SPECIES DOSSIER

Creating ponds for bats

MILLION PONDS PROJECT
Pond Conservation

A 50-YEAR PROJECT TO CREATE A NETWORK OF CLEAN WATER PONDS FOR FRESHWATER WILDLIFE

1. Introduction

Freshwater is an important resource for all bat species in the UK. Bats drink from open water surfaces and many species also forage on emerging insects – such as caddis flies, crane flies, midges and mosquitoes – that have aquatic larval stages. Creating and managing ponds to benefit bats could encourage greater numbers and also higher species diversity of bats visiting a site.

Bats will visit a wide range of pond types, including ponds of all sizes. Best practice design principles for pond creation schemes, such as good water quality, wide drawdown zones, and pond complexes with varied profiles (see *Pond Creation Toolkit Factsheets 2 and 4*), will all benefit bats. There are, however, specific habitat features and aspects of pond location, design and management, which can improve a ponds' value for bats, by enhancing their drinking and foraging opportunities.

Table 1, at the end of this dossier, lists the habitat preferences and pond habitat requirements of British bat species.

Brown long-eared bat drinking from a small pond.

2. Locating ponds for bats in the landscape

Bats may travel several kilometres from their day roosts (in buildings, bridges, trees or caves) each night whilst commuting and foraging across the surrounding landscape.

Some bat species can use the same traditional roost site throughout the year, other species may move roost every few nights. Bats are most active during March to October, but some bat activity can occur on warmer nights throughout the year.

Key messages

- Locate ponds within 1 km of good landscape features that are typically used by bats as commuting routes or foraging areas, such as river corridors, woodlands, tree-lines or hedgerows with mature standard trees.
- Retain trees around the pond edges, to provide shade and shelter for foraging and roosting opportunities.
- Create medium- to large- sized ponds (5 m x 10 m upwards) to benefit the widest range of bat species.
- Ideally, create pond complexes with a range of pond types, including some with shallow water areas (to benefit invertebrate prey) and others with deeper water areas (to maintain areas of open surface water for bats).
- Create pond complexes that include ponds sheltered and shaded by mature trees, to benefit smaller woodland bat species, and ponds with open margins to benefit larger bat species.
- Consider installing bat boxes or bat houses near to ponds and pond complexes, in areas with limited natural roosting opportunities.

Bats will use linear habitat features such as riparian corridors, woodland edge, tree-lines and hedgerows with mature standards as flight paths to travel through the landscape. These habitats are also of particular importance to foraging bats because they provide a high diversity and abundance of insect prey as well as suitable foraging conditions (e.g. sheltered and shaded foraging areas).

New ponds and pond complexes created for bats should be located in areas near to, or with good connectivity to, other important habitats for bats, such as woodlands, river corridors and wetlands.

Create ponds with good connectivity to other important habitats

Isolated ponds surrounded by poor quality habitat (e.g. intensively managed agricultural fields) may become important foraging sites for the small numbers of bats that find and will travel to visit them.

In contrast, ponds located in close proximity (within 1 km) to existing river corridors or woodland habitats are likely to be discovered quickly by high numbers of commuting bats (see Figure 1).

Foraging bats will exploit concentrations of flying insects wherever they are encountered. As long as new ponds provide suitable conditions (see Section 3 below), they can rapidly become established drinking sites and foraging areas for numerous bats of several species.

Locating ponds near existing habitat corridors, particularly tree-lines or hedgerows containing mature trees, will increase the likelihood that bats will travel to and from the pond early and late in the night, for drinking, and also to forage for extended periods of time. Planting trees will also be beneficial if this creates or improves connectivity to nearby river corridors, woodland, or existing tree-lines and hedgerows.

Situating ponds in semi-improved or species-rich grassland areas with low nutrient inputs would be preferable to improved grassland or arable areas (but make sure that existing habitats of conservation value are not destroyed – see *Pond Creation Toolkit Factsheet 5*). Bats also benefit from the presence of grazing livestock, due to the additional insects associated with farm animals (especially cattle) and their dung (provided that the grassland is not overgrazed). For detailed information on creating and managing ponds in grazed grassland see *Supplementary Design Factsheet 2*.

Woodland ponds can be especially good for bats

Many bats are strongly associated with broad-leaved woodland habitats. This includes several rare and conservation priority species such as barbastelle, Bechstein's bats, and lesser horseshoe bats (species with restricted ranges in the UK), as well as brown long-eared bats, Natterers' bats, and soprano pipistrelles (species widely-distributed across the UK). Situating ponds within (or close to the edge of) woodland could therefore benefit a wider range of bat species, including Biodiversity Action Plan (BAP) priority bat species.

Woodland ponds should receive some shading from adjacent trees, particularly over areas of open water where bats can drink early and late in the night. However, it is generally desirable to include some areas with open pond margins (either in the same pond or elsewhere in a pond complex), or to locate ponds next to glades or rides, in order to provide suitable 'approach routes' in dense woodland for larger, less manoeuvrable, bat species (see Figures 1 and 2 and Section 3).

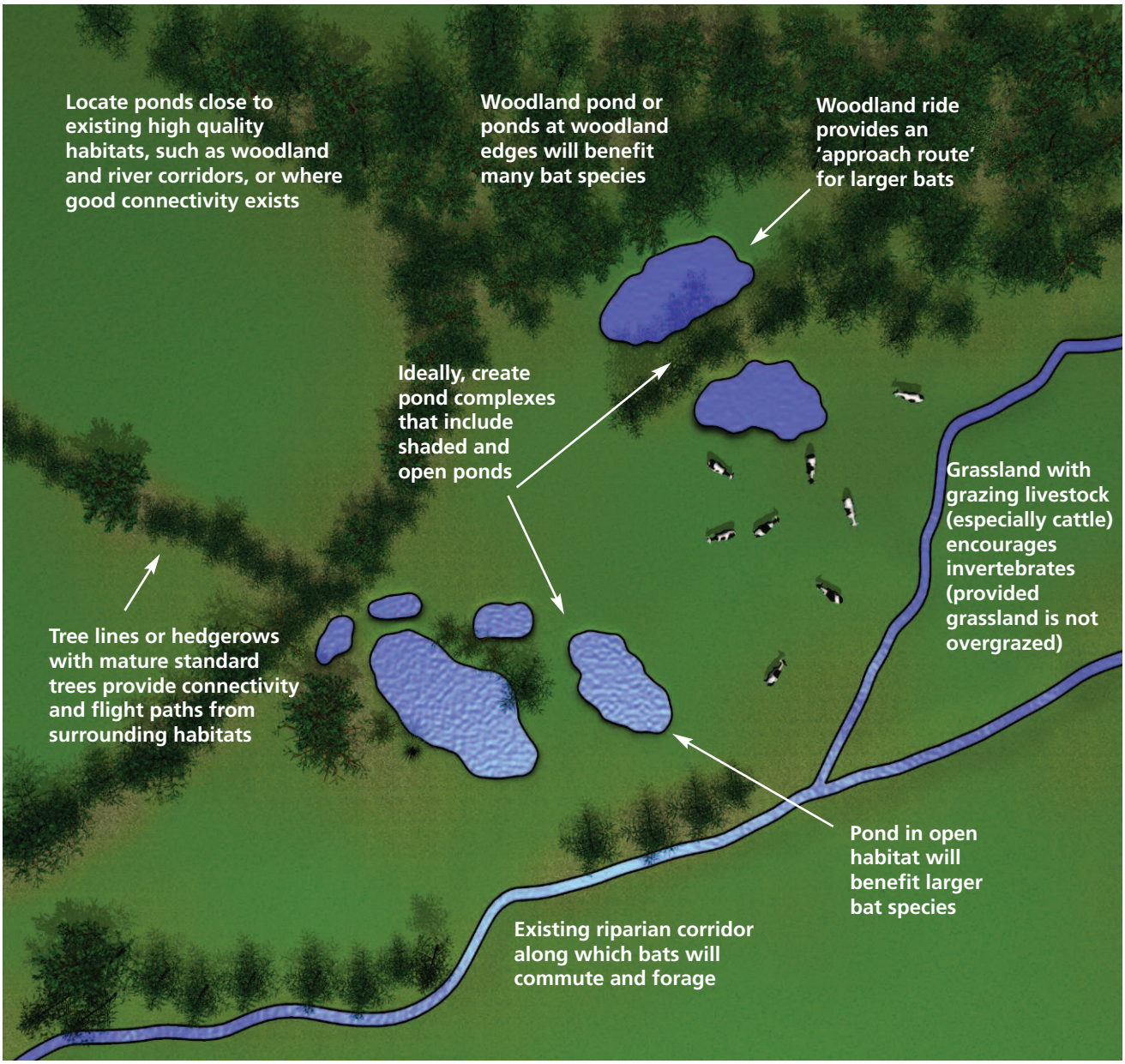

Figure 1a. Locating ponds in the landscape to benefit bats.

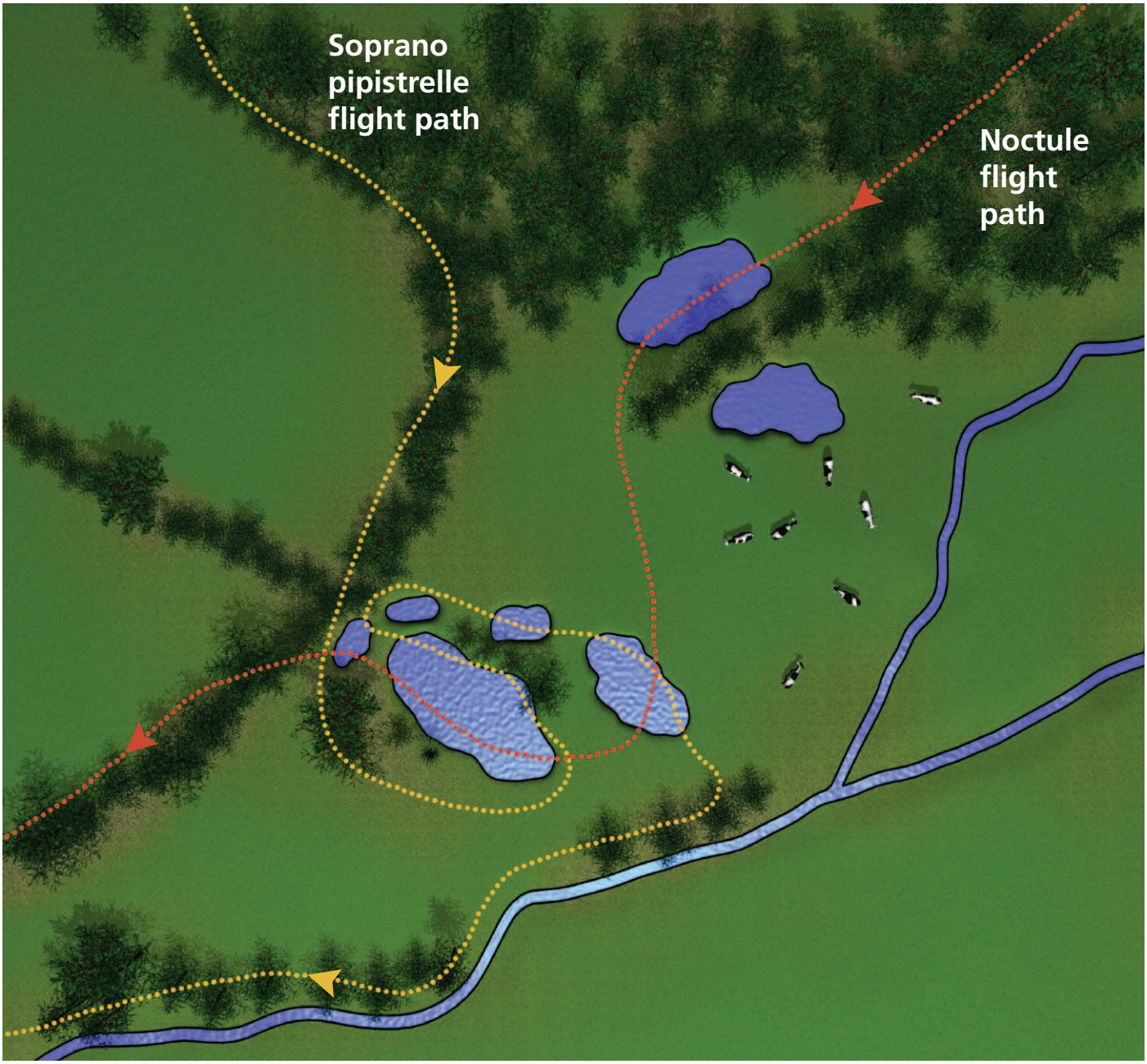

Figure 1b. How a large bat species (noctule) and a small bat species (soprano pipistrelle) might use ponds in the landscape.

3. Scheme design

Habitat diversity within and surrounding ponds and pond complexes will enable a wide range of bat species to forage and drink over ponds, and even to roost nearby.

Within ponds, and pond complexes, shallow water areas will provide diverse and abundant emergent insect prey for foraging bats, whilst deeper water areas are more likely to provide the open surface water required by bats for drinking. Ideally some pond areas should be deep enough to ensure that they hold water throughout the year, to provide reliable drinking and foraging resources for bats during the breeding season and during preparation for winter hibernation.

Within pond complexes, varying the size, depth, and location of ponds to provide a wide variety of habitats will benefit and encourage invertebrate prey. Ponds with mature trees or woodland around their margins will be shaded and sheltered and roosting opportunities may also exist – or could be created, whilst ponds in open habitats, such as species-rich grassland, may be the most suitable for larger bat species which require uncluttered approach routes to fly low over ponds.

Create medium- to large- sized ponds

Although even very small waterbodies like garden ponds may be important to bats in suburban areas, in general medium-sized waterbodies, e.g. 10 m x 15 m, or larger, are likely to be visited by a wider range of bat species and support higher levels of bat activity overall.

Large ponds are more likely to be visited by larger bats. For example, noctule bats, with long narrow wings, can fly at high speeds out in the open but are less manoeuvrable than smaller bats close to vegetation or over water.

Large pond with areas of calm open water and sheltered margins.

Some smaller species also benefit from large waterbodies. Across the UK, the rare Nathusius' pipistrelle bat is most often recorded around very large water bodies (over 100 ha), including lakes, reservoirs and restored gravel pit complexes. Bank-side trees and areas of reedbed will further benefit bats at very large water bodies.

Daubenton's bats specialise in foraging low over large areas of calm water and also prefer open, uncluttered, water surfaces where they can trawl for insects using their feet and tail.

Ideally, medium-sized and large ponds should be situated within pond complexes (see *Pond Creation Toolkit Factsheet 4*) that include shallow water areas and smaller waterbodies. This variety in size and profile will provide the widest variety of micro-habitats, supporting a high diversity and abundance of insects, which will benefit foraging bats.

Pond depth and open surface water

Combine shallow water areas and wide drawdown zones (see *Pond Creation Toolkit Factsheet 4*) with deeper water areas (in a single pond, or in separate ponds within one pond complex). Shallow water areas will benefit invertebrates, increasing diversity and abundance of potential prey for foraging bats. Wide, muddy drawdown zones are particularly valuable for Diptera (true flies), which are major prey items for many bats.

Areas of deeper water are also useful, within a pond complex. Bats will visit ponds to drink but require areas of open water - without surface vegetation, debris or clutter - where they can fly low over the calm surface to drink. Deeper water areas (up to 1 – 1.5 m deep) will prevent emergent plants completely dominating the water surface (leaving open areas for bats to drink), and are more likely to provide permanent standing water throughout the year.

▲ **Daubenton's bat about to catch a cranefly from the surface of a pond.**

Falling debris (such as flowers, seeds, twigs and leaves, etc.) from adjacent trees can clutter pond water surfaces. Ideally, ponds should receive enough wind exposure so that some areas of open water are maintained naturally. Planned orientation of the pond relative to prevailing wind conditions, and/or removal of some adjacent trees to create gaps in the tree cover surrounding a pond, could help create sufficient wind and wave wash to keep parts of the pond surface free from debris (see Figure 2).

In open grazed grassland, shallow ponds visited by cattle are likely to retain areas of open surface water through cattle disturbance and grazing.

Trees to provide shade and shelter

When certain bat species emerge from their roosts at dusk they remain sensitive to the still dropping light levels and will 'stick to the shadows' provided by trees and buildings.

As bats often go for a drink before foraging, ponds with over-hanging trees that provide some shading over areas of open water will be particularly favoured by bats early in the night, and again as light levels increase at dawn, when bats may again visit ponds for a final drink before returning to their daytime roosts.

As well as providing valuable shade, trees also provide shelter from wind and rain. Insects often accumulate in these sheltered areas, which bats will then use as foraging areas (see Figure 2). The presence of trees around pond margins therefore extends the amount of time, and also the range of weather conditions, during which bats can drink and forage.

However, not all the pond margins should be completely over-shaded (especially shallow areas and muddy margins), as this can reduce the abundance of insects, including Diptera, emerging from the pond edge which in turn provide important and sustained foraging opportunities for many bat species.

Therefore, allow trees to grow up around most, but perhaps not all, of the pond margins. If ponds are being created in grazed grassland, consider fencing some of the ponds to protect from grazing, to allow the pond banks to develop tree cover. However, leaving some ponds unfenced will retain trampled pond margins with open aspects, which provides habitat for insect prey, and also provides open approach routes for larger bat species (see below). However, it is not desirable for ponds to be overgrazed, or for large amounts of silt to erode into the pond. For detailed information on creating and managing ponds in grazed grassland see *Supplementary Design Factsheet 2*.

Trees surrounding part or all of a pond provide shade and shelter for bats.

Open 'approach routes' to benefit larger bat species

Noctule bats, and to a lesser extent Leislers' bats and serotine bats, are adapted to flying in open habitats but are less manoeuvrable than smaller bats when flying close to vegetation or in tight spaces. So, particularly with smaller ponds, it is worth ensuring that ponds have open approach routes, such as bordering glades or rides, to allow larger bat species to access these pools (see Figure 2).

Large bats will drink from ponds of all sizes (over 5 m^2) provided that areas of open water exist which these species can approach along open 'flight routes'. Providing or maintaining some gaps (minimum width 3 – 5 m) in tree coverage around pond edges should offer suitable 'access routes' for larger bat species. Where pond complexes are being created an alternative approach would be to include some ponds located in entirely open habitats.

Large ponds (over 20 m x 25 m) are likely to provide sufficient open 'flight space' over the water for larger bat species to drink and forage (when concentrations of flying insects are present).

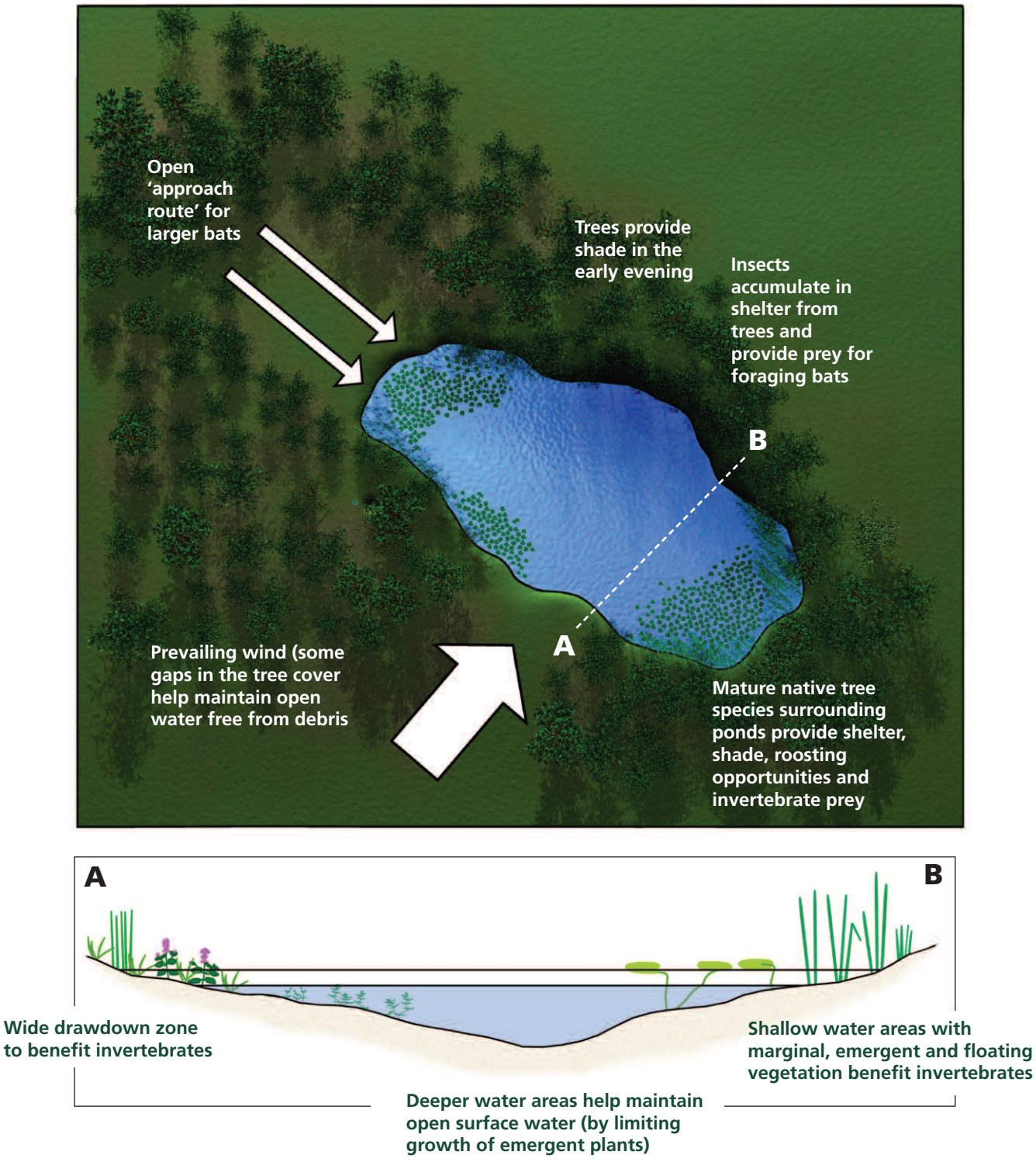

Figure 2. Key habitat features to benefit bats.

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Artificial roosts: bat boxes situated next to a large sheltered pond.

Provide roosting opportunities

Mature native tree species, especially oak, ash, beech and willows, have numerous cracks, crevices, rot holes, flaking bark and woodpecker holes that bats will use as roost sites. Any trees (often surprisingly young and small specimens) with suitable features located close to water will be attractive to bats.

During site selection for new ponds, existing trees should be retained, and ideally also utilised to provide shade and shelter around ponds wherever possible.

Artificial roosts; ranging from any of several commercially available 'bat box' designs, to custom built 'bat houses' (see box below), or renovated bunkers (providing potential roost and/or hibernation sites), could be installed adjacent to pond habitats, especially where the availability of natural roosts is limited. Locating boxes in a variety of shaded and open positions will encourage a range of bat species.

In the UK, all bat roosts are legally protected. Any works affecting known roosts should only be undertaken after consultation with your Statutory Nature Conservation Organisation (SNCO) (e.g. Natural England or Countryside Council for Wales).

Pond complexes and bat houses at the Cotswold Water Park

The abundance of open water and wetland habitats present within the Cotswold Water Park (an extensive area of aggregates extraction in the South West of England) provides high quality foraging habitat for at least 14 bat species (recorded to date).

A new initiative by the Cotswold Water Park Trust to improve roosting opportunities in the area, through restoration of disused farm structures and the creation of dedicated 'bat houses' following guidelines developed by The Vincent Wildlife Trust, is now underway. The first 'Bat House', restored in 2009 (part funded by Natural England's Aggregates Levy Sustainability Fund), has already attracted its first resident, a rare (Biodiversity Action Plan Priority Species) lesser horseshoe bat! The project contributes to the Cotswold Water Park Biodiversity Action Plan.

A lesser horseshoe bat roosting in the new bat house.

The creation of pond complexes adjacent to 'bat houses' is an important part of this initiative, which will enhance biodiversity generally as well as providing additional foraging opportunities for bats and improved habitat connectivity for commuting bats.

New pond complexes, and associated 'bat houses', are to be situated close to existing habitat corridors, e.g. tree-lines and rivers. Management and restoration of hedgerows, trees, riparian woodland and meadows in the surrounding landscape is also planned.

4. Monitoring and management

Clean water ponds are likely to require less management input and be more long-lived than ponds with a polluted water source (see *Pond Creation Toolkit Factsheet 5*). The gradual growth of lush marginal and woody vegetation around a clean water pond will provide shelter and prey for foraging bats, and there will usually not be any cause to remove aquatic or bank-side vegetation. In a pond or pond complex incorporating deeper water areas of 1 – 1.5 m, open surface water suitable for drinking by bats should persist without the need for frequent management. However, in shallower ponds, it may be beneficial to carry out occasional management to maintain some areas of open water by controlling the growth of emergent and floating vegetation so that this does not cover the entire water surface of the ponds. It is also advisable to monitor the bare pond edges for invasive alien plant species in the first few years following pond creation. If caught early enough, these plants can be removed whilst they are still controllable (see *Pond Creation Toolkit Factsheet 8*).

Monitoring bat activity at ponds

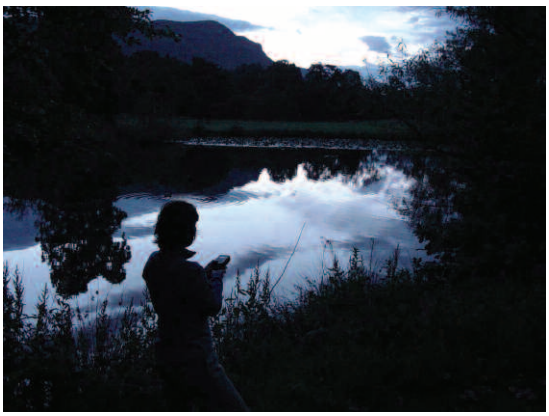
Ultrasound detectors Bats produce high frequency 'ultrasonic' calls (above the range of human hearing) whilst flying.

Using bat detectors to listen to these calls can be an effective and fun way of assessing levels of bat activity at ponds.

Different species (or species groups) can be identified and levels of bat activity, feeding attempts, and even social calls, can be quantified and compared over time.

Bat boxes Checking boxes can be an invaluable means of determining which bat species are present at ponds.

Due to the high probability that some boxes may contain roosting bats, checking boxes should be undertaken by licensed bat workers (consult your SNCO, BCT or Local Bat Group for advice).



Other survey techniques e.g. netting, radio-tracking, and even photography. All require expert assistance from experienced and licensed bat workers (consult your SNCO, BCT or Local Bat Group for advice).

Records generated from bat monitoring work should be sent to local biological records centres. Information about the National Bat Monitoring Programme, run by the BCT, can be found at *www.bats.org.uk*.

Table 1. Bat species found in the UK and their specific habitat requirements in relation to ponds.

Species[1]	Conservation status[2]	UK distribution	Habitat preferences and pond habitat requirements
Soprano pipistrelle *Pipistrellus pygmaeus*	UK BAP	UK-wide (Very Abundant)	Strongly associated with water and woodland habitats. Will forage at the edges of ponds, lakes, rivers and streams, especially around trees.
Common pipistrelle *Pipistrellus pipistrellus*	Wales BAP	UK-wide (Very Abundant)	Successful generalist. Will forage over a wide range of terrestrial and aquatic habitats, including ponds, especially around trees.
Nathusius' pipistrelle *Pipistrellus nathusii*		UK-wide (Rare)	Particularly associated with very large water-bodies (over 100ha) including lakes, reservoirs and restored gravel pit pond complexes.
Daubenton's bat *Myotis daubentonii*		UK-wide (Abundant)	Specialises in foraging low over water, including trawling to capture prey. Prefers calm open water along rivers, or at lakes and ponds.
Natterer's bat *Myotis nattereri*		UK-wide (Abundant)	Woodland and riparian corridor specialist. Will visit ponds. Often forages in cluttered vegetation, e.g. around trees and shrubs.
Whiskered bat *Myotis mystacinus*		C. & S. Scotland, England, Wales & N.I. (Occasional)	Associated with woodland and wet habitats. Situate ponds in or near woodland, or close to existing riparian corridors or other water bodies.
Brandt's bat *Myotis brandtii*		England & Wales (Occasional)	Associated with woodland and wet habitats. Situate ponds in or near woodland, or close to existing riparian corridors or other water bodies.
Bechstein's bat *M. bechsteinii*	UK BAP	S. England & Wales (Rare)	Broadleaved woodland specialist. Ponds should be situated within woodland or very close to woodland edge to benefit this rare species.
Barbastelle *Barbastella barbastellus*	UK BAP	C. & S. England & Wales (Rare)	Woodland specialist. Ponds within or close to woodland will benefit this rare species. Will forage in open habitats. Feeds on moths.
Brown long-eared bat *Plecotus auritus*	UK BAP	UK-wide (Abundant)	Woodland specialist but will visit ponds in the wider landscape. Often forages by gleaning from vegetation, flies in clutter, even reedbeds!
Noctule *Nyctalus noctula*	UK BAP	C. & S. Scotland, England & Wales (Frequent)	Large bat. Not very manoeuvrable when flying in clutter, so needs 'open approach routes'. Prefers large ponds, lakes and reedbeds.
Leisler's bat *Nyctalus leislerii*		S. Scotland, England, Wales & N.I. (Occasional)	Medium-sized bat. Not very manoeuvrable in clutter. Prefers larger ponds, ponds with 'open approach routes' or ponds in open habitat.
Serotine *Eptesicus serotinus*		C. & S. England & Wales (Frequent/Occasional)	Large bat. Limited manoeuvrability when flying in enclosed spaces. Requires 'open approach routes' for access. Prefers large ponds.
Lesser horseshoe bat *Rhinolophus hipposideros*	UK BAP	SW. England & Wales (Rare)	Forages in woodland and commutes along shaded tree-lines. Will visit ponds if there is good connectivity in the surrounding landscape.
Greater horseshoe bat *Rhinolophus ferrumequinum*	UK BAP	SW. England & Wales (Rare)	Large yet highly manoeuvrable species. Capable of hunting for large insect prey from perches. Will visit ponds with good connectivity.

[1] Grey long-eared bat, greater mouse-eared bat, and other occasionally recorded species, were excluded due to their restricted distributions within the UK.
[2] UK BAP = UK Biodiversity Action Plan (BAP) Priority Species. Wales BAP = Wales BAP Priority Species. It is important to note that ALL bat species are included in numerous local BAPs across the UK.

Sources of further information

The Bat Conservation Trust (BCT) is a national charity working for bat conservation in the UK. Website: *www.bats.org.uk*, BCT National Bat Helpline: 0845 1300228.

Habitat Management for Bats - a general booklet available to download free from: *www.jncc.gov.uk/pdf/habitat_management_for_bats.pdf*

Local Bat Groups can be a useful source of additional advice about bats, as well as providing assistance with training, e.g. in the use of bat detectors and help with bat box checking.

For further information about the Million Ponds Project and to consult the Pond Creation Toolkit, please visit *www.pondconservation.org.uk/millionponds*

Pond Conservation
For life in fresh waters

NATURAL ENGLAND
Supported through Defra's Aggregates Levy Sustainability Fund

Bat Conservation Trust

This factsheet was prepared by Dr. Danielle Linton in consultation with: Gareth Harris, Karen Haysom, Ruth Angel, Matt Dodds and Steve Laurence.

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