshes and areas of freshwater, are often focal points for foraging, as insects are particularly plentiful in these areas (Mitchell-Jones 2004). Bats use linear features, such as rivers, hedgerows, smaller roads and woodland edges, as landmarks in order to commute from one location to another (Schofield and Mitchell-Jones 2003).
- 1.10 Although no British bats are specifically associated with heathland, lowland heaths are a semi-natural habitat with a plentiful insect food source for bats; while roost sites may be sparse, foraging and commuting is likely. Patchy evidence for bats' use of lowland heathland includes, for e.g. Bechstein's bat (*Myotis bechsteinii*) recorded in 2018 on the Dorset Heaths<sup>3</sup>. Moreover, recent records collected jointly by Derbyshire Bat Conservation Group and the Moors for the Future Partnership (Roe 2020), have recorded six species or species groups on upland heathlands of north Derbyshire: including noctule (*Nyctalus noctula*), brown long-eared bat (*Plecotus auritus*) and pipistrelle (*Pipistrellus* sp.) bats. There is evidence that heather-dominated habitats are used by bats, although records in these habitats may be sparse.
- 1.11 Regarding plantation woodlands, only Natterer's bat (*Myotis nattereri*), Nathusius' pipistrelle (*Pipistrellus nathusii*) and brown long-eared bats have been recorded roosting in plantation trees (Andrews 2018), while all tree-roosting species have been recorded in woodlands of a more semi-natural nature.
- 1.12 The place a bat lives is called its roost. In UK law, bat roosts are defined as '*any structure or place used for shelter or protection by a bat*' (Wildlife and Countryside Act 1981). Bats need different roosting conditions at different times of the year, and they will often move around to find

<sup>3</sup> <https://twitter.com/NatureBfB/status/997008967757975552>

a roost that meets their needs. Some bats prefer hollow trees, some like caves and some use both at different times. Many bats shelter in buildings, behind hanging tiles and boarding or in cavity walls or roof spaces. Bats do not make roosts; they use structures already available.

- 1.13 Between late October and March, bats hibernate; these roosts are typically sheltered, with a stable temperature, typically a cave, cellar or tunnel. Around March, the bats emerge and gradually move to their summer roosts, typically within man-made structures or suitable crevices in trees. During the spring and summer period, already pregnant female bats gather at maternity roosts to give birth and rear their single pup. Most births occur between late June and mid-July, with the pups able to fly within three to five weeks (Altringham 2003; Waters and Warren 2003). During this time, male bats (and some non-breeding females) form bachelor roosts of one to several bats. By the end of August, most pups are independent and maternity colonies break up (Schofield and Mitchell-Jones 2003). Mating takes place between August and December, either at the winter hibernation site or at autumn mating sites. Colony sizes vary greatly between bat species and populations (Altringham 2003), with some roosts occupied by single bats (typically non-breeding summer roosts) while others may contain hundreds of bats (e.g. soprano pipistrelle (*Pipistrellus pygmaeus*) maternity colonies, and some hibernation sites of single or mixed species).

## Bat Biodiversity, Conservation and Protection

- 1.14 There are 17 species of native bats known to be resident (i.e., breed) in the British Isles, with a few very rare species also present but not confirmed as breeding. Bats are important for the UK's biodiversity, accounting for more than a third of Britain's mammal species, based on Matthews *et al.* (2018). The ratio is higher if just native mammals are considered. In biodiversity conservation terms, bats are viewed as valuable indicators of ecosystem health, being reliant on high quality habitats for food and shelter as well as suitable weather and climate for foraging, breeding and hibernating.
- 1.15 Around the world, many bat species are exposed to threats such as habitat loss and fragmentation, reduced food supply, destruction of roosts, disease and hunting or killing of bats. Across the UK, bat populations have declined considerably over the last century, due to building and development work that affects roost and foraging areas, deterioration and loss of quality habitats, severance of commuting routes and domestic threats such as cats, flypaper and chemical treatments of building materials. Other potential threats can include forestry operations, quarrying, wind turbines and increased lighting.
- 1.16 Climate change is also likely to impact upon UK bats, through changes to weather patterns, food resources, hibernation periods and the availability of suitable hibernacula. Future impacts may also include changes in the geographic range of species, such as species moving northwards, and/or to higher altitudes, new species arriving from Europe and the arrival of new diseases (for example, bat workers in the UK are alert for bats exhibiting signs of white-nose syndrome<sup>4</sup>).

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<sup>4</sup> White-nose syndrome (WNS) is an emerging disease in North American bats which has resulted in the dramatic decrease of the bat population in the United States and Canada. The condition is named for a white fungal growth on the muzzle and wings of hibernating bats, caused by a fungus, *Pseudogymnoascus destructans*. The fungus has been identified on bats in at least 18 European countries, including the UK. However, unlike in North America, these findings have not been linked with mass mortalities and WNS has not been confirmed in Europe.

1.17 All British bats are legally protected under European<sup>5</sup> and national legislation<sup>6</sup>. Seven native British bat species are listed as a 'Priority Species' under the 2011 biodiversity strategy for England, *Biodiversity 2020: A strategy for England's wildlife and ecosystem services*, under the 2012 UK Post-2010 UK Biodiversity Framework. These Priority Species are also often referred to as 'species of principal importance' for the conservation of biodiversity in England and Wales within Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006.

1.18 The seven UK Priority Species of bat are:

- Soprano pipistrelle;
- Lesser horseshoe (*Rhinolophus hipposideros*);
- Greater horseshoe;
- Barbastelle (*Barbastella barbastellus*)
- Bechstein's;
- Noctule; and
- Brown long-eared bat.

1.19 In the area of Staffordshire around Cannock Chase AONB, the Priority species greater horseshoe, barbastelle and Bechestein's have never been recorded.

## Bats of Staffordshire

1.20 In the county of Staffordshire, a total of 12 bats have been recorded, as follows:

- Common pipistrelle;
- Soprano pipistrelle;
- Nathusius' pipistrelle;
- Noctule;
- Leisler's bat (*Nyctalus leisleri*);
- Serotine (*Eptesicus serotinus*);
- Natterer's bat;
- Daubenton's bat;
- Whiskered bat (*Myotis mystacinus*);
- Brandt's bat (*Myotis brandtii*);
- Lesser horseshoe bat; and
- Brown long-eared bat.

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<sup>5</sup> Bat species are listed under Annexes IIa and IVa of the EC Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora, also known as the 'Habitats Directive'. Inclusion on Annex IVa means bats are identified as European Protected Species and protected under the Conservation of Habitats and Species Regulations 2017 (amended), also known as the Habitats Regulations. Because it is in UK law, this legislation is still applicable now Britain has left the European Union.

<sup>6</sup> All wild species of bat are protected under the Wildlife and Countryside Act (WCA) 1981, which has also been amended by later legislation, including the Countryside and Rights of Way (CROW) Act 2000; legislation applicable in England and Wales.

## 2. METHODS/APPROACH

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### 2.1 In this section:

- Identifying the study area;
- Consultee list,
- Data collation and analysis;
- About the GIS dataset;
- Interactive map instructions; and
- Limitations of the study.

### Study Area

#### ***AONB Description***

### 2.2 A high-level desk study of Cannock Chase AONB was carried out to broadly characterise the area in terms of habitat features that might be of particular value to bats. The objective was to provide reference areas for discussion of bat records. The study focussed upon the AONB and immediate surrounds. Aspects considered were:

- Designated sites;
- Priority habitats;
- Landscape character; and
- Broad habitat classification.

### 2.3 Phase 1 habitat data was considered too detailed for this study.

### 2.4 Elevation data was used for presenting the species distribution maps.

#### ***Bat Records***

### 2.5 The study relates primarily to the Cannock Chase AONB. However, bats are mobile species and guidance for surveys (Collins 2016) suggests that desk studies for ecological data on bats should extend for 2km from a development site boundary in most cases and up to 10km for special circumstances. For this project, the same rationale was used to include records beyond the site boundary. Thus, records for all species were sought for up to 2km buffer around the AONB boundary, and further records were sought up to 10km from the boundary for rarer species, especially lesser horseshoe bat which have been recorded within Staffordshire in recent years. As a whole, the study aimed to gather information on the existing status of bat species within the AONB and its immediate (2km) surrounding zone.

### 2.6 Rarer species were defined on the basis of their known rarity in Staffordshire, as follows:

- Leisler's – rare in Staffordshire;
- Lesser horseshoe – two known Staffordshire records in recent years;
- Nathusius' pipistrelle – rare in Staffordshire;
- Serotine – rare in Staffordshire; and
- Whiskered/Brandt's – rare in Staffordshire.

- 2.7 Three further rare bats, Alcathe's (*Myotis alcathoe*) (very similar to whiskered and Brandt's), Bechstein's (not known from Staffordshire) and Barbastelle (not known from Staffordshire, but recorded in the neighbouring county of Derbyshire in 2019) were not considered likely to occur in the datasets available to this study, but were included in the data searches and requests.

## Consultation

- 2.8 A list of potential sources of bat records was discussed and agreed with Staffordshire County Council. The original list is presented in Table 1. Consultees were contacted by email or telephone and the availability of relevant data identified. Where consultations identified other potential data sources these were followed up.

**Table 1 Initial List of Consultees**

Consultee
Bat Conservation Trust
Cemex
Environment Agency
Forestry England
HS2
Lichfield District Council
MAGIC website
National Trust
Natural England
NBN website
Planning Portal
SAC Partnership
South and South East Staffordshire Bat Group
Stafford Borough Council
Staffordshire Bat Group
Staffordshire County Council
Staffordshire Ecological Record

## Data Collation and Analysis

- 2.9 Data were received in a range of different formats. These included biological records already formulated from Staffordshire Ecological Record (SER), to bat box survey results and reports containing data that needed to be extracted into biological records. In essence, data could be added to the database if it contained the following information (who/what/when/where):

- Accurate location (or National Grid Reference (NGR));
- Species identification;
- Source; and
- Date.

- 2.10 Data were scanned for duplication and records removed. Data were then categorised for accuracy and scanned to identify confirmed roost records. The database was interrogated to derive general statistics for the study such as total number of records in each zone, etc.
- 2.11 Data were used to generate maps for each species or species group. Where there were sufficient data, the dataset could then be compared with the habitat and landscape information for the area to discuss whether potential influences on bat occurrence across the area could be discerned.

## GIS Dataset

- 2.12 On receipt, all records were transferred to the project database, with key information extracted and standardised, including source, date, species, record type and location. In this way the biological records were generated for the study.
- 2.13 During the collation process a spatial accuracy value for each record was assigned, extracted from the number of figures provided in the national grid reference - for example, a ten-figure grid reference would have an accuracy of 1m, six-figure reference would have an accuracy of 100m. The spatial accuracy value is important and should be considered if carrying out any further exploration, analysis or presentation of the dataset, in relation to the spatial scale of the study. Records with a spatial accuracy of 1,000m, for example, should be considered as an indication of presence of that species within a 1km grid square, rather than a point record. For presentation reasons, this information is not visible on the maps in this report.
- 2.14 When all the records were entered, the project database was transferred to a point GIS dataset, with each individual record being assigned a unique identifier to help with quality checking and easy interrogation of the data.

## Limitations of the Study

- 2.15 Biological records should always be considered as indications of the presence of a species but do not indicate absence. To this end, records were sought for all bats including rare species such as barbastelle (known from Derbyshire).
- 2.16 Bats are difficult to record because they are small, nocturnal, avoid light, have inaudible calls and roost in inaccessible areas. As a consequence, their under-recording is an issue in biological datasets compiled from varied sources and record types such as in this study. Under-recording is especially marked away from populated areas, and habitats such as woodland and heathland are particularly likely to suffer a lack of records. Because of this, the results of the study cannot be used as if they were the findings of a systematic survey, namely to indicate the presence or absence of bats. The results can only indicate where bats have been observed.
- 2.17 Data accuracy varied between records. Spatial accuracy affects data exploration, analysis and presentation of the dataset. For example, records with a spatial accuracy of 1,000m, for example, should be considered as an indication of presence of that species within a 1km grid square, rather than a point record. Bats are very mobile species, so for non-roost records, even point data can only be seen to indicate activity in the area, not necessarily roost locations.
- 2.18 Raw numbers should be viewed with caution. For example, this study included many repeat surveys focused on known roosts, such as bat box monitoring or National Bat Monitoring

Programme roost surveys. As such, raw numbers should not be overly scrutinised or used to derive population estimates.

- 2.19 Hard to identify species and those that persist at smaller population densities may have eluded detection or be under-recorded entirely. This is because the data compiled for this study was based upon information from development surveys, site specific conservation monitoring, such as bat box schemes, and incidental occurrences, such as grounded bats or bats in homes. The records do not, therefore, represent a robust basis on which to estimate population status.
- 2.20 The desk study was unable to acquire records from commercial quarry companies, if they exist. An absence of bats is unlikely at such locations.
- 2.21 An absence of records from Forestry England likely reduces the detection of more isolated bat populations within continuous forest habitat.
- 2.22 The full dataset includes consultancy survey records from the nearby HS2 proposed route. This has produced a significant increase in records to the east of Cannock Chase. While the records are valuable, it is a good example of records accumulating from localities which have received particular survey effort, rather than because there are more bats in these places. Instead, the HS2 records may show how under-recorded bats may be in the surrounding areas, including Cannock Chase.

### 3. DATA OVERVIEW

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#### 3.1 In this section:

- A description of the AONB in terms of its protected sites, habitats and landscape as a setting for the bat records; and
- A description of the data obtained for the database, including range of sources, record type, dates and species included. The data is discussed at the wider area of the AONB plus a 2km and 10km buffer.

#### Cannock Chase AONB Description

- 3.2 Cannock Chase AONB is important for wildlife - a significant proportion of the AONB is designated for conservation (30%) on the basis of important habitats and or species. This includes the Cannock Chase Special Area of Conservation (SAC), considered to be important at the European level and comprising extensive lowland heathlands and associated habitats which are some of the largest in England (1,244ha). Nationally, five Sites of Special Scientific Interest (SSSI) have been designated within the AONB to preserve important habitats and geological features<sup>7</sup>. The Cannock Chase SSSI citation mentions '5 species of bat' but other sites do not feature them. Furthermore, 33 Local Wildlife Sites (LWS) and five Local Geological Sites (LoGS) are also present reflecting sites with regional to county value. These are all shown on Figure 1.
- 3.3 Outside formal designations, rivers, wetlands and waterways are important features of the area, including the Rivers Trent and Sow, which converge in the northern tip of the AONB. Other waterbodies include the Trent and Mersey Canal (following the River Trent valley) and spring-fed mires and wet heaths at Sherbrook and Oldacre. Smaller watercourses include Sherbrook, Old Brook and others. Ancient broadleaved woodland and wood pastures are also characteristic, with their associated veteran trees and other fauna and flora. The varied habitats of the AONB also support a range of wildlife species, including plants, insects, birds, bats and other mammals that are rare or protected.
- 3.4 A Landscape Character Assessment (Ashmead Price 2017) places most of the AONB within the 'forest heathlands', strongly associated with the high plateau of Cannock Chase with its unenclosed topography of rounded summits and incised valleys covered with woodland and heath. The woodland is typically conifer plantation with small areas of semi-natural oak-birch woodland and heath. Fringing the forest heathlands within the AONB are 'sandstone hills & heaths' plus smaller incursions of 'settled farmlands'. In the far north of the AONB lie the 'river meadowlands' of the River Trent catchment which occur on flat low-lying alluvial terrain which seasonally floods.
- 3.5 UK Priority Habitats categorise a wide range of semi-natural habitat types, and define those considered most threatened and requiring conservation action under the UK Biodiversity Action Plan (BAP). UK Priority Habitats within the AONB are dominated by deciduous woodland, with important areas of lowland heathland, coastal and floodplain grazing marsh and some good quality semi-improved grassland. The areas of each Priority Habitat within the AONB are outlined in Table 2. UK Priority Habitat datasets should be viewed with some caution as they do not include all habitat areas of value and have some categories such as 'No main habitat but additional habitats present' which cannot be usefully interpreted. However, the data does indicate the

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<sup>7</sup> Cannock Chase SSSI (notified for semi-natural vegetation and woodland), Milford Quarry SSSI (geological), Rawbones Meadow SSSI (floodplain meadow), Stafford Brook SSSI (carr woodland) and Gentleshaw Common SSSI (semi-natural common land).

importance of deciduous woodland and lowland heathlands within the AONB, and the presence of other important habitats such as grazing marsh (in the Trent Valley).

**Table 2 UK Priority Habitat Areas Within Cannock Chase AONB**

UK Priority Habitat	UK Priority Habitat Area (hectares)
Deciduous woodland	844.3
Lowland heathland	493.3
No main habitat but additional habitats present	244.3
Coastal and floodplain grazing marsh	148.2
Good quality semi-improved grassland	35.3
Lowland dry acid grassland	5.1
Lowland fens	2.1
Purple moor grass and rush pastures	1.7
Traditional orchard	0.5
Reedbeds	0.3

3.6 In addition to identifying a suite of Priority Habitats (and species) requiring action, a wider classification of Broad Habitats was, therefore, developed, to cover the whole land surface of the UK<sup>8</sup>. UK Priority Habitats were all to be included within one (or sometimes more) Broad Habitat. Broad Habitats have been collated for the AONB (Figure 2), and the areas of each present are shown in Table 3. Because of the fuller coverage within the AONB, the Broad Habitat categories were considered to better characterise the habitat types available to bats locally.

3.7 The Broad Habitat data indicates the strong dominance of coniferous woodland plantation within the area, with large elements of broadleaved and mixed woodland. The data also shows the high cover of arable farmland – a habitat not featured in UK Priority Habitat inventories. In addition to woodland, other Broad Habitat types of special interest for bats present within the AONB include neutral grassland, parkland and wood pasture, standing open water and canals, rivers and streams and fen marsh and swamp. Built-up areas are also important for bats that dwell in man-made structures, e.g., pipistrelles. The value of conifer woodland (plantation) and dwarf shrub heath (lowland heath) is not well understood for UK bats, but there is evidence that they are used.

**Table 3 Broad Habitat Areas Within Cannock Chase AONB**

Description	Broad Habitat Area (hectares)
Coniferous woodland	2068.6
Broadleaved, mixed, and yew woodland	1118.0
Arable and horticulture	810.6
Dwarf shrub heath	689.9
Neutral grassland	374.5
Bracken	251.9

<sup>8</sup> <https://jncc.gov.uk/our-work/uk-bap-priority-habitats/#uk-bap-broad-habitats>

Description	Broad Habitat Area (hectares)
Poor semi-improved grassland	248.3
Improved grassland	220.2
Recently felled woodland	207.8
Inland rock	122.2
Parkland and wood pasture	80.8
Acid grassland	72.3
Scrub	61.9
Standing open water and canals	45.4
Rivers and streams	37.4
Fen, marsh and swamp	28.8
Bare ground	14.1
Built-up areas and gardens	8.7
Tall ruderals	2.4
Bog	0.4
Boundary and linear features	0.2

- 3.8 Surrounding the AONB, there are the significant conurbations of Stafford to the northwest, Cannock to the southwest and Rugeley to the east. Shugborough Estate (National Trust) is located near to the rivers' confluence. A network of roads traverses the AONB, including the trunk routes of the A51 at the eastern edge, the A513 between Stafford and Rugeley and the A460 from Rugeley to Cannock. There is also a railway line and the A34 runs along or close to much of the western boundary. These routes may provide edge habitats and commuting corridors through dense plantation zones, allowing bats to move across the AONB. Roads also provide easier access for observers to record bats.

## Bat Records

- 3.9 A range of sources were used to collate the database. These are summarised in Table 4.

**Table 4 List of Data Obtained for the Database**

Consultee	Description of Data
Staffordshire County Council	A range of data from consultancy reports, bat box checks etc.
National Trust	Bat survey report for Shugborough Estate
Natural England	All data with SER
MAGIC	Data from EPSL records (3 separate licences)
Lichfield District Council	Jacks Wood bat box check report 2010, HS2 Phase 2a bat survey report, July 2017, containing many records for 2016.
Staffordshire Ecological Record (SER) -	Data for the AONB footprint+ 2km obtained from a range of sources: Volunteer Bat Roost Visitor reports, Cannock Chase DC, Consultants reports, County recorders, National Bat Monitoring Programme waterway and emergence counts (superseded by BCT data), NE files, NE EPSL returns, South and South East Staffordshire Bat Group, Staffordshire Bat group (to 2015), Staffordshire County Council, Staffordshire Mammal group, Staffordshire Wildlife Trust records

Consultee	Description of Data
Staffordshire Bat Group (SBG)	Bat box check records for a range of sites up to 2019
Bat Conservation Trust	National Bat Monitoring Programme data provided - high accuracy data
South and South East Staffordshire Bat Group (SSEBG)	SSEBG merged with SBG post 2015 - all records with SER.
National Biodiversity Network Gateway (NBN)	Records extracted from the NBN Gateway
Planning Portal	Records extracted from bat reports accompanying applications on the Planning portal for applications within the AONB and immediate surrounds of Cannock Chase DC, Lichfield DC and Stafford DC

3.10 Organisations that were also consulted but did not hold data that was available to the study were:

- Cemex and other quarries;
- Environment Agency;
- SAC Partnership; and
- Forestry England.

3.11 Natural England's bat data was included in other datasets within the study.

3.12 The total number of bat records compiled in the study was 2409, as shown on Figure 3. Of these, 947 records were for the AONB itself, a further 893 for the 2km buffer zone. In the 10km zone, 568 records were received, but this was only for selected 'rarer' bat species (i.e., Leisler's bat, lesser horseshoe bat, Nathusius' pipistrelle, serotine and whiskered/Brandt's bats). The 2409<sup>th</sup> record, for a lesser horseshoe bat roost 4km outside the 10km zone, was also included because this species is of particular interest in the area of the AONB.

3.13 Bat records dated from 1975 to 2020.

3.14 Species for which data was obtained are summarised in Table 5. The table also shows the total numbers of records in the database for each species within Cannock Chase AONB, and its 2km and 10km buffers. For commoner species, data within the 10km zone was not specifically sought and the records should be considered as only part of the dataset for that species or group. For these commoner species, the 10km column is shaded.

**Table 5 Number of Records for Each Bat Species**

Bat Species or Group		No. Records			
Common Name	Scientific Name	Dataset	AONB	2km	10km
Bat	NA	172	63	63	46
Pipistrelle species	<i>Pipistrelle</i> sp.	327	104	193	30
Common pipistrelle	<i>Pipistrellus pipistrellus</i>	372	138	176	58
Soprano pipistrelle	<i>Pipistrellus pygmaeus</i>	288	141	117	30

Bat Species or Group		No. Records			
Common Name	Scientific Name	Dataset	AONB	2km	10km
Nathusius' pipistrelle	<i>Pipistrellus nathusii</i>	16	0	2	14
<i>Myotis</i> species	<i>Myotis</i> sp.	61	13	30	18
Natterer's	<i>Myotis nattereri</i>	213	116	24	73
Whiskered	<i>Myotis mystacinus</i>	69	5	11	53
Brandt's	<i>Myotis brandtii</i>	34	3	2	29
Whiskered or Brandt's	<i>Myotis mystacinus</i> or <i>M. brandtii</i>	67	8	11	48
Daubenton's	<i>Myotis daubentonii</i>	114	41	42	31
<i>Nyctalus</i> species	<i>Nyctalus</i> sp.	13	12	1	0
<i>Nyctalus/Eptesicus</i> agg.	<i>Nyctalus/Eptesicus</i> agg.	18	0	5	13
Noctule	<i>Nyctalus noctula</i>	219	91	116	12
Leisler's	<i>Nyctalus leisleri</i>	54	22	6	26
Serotine	<i>Eptesicus serotinus</i>	19	0	8	11
Brown long-eared	<i>Plecotus auritus</i>	351	190	85	76
Lesser horseshoe	<i>Rhinolophus hipposideros</i>	1	0	1	(1*)
<b>Total no. records</b>	NA	<b>2408</b>	<b>947</b>	<b>893</b>	<b>568</b>
* Single roost record at 14km from the AONB included in study due to the high conservation interest of this species.					
Shaded text indicates partial data only as records not sought from data repositories such as SER for these 'commoner' species.					

- 3.15 In the AONB, a total of nine bat species are reported in the data; common and soprano pipistrelle, Natterer's, whiskered, Brandt's, Daubenton's, Leisler's, noctule and brown long-eared. Brown long-eared bat have the most records within the AONB, with soprano pipistrelle and common pipistrelle next, respectively. Activity by common pipistrelle, which is often the most commonly encountered bat, is closely allied to settlements, while brown long-eared bat and soprano pipistrelle are more associated with wooded and semi-natural habitats which dominate the Chase. The distribution of bats is discussed in the Species Accounts.
- 3.16 Overall, the numbers of species compare well to the 12 confirmed from Staffordshire, and there are records of the remaining species, Nathusius' pipistrelle and serotine, from the surrounding 2km zone. Lesser horseshoe bat has been recorded just beyond 10km. Comparatively, Staffordshire County has an area of 302,673 hectares while Cannock Chase AONB is 6,866 hectares. Cannock Chase AONB covers 2% of the county area and supports a bat fauna containing 75% of the bat species present in the county – in essence a rich and diverse bat fauna is present for a relatively small area of land. This reflects the diversity and overall good quality of

the habitats present in the AONB. However, records are patchily distributed and some habitat types have few records.

- 3.17 Bats have been found in most Broad Habitats within the AONB. However, some habitats are associated with more bat records. Table 6 shows the number of bat records for each broad habitat category in the AONB. Bearing in mind the caveats already stated about interpreting data from this study in relation to habitat, the semi-natural habitats seem important, as would be expected: neutral grassland and broadleaved woodland top the list for the most bat records per habitat and plantation woodland is third, though it is by far the most abundant habitat (32% of AONB area).
- 3.18 When numbers of bats are compared per habitat unit (records per hectare), coniferous woodland is 12th in line, behind a list which includes some expected bat-rich habitats, such as rivers and streams, neutral grassland, parkland and wood pasture, as well as bare ground, poor semi-improved grassland, standing open water and canals, inland rock, broadleaved woodland, improved grassland, acid grassland and fen, and marsh and swamp.
- 3.19 Over half of the bat records were within neutral grassland and broadleaved woodland habitats alone, while rivers and streams produced the most records per area. Coniferous woodland was relatively poor considering its large cover (32%). Parkland and wood pasture also had good numbers of records per hectare. Other habitats of interest for the Chase such as heathland had low numbers – but this may be due to lack of sampling and would be interesting to study further.

**Table 6 Broad Habitat Areas within the AONB and Number of Bat Records**

Description	Broad Habitat Area (ha)	Habitat as % of AONB	Number of Bat Records	Records per ha
Neutral grassland	374.5	5.79	233	0.622
Broadleaved, mixed, and yew woodland	1118	17.29	187	0.167
Coniferous woodland	2068.6	32.00	70	0.034
Poor semi-improved grassland	248.3	3.84	56	0.226
Rivers and streams	37.4	0.58	48	1.283
Parkland and wood pasture	80.8	1.25	44	0.545
Inland rock	122.2	1.89	21	0.172
Arable and horticulture	810.6	12.54	20	0.025
Dwarf shrub heath	689.9	10.67	17	0.025
Improved grassland	220.2	3.41	10	0.045
Standing open water and canals	45.4	0.70	8	0.176
Bare ground	14.1	0.22	4	0.284
Acid grassland	72.3	1.12	3	0.041
Bracken	251.9	3.90	3	0.012
Fen, marsh and swamp	28.8	0.45	1	0.035
Scrub	61.9	0.96	1	0.016
Recently felled woodland	207.8	3.21	1	0.005
Bog	0.4	0.01	0	0
Boundary and linear features	0.2	0.00	0	0

Description	Broad Habitat Area (ha)	Habitat as % of AONB	Number of Bat Records	Records per ha
Built-up areas and gardens	8.7	0.13	0	0
Tall ruderals	2.4	0.04	0	0

- 3.20 Record types within the database were for activity survey, bat detector and visual records, surveys with harp trap/mist net/artificial light, bat box checks, roost visits, formal bat surveys, building and tree inspections, collected/grounded/dead bats, dusk/dawn emergence surveys, bat droppings, static detector and transect surveys. However, many records were just classified as 'field observation' or similar.
- 3.21 The records included results from certain survey types that generated a lot of records for very localised areas, for example, over 100 Natterer's records form a single bat box scheme at Oldacre. Thus, the numbers do not reflect population size, just sampling effort. Examples of such focussed surveys include:
- National Trust bat survey at Shugborough (107 records);
  - Bat Conservation Trust (BCT) National Bat Monitoring Programme surveys at Acton Trussell, Baswich, Rugeley, Blithbury and 3 other locations (168 records); and
  - Bat box schemes at Milford/Oldacre, Brocton, Haywards and Moors Gorse (254 records).
- 3.22 A search of the database for any records that clearly related to roosting revealed a total of 411 confirmed roost records across the AONB and its 10km buffer. Within the AONB there were 188 roost records, and a further 103 roost records in the surrounding 2km buffer. The remaining 119 roost records were for the 10km zone, but this area was less consistently covered by the data as only selected records were requested.

## 4. SPECIES ACCOUNTS

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- 4.1 In this section:
- Brief introduction to detailed accounts for each bat species and species groups;
  - Description of data for relevant zones – within AONB and up to 2km for all species, and up to 10km for rare bats (i.e., Leisler's, lesser horseshoe, Nathusius' pipistrelle, serotine and whiskered/Brandt's);
  - Maps showing bat occurrence and roosts; and
  - Discussion of data in relation to bat habitats.
- 4.2 The species introductions are broadly based upon the species profiles prepared by BCT<sup>9</sup> and found in Couzens *et al.* (2017). UK population estimates for each species are based on Matthews *et al.* (2018). The Staffordshire Bat Group website<sup>10</sup> was also referred to.
- 4.3 The description of those data for each bat species or species group considers the number of records (Table 5), where bats are present (distribution within study area and habitat/land uses), what bats are doing (e.g., roosting, commuting, foraging), and what the data indicates in relation to the expected patterns for the species.
- 4.4 However, because these data are not based upon a systematic survey across the AONB, absences of data cannot be used to indicate absence of a species. Consequently, any discussion has to focus upon where bats have been recorded, not where there are no records.

### The Bats of Cannock Chase and Surrounds

- 4.5 Please refer to Table 5 for the numbers of records collated for each bat species or species group.
- 4.6 All bat records collated within the database are presented in Figure 3, including unspecified bats.

#### ***Unspecified Bats***

- 4.7 There were 172 records for bats which were not able to be identified to family level or species, 63 of which occurred directly within the AONB boundary. Data included 18 records for roosts in the AONB and a further eight in the 2km buffer zone. The records were well-distributed across the study area, especially associated with settlements at the fringes of the AONB and its 2km buffer, such as Brocton and Great Haywood, Little Haywood, Rugeley, Cannock Wood and Hednesford. Records were also received, including for roosts, for the wider 10m zone. The pattern of records largely reflects the distribution of pipistrelle bats, favouring conurbations and areas of diverse mixed countryside.

#### ***Pipistrelles***

- 4.8 Bats in the pipistrelle genus occurring within Cannock Chase AONB are common pipistrelle, soprano pipistrelle and Nathusius' pipistrelle. Bats classified as simply 'pipistrelle' were also included, most likely to be common or soprano pipistrelle.

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<sup>9</sup> [www.bats.org.uk](http://www.bats.org.uk)

<sup>10</sup> <https://www.staffsbats.co.uk/bats>

- 4.9 Pipistrelles as a group make up by far the most recorded genus of bats in the study, accounting for 1003 of all the records. Of these 987 were considered likely to be for the two commoner species – common and soprano pipistrelle, including all those classified simply as ‘pipistrelle’.

### **Pipistrelle Species**

- 4.10 Data for pipistrelle bats which were not identified beyond the genus are presented in Figure 4. These non-specific records are considered most likely to be common or soprano pipistrelles. This is because the two commonest pipistrelle species found in the UK, the common and soprano pipistrelle, were only identified as separate species in the 1990s. The two species look very similar and often the easiest way to tell them apart is from the frequency of their echolocation calls. As a consequence, many, often older, records for ‘Pipistrelle’ could be either common or soprano pipistrelle.
- 4.11 Nathusius’ pipistrelle is unlikely to have been included in these records, since is more easily identified on distinctive morphological characteristics and echolocation calls.

### **Common Pipistrelle**

- 4.12 Data for common pipistrelle are presented in Figure 4.
- 4.13 Common pipistrelles are among the smallest bats in the UK. They have a medium dark brown colouration and a typically darker face. Their flight is usually low, rapid and agile.
- 4.14 It is estimated that there are three million individuals in the UK in 2018 (Matthews *et al.* 2018). The species is of Least Concern (LC) on the IUCN Red List for England<sup>11</sup>.
- 4.15 The relative success of common pipistrelles in the UK is partly due to the species’ adaptation to urbanisation, as well as their tolerance of relatively exposed locations. Summer roosts are frequently located on buildings, using crevice features such as hanging tiles, between roofing felt or within cavity walls. The species will also roost in tree holes and cavities.
- 4.16 Common pipistrelles will feed in a wide range of habitats, including woodland, hedgerows, grassland, farmland, as well as suburban and urban areas.
- 4.17 The known widespread distribution of common pipistrelle is reflected in the dataset, being the most commonly recorded species in the total dataset (372 records). 138 records were found within the Chase itself, making it the third most frequent species reported.
- 4.18 Particularly dense accumulations of records for common pipistrelle were located in urbanised settings at Cannock Town and Rugeley, both of which lie just outside of the boundary of the AONB. This is likely a reflection of the species’ close association with built structures, as well as consultancy survey effort directed towards development areas.
- 4.19 Records have also accumulated around Shugborough and along the River Trent in the north of the Chase, thanks to consultancy surveys in these areas (Shugborough Estate and HS2).
- 4.20 Records within the expanses of habitat within Cannock Chase showed a greater density of records in the north. This is where a mosaic of mixed broadleaved woodland, grassland and farmland are present as well as stretches of the Rivers Sow and Trent and the Trent and Mersey Canal.

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<sup>11</sup> **LEAST CONCERN (LC)** A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.

- 4.21 Records within the larger coniferous woodland compartments were more sporadic. Records are generally lacking for all bats in these areas and may stem from an absence of survey effort.
- 4.22 Roost records within the Chase date from 2007 to 2019. Confirmed roosts include those at Haywood bat boxes, Upper Longden, Milford/Oldacre, north west of Etchinghill, Wolseley Park and Little Haywood. As expected, they are mostly associated with bat box schemes and settlements, reflecting survey efforts at box schemes and roosting preferences for the species.

### **Soprano Pipistrelle**

- 4.23 Records for soprano pipistrelle are presented in Figure 4.
- 4.24 Soprano pipistrelles are the UK's smallest bat. Very similar to common pipistrelles in appearance, but the face and area around the eyes is typically pink in colour.
- 4.25 The species is estimated to be the most numerous in the UK, with best estimates at 4,670,000 individuals. It is of LC on the IUCN Red List for England, although it is listed as a priority species in the UK BAP.
- 4.26 Soprano pipistrelles usually feed in wetland habitats over lakes and rivers, as well as on woodland edges, tree lines and hedgerows. Like the common pipistrelle, they are also a species that is more tolerant of suburban settings, and will also forage in parks and gardens.
- 4.27 Roosting locations are typically similar to common pipistrelle, however, summer roost colonies are usually larger, with an average size of 200 bats compared to 75 for common pipistrelle.
- 4.28 288 records for soprano pipistrelle are present in the dataset, with 141 falling within the AONB boundary.
- 4.29 By far the largest concentration of records lies in the north of the Chase, centred around the Shugborough Estate and along a localised stretch of the River Trent. These were the locations of dedicated bat surveys: Shugborough Estate (Churton Ecology 2018) and HS2 Phase 2a bat reports (HS2 2017) which variously included systematic inspections of suitable roost features, bat activity surveys, and static detector monitoring. Thus, more bats have been detected in these areas.
- 4.30 Confirmed soprano pipistrelle roosts include two along Penkridge Bank, at Wolseley Park and on the edge of Little Haywood - all locations within or close to open countryside.

### **Nathusius' Pipistrelle**

- 4.31 Data for Nathusius' pipistrelle is presented in Figure 5.
- 4.32 Nathusius' pipistrelles are distributed throughout the UK, but are considerably rarer than common and soprano pipistrelles, with no reliable UK population estimates available. They are listed as Near Threatened (NT) on the IUCN Red List for England<sup>12</sup>. They are one of the species which is known from Staffordshire, but not yet recorded within the AONB.
- 4.33 They are similar in appearance to, but slightly larger than, other pipistrelle species. The fur on its back is longer, and this shaggy appearance can be characteristic. Flight is typically faster than common and soprano pipistrelles, although less manoeuvrable.

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<sup>12</sup> Near Threatened (NT) A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.

- 4.34 Nathusius' pipistrelles are migratory bats and have been known to breed in the UK since the 1990s. A small number of maternity colonies are known in England, and it appears that a small summer breeding population is supplemented by migratory individuals in winter.
- 4.35 Nathusius' pipistrelles are particularly associated with freshwater habitats, especially still waters - this is a habitat which is sparse within the AONB. The majority of known roosts in the UK are located close to large freshwater lakes, with foraging sites near to rivers, canals, lakes and waterlogged areas, as well as along woodland edges. Roosts have been reported in walls of traditional buildings usually comprising stone or brick, in wall cavities and under flat roofs. Nathusius' are also one of the few tree-dwelling species which have been recorded roosting in plantation trees (Andrews 2018).
- 4.36 There are no records of Nathusius' pipistrelle within Cannock Chase. Nathusius' pipistrelle is confirmed to be present within the wider landscape, though records are sparse. There are only 16 records for the species in the wider 10km buffer; two of which are within 2km to the north of the Chase and associated with the River Trent corridor also containing the River Sow and the Trent and Mersey Canal.
- 4.37 The dataset confirms presence of Nathusius' pipistrelle in nearby proximity to the Chase in all directions, despite records not being present within the AONB boundary. The lack of detection within the Chase may be anomalous, given the presence of suitable woodland edges and habitat mosaics, as well as numerous waterbodies that the species is often closely associated with. Alternatively, the scarcity of built structures for roosting compared to the urbanised environments surrounding the Chase may account for the species apparent absence.
- 4.38 There is also a possibility that some Nathusius' calls are dismissed as a call variation of the common pipistrelle by bat workers who are not experienced with the species, or have insufficient call data to work with.
- 4.39 The Shugborough Estate and surrounding River Trent valley area would seem the most likely location for the species to be recorded inside the AONB, but a recent bat activity survey in potentially suitable areas turned up no records (Churton Ecology 2018). A long-term static detector survey here might be more successful at recording the species within the AONB.

### ***Myotis Bats***

- 4.40 Seven species in the *Myotis* genus have been recorded in the UK, of which four have been recorded within Cannock Chase: Natterer's bat, whiskered bat, Brandt's bat and Daubenton's bat, and are represented in the database.
- 4.41 As a whole, a total of 558 records were obtained for species in the *Myotis* genus, made up of records for the above species plus *Myotis* species and whiskered/Brandt's.
- 4.42 There are 61 records in the dataset which have identified *Myotis* to only genus level, and another 67 that have been identified as 'whiskered/Brandt's' due to their similarities and the difficulties in differentiating these species.
- 4.43 Data for all the *Myotis* bats is presented in Figure 6.

### **Natterer's Bat**

- 4.44 Natterer's bats are a medium-sized species with light buff brown fur and a bare, pink face. Their flight is usually low, at slow to medium speed, often amongst trees or over water.
- 4.45 The UK population estimates vary greatly for the species, with plausible intervals from 15 thousand to 2.6 million. It is listed as LC on the IUCN Red List for England, but the status of the species is not well understood. Roost densities are extremely uncertain and recording effort is low across the UK.

- 4.46 Most known colonies of Natterer's bat are in old stone buildings with larger timber beams, such as manor houses or old barns. They will also roost in mine entrances or under bridges. Colonies are rare in houses but do occur occasionally in roof spaces and features. Natterer's bats are one of the species often found in cave sites or exposed rock crevices. Natterer's bats are also one of the few tree-dwelling species which have been recorded roosting in plantation trees (Andrews 2018).
- 4.47 Records for Natterer's bat within Cannock Chase date between 1991 and 2019. They are the most numerous *Myotis* species in the dataset. In total, there are 213 records of Natterer's bat in the dataset; 116 of which are located within the AONB. However, 100 of these 116 records pertain to bat box checks at a single site located at Milford/Oldacre in the west of the AONB, dated between 2013 and 2019.
- 4.48 The species has also been recorded at Shugborough Hall grounds, during intensive surveys in 2018. Outside of the AONB, several field observations have been recorded for the species around the Wolseley Centre, just east of the boundary, between 2007 and 2015; another product of recording effort. Natterer's bat has also been recorded during HS2 consultancy surveys in the wider 10km buffer.
- 4.49 As evident in Figure 6, the records of Natterer's bat are not widely distributed in the AONB, and the number of records are a result of focused checks of known roosts over a number of years. However, habitats of the AONB (including plantation which is understood to be little used by many bat species), are likely to suit Natterer's bat, and it is likely that the species is widespread across the Chase.
- 4.50 Lack of roost features in plantation woodlands may be one reason for low numbers of bats in these habitats (habitat quality being another). Natterer's bat would benefit from more rides through the plantation blocks, giving greater connectivity between open and wooded areas of the Chase, and more habitat diversity. Installation of bat boxes may be beneficial, but such schemes require regular maintenance/replacement and should only be undertaken if long-term provision is guaranteed. More concentrated monitoring (e.g. using static detectors or recordings during bat walks) along woodland and plantation edges might reveal more widespread activity than currently indicated.

### **Whiskered Bat and Brandt's Bat**

- 4.51 Whiskered bat and Brandt's bat are very similar bats which have only been described as separate species since the 1970s. Many current day records do not differentiate the species with certainty, leading to databases with many 'whiskered/Brandt's' records. The National Bat Monitoring Programme (NBMP) also does not distinguish between the two species. Alcaethoe's bat is another species which is often included in this grouping due to its similarities. As a group they are known to occur in Staffordshire but, to date, Alcaethoe's bat has never been recorded in the county.
- 4.52 Whiskered and Brandt's bats are small to medium in size and have a fast and fluttering flight to a height of 20m. Brandt's bats are on average slightly larger, but the most reliable morphological differences are in dentition, penis shape, tragus shape and claw length; alternatively they can be accurately separated by DNA testing.

- 4.53 There are no reliable UK population estimates available for either species; both are listed as Data Deficient (DD) in the IUCN Red List for England<sup>13</sup>. Whiskered bats are thought to be slightly more common and widespread than Brandt's bat.
- 4.54 The species are often found in buildings both new and old, with colonies most commonly found in the north and west of the UK. They are regularly found hibernating in caves and tunnels, almost always in small numbers. Foraging habitat is typically around habitat margins, including woodland edges, hedgerows, farmland, rivers, parks and gardens. The species are vulnerable to modern agricultural practices such as pesticides and the decline of woodland habitat.
- 4.55 Records for whiskered bat and Brandt's bat are scarce within the AONB. There are only three records of confirmed Brandt's within the AONB, with two dating from the early 1980s and another from a granted European Protected Species Licence (EPSL) application near Shugborough Hall in 2009. Five records of confirmed whiskered bat date from 1976 to 2009, with the 2009 record pertaining to the same Shugborough Hall location as the Brandt's bat EPSL licence.
- 4.56 Another eight records are present within the AONB which identify the species as either whiskered bat or Brandt's bat. The whiskered/Brandt's bat morphospecies has been confirmed in the AONB as recently as 2018 at Shugborough.
- 4.57 As rarer bat species, consideration is given to these species outside of the AONB. In the wider 10km buffer, additional records exist for these species. This includes a dense accumulation of records around Black Slough and Ravenshaw Wood, as well as at The Wolseley Centre, both due east of the Chase in the River Trent valley. A strong number of records are also present around Hatherton to the south-west.
- 4.58 Roosts are confirmed in the parishes of Fradley and Streethay, Abbots Bromley, Colton, Seighford, Kings Bromley and Mavesyn Ridware.
- 4.59 Considering those data for whiskered bat, Brandt's bat and whiskered/Brandt's bats, these bats are present in the AONB, with a marked favouring of the north-eastern part, flanking the River Trent valley. However, the records are sparse in comparison to the 10km surrounding zone. This group of bats appear to favour the edges of the conifer lands of the Chase and particularly the River Trent valley although the abundance of records here also reflects the intensive consultancy survey effort carried out for HS2 ecology studies.
- 4.60 The species would benefit from more rides through the plantation blocks, giving greater connectivity between open and wooded areas of the Chase. Installation of bat boxes may be beneficial, but such schemes require maintenance and should only be undertaken if long-term provision is guaranteed. More concentrated monitoring (e.g. using static detectors or recordings during bat walks) along woodland and plantation edge areas might reveal more activity than currently indicated by the data.

### Daubenton's Bat

- 4.61 Daubenton's bats are a medium sized bat in the *Myotis* genus. They have fast, straight flight, characteristically flying low over smooth water.
- 4.62 The estimated population size is 1 million, however, there is some uncertainty. The species is widespread across the UK and is listed as LC on the IUCN Red List for England.

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<sup>13</sup> Data Deficient (DD) A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking (IUCN 2012).

- 4.63 The species is associated with water, typically feeding on caddisflies, mayflies and small flies such as chironomid midges. Despite the loss of wetland habitats and alterations to water quality, Daubenton's bat seems to be increasing in some parts of its range.
- 4.64 In the UK, the known summer colonies are typically in underground sites or bridges near water. They are only occasionally found in buildings. Tree holes are also sometimes used, however, roosting association with trees is probably under-recorded.
- 4.65 Daubenton's bat records in the Chase date back to 1990, with the most recent in 2018. The dataset holds 41 records for the species within the AONB. These are greatly focused on the Shugborough Estate and adjacent River Trent valley. Suitable habitats close to waterbodies are scarce and isolated across much of the rest of the AONB. Hence, the other records are more sporadic, associated with waterbodies such as at Fair Oak Pools.
- 4.66 In terms of roosts for Daubenton's, only two roosts were reported, one in the centre of the AONB near Penkridge Bank (from EPSL records), and one in the 2km buffer at Hatherton Parish.
- 4.67 Monitoring close to still waters, the Rivers Trent and Sow and along the Trent and Mersey Canal would be most likely to reveal more activity of Daubenton's bats within the AONB.

### **'Big' Bats**

- 4.68 The 'big bats' is a term used to refer to three species in the UK. These are the two *Nyctalus* species: noctule and Leisler's bat; as well as the similarly sized serotine, the only UK member of the *Eptesicus* genus.
- 4.69 While all species are easily identified in the hand and can have very distinctive calls when recorded on bat detectors, sometimes there is insufficient data to attribute calls accurately, or calls can be atypical. Also, it is not possible to separate bats on the wing by sight and behaviour alone. Therefore, records are sometimes made of aggregations of bats such as:
- *Nyctalus/Eptesicus* which could be noctule, Leisler's bat or serotine; and
  - *Nyctalus* sp. which could be noctule or Leisler's bat.
- 4.70 Taken together, a total of 323 records for 'big bats' were collated within the study.
- 4.71 Within the AONB, *Nyctalus* species were recorded 12 times, in similar places to noctule and Leisler's bats particularly to the north of the AONB and at Pottal Pool Quarry. In the 2km buffer, a single record was from Rugeley Power Station.
- 4.72 For *Nyctalus/Eptesicus*, all five records were for the 2km buffer zone with none inside the AONB. These were located at two locations: Ingestre Parish near the River Trent; and adjacent to the River Trent near Great Harwood. It may be worth noting that most other records in the area are for noctule.
- 4.73 No roosts were reported of either group.
- 4.74 Mapped data for the 'big bats' is presented in Figure 7.

### **Noctule**

- 4.75 Noctule is one of the UK's largest bat species, as well as usually the earliest emerging species at sunset. Noctules have sleek golden-brown fur, broad brown ears and a distinctive mushroom-shaped tragus. The species has a characteristic flight, being powerful and direct, and often well above tree canopy level.
- 4.76 There is a population estimate of 565,000 in England, however this number is highly uncertain. The species is still relatively widespread across the UK despite the continued decline of its habitat. It is listed as LC on the IUCN Red List, though is listed in the UK BAP as a priority species.

- 4.77 Noctule are primarily tree dwellers and rarely found in buildings. They are often associated with woodlands and woodland edges. They also typically hibernate in trees, or occasionally rock fissures.
- 4.78 A total of 219 records for noctule were collated in this study. Within the AONB, there are 12 records of confirmed noctule, with a further 116 in the 2km buffer. The remaining records relate to the wider 10km zone and are not considered further.
- 4.79 The noctule records were scattered widely across the AONB, with the greatest concentration of locations in the north, around the Rivers Trent-Sow confluence and associated with the conifer plantations around Shugborough Estate. Occasional records were present around the edge of the AONB and along the Rugeley Road. The dwarf shrub heath of Cannock Chase SAC was devoid of records for noctule, possibly reflecting a lack of sampling here rather than an absence of bats – noctule are one of the species that has been recorded on dwarf shrub habitats and are strong flyers able to cope with open environments. Within the 2km zone, noctule records were present throughout, including records in Weeping Cross, Rugeley and Cannock settlements, but most were associated with the River Trent valley to the east of the AONB.
- 4.80 Within the AONB area, a total of six records for roosts were reported for three separate sites, with a further two roosts of *Nyctalus* species. An additional three roost records are available from the 2km buffer, but for just two sites. The AONB roosts are located in Hatherton Parish in the south, and one in Colwich Parish to the north. Both situations would put bats close to woodland habitats and woodland edges and give good access to other habitats on Cannock Chase for foraging.

### Leisler's Bat

- 4.81 Leisler's bat is similar to the noctule, but typically slightly smaller. Leisler's bats have dark golden to rufous brown fur with a characteristic 'lion's mane' of longer fur around the shoulders and upper back.
- 4.82 Matthews *et al.* (2018) found a paucity of data available to make a population estimate. The species is listed as NT in the IUCN Red List for England. The species is common in Ireland (where noctule are absent) but is rare in the rest of the UK.
- 4.83 Leisler's bat is typically a woodland species, roosting in trees. They have occasionally been found to roost in buildings. The species is mobile, with a roost often occupied for only a few days before the colony moves on.
- 4.84 A total of 54 records for Leisler's bat were collected in this study. Within the AONB, Leisler's bat occur in 22 records, with a further six in the 2 km buffer. The remaining 25 records relate to the wider 10km zone.
- 4.85 Leisler's bats are sparsely spread across the AONB, but with clusters of records around Brocton and west of Rugeley and also presence associated with the northern woodland edges and Penkridge Bank across the centre of the higher ground of the Chase. An isolated record is also present at Pottal Pool. Outside the AONB in the 2km zone, a cluster of records occurs west of Cannock. Within the 10km zone, Leisler's can be seen to occur on all sides of the AONB, but records are sparse and mainly associated with open countryside.
- 4.86 Two Leisler's bat roosts are known within the AONB; from Pottal Pool bat box scheme and a bat box scheme near Penkridge Bank. Within the 2km zone, a roost was recorded at Hatherton Parish. No roosts were reported from the 10km zone. Similar to noctule, the roost locations put bats close to woodland habitats and woodland edges and give good access to other habitats on Cannock Chase for foraging.
- 4.87 Leisler's bat are a rare bat but seem to find attractive habitats within the AONB more than in surrounding less wooded/forested areas. There is an absence of records from within forestry blocks, but this pattern is mirrored in all the bat records and may be a product of both habitat

unsuitability and/or lack of recording. It is notable that noctule, with a similar habitat niche, is more well-represented generally but also absent from these forestry blocks.

## Serotine

- 4.88 Serotine is another large bat species. Its fur is dark brown above and pale underneath, with a black face and ears. It is a highly manoeuvrable bat with a flapping flight with occasional short glides and descents. Its preferred prey are beetles, and while it is regarded as a southern bat, it is known to migrate north in summer to feed on cockchafer beetles where they occur in high numbers.
- 4.89 This species roosts mainly in buildings with an availability of high gables or cavity walls. Structures where the species is found are usually older buildings and churches. Serotines are particularly associated with habitats of woodland, hedgerows, parkland and pastures, all of which are present within the AONB. There is a scarcity of studies on the winter behaviour of serotines, but it is likely that most hibernate in buildings.
- 4.90 The serotine is a rare bat in the UK, with best population estimates at 136,000. Records are almost entirely absent in the north of England and in Scotland. Serotine is listed as Vulnerable (VU) in England by the IUCN<sup>14</sup>. Serotine is known from Staffordshire, but not yet recorded within the AONB.
- 4.91 A total of 19 records were collated for serotine in this study; none within the AONB, eight in the 2km zone and a further 11 in the wider 10km buffer. In the 2km zone, records were collated for observations at Weeping Cross and Rugeley Power Station. Beyond, in the 10km zone, records occur very sparsely to the north, west and south of the area. The data contains records of a single roost for the species, at Jacks Wood near Chasewater, in 2010.
- 4.92 Serotine have not been recorded within the AONB and outside this, data collated is sparse, even including the *Nyctalus/Eptesicus* records along the HS2 corridor. Serotine is a broadly southern bat that favours open parkland and farmland. Serotine are known to be rare in Staffordshire and toward the northern edge of their current range in the UK. However, where suitable habitats exist the species may well be present, just not detected by *ad hoc* surveys completed to date. Areas of potential interest would include Shugborough and the River Trent valley, and wood pasture/parklands at Wolsley Park, Hatherton Hall and Brocton Coppice. Timing surveys to coincide with the presence of large invertebrate prey such as cockchafer beetles would increase likelihood of detection as serotines migrate to forage abundant insects in summer.

## Brown Long-eared Bat

- 4.93 Mapped data for brown long-eared bat are presented in Figure 8.
- 4.94 Brown long-eared bats are medium-sized. Their ears are as long as the body, though these can be tucked back when at rest. Fur is light brown and pale underneath. Their broad wings and tail allow them to be highly manoeuvrable, and to hover in flight.
- 4.95 Brown-long eared bats will take larger prey to feeding perches, which are often identifiable by accumulations of moth wings and other remains.
- 4.96 Brown long-eared bats are associated with woodland, their manoeuvrability allowing them to fly and forage in cluttered environments. Summer roosts are usually located in older buildings, barns and churches, as well as in trees. Winter roosts tend to be found in caves, tunnels, trees and

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<sup>14</sup> Vulnerable (VU) A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria for Vulnerable, and it is therefore considered to be facing a high risk of extinction in the wild.

occasionally in buildings. Brown-long eared bats are also one of the few tree-dwelling species which have been recorded roosting in plantation trees (Andrews 2018) and using plantation areas (Collins 2016).

- 4.97 The species is widespread across the UK with a population estimate of 934,000. The IUCN Red List for England lists brown long-eared bats as of LC.
- 4.98 Brown long-eared bats have declined in the UK due to changing land use and intensive agricultural practices, as well as conversions of barns. They are a priority species in the UK BAP.
- 4.99 A total of 351 records were collated for brown long-eared bats in this study, with 190 occurring within the AONB, and 85 more within the 2km zone. The remaining records were for the 10km zone and are not discussed further because this is a relatively common bat.
- 4.100 Within the AONB brown long-eared bat records are well distributed across the area, associated with the large tracts of conifer plantation and deciduous woodland. Concentrations of records occur around Shugborough in the north and Upper Longdon in the south, the former reflecting concentrated survey efforts in 2018. In the 2km zone, a similar well spread pattern of occurrence can be seen, but with many records picked up by the surveys for HS2 which clip the north-eastern edge of the buffer zone.
- 4.101 Within the AONB a total of 98 brown long-eared bat roosts have been recorded, although some records are repeat occurrences at bat box schemes over several years of survey. In the wider 2km zone, a further 19 brown long-eared bat roosts have been recorded.
- 4.102 Overall, the habitats of the Chase are very suitable for brown long-eared bats, being strongly dominated by woodland and plantation areas.

### ***Lesser Horseshoe Bat***

- 4.103 Data for lesser horseshoe bat are presented in Figure 5 (with Nathusius' pipistrelle).
- 4.104 The lesser horseshoe bat is a small bat belonging to the Rhinolophidae family. Along with the larger and rarer greater horseshoe bat, it is evolutionarily distinct from other UK bat species, all of which belong to the Vespertilionidae family. Horseshoe bats have a complex, fleshy noseleaf shaped like a horseshoe, which functions as part of their echolocation system. Lesser horseshoe bats are 'plum-sized' as compared to the 'pear-sized' greater horseshoe bats and have grey-brown fur on their back and are white underneath.
- 4.105 Lesser horseshoe bats forage amongst vegetation in sheltered lowland valleys, usually no more than 5m above ground. They favour broadleaved woodland which is well-connected by commuting routes such as hedges, woodland hedge and riparian trees. Their high-pitched echolocation calls (at around 112kHz) do not carry far, and they are very reliant on boundary features such as hedgerows, walls and watercourses for navigation. Naturally cave dwellers, summer colonies are now often found in larger rural houses. Hibernation sites are typically underground, with known use of caves, mines, tunnels and cellars. The species has also been recorded in coniferous woodland and is considered reluctant to cross open landscapes.
- 4.106 The distribution of the species in the mainland UK is highly skewed towards Wales and south-west England. The UK population is estimated at just 50,400. It is listed as LC in the IUCN Red List. It is a priority species in the UK BAP. A rare bat of Staffordshire, it has not yet been recorded within the AONB.
- 4.107 No records for lesser horseshoe bats were found within the AONB itself; however, during the data collection phase of this study, two records were located in the River Trent valley.
- 4.108 The closest record lies approximately 1km from the northern AONB boundary within the 2km zone. The finding was made on a static detector during HS2 consultancy surveying in 2016.

- 4.109 The second is a roost record dated to 2018. The record is located outside of the 10km buffer, roughly 14km north-west of the AONB boundary, at Oulton, near Stone. Given that the species is both nationally and regionally rare, the record is of interest for the purposes of this study. These records are among the most northerly and easterly records of the species known UK range.
- 4.110 Lesser horseshoe bats rely on intact countryside with woodlands and pastures well connected by hedgerows, walls and streams. They also require high-quality roost sites of quite specific dimensions and internal conditions. Suitable foraging habitats occur within the AONB, especially around Shugborough and along the River Trent valley, and these are considered the most likely regions for the species to be recorded within the AONB. Dense plantation areas are less likely to be suitable although plantation edges and rides may be used.
- 4.111 Lesser horseshoe bats are not known to be present in the Chase, and only rarely in the surrounds. The known hibernation use of mines and caves suggests directing some survey effort towards the poorly studied quarries in the Chase, although the species is particularly sensitive to disturbance. The deployment of passive (static) detector at or near cave/mine entrances could also be worthwhile, if these habitats are present within the Chase.

### **Other Rare Species**

- 4.112 Although considered to be very rare, the presence of Alcaethoe's bat should also not be completely ruled out, given the limited understanding of the species in the UK. The habitat types present within the Chase would broadly be suitable for the species. Even if Alcaethoe's bat is present, separation (either in the hand or by echolocation call data) from whiskered/Brandt's bats is something only a small number of experts in the country would be able to achieve. Therefore, it may have been and continue to be missed from surveys. DNA sampling can reliably identify the species. One way to test for presence of Alcaethoe's might be to collect and carry out a DNA analysis of droppings from known whiskered/Brandt's roost sites within the AONB.
- 4.113 Finally, there are other rare bat species resident or vagrant to the UK that have very limited ranges and are considered absent in Staffordshire entirely. These are the grey long-eared bat (*Plecotus austriacus*) – confined to the south of England, greater horseshoe bat – a south-western species only although recently recorded in Kent, barbastelle (*Barbastella barbastellus*) – known from southern Derbyshire (Findern), Bechstein's bat – southern England and Wales and greater mouse-eared bat (*Myotis myotis*) – vagrant/occasional.

### **Data Quality, Constraints and Gaps**

- 4.114 In comparison to other mammal groups, bats are under-studied, and this is compounded by their nocturnal and elusive nature and the requirement for sophisticated equipment and detailed knowledge to find and identify them. This leads to biases in how data is collected and how reliable it is for various analyses.
- 4.115 Overall, data was collated from a range of sources into a new dataset for bats within and surrounding the AONB. Most of this data was known about but had not hitherto been collated into biological records. Additional bat records may still be available, for example from surveys undertaken at the various quarries within the AONB. It was a surprise to the study that no bat data was available from Forestry England – a significant gap as the forestry estate accounts for approximately 35% of the AONB. Forestry lands could be an area to target with survey effort in the future, to better understand the bat fauna of the plantation areas. Forestry England and the BCT undertook a study in south-west Britain to explore the ability of emerging technology to inform natural capital accounting and woodland condition monitoring. These data will contribute to conservation efforts and help uncover more about the bats living in the nation's forests.
- 4.116 In addition, future data may be collated on an ongoing annual basis from consultancy reports (related to development), ongoing bat group activities, NBMP and Natural England roost visits.

Indeed, consultancy surveys have delivered some of the more notable records for this study, namely for lesser horseshoe bat. Consultancy surveys also deliver a high degree of accuracy in terms of species identification and location but do tend to be focussed on already developed areas (except for infrastructure projects such as HS2). Because of this, species that are most found in developed areas such as pipistrelles and brown long-eared bats occur more frequently in consultancy surveys, while more elusive or woodland bats such as the *Myotis* genus or noctules may be under-recorded.

- 4.117 There are accepted biases in a desk study of this type because it relies upon existing data and surveys. These data by their nature have been focussed upon development sites, site specific conservation monitoring such as bat box schemes or incidental occurrences such as grounded bats or bats in homes. They do not, therefore, represent a robust basis on which to estimate population status. If this was a study objective, the methods used by the BCT's National Bat Monitoring Programme should be consulted for appropriate approaches (especially Waterway Survey and Field Survey methods). Local bat groups can also advise on approaches and potentially provide support in terms of volunteer effort and equipment and expertise.
- 4.118 The desk study was unable to acquire any bat records from commercial quarry companies. Twenty-one records were obtained from the Staffordshire Bat Group bat box scheme at Pottal Pool, but no incidental records are located at Rugeley Quarry or other quarries present within the AONB. An absence of bats seems unlikely at such locations as there is often habitat creation and also rock features such as cliffs, caves and mines which are known to be used by bats. Where accessible, future survey effort directed towards quarries would be of value for understanding the wider use of the Chase by bats.

## 5. DISCUSSION

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- 5.1 This section:
- Summarises and discusses the key headlines for species and habitats within the Chase and surrounds;
  - Identifies 'flagship' bat species for Cannock Chase AONB; and
  - Makes outline habitat management recommendations for these bats.
- 5.2 Possible future survey ideas are also proposed.

### Key Headlines

#### ***Cannock Chase AONB has a Rich Bat Fauna***

- 5.3 Cannock Chase AONB supports nine of Staffordshire's 12 bat species, and has the potential to support all 12 species. The bats already known to be present within the AONB are:
- Common pipistrelle;
  - Soprano pipistrelle;
  - Natterer's bat;
  - Whiskered bat;
  - Brandt's bat;
  - Daubenton's bat;
  - Noctule;
  - Leisler's bat; and
  - Brown long-eared bat.
- 5.4 The patchy nature of the records available and the lack of systematic survey across the Chase may mean several species have simply not been recorded. Bats which could also potentially occur in the AONB are Nathusius' bat, serotine and lesser horseshoe bat. The rich bat fauna highlighted by the study shows the Chase is an important area for bats, both locally and in Staffordshire.

#### ***Local Status of the AONB's Bats***

- 5.5 Some bats, such as common pipistrelle, soprano pipistrelle and brown long-eared bats represent the more commonly occurring bats of the UK and are well distributed across the AONB as would be expected and have good numbers of records.
- 5.6 Other bats which occur less commonly but are still well-distributed are noctule, Natterer's bat and Daubenton's bat. Noctule would be typical of such an area of woodland and open habitats. Daubenton's bats favour, as expected, the River Trent valley with its plentiful waterbodies. Natterer's bat would also be able to use woodland and plantation habitats which are abundant and their records are dotted about across the AONB (with a clearer pattern if *Myotis* species are included).
- 5.7 The rarest bats within the AONB are Leisler's bat, whiskered bat and Brandt's bat. Leisler's are simply a rare bat in mainland UK and their occurrence broadly mirrors that of noctule bats as they occupy a similar ecological 'niche'. Whiskered/Brandt's bats are woodland edge specialists

without a known association with plantations – their records mainly come from the fringes of the AONB. They are considered rare in general and are difficult to separate from Natterer's bat (and other *Myotis* species) on the basis of sound recordings alone; they are sometimes even inseparable from each other in the hand, and these factors mean they may often be under-recorded. Habitats in the Chase are potentially suitable for all three species, however, and the records reflect their rarity rather than habitat unsuitability.

- 5.8 Of the bats recorded locally but not in the AONB, both Nathusius' bat and serotine are likely to use habitats of the Chase, especially around Shugborough and the River Trent valley, and more targeted survey effort in these areas is likely to detect them. Lesser horseshoe bat is so rare in the county that it is less likely to be reported, but the quality of habitats at the fringes of the AONB is certainly potentially useful to this species, but they would probably avoid open habitats such as heaths.

### ***'Flagship' Bats for Cannock Chase AONB***

- 5.9 All British bats are fully protected under European and UK law, and some have been classed as Priority Species under Biodiversity 2020 and Species of Principal Importance under NERC Act (1990), e.g. soprano pipistrelle, noctule, brown long-eared bat and lesser horseshoe bat. Based upon biodiversity priorities and the data collated, certain species can be selected for more targeted conservation action within the AONB (and its surrounds). The following bats are selected as 'flagship' bat species for Cannock Chase because they are both Priority Species, and provide a focus for conservation actions that would benefit a wider array of species:

- Soprano pipistrelle – actions will benefit other pipistrelle species and edge-foragers such as whiskered/Brandt's bats;
- Noctule – survey and habitat management actions would likely also detect and benefit Leisler's and serotine bats;
- Brown long-eared bat – actions favouring this species will also benefit Natterer's and other *Myotis* species bats; and
- Lesser horseshoe bat – if this species can be attracted to the AONB, then all other bat species will benefit as they are reliant on good habitat quality for foraging as well as high habitat connectivity for commuting around.

- 5.10 These bats also have the advantage that they are more easily separated from other bats by sound analysis. For example, most *Myotis* species cannot be separated on call alone – leading to the large number of records for 'Myotis' in the dataset. If bats can be clearly identified to species using recorded calls, they can be monitored effectively using static bat detectors which is less expensive than field teams, gathers a lot of data, and data can be 'banked' for future analysis.

### ***Distribution of Bats***

- 5.11 Care must be taken when interpreting the data collated in relation to habitats. This is because the absence of data may not mean a lack of bats but rather reflects a lack of survey effort. In addition, sample sizes within the data collated for this study are likely too small to make generalist habitat priorities for individual species or groups in most cases. Nonetheless, preferences are generally known for most species and the dataset seems to reflect expected patterns.

- 5.12 Within the AONB, records are concentrated to the north, with the greatest amount of data found in the pocket north of the A513. This is the location of the confluences of the Rivers Trent and Sow, as well as the grounds of the Shugborough Estate. The accumulation of records here is to some extent a reflection of increased sampling effort in the area. However, the occurrence of numerous bat species here should be expected with the presence of canals and rivers, old and

new built structures, as well as a mosaic of habitats managed at various successional stages, with a high availability of continuous woodland edges plus old trees and wood pasture.

- 5.13 Linear woodland edge elements and edge-effects are a strong predictor of bat presence. The broad habitat map (Figure 2) reflects this, with accumulations of records located along woodland edges, bordering grassland and close to river systems in the north.
- 5.14 These data points also highlight built environments, as illustrated by the large number of common pipistrelle records around Cannock at the south-west border of the Chase, at Brocton in the west, and north of the A513 close to Great Haywood, Little Haywood and Shugborough.
- 5.15 Records in the south of the Chase are patchier. Records within continuous coniferous woodland are sporadic, and almost entirely absent over dwarf-shrub heath and bracken-dominated landscapes, which are also at higher altitudes. Literature seems to suggest that although coniferous plantation woodlands are used by some British bat species (Andrews 2018), there is selectivity for mixed and broadleaved woodland (Hill and Greenaway 2008). Use of heathlands by bats is even less well understood. Absence of bat records for these habitats may also reflect a lack of survey effort.
- 5.16 Gaps in the data relate to the way data has been collected to date – such as *ad hoc* records from the public, consultancy reports relating to development (often urban dwellings), bat box schemes, BCT and Natural England Volunteer Roost Visit records focussed upon very localised sites and more extended studies, such as for HS2 and at Shugborough Estate. The bat fauna of other parts of the Chase has probably never been looked at, and this includes large areas of conifer plantation, deciduous woodland, dwarf shrub heath and other habitats with the potential to support bats.

### ***Important Habitats***

- 5.17 Bats have been found in most Broad Habitats within the AONB. However, some habitats are associated with more bat records. Bearing in mind the caveats already stated about interpreting data from this study in relation to habitat, the semi-natural habitats seem important, as would be expected: neutral grassland and broadleaved woodland top the list for the most bat records per habitat and plantation woodland is third, though it is by far the most abundant habitat (32% of AONB area).
- 5.18 When numbers of bats are compared per habitat unit (records per hectare), coniferous woodland is ranked 12th, behind a list which includes some expected bat-rich habitats, such as rivers and streams (1<sup>st</sup>), neutral grassland (2<sup>nd</sup>), parkland and wood pasture (3<sup>rd</sup>), as well as bare ground (quarries)(4<sup>th</sup>), poor semi-improved grassland (5<sup>th</sup>), standing open water and canals (6<sup>th</sup>), broadleaved woodland (8<sup>th</sup>), improved grasslands (9<sup>th</sup>) and fen, and marsh and swamp (11<sup>th</sup>). See Table 6.
- 5.19 To summarise on habitats, over half of the bat records collated were within broadleaved woodland and neutral grassland habitats alone, while rivers and streams produced the most records per area. Coniferous woodland was relatively poor in data considering its large cover (32%). Parkland and wood pasture also had good numbers of records per hectare. Other habitats of interest for the Chase such as heathland (a semi-natural and Priority Habitat) had low numbers – the reasons for which would be interesting to study further.

### **Future Surveys**

- 5.20 This project provides a baseline desk study collating all available records of bats for the AONB and highlighting data gaps and potential target areas for future work, both in gathering data and in improving habitats for bats.

- 5.21 Data gaps have been identified for species and habitats, especially regarding the lack of records in heathland and the low proportion of records in conifer plantation relative to area. Nathusius' and serotine bats seem likely to occur within the AONB but have yet to be recorded, while lesser horseshoe bat presence also seems possible given the types of habitats present at the edges of the Chase. Also, because of the type of records collated, populations of bats cannot currently be established, but it would be useful to understand more about what population levels are and whether the AONB can support greater numbers of bats.
- 5.22 Furthermore, habitat management and conservation actions are best undertaken in the knowledge of what species are most likely to benefit. Also, monitoring the success of measures relies upon a useable species baseline. As has been explained, this study relies upon *ad hoc* records rather than systematic survey and so does not necessarily provide an adequate baseline.
- 5.23 The section on species accounts outlines some potential survey approaches and focus locations for each bat species. Here, more wide-reaching approaches for the whole AONB area are presented.
- 5.24 Survey approaches should be determined by the type of information required. Considerations of cost and personnel also need to be made.
- 5.25 Potential survey approaches to gathering more comprehensive and robust population data for bats within Cannock Chase AONB are listed in Table 7, highlighting target species, where relevant, and referencing example projects undertaken elsewhere.

**Table 7 Possible Survey Approaches**

Survey	Description	Requirements	Example
Randomised field survey	Randomly select tetrads, 1km squares or smaller areas to receive a bat walk recording all species. Good for determining population levels of target species.	Bat detector that can record, surveyor, data analysis	Similar approach to NBMP Waterway/Field Surveys run by the BCT across the UK to monitor Daubenton's, noctule, serotine and Leisler's
Static detector field survey	Static detectors are set up systematically across an area, or habitat, e.g. forestry and left to record for selected period. Good for picking up all (or most) species present in targeted areas	Bat detector (e.g. audiomoth)/ access to forestry lands (or other habitat)/surveyor to deploy and collect/data analysis	This approach has been used by BCT and Forestry England with great success <sup>15</sup>
Quarry surveys	Ask quarries to allow some form of bat surveys to be undertaken on or adjacent to their sites. Likely to be static surveys as operational sites may not be suitable for surveyors to access at night	Access to quarry sites, detectors/ data analysis	PAA has undertaken several bat surveys at quarry sites in Derbyshire using static detectors set to record for periods throughout the year

<sup>15</sup> <https://www.bats.org.uk/our-work/national-bat-monitoring-programme/forestry-england-bat-survey>

Survey	Description	Requirements	Example
Review of planning applications	Annually review planning applications for consultants' reports containing bat records. NB - ecologists holding bat licences are obliged to submit their records to the relevant data repository as part of their licence renewal, but there can be reasons why this doesn't happen in a timely manner leading to a lag in bat data available for consideration	Access to planning portal – no specialist expertise. Could be done by volunteer/student	This process was undertaken for this study
Site surveys	Target particular sites with static detector or activity surveys	Detectors, surveyors, data analysis	Shugborough survey for National Trust (Churton Ecology 2018)
Bat walks	Bat groups and ranger services carry out bat walks for public engagement. Data can be gathered from these events. Rather <i>ad hoc</i> type of survey and often very localised	Detectors, walk leader, data analysis	Staffordshire Bat Group carry out bat walks
Habitat surveys	Target particular habitats with static detector or activity surveys	Detectors, surveyors, data analysis	Forestry estates, dwarf shrub heath
Known colony monitoring	Regular annual surveys of known bat maternity colonies can detect population trends if carried out over enough years. Useful if located close to habitat improvements targeted at bats	Detectors, surveyors, known maternity roost with good accessibility	BCT/NBMP run maternity colony counts annually for a range of species to monitor populations across the UK. A similar approach could be applied more locally, and these data provided to the NBMP as well for national monitoring

- 5.26 Staffordshire Bat Group should be consulted on survey ideas – some of their members are local/national experts and they have a good understanding of bats across the county as well as useful contacts. They could also potentially provide some equipment and/or surveyor effort. The BCT may also be able to advise on some matters.
- 5.27 In terms of citizen science projects, Bat Detective<sup>16</sup> is an online citizen science project which allows visitors to the website to take part in wildlife conservation by listening out for bat calls in recordings collected all over the world. By sorting the sounds into insect and bat calls, citizen scientists help biologists learn how to distinguish bat sounds and develop new automated identification tools. The project has been developed at University College London, with BCT, Bat Life Europe and the Citizen Science Alliance. Instigating such a project for Cannock Chase AONB would need specialist support, but members of the public interested in bats could be encouraged

<sup>16</sup> <https://scistarter.org/bat-detective>

to investigate this and other citizen science endeavours, and help develop methods of automated bat identification which might be applicable to the AONB in the future.

- 5.28 Surveys should always provide their data to the local records centre, as a minimum reporting requirement. SER can provide a template for accepting records. Any surveys planned should stipulate that this is completed for all data. Data should be provided within one year of collection to help maintain currency of datasets.

## Habitat Management

- 5.29 Habitat management actions have been identified for the flagship species and are described in Table 8. Most measures will benefit more or all bat species because they all improve the ecological quality and diversity of the landscape. Habitat actions will also help bats and other wildlife of the Chase adjust to changes in climate and boost population levels.

**Table 8 Management Recommendations for Bats of Cannock Chase AONB**

	Flagship Bat Species (Key Habitats)			
	Soprano Pipistrelle	Brown Long-eared Bat	Noctule	Lesser Horseshoe Bat
<b>Habitat Preferences</b>	Wide range of habitats but associated with riparian zones and semi-natural habitats. Mainly roosts in buildings.	Tree-cover, woodland with a cluttered understorey, especially native deciduous, mixed woodland edge, conifers, hedgerows. Mainly roosts in buildings.	Open habitats, broadleaved woodland and pasture, over trees, strong affinity to water. Mainly roosts in trees.	Broadleaved woodland, hedges, woodland edge, riparian trees, coniferous woodland, well-connected landscapes. Mainly roosts in buildings, caves and mines.
<b>Suggested Actions</b>				
<b>Habitat Connectivity</b>				
Increase habitat connectivity between all broadleaved woodland habitats and parklands by creating rides through plantation areas	x	x	x	x
Create broadleaved/native scrub edge habitats around plantation areas, including tree/shrub species able to adapt to predicted future climate change	x		x	
Increase connectivity between heathland blocks by felling rides through plantations	x		x	
Improve connectivity between waterbodies and other semi-natural habitats, e.g. grasslands	x		x	x
<b>Habitat Quality</b>				

	Flagship Bat Species (Key Habitats)			
	Soprano Pipistrelle	Brown Long-eared Bat	Noctule	Lesser Horseshoe Bat
Improve quality of semi natural habitats such as grassland, pasture and parkland	x	x	x	x
Increase broad leaved component of forestry areas to benefit roosting and foraging	x	x		x
Reduce density of forestry areas to provide more foraging habitats		x		x
Introduce native scrub and understorey to plantation forestry areas		x		x
Improve structure of field boundaries such as walls and hedgerows and increase planting along watercourses to provide navigational aids onto and across the Chase	x	x	x	x
Maintain wetland areas as valuable food source	x		x	x
Traditional management of neutral and other semi-natural grasslands	x		x	x
Introduce insect-friendly Headlands in improved pastures, arable and horticulture fields	x		x	x
Increase populations of parkland trees with new planting	x		x	x
Artificial 'veteranisation' of parkland, wood pasture and woodland trees to provide roost sites for bats and increase invertebrate populations (refer to Bengtsson 2002)		x	x	
Create/maintain standing and fallen deadwood in all broadleaved woodland and plantation forestry areas (roost sites and invertebrate habitat)		x	x	
Well managed and monitored bat boxes located in edge habitats	x	x	x	
Well managed and monitored bat boxes located in plantation		x		

	Flagship Bat Species (Key Habitats)			
	Soprano Pipistrelle	Brown Long-eared Bat	Noctule	Lesser Horseshoe Bat
Identify and establish potential roost site(s) for maternity and hibernation (refer to Schofield 2008)				x
Maintain low lighting levels, especially on roads. Reduce lighting at night wherever possible, especially during spring, summer and autumn when bats are most active	x	x	x	x
Increase invertebrate biomass and diversity in all habitats, through habitat maintenance, restoration and creation and lowered agricultural pesticide use	x	x	x	x

5.30 The book, *Habitat Management for Bats – A guide for Land Managers, Landowners and their Advisors* (Entwhistle 2001) may be a useful source of information.

The RSPB's free *Woodland Wildlife Toolkit*<sup>17</sup> may be useful to help land managers set and keep track of objectives - the toolkit can be used to store data, create maps, generate management plans and assess woodland condition.

<sup>17</sup> <https://woodlandwildlifetoolkit.sylva.org.uk/>

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## 7. ABBREVIATIONS

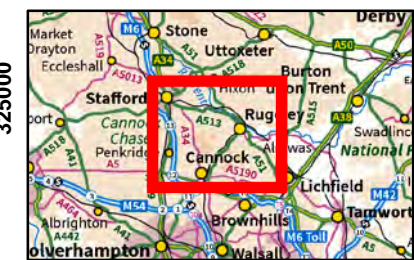
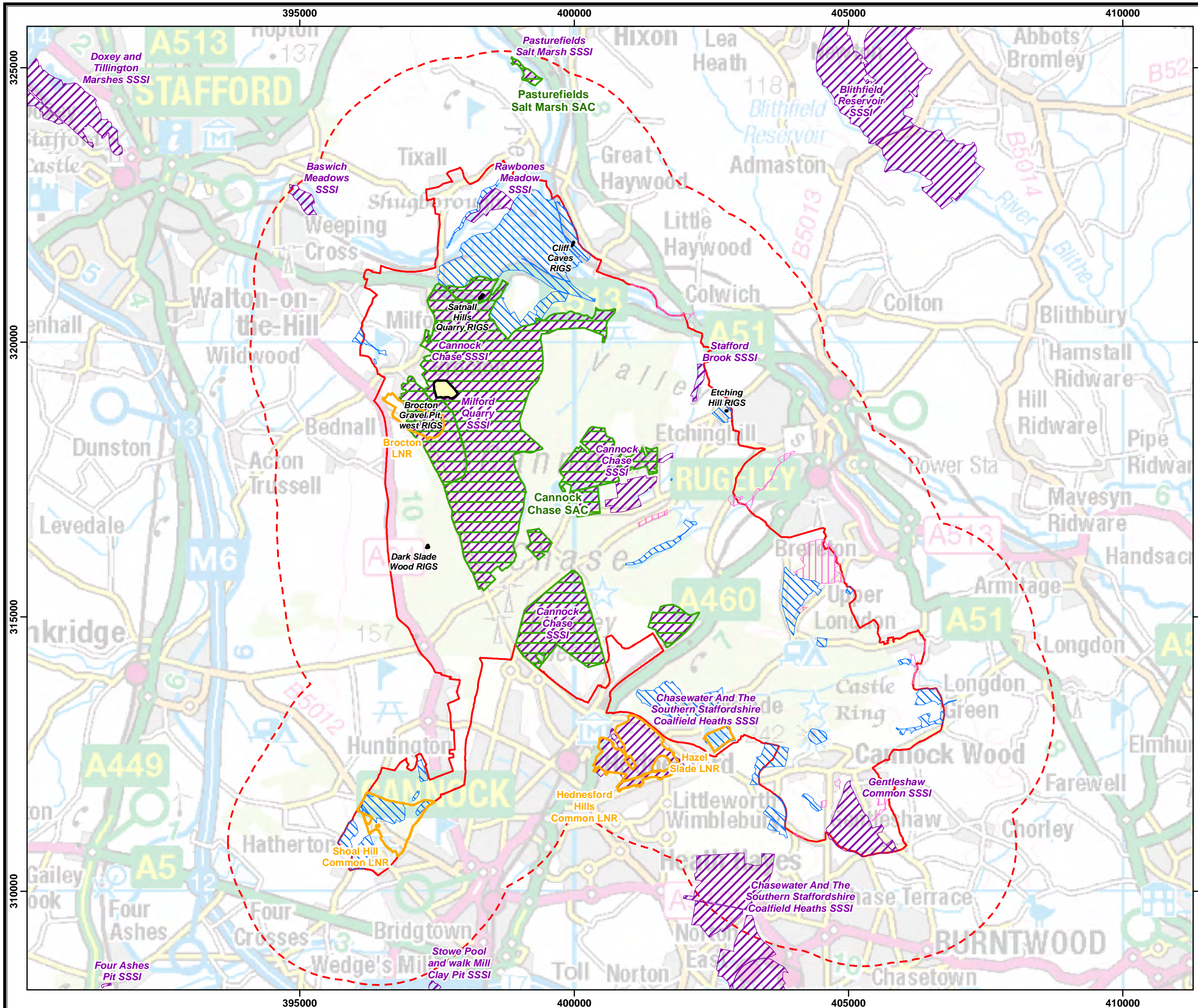
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AONB	Area(s) of Outstanding Natural Beauty
BAP	Biodiversity Action Plan
BCT	Bat Conservation Trust
DD	Data Deficient
EPSL	European Protected Species Licence
GIS	Geographic Information Systems
LC	Least Concern
LoGS	Local Geological Site(s)
LWS	Local Wildlife Site(s)
NBMP	National Bat Monitoring Programme
NERC	Natural Environment and Rural Communities
NGR	National Grid Reference
NT	Near Threatened
SAC	Special Area(s) of Conservation
SER	Staffordshire Ecological Record
SSSI	Site(s) of Special Scientific Interest
VU	Vulnerable
WNS	White-nose Syndrome

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## FIGURES

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**Legend**

- Cannock Chase AONB
- 2km buffer of AONB
- Special Area of Conservation (SAC)
- Site of Special Scientific Interest (SSSI)
- Local Nature Reserve (LNR)
- Site of Biological Importance
- Biodiversity Alert Site
- Regionally Important Geological Site (RIGS)

British National Grid  
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False Northing: -100000.000000  
Central Meridian: -2.000000  
Scale Factor: 0.999601  
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ISO A3

Metres

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Project Name: Cannock Chase AONB

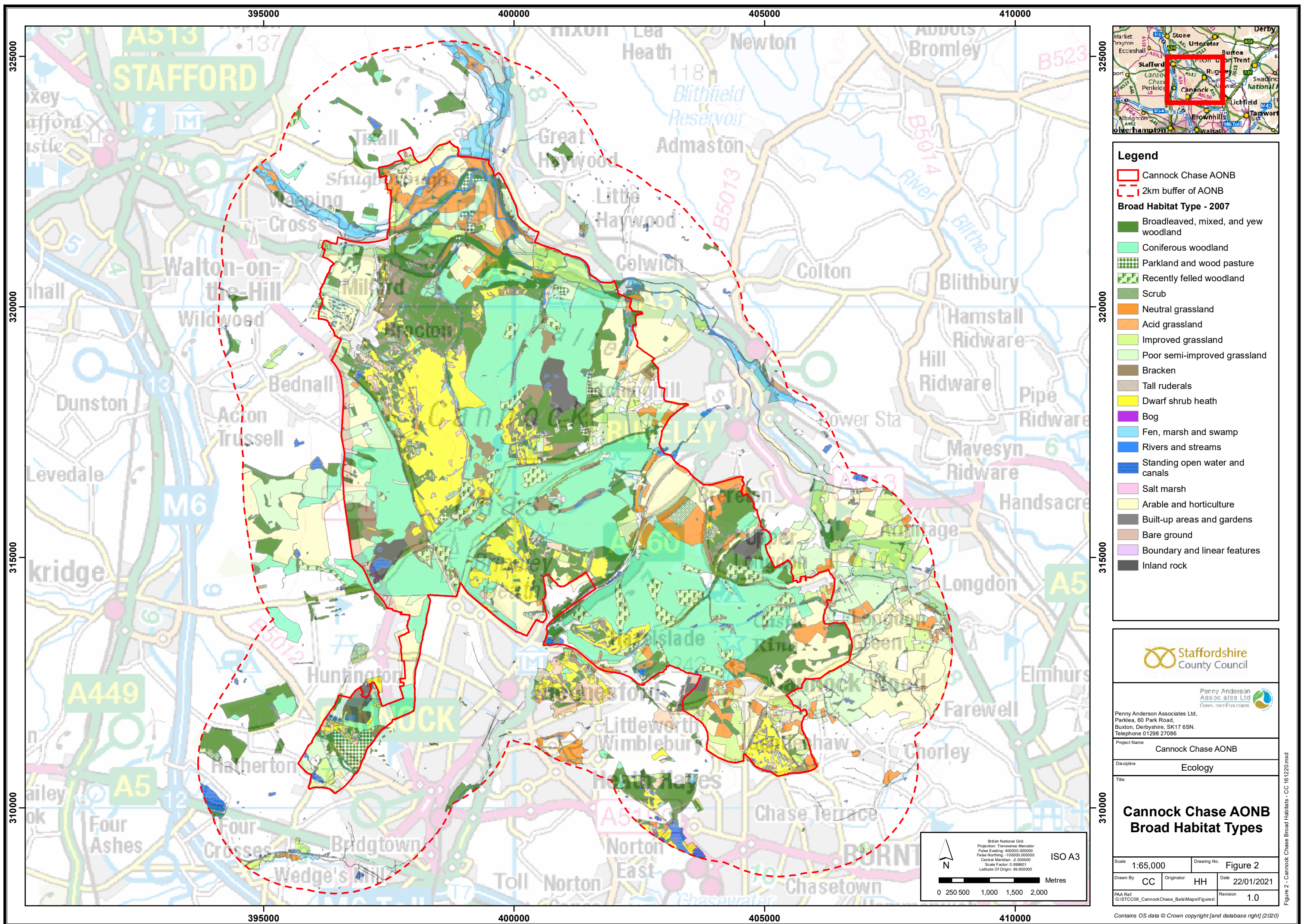
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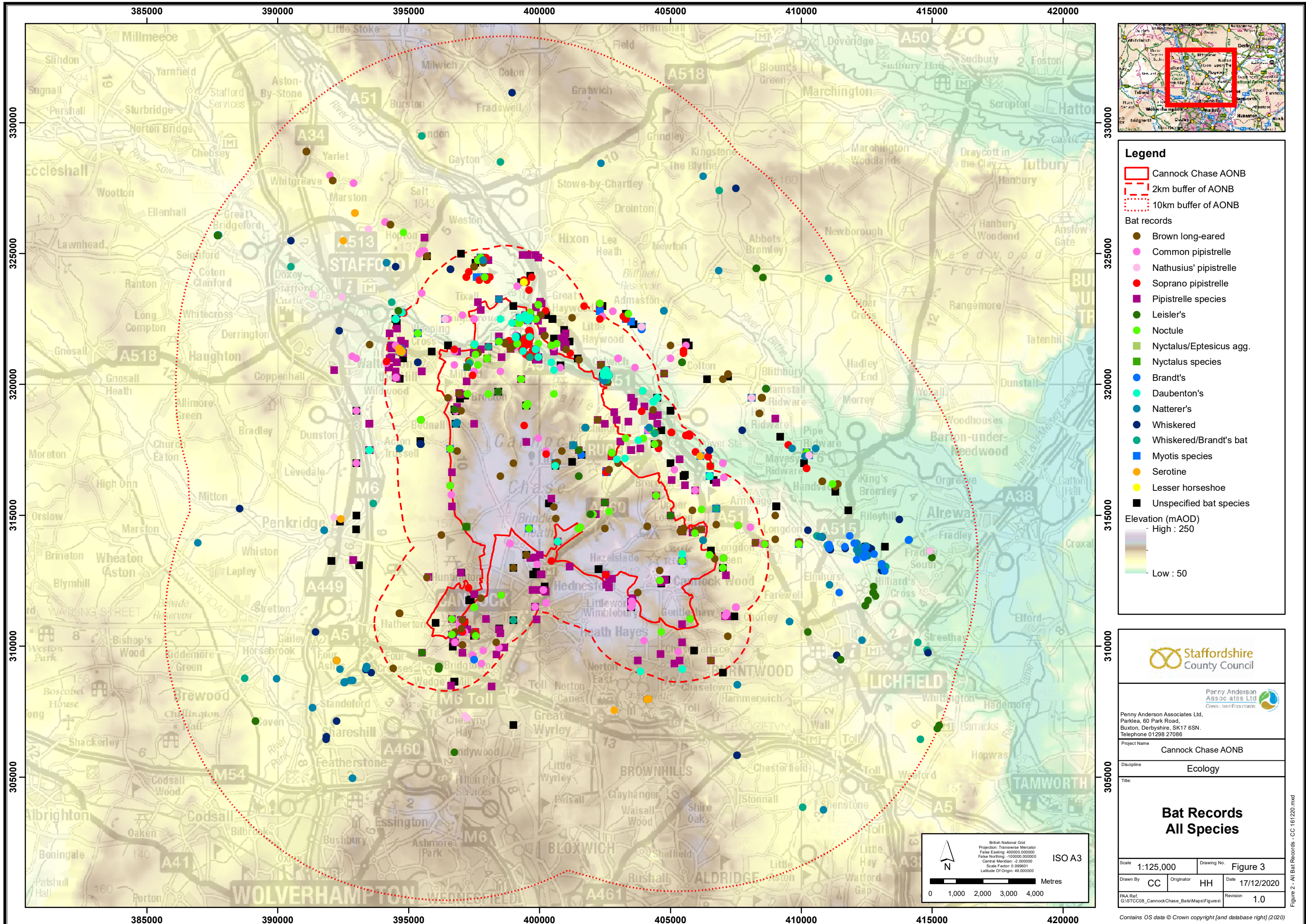
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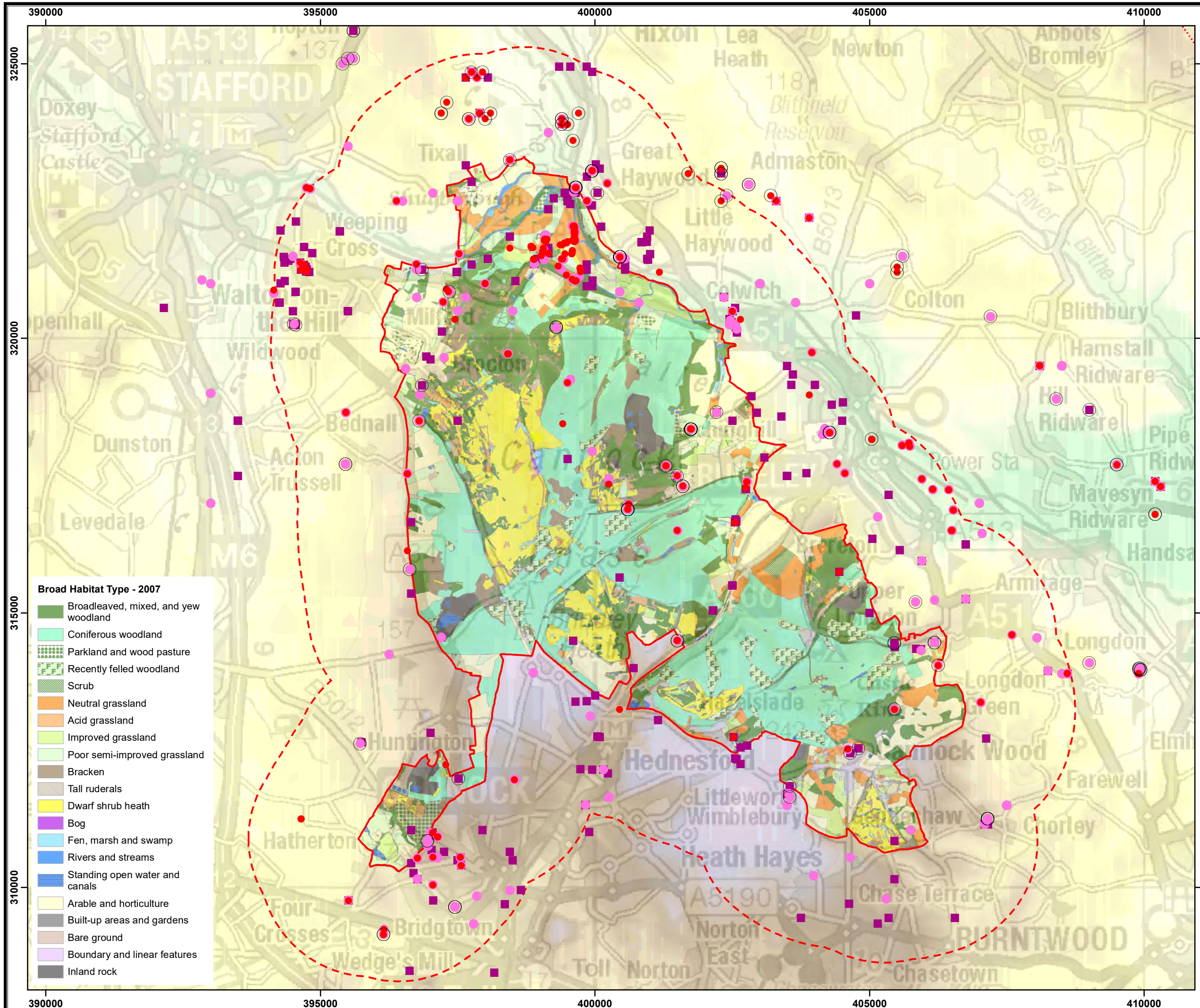
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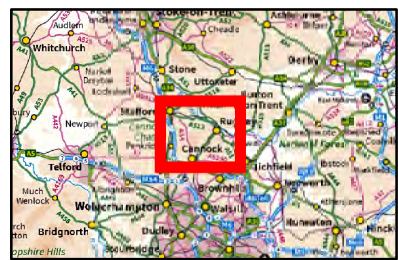
Figure 1 - Cannock Chase AONB - CC 161220.mxd







- Broad Habitat Type - 2007**
- Broadleaved, mixed, and yew woodland
  - Coniferous woodland
  - Parkland and wood pasture
  - Recently felled woodland
  - Scrub
  - Neutral grassland
  - Acid grassland
  - Improved grassland
  - Poor semi-improved grassland
  - Bracken
  - Tall ruderals
  - Dwarf shrub heath
  - Bog
  - Fen, marsh and swamp
  - Rivers and streams
  - Standing open water and canals
  - Arable and horticulture
  - Built-up areas and gardens
  - Bare ground
  - Boundary and linear features
  - Inland rock



**Legend**

- Cannock Chase AONB
- 2km buffer of AONB
- 10km buffer of AONB

**Pipistrelle records**

- Common pipistrelle
- Soprano pipistrelle
- Pipistrelle species
- Pipistrelle roost record

**Elevation (mAOD)**

High : 250

Low : 50

British National Grid  
Projection: Transverse Mercator  
False Easting: 400000.000000  
False Northing: 100000.000000  
Central Meridian: -2.000000  
Scale Factor: 0.999601  
Latitude Of Origin: 49.000000

ISO A3

Metres

0 500 1,000 1,500 2,000 2,500

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Project Name: Cannock Chase AONB

Discipline: Ecology

**Bat Records  
Pipistrelle Species**

Scale: 1:65,000 Drawing No. Figure 4

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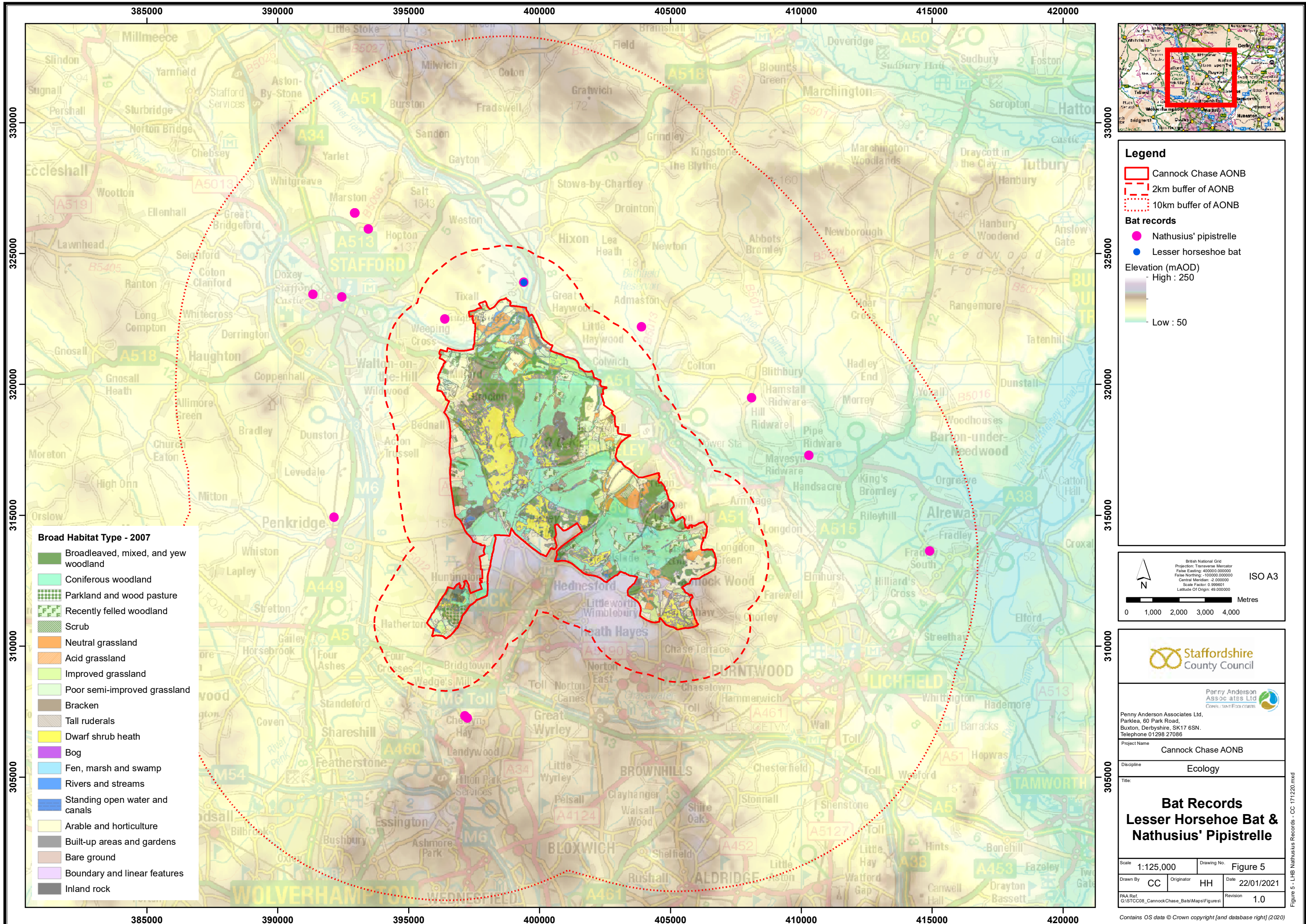
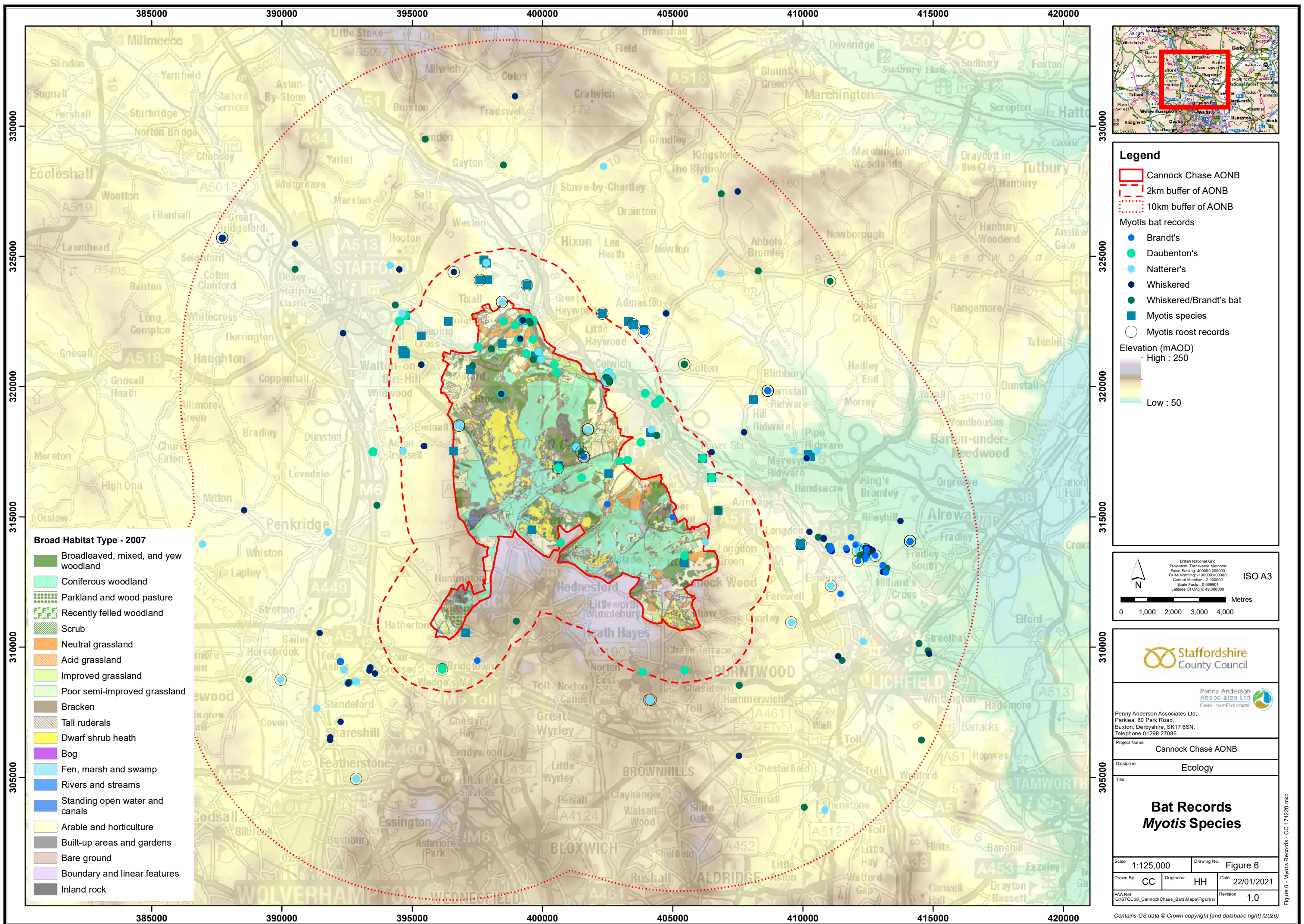


Figure 5 - LHB Nathusius Records - CC 171220.mxd



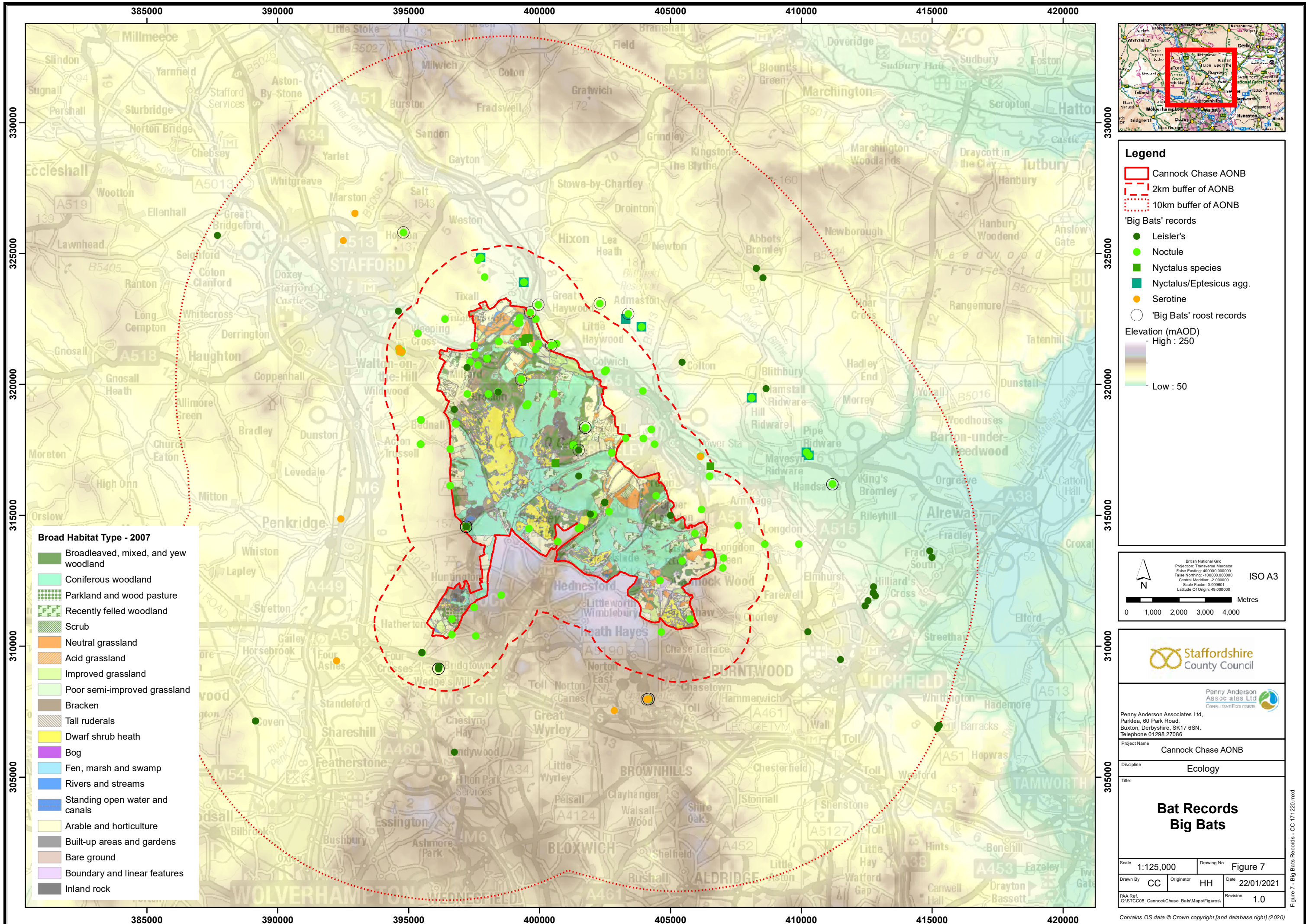
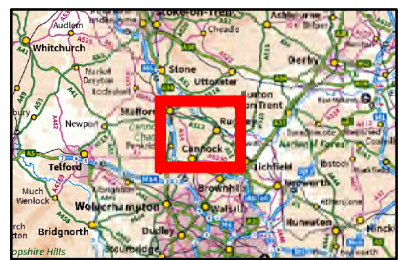
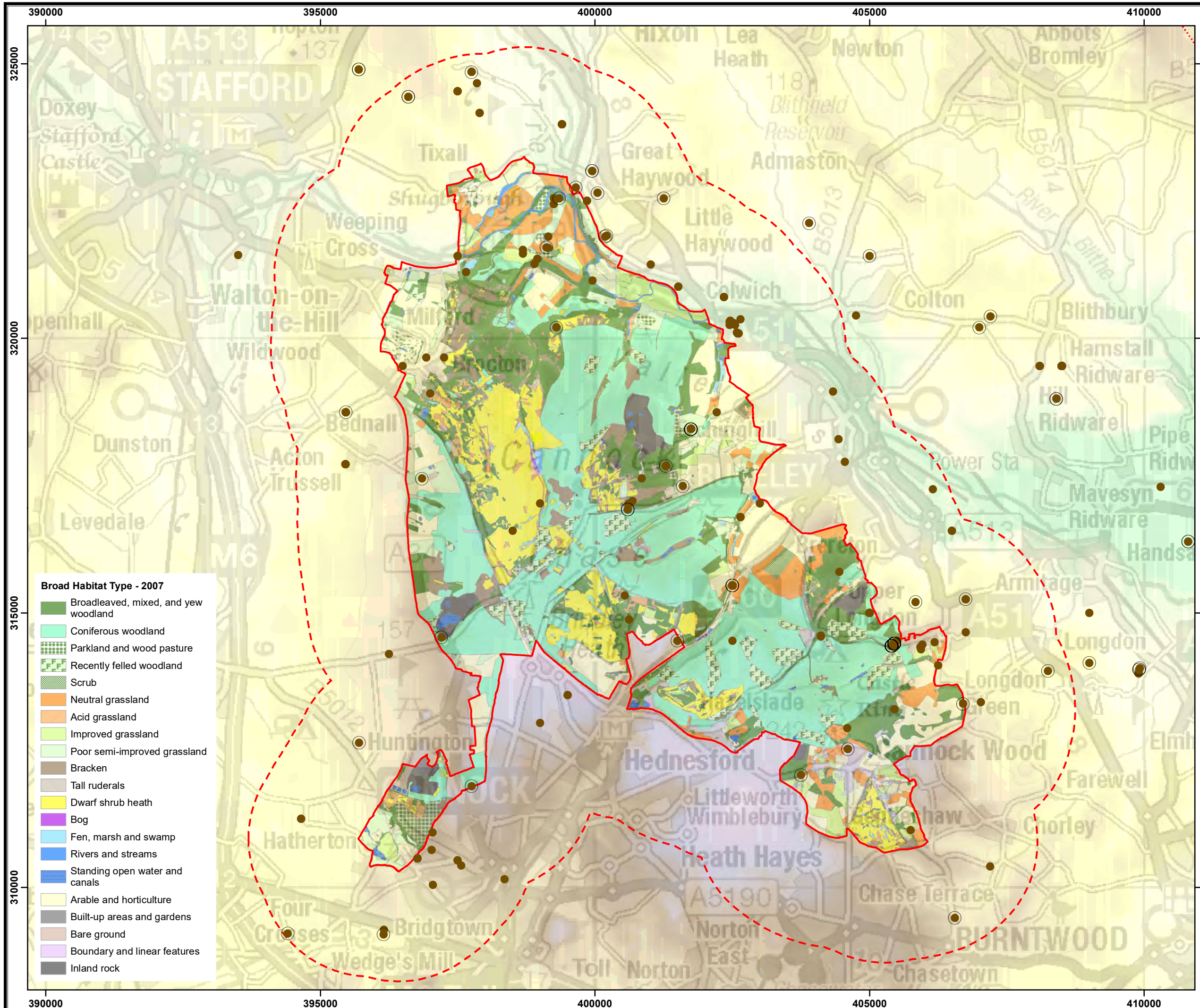


Figure 7 - Big Bats Records - CC 171220.mxd



**Legend**

- Cannock Chase AONB
- 2km buffer of AONB
- 10km buffer of AONB
- Brown long-eared bat records
- Brown long-eared bat roost record

Elevation (mAOD)

High : 250

Low : 50

British National Grid  
Projection: Transverse Mercator  
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False Northing: 100000.000000  
Central Meridian: 2.000000  
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Latitude Of Origin: 49.000000

ISO A3

Metres

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Project Name: Cannock Chase AONB

Discipline: Ecology

Title: **Bat Records**  
**Brown Long-Eared Bat**

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PRA Ref: G:\STCC08_CannockChase_Bats\Maps\Figures\	Date: 22/01/2021
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