



## Core Sustainance Zones and habitats of importance for designing Biodiversity Net Gain for bats

### What is a core sustainance zone

A core sustainance zone (CSZ), as applied to bats, refers to the area surrounding a communal bat roost within which habitat availability and quality will have a significant influence on the resilience and conservation status of the colony using the roost.

### Why are core sustainance zones important when designing Biodiversity Net Gain for bats

The UK's Good Practice Principles for Biodiversity Net Gain <https://cieem.net/wp-content/uploads/2019/02/Biodiversity-Net-Gain-Principles.pdf> include application of the 'mitigation hierarchy' to first avoid and then minimise impacts on biodiversity. In this respect this part of the process is unchanged when it comes to protected species such as bats. The Principles also include achieving measurable net gain outcomes and, to support this, Natural England has published a Biodiversity Metric that uses various data on habitats to measure change from development in 'biodiversity units'. Biodiversity units are a proxy indicator only, and good practice is to design Biodiversity Net Gain based on all ecological features and functions of a site with appropriate use of a metric, especially to avoid making decisions based on numbers. But how does that work in practice, especially when designing Biodiversity Net Gain for species such as bats?

*An important note is that legal and policy requirements regarding development and biodiversity apply, which includes protected species such as bats. The scenario covered by this document is when development has complied with legal and policy requirements for bats and now the question is how best to design net gain outcomes for bats.*

The use of a habitat-based metric that can take net gain measures (such as enhancing existing or creating new habitats) offsite raises a new consideration for bats regarding habitats that support the ongoing viability of a roost. Whilst the location of net gain measures may be part of a strategic approach to landscape scale improvements via existing and new mechanisms (such as the Nature Recovery Network) a vital step is to determine whether the location of such 'net gain' habitats outside the development footprint and the immediate surrounding area is actually outside the core sustainance zone of affected roosts, thereby reducing or removing viability of the affected roosts.

### How to use core sustainance zones when designing Biodiversity Net Gain for bats

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This is a quick and easy process that makes use of existing knowledge.

First identify the species of bats affected by development and the target beneficiaries of the net gain design. Then use the following tables to ascertain the species core sustenance zone and which habitats are of primary importance for foraging to support the roost. These two sets of information provide the basic essentials for designing Biodiversity Net Gains for bats, especially ensuring long-term outcomes in terms of roost viability, sustainability and resilience. This approach will mean that other bat roosts in the locality, that are not directly impacted by the development, will also benefit from improved habitats and thereby enhance the resilience of these roosts too as part of biodiversity net gain delivery.

**Table 1. Core Sustenance Zone sizes calculated for UK bat species**

Species	CSZ radius (km)
Greater horseshoe bat <i>Rhinolophus ferrumequinum</i>	3
Lesser horseshoe bat <i>Rhinolophus hipposideros</i>	2
Barbastelle <i>Barbastella barbastellus</i>	6
Brown long-eared bat <i>Plecotus auritus</i>	3
Grey long-eared bat <i>Plecotus austriacus</i>	3
Daubenton's bat <i>Myotis daubentonii</i>	2
Natterer's bat <i>Myotis nattereri</i>	4
Whiskered/Brandt's/Alcathoe bat <i>Myotis mystacinus/brandtii/alcathoe</i>	1
Bechstein's bat <i>Myotis bechsteinii</i>	3**
Common pipistrelle <i>Pipistrellus pipistrellus</i>	2
Soprano pipistrelle <i>Pipistrellus pygmaeus</i>	3
Nathusius pipistrelle <i>Pipistrellus nathusii</i>	3
Noctule <i>Nyctalus noctula</i>	4
Leisler's bat <i>Nyctalus leisleri</i>	3
Serotine <i>Eptesicus serotinus</i>	4

\*\* Note: There may be justification with Annex II and other rare species to increase the CSZ to reflect use of the landscape by all bats in a population. We suggest increasing the CSZ of Bechstein's bat to at least 3km, reflecting its very specific habitat requirements.

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**Table 2 Habitats of importance to bats**

Provision for all bat species needs to take into account the artificial lighting and avoid or minimise this to acceptable levels  
<https://cdn.bats.org.uk/pdf/Resources/ilp-guidance-note-8-bats-and-artificial-lighting-compressed.pdf?mtime=20181113114229>

Primary habitats are those the species rely on most. They need to be available within the CSZ in increased quantities and (where currently poor quality) improved condition to achieve net gain.

Secondary habitats are also of importance to the species. Where possible these should also be available within the CSZ in increased quantities and improved condition to achieve net gain.

<b>Bat species</b>	<b>Primary habitats/features</b>	<b>Secondary habitats</b>	<b>Boosting connectivity for bats</b>
Greater horseshoe bat	The greater horseshoe bat forages in edge habitats with broadleaved woodland important. The species is highly dependent on pasture sympathetically grazed by livestock, particularly cattle to support dung fauna (Ransome, 1996).	Areas such as pasture and parkland are used, preferring landscapes with numerous large trees, tall hedgerows and woodland patches	Hedgerows, treelines and woodland edge
Lesser horseshoe bat	The lesser horseshoe bat forages largely in broadleaved woodland and in wooded riparian corridors, as well as along mature treelines and hedgerows. Sympathetically grazed pasture (preferably cattle) supporting dung fauna also important.	Semi- or unimproved wet pasture	Foraging areas connected by hedges, woodland edge and riparian trees (Bontadina <i>et al</i> 2002)

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Bat species	Primary habitats/features	Secondary habitats	Boosting connectivity for bats
Noctule		Found in a range of habitats foraging in the open or often over trees, pasture and water	No specific needs
Serotine		Found in a range of habitats including cattle pasture, woodland edge and tree-lined hedgerows	Commonly commutes along hedgerows and treelines
Leisler's	Sympathetically managed pasture appears to be a preferred foraging habitat in both Great Britain and Ireland (Shiel and Fairley, 1999; Waters et al., 1999), Use is also made of woodland edges and tree-lined roads (Waters et al., 1999; Russ and Montgomery, 2002).	Drainage channels, lakes, rivers, canals, coniferous forests, parkland	No specific needs known
Common pipistrelle	The common pipistrelle bat forages over sympathetically managed grazed pasture and deciduous woodland.		No specific needs known
Soprano pipistrelle	The soprano pipistrelle bat is frequently reported to make particular use of riparian habitat (Davidson-Watts and Jones, 2006; Nicholls and A. Racey, 2006; Lintott et al., 2016	In woodlands edges	No specific needs known
Nathusius pipistrelle	Riparian habitats, large freshwater lakes, estuaries and canals. Broad-leaved & mixed woodland edges and parkland.	Managed gardens and fields around lakes	No specific needs known

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Whiskered bat	Studies indicate a preference for, mixed or broadleaved woodland, hedgerows, Sympathetically grazed pasture riparian vegetation and wetlands.	Orchards	Likely to commute along linear features such as tall hedgerows, woodland edges and small waterways enclosed by trees
Brandt's bat	Woodland, particularly damp areas close to water (Taake, 1984).	Sympathetically grazed pasture.	Likely to commute along linear features such as tall hedgerows, woodland edges and small waterways enclosed by trees
Brown long-eared bat	The species is strongly associated with trees, particularly broadleaved preferring woodland with a cluttered understorey, (Murphy <i>et al</i> , 2012)	Will forage in mixed woodland and also forages around trees in more open habitats, including parks, orchards and gardens (Dietz and Keifer, 2016).	Uses linear features such as treelines and large hedgerows to move between roosts and alternative foraging areas (Howard, 1995; Murphy <i>et al.</i> , 2012),
Grey long-eared bat	Grey long-eared bats forage in unimproved lowland grassland (meadows and marshes) and along woodland edges.	Forages along field margins, hedgerows and scattered trees.	Commonly commutes along hedgerows and treelines
Bechstein's bat	Strongly associated with broadleaved woodland, particularly semi-natural ancient woodland with dense structured understorey (Greenaway & Hill 2004).	Also forages along large hedgerows and wooded riparian corridors	Stream corridors and hedgerows used for commuting (Palmer, 2013) also coniferous

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			woodland (Davidson-Watts, 2013)
Barbastelle	Deciduous woodland, wet meadows and water bodies, such as woodland streams and rivers, riparian margins and unimproved grassland.	Field margins and hedgerows also used	Commutes along hedgerows, riparian corridors and treelines
Natterer's bat	The species is commonly associated with trees, particularly broadleaved woodland, but also makes use of tree-lined river corridors, trees in parkland, and hedgerows adjacent to pasture (Parsons and Jones, 2003; Smith and Racey, 2008; Zeale et al., 2016).	It also forages over grassland	No specific needs known
Daubenton's bat	The species is strongly associated with riparian habitats. It prefers large waterways with abundant woodland in the local environment (Langton et al., 2010) and, at least in upland riverine environments, it appears to select locations with trees on both banks (Warren et al., 2000)	Also forages in woodland	No specific needs known
Alcathoe bat	Little evidence on its habitat preferences in Great Britain. However, the species is usually captured in areas with extensive semi-ancient woodland ((Jan et al., 2010; Daniel Whitby, pers. comm.); Daniel Whitby, pers. comm.).		No specific needs known

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