THE NATIONAL TRUST

WILDLIFE AND BUILDINGS

TECHNICAL GUIDANCE FOR ARCHITECTS, BUILDERS, REGIONAL BUILDING MANAGERS AND OTHERS

MANUAL OF BUILDING

5/03

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How to use this manual

If you require detailed information, including information on statutory regulations, then go to the relevant parts of sections 1 - 9. For quick reference, or if you require information on types of wildlife in specific habitats, then go to sections 10 - 12.

THE NATIONAL TRUST

MANUAL OF BUILDING

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The National Trust - established in 1895 for the 'permanent preservation for the benefit of the nation of lands and tenements (including buildings) of beauty or scientific interest and as regards lands for the preservation... of their natural aspect features and animal and plant life' (National Trust Act 1907).

INTRODUCTION

Buildings have their own wildlife. The communities of often specialised plants and animals found on and in buildings are important and highly distinctive. This manual provides technical guidance for people who create and maintain buildings and other structures.

Not all wildlife is friendly to buildings, but the majority is not as unfriendly as is generally perceived. This manual clarifies the real impact of a wide range of species and explains how the relatively few problem species can be managed without damaging others or their habitats. The approach to the management and conservation of wildlife on existing buildings can and should be equally applied to the creation of new buildings or structures.

Some species are protected by law. Environmental changes are likely to affect the wildlife in and on buildings over the next few decades. This may result in further species receiving legal protection. As one of the UK's leading environmental organisations, the National Trust has an important role to play in the conservation of these species and their habitats. The manual explains how building work must be carried out in compliance with the law and for the wellbeing of protected species and their habitats. Whilst this sits easily within the environmental purposes of the National Trust, conflict between conservation of wildlife and curatorial responsibilities are sometimes inevitable. The manual provides guidelines as to how this conflict can be reduced or avoided.

SURVEY AND PLANNING

'Wildlife' should be considered during the preparation of Statements of Significance and Management Plans. It is important that everyone should be aware as soon as possible what kinds of species are present on or in every building before any conservation work starts. This may need specialist survey but more often will require managers to assess the situation for themselves. The risk of prosecution for disturbing protected species will encourage diligence, and training is provided for all National Trust building staff.

Specialised advice can be sought from the Nature Conservation Section of the Conservation Directorate at Cirencester – tel: 01285 651818, fax: 01285 657935.

Planned work should only proceed when agreement about the protection of wildlife has been reached. This should form part of any brief to architects and be incorporated into contract documents or instructions to builders. Failure to do this can result in unnecessary delays with penalties incurred at a later date.

Project Managers should ensure that the subject is considered at Step 1 Initial Appraisal (Manual of Building - Practice Notes for Major Projects - Section 10-1) and at the formulation of the Project Brief (Manual of Building - Preparation of a Project Brief - Section 10-7).

MANAGING BUILDINGS

The appearance of buildings is changed by colonising plants and nesting birds. Even if they cause no structural damage, some people will find this unattractive while others will see it as improvement. Managers must use their best judgement in negotiating a satisfactory way to resolve contradictory views. However, the National Trust will proactively encourage the effective conservation of wildlife on buildings.

Buildings invariably need maintenance and repair. Good building conservation requires most repair and maintenance work to be undertaken "little and often". For example, re-pointing of small areas on a regular basis ensures the minimum loss of historic fabric and the most cost-effective long-term care. This is also good for wildlife. Only a proportion of the building is affected at any time and this approach allows for the fairly rapid re-colonisation of repaired surfaces.

The Trust's approach to building conservation, especially the use of traditional materials and techniques, generally results in the use of softer, more natural materials. Not only are these most appropriate for the building, they also tend to provide the best habitats for most species that have relationships with built structures.

The most likely impact of wildlife on the management of buildings will be the timing of operations. This manual highlights where and when this will need consideration. With good planning and communication the effect of any time constraints can usually be mitigated.

Disclaimer

The focus of this manual is upon managing wildlife on National Trust properties, but the guidance is applicable anywhere. In some situations wildlife can be a nuisance or cause damage and control of species is necessary. However, the spirit of this technical guidance is that most wildlife is innocent until proven guilty.

The interaction of wildlife and buildings has not always featured prominently in building conservation. It is expected that the production of these guidelines will prompt comment, areas will be identified where further guidance will be needed or research undertaken to achieve a more detailed understanding of cause and effect. There is much to be learnt and experiences must be shared. The Nature Conservation and Buildings Sections of the National Trust (33 Sheep Street, Cirencester, Gloucestershire, GL7 1RQ, tel: 01285 651818), would welcome comments, suggested additions and corrections to the manual.

These are generic guidelines. They do not attempt to cover every situation, or list every plant or animal that may be encountered, or provide all the solutions. It must also be noted that not all species are found in all situations. In particular, several of the species mentioned are absent from Ireland.

1. PLANTS ON OR NEAR BUILDINGS

1.1 WHY ARE BUILDINGS IMPORTANT FOR PLANTS?

Buildings present habitats for species from all plant groups. They are especially important in lowland Britain and Ireland for higher plants, ferns, mosses and liverworts for which they provide the firm, rocky substrate that would otherwise be absent. Plant life of buildings varies greatly around the country, depending on climate, degree of pollution, age of the structure and the building materials used. On the whole it is richest in the west; some of the finest wall vegetation in Europe is to be found along the western seaboard of Britain. Restoration and maintenance of buildings needs to be adapted to maintain and enhance this flora. Most plants are rooted in mortar joints – many species require the alkaline conditions provided by lime mortar, although the stonework itself may be of acidic rock such as granite. The wall base, face and top support different suites of species.

The most spectacular wall vegetation is associated with the vertical faces. Walls provide ecologically demanding conditions so may in places support a highly specialist flora – these are usually species of nature conservation value and have minimal impact on the wall structure. Opportunist species (such as bramble (English and scientific names of all species in the text are listed in Appendix 1), sycamore and Buddleia) will grow anywhere and are usually the problematic ones – they have little conservation importance except as habitats for other species.

1.2. WHAT TYPES OF PLANT ARE FOUND ON BUILDINGS?

HERBACEOUS VASCULAR PLANTS

Small herbaceous species with soft stems such as ivy-leaved toadflax, ferns, hawkweeds, yellow corydalis, stonecrops, bellflowers, winter annuals, purple toadflax and many others do not break down walls. Many are considered attractive and can be left to decorate walls, providing local character and softening otherwise hard landscape features. Ivy-leaved toadflax can become locally so dense that it obscures stonework and needs controlling.

WOODY PLANTS, CLIMBERS AND CREEPERS

Another group of plants made up of long-lived perennials includes several of the most beautiful wall plants such as red valerian, snapdragon and wallflower. These species have woody rootstocks and may disrupt stone work over a long period of time. Red valerian is a potentially damaging species. It is common in the west of Britain where it grows most vigorously. Susceptible walls are those made of small bricks and stones. However, this striking plant has considerable visual impact. In sites that are conspicuous and accessible, it may be beneficial to retain populations and incur the cost of more regular checking and repairing of stonework in order to retain colonies for picturesque effect.

Ivy is one of the most common, and generally regarded as the most potentially structurally damaging, woody plant found on walls. It does not necessarily pose a threat. If growing on good brickwork it simply grows over the surface and will not cause damage. On older walls the stems can enter cracks, and expand and loosen blocks, though a really dense growth of old stems can also hold a wall together. In this case its removal can be unsightly and lead to severe damage. The build up of dense growth at wall heads can also increase the 'wall area' exposed to the wind. This imposes additional stresses in the wall structure which, in extreme conditions, can lead to premature failure or wall collapse. Control of wall head growth is needed if the decision is taken to leave the ivy *in situ*.
There is some debate as to whether ivy shelters walls from weathering or if it harbours damp. Recent research suggests that there is no difference in humidity between walls with ivy and those without (National Trust, unpublished - for more detail please contact the Head of Conservation).

Ivy is important for other wildlife. It provides a home and food source for some invertebrates, but may shade out lichens. If important lichen species are present it may be preferable to remove some of the ivy. This is best done by cutting the plant at its base and then allowing it to decay naturally. If just pulled off the wall the ivy's root-like anchors or "haustoria" may remove some fragments of stonework. In certain circumstances it may be necessary to treat the cut stump with a systemic herbicide such as glyphosate to ensure the plant is killed. A list of COSHH (Control of Substances Hazardous to Health) approved products "COSHH Professional products endorsed for use within the National Trust: gardens, woods, and countryside" is updated annually and can be obtained from Regional COSHH Co-ordinators or the Health and Safety Department of the National Trust.

Wisteria often grows on buildings. When present on a well-maintained structure where it is artificially attached to the wall surfaces, Wisteria poses little threat. The situation is different on ruinous structures where the stems entwine around elements of the fabric, window mullions and transoms. There is naturally a reluctance to remove what is often seen as an attractive plant, and one that contributes to the general appearance of a ruin. This can, however, prove to be a short-term gain. Plant growth can lead to severe structural damage in a matter of a few years, at which point either there will be an acceptance of the building's rapid demise, or the plants will have to be removed and avoidable damage rectified.

BRYOPHYTES

Bryophytes, the mosses and liverworts, present little threat to a building – their root-like rhizoids can do no damage. They do absorb and hold moisture, which means they can keep the surfaces of tiles and slates damp and this can speed up the process of weathering. If the retained water freezes, roof tiles/slates may be damaged. In addition, drying colonies can come off the roof and block gutters and flumes. If it is believed that moss/liverwort growth on a certain roof slope needs to be controlled, care must be taken that the plants are not completely removed if any are rare. A number of moss and liverwort species are protected under Schedule 8 of the Wildlife and Countryside Act, 1981 (see Section 9). It is an offence to destroy these species, wherever they are found, when it can be reasonably avoided.

1.3 MANAGEMENT GUIDELINES

THE LAW

Certain plants receive legislative protection under the Wildlife and Countryside Act 1981 (or the equivalent Wildlife Order 1985 in Northern Ireland) and the EU Habitats and Species Directive 1992, which must be taken into account when formulating management plans. Protected plants associated with the built environment include Nowell's limestone-moss plus two plants associated with water bodies: Floating water plantain and starfruit (see Section 9).

SURVEY AND PLANNING

There is a need to balance nature conservation with the conservation value of stonework. It is important:

- that a detailed survey is carried out to determine the botanical interest of the walls.
- to include wall flora in management plans with clearly defined objectives.

CLEARING AND TIDYING

It may be desirable to carry out substantial clearing and tidying of walls where they have become so overgrown that the colour, texture and arrangement of the stonework is obscured. However, sufficient plants should be retained to soften the appearance of the structure and one should ask whether tidying is absolutely necessary. It is important to remember that vegetation takes time to develop and, if removed, could take several decades to return to a site. In terms of time taken to develop, a well-colonised wall is the equivalent of a mature oak tree.

- Most plants can be left on a wall provided they do not cause structural damage or obscure the historic stonework.
- Woody species usually need to be removed as their roots can cause damage (expand crevices), and their weight can bring down walls.
- Piecemeal repair, doing little and often, is recommended as this allows the existing flora to spread onto cleaned stonework.
- Both chemical and mechanical cleaning of walls, painting and whitewashing walls destroys plants and the latter also retards subsequent colonisation.
- Herbicide spraying and weeding should be restricted to those species most likely to harm masonry or obscure important details.
- Spraying the angle at the base of the walls is acceptable because this habitat is rarely of great interest but always question if this is really necessary first. It is possible that there will be a single species re-colonisation after spraying, and the situation could become worse than to begin with.
- The use of biocides to control bryophytes and lichens should only be carried out in exceptional circumstances.

RESTORATION AND RENOVATION

Any restoration work needs expert advice beforehand if important plants are present.

- It may be necessary to remove important plants temporarily then replace after consolidation.
- For dry-stone walls, piecemeal repair is recommended to help retain a varied age structure among the wall flora.
- Soft-capping of walls, especially ancient ones in ruins, is both beneficial to the monument itself and to the botanical interest of the site.
- Hard-capping (placing hard mortar on wall tops) leads to deterioration and discolouration of the stonework due to the run-off of rainwater from the wall top.

Soft-capping using sacrificial, softer mortar does not accelerate weathering in the same way as hard capping – softer mortars are more permeable and therefore run-off is less.

- Softer mortars are also frequently colonised by plants as a result of their increased retention of water and higher rate of weathering. Vegetation on the wall top will act like a sponge and retain water, and root action will draw moisture up from inside the wall. In some circumstances it might be desirable to include planting pockets on newly repaired wall-heads.

NEW BUILDINGS

Encouraging plant colonisation of new buildings contributes to the conservation of specialised plants and can help to soften the impact of new materials if this is desirable.

- Use local, traditional building materials.

- Use lime mortar.
- Use traditional building techniques.

1.4. SUMMARY OF POINTS TO CONSIDER – PLANTS ON OR NEAR BUILDINGS

Existing buildings

- Consider the existing plant populations at the planning stage of any building operations.
- Avoid wholesale repointing or surface renovations.
- Protect existing plant populations.
- Allow for, and encourage, recolonisation.
- Only remove plants that are demonstrably causing damage.
- Avoid the use of biocides.
- Is a 'cyclical' approach to management desirable?
- Only use similar materials to existing construction.

New buildings

- Build in opportunities for colonisation where appropriate, OR adopt a pro-active approach to plant establishment.
- Ensure subsequent maintenance plans are plant friendly.
- Use 'traditional' materials and techniques.

1.5. MANAGEMENT OF TREES CLOSE TO BUILDINGS

EFFECTS OF TREES ON BUILDINGS

Trees can occasionally have a deleterious effect on buildings. Above ground problems can include leaf- and needle-drops blocking gutters and downpipes; branches rubbing and knocking roofs and walls; and general shade and dampness. In addition, trees adjacent to buildings may allow grey squirrels access to roof voids. Generally these problems can be dealt with relatively simply by pruning and regular preventative maintenance.

Below ground the situation is more difficult to control, out of sight and out of mind until something dramatic occurs. Tree roots can block drains (though they can only enter them if the drain is already cracked or parted). Roots can also lift paths, monuments and low walls.

It is often feared that if trees grow close to the foundations of a building their roots will undermine them and cause damage. This is rarely the case – tree roots do not have the capacity to break up large modern concrete foundations, although older, more open corbelled brick foundations may be more vulnerable to root penetration.

TREES AND SUBSIDENCE

Occasionally trees can have more serious consequences, causing damage as a result of absorption of moisture from clay soils which expand and contract depending on water content. Trees can abstract considerable amounts of water from these soils and thus increase the rate of shrinkage in a localised area. This can cause a section of a building's foundation to drop further than a neighbouring section leading to deformation and subsidence.

If a building suffers from subsidence, early and specialised investigation is important. The proximity of trees is only one possible contributory factor that requires investigation. If trees are found to be the cause of damage, early removal or pruning can lead to stabilisation of the damage at little cost. Before a tree is felled in subsidence cases the following facts should be taken into account: the felling of a mature tree (on shrinkable soils) can often make matters worse rather than better. When moisture is no longer being withdrawn (by the tree) some soils expand leading to what is known as 'heave'. If the building has been deformed by subsidence, heave can increase the deformation.

The key is often to maintain a balance and consistency in the water content of the subsoil over the whole building site. Trees (and to a lesser extent other vegetation) are only one piece of this jigsaw. Unattended blocked drains can have a much greater and more rapid deleterious effect on a building's stability.

1.6. SUMMARY OF POINTS TO CONSIDER – TREES AND SUBSIDENCE

Existing buildings

- Do not assume that in movement situations trees are the cause.
- Question advice to remove existing trees.
- Control of growth (pruning) may be needed regularly.
- Ensure maintenance of gutters and flumes is established and effective.
- Consider what might be happening below ground: Are root barriers an option?

New buildings

- Substructure works are applicable to both the ground conditions and the planting plans.
- Does the design of drains etc. reflect planting plans (and *vice versa*)?
- Are gutters needed where they will be prone to leaf blockage, or is over-sizing desirable to avoid blocking.
- Consider inspection and access arrangements.
- Avoid roof valleys etc. in tree areas.

2 LICHENS ON BUILDINGS AND STONEWORK

2.1 WHY ARE BUILDINGS IMPORTANT FOR LICHENS?

Lichens are symbiotic associations between algae and fungi. Walls and buildings have allowed many lichens that were previously restricted to the uplands to extend into the lowlands through the provision of the stone-based habitats required by these organisms. Walls, roofs and buttresses are frequently covered with lichens, which are important in softening the appearance of many built structures. Different species are found on different types of stone; some display preferences for acidic and others for alkaline surfaces. More than 600 lichens have been recorded from the built environment. A few of these that appear almost exclusively on built structures are nationally scarce.

Lichens are important as indicators of air pollutants such as nitrogen compounds and sulphur dioxide. They also harbour many small mites, larvae and other invertebrates which are a food source for yet other invertebrates and some birds.

2.2 MANAGEMENT GUIDELINES

THE LAW

Certain lichens, such as churchyard Lecanactis, receive legislative protection under the Wildlife and Countryside Act 1981 (or the equivalent Wildlife Order 1985 in Northern Ireland) and the European Habitats and Species Directive 1992 (see Section 9).

SURVEY AND PLANNING

The management of lichens should be built into management plans. Knowing what you have got is the key. Few people can be expected to identify lichen species with confidence. It is important to take professional advice.

- Differentiate between traditionally common species and those with a very limited distribution (e.g. *Caloplaca granulosa* which is found on Corfe Castle in Dorset,) and whether any locally or nationally rare species are present.
- Distinguish between those few species that might damage stonework and the huge majority that do not, in accordance with the durability of the building material used.

CLEARING AND TIDYING

In extreme situations lichens may cause chemical erosion of friable stonework surfaces, etch stained glass and obscure inscriptions. In such cases where there is a conflict between the conservation of stonework and the conservation of lichens it is necessary to analyse the costs and benefits involved with each.

Chemical control should only be used in exceptional circumstances – where necessary the lichens may be removed from inscriptions using a scrubbing brush or soft toothbrush and water.
Cleaning stonework is not recommended because it can cause more harm than good by exposing fresh layers for further weathering.

Paving stones provide a poor habitat for lichens, and there are health and safety implications associated with their presence. Lichens may make pathways slippery and therefore hazardous to walk on. Because it is difficult to remove them from paving stones it may be necessary to consider re-routing visitors around buildings, or applying a top dressing of gravel where there may be some danger to public safety.

RESTORATION AND RENOVATION

- Piecemeal or phased repair of walls and other stonework is recommended as this allows the existing flora to colonise new stonework.
- On the wall top it is important to ensure that stones are replaced in the same orientation.
- Soft capping may be a valuable management tool.
- Replacement materials, such as using cement in place of lime mortar, should be carefully considered for their suitability. Lime mortar weathers more rapidly and supports a greater number and variety of lichens.

NEW BUILDINGS

Untreated timber provides an important habitat for certain species of lichen – 280 species will colonise timber, including a small number that are nationally rare and which may be found on old wooden seats, untreated oak gates and old barn timbers.

- Try to use untreated timber. In fencing, although treated timber may be more suitable for uprights, the use of local untreated wood for horizontal rails will allow the development of a natural worked timber lichen flora.

2.3 SUMMARY OF POINTS TO CONSIDER – LICHENS ON BUILDINGS AND STONEWORK

Existing buildings

- Consider lichens at the planning stage of any work.
- Avoid wholesale cleaning.
- Avoid the use of biocides.
- Carry out operations to minimise the damage to existing colonies e.g. stack tiles in such a way to avoid killing existing growths.
- Reuse components in similar attitudes e.g. west facing.
- Intermix new and old components.
- Use similar materials to those existing.
- Leave redundant components on site to aid recolonisation.

New buildings

- Consider the use of materials that will be conducive to lichen colonisation e.g. lime mortar.
- Use 'natural' untreated materials wherever possible.
- Ensure subsequent maintenance is lichen-friendly.

3. FUNGI IN BUILDINGS

3.1 WHAT ARE FUNGI?

Fungi are not plants although they have been classed as such for many years. They are actually more closely related to animals, but are distinct and separate life forms, and are now placed in their own Kingdom. They are heterotrophic, absorbing nutrients from the environment around them. The bulk of the fungus (the mycelium) consists of a web of tiny filaments known as hyphae, which is found growing throughout the substrate on which it is feeding. The mushrooms, toadstools and moulds that we see are the fruiting bodies of the fungus.

3.2 WHY ARE FUNGI FOUND IN BUILDINGS?

Fungi are very diverse and can utilise a wide range of foodstuffs. Buildings present them with a range of potential food sources, from roofing timbers to wallpaper and textiles. It is beyond the scope of this manual to describe every situation in which fungi might be found in buildings. Instead the main types of fungi and methods of controlling them are outlined below.

3.3 WHAT TYPES OF FUNGI ARE FOUND IN BUILDINGS?

MILDEWS

"Mildew" is the name given to a type of mould growth, though this term really has little meaning. Mildews are generally black, powdery growths, though they may be brown, red or grey. Mildews are able to dissolve cellulose fibres in cotton and paper and can cause irreversible staining and disintegration of these materials.

MOULDS

"Mould" is another generic term given to a variety of fungal growths. Mould will grow almost anywhere given the right environmental conditions. In buildings moulds are found on a variety of materials including textiles, leather, biological collections, painted walls and wallpapers. Moulds can pose a health risk: some people have allergic or toxic reactions to mould. Advice should be sought from the Head of Conservation before attempting to remove mould growth.

ROTS

Wood rots can pose a serious threat to the structural integrity of buildings. They are particularly destructive to timber in buildings but are less likely to affect indoor wooden objects. There are three main types of rot affecting wood in buildings in the UK: brown, white and soft rot.

Brown rot primarily attacks softwoods, leaving the wood stained with cuboidal cracking of the surface. There are two types of brown rot: dry rot and wet rot. Dry rot can be extremely destructive, causing an estimated £150 million worth of damage to buildings in the UK each year. It can grow some distance away from its moisture source, delivering water across masonry through its strand hyphae. By the time the presence of dry rot becomes obvious (by fruiting bodies and spore dust) it is often at an advanced stage. Wet rots tend to occur in persistently damp conditions, with an optimum moisture content of 50-60%. They cause cuboidal cracking in a similar way to dry rot but the attacked wood is lighter in colour and the cracks are not as deep.

White rot in timber leaves the wood a whitish colour and lighter in weight with a fibrous appearance. A number of different fungi cause white rot: *Donkioporia expansa* affects mainly hardwoods whereas *Phellinus contiguus* is restricted to softwoods. Both fungi cause wood to become easy to crush but resistant to crumbling.

Soft rot occurs in wood that is continuously damp or in contact with the ground. It very rarely occurs in buildings.

3.4 MANAGEMENT GUIDELINES

All the different types of fungi mentioned thrive in humid conditions. It thus follows that to reduce the risk of fungal decay in buildings it is necessary to avoid a high humidity environment (ideally relative humidity should be less than 65%), and ensure ventilation is good.

Fungi in buildings can be surprisingly tolerant of dry conditions, but none can live without some moisture. The source of this moisture might be a dripping pipe, rising damp, a leaky basement or roof or even condensation within north-facing walls. It is essential to identify and eliminate the source of moisture. It is also important to maintain good levels of hygiene and cleanliness. Dirt, dust and builders' rubbish can all provide a haven for fungal spores. Clear out any voids and cavities and use a vacuum cleaner to remove dust.

To prevent rot in timber it is necessary to reduce its moisture content. Isolate timber from damp masonry either by air space or a damp-proof membrane. If rot has already set in, remove all active fungal material and replace rotten wood.

3.5 SUMMARY OF POINTS TO CONSIDER – FUNGI IN BUILDINGS

Existing buildings

- Identify and eliminate all sources of damp.
- Remove and replace any rotted wood.
- Try to avoid a high humidity environment (ideally relative humidity should be less than 65%).
- Ensure that ventilation is good.
- Maintain high standards of hygiene - dirt and dust provide havens for fungal spores.

New buildings

- Ensure that the building has been adequately damp-proofed.
- Protect timber from wetting during construction.
- Use preservative treated wood, especially for exposed features.
- Ensure ventilation is adequate.
- Provide gutters at roof edges.
- Use exterior finishes that shed water and ensure that they are well maintained.

For more information on fungi within the built environment see:

- Pierce, M. (2001) Dry rot fungi (WWW) www.human.cornell.edu/dea/extension/docs/fal96/fungi.htm
- Singh, J. (2001) Environmental Monitoring and Control (WWW) www.buildingconservation.com/articles/envmon/envmon.htm

4. INVERTEBRATES IN BUILDINGS

4.1. WHY ARE BUILDINGS IMPORTANT FOR INVERTEBRATES?

The term "invertebrate" is used to describe any animal lacking a vertebral column, or backbone. They are generally soft-bodied animals with a hard outer skeleton (as in most molluscs, crustaceans, and insects) that serves for the attachment of muscles as well as for body protection.

A variety of different invertebrates are found within the built environment. The majority are harmless, and should be left undisturbed as far as possible. Some invertebrates (e.g. cockroaches and house crickets) rely on the warmth provided by buildings which, allows them to survive in a climate that would otherwise be too cold. Some need the shelter of built structures (e.g. silverfish), whilst others are just casual visitors, entering buildings accidentally. Some species hibernate in buildings (e.g. peacock butterflies, herald moths and others), others use dark crevices found in lofts, cellars and walls as substitute caves (e.g. cave spiders). A few insects use buildings as breeding sites including social wasps, wood-boring beetles and masonry bees. It is generally these species that cause the most concern.

4.2 WHAT TYPES OF INVERTEBRATES ARE FOUND IN BUILDINGS?

MASONRY BEES

Several species of solitary bee nest in crevices or holes in masonry and are known as "masonry" or "mortar" bees. The natural habitats of masonry bees are earth banks and exposed root plates into which the female bee burrows. Masonry bees are increasingly found nesting in holes in walls due to the decline in the number of their natural habitats.

It is frequently believed that solitary bees eat away the mortar between bricks, causing walls to collapse. This is untrue. The red masonry bee is frequently accused of damaging walls in this way. It is a species which uses pre-existing cavities in which to build its mud nests. It is not known to excavate cavities in hard materials such as mortar, unless this is already cracked and weathered. Only one scarce species of bee, *Colletes daviesanus*, has the ability to dissolve the chemicals cementing sand together.

WOOD-BORING BEETLES

The most important family of wood-boring beetles in buildings in Britain and Ireland, the Anobiidae, includes furniture beetles and the deathwatch beetle. The beetles themselves are rarely seen and are difficult to identify. Usually their presence is indicated by their flight holes in colonised timber – the holes from which the adult beetles emerge.

The larvae of the common furniture beetle live mainly in the sapwood of softwood timber. The adults are very small and brownish with an almost cylindrical body. The larvae are small and curved with very small legs and are difficult to distinguish from related species. They are colloquially known as woodworm. Adult furniture beetles emerge in the summer by gnawing their way out of the timber through circular exit holes (diameter 1.5-2.0mm). The water content of the wood is very important for the larvae – the damper the better, provided that the timber is not completely saturated over long periods of time. It thus follows that the most serious infestations of this beetle are found in kitchens, cellars, outhouses and stables which are often quite damp.
Deathwatch beetle is most common in southern Britain. Adults are 6-8mm long and dark brown with a golden mottled appearance caused by hairs on the wing cases. They generally only feed in hardwoods, preferring areas that are damp and already subject to fungal decay. The length of time spent in the larval stage of the life cycle depends on the moisture content of the timber – wood with a high moisture content will cause rapid maturation of the larvae, whilst dry wood, if colonised at all, will result in slow maturation (up to 10 years). Adults emerge from March to June through circular holes 2-3mm in diameter, and except in very warm situations, rarely fly. In severely affected wood the adults may emerge into cavities within the wood and thus complete their life cycles without ever appearing on the surface.

The house longhorn beetle is the largest of the woodborers, with adults approximately 16mm long with long antennae. Larvae of this species grow up to 25mm in length and bore tunnels up to 4mm in diameter. Their exit holes are oval and about 7mm x 3mm. This beetle feeds in the sapwood of softwoods and can be extremely damaging. Often there is no indication of damage to the timbers until the adults emerge, by which point the structural timber is just a shell. It is currently confined to southern England, though it is likely to spread with global warming. In the local authority areas of Surrey and Hampshire where it occurs, pre-treatment of newly installed timbers is mandatory.

INSECTS THAT MAY DAMAGE TEXTILES AND OTHER COLLECTIONS

A variety of insects feed on, and can damage, textiles. The most susceptible objects are those containing materials of animal origin such as wool (or wool products such as felt), animal fur, feathers and hair, and untanned leather and skins. The main insect pest species in Britain and Ireland are clothes moths and carpet beetles.

Clothes moths

There are two species of moth that will damage textiles: The case-bearing moth, and the common clothes moth. Both species are grey-fawn coloured and 5-7mm long. They tend to scuttle around rather than fly. The moths hide in dark areas and lay batches of eggs on fur, feathers, skins, wool or soiled silk. It is the larvae that hatch from these eggs that are the cause of damage - they have the ability to digest keratin, the protein in fur, wool, feathers, hair etc. They prefer food that is dirty or stained and so tend to attack clothing in areas where there may have been perspiration or urine staining, or the edges of carpets where vacuuming is less effective.

The case-bearing clothes moth larva spins a silk cocoon around itself, leaving the front end open so that it can use its jaws and legs. It then eats its way across the material leaving a trail of grazed textile and excreta. The common clothes moth has different habits - its larva leaves a tunnel of silk webbing across the attacked material. Damage by this species is often accompanied by copious webbing tubes and so its infestations appear messier than those of the case-bearing clothes moth. The excreta (or 'frass') of clothes moth larvae is often mistaken for eggs. However, frass is hard and opaque and eggs are much smaller and translucent. It is often believed that moth eggs can remain dormant for several months before hatching but this is not the case.

Carpet beetles

The most common species is the varied carpet beetle although there are a number of other species within this genus which are similar in appearance and habits. Adults are round, 2-3mm long and covered with patches of grey and gold scales. The larvae are short, fat and very hairy and are commonly known as "woolly bears". The larvae are voracious feeders and will rapidly demolish fur, feathers and woollen textiles. Carpet beetles are naturally found in birds' nests, and in some houses have a direct route into the building via birds' nests in the attic.

The Australian spider beetle

The Australian spider beetle originated in Tasmania but is now widespread throughout the temperate zones of the world, although it favours the indoor environment. Adult beetles are 3-4mm long with brown, hairy spider-like bodies. They are detritivores, feeding on vegetable and animal remains including dead insects. They may cause damage to textiles, as well as plant specimens and insect collections.

Silverfish

Silverfish are omnivorous insects that will occasionally gnaw textiles. They are torpedo-shaped, 3-10mm long, without wings and with bristles at the rear end. They usually cause only nuisance, but may cause damage to books and textiles if these are stored at high humidities.

Booklice

Booklice are very small insects, less than 1mm long that may cause damage to books and textiles by surface grazing, if these are stored at high humidities.

OTHER INSECTS

Social wasps

Social wasps make large nest structures, using overhangs (such as under the eaves) and roof voids as nest sites. Although social wasps are almost always treated as pests, they may also be beneficial - as larvae they consume vast numbers of insects (including garden pests).

Honey bees

Occasionally honey bees nest in roof voids and wall crevices. Honey bees, which are important pollinators of both commercial crops and garden plants, have declined in number over recent years due to the *Varroa* mite which can result in the loss of entire colonies.

Cluster flies

Cluster flies are large, greyish flies that can appear in buildings during the winter, though the term 'cluster-fly' may also be used to describe the autumn-fly and the green cluster-fly. They do not breed or feed on meat or domestic waste and so do not pose any risks to human health. However, in some places they occur in their thousands and are a nuisance as they buzz around lamps and fall into teacups.

The flies spend the summer months outside foraging for nectar, then come indoors for the winter. They often gather in cool, unheated areas, including lofts. They have a tendency to return to the same building year after year – they deposit pheromones which are attractive to the following year's flies, causing them to return to the same spot. With each successive generation depositing more and more pheromone, its levels accumulate over time making the sites more and more attractive to future broods. In order to control cluster flies it is necessary to break this cycle.

House flies

House flies are about 6mm long and grey/black in colour. Lesser house flies are superficially similar to house flies but are slightly smaller. They can both cause superficial damage to surfaces, by leaving disfiguring 'flyspots' which are residues of vomit and faecal material. These domestic flies are associated with poor hygiene and rotting organic matter, as this is where their eggs are laid, larvae develop and from which adults emerge and feed. They are pests as they can carry diseases which can be transmitted to people when the flies rest and feed on food.

4.3. MANAGEMENT GUIDELINES

MASONRY BEES

- Occasionally masonry bee burrows honeycomb a particularly soft sandstone block or a region of pointing – in such a case the only solution is to replace the weakened material or re-point the worst affected areas with a lime-based mortar, after raking out the joints.
- Such work should be done only when there is a strong need, and in rotation, ensuring that sufficient nesting places are left to maintain the population of bees.
- The spraying of insecticides on walls is unlikely to provide a long-term solution, as favourable sites are likely to be re-colonised from the surrounding areas.
- It may be beneficial to provide artificial holes for them to use in order to deter them from nesting in walls. For details of artificial nesting boxes contact Oxford Bee Co. Ltd., 40 Arthur Street, Loughborough, Leicestershire, LE1 1 3AY, tel: (01509) 261654, fax: (01509) 261672, email: info@oxbeeco.com.

WOOD-BORING BEETLES

- Wood-boring beetle species present a readily identifiable threat to the integrity of a building's structure and badly affected timbers need replacement.
- Removed timbers should not be burnt, but where possible, stood up in the sun in a suitable place. The old burrows will provide nesting sites for other invertebrates such as solitary bees and wasps. Destruction of individual affected timbers is unlikely to affect the potential infective population of the beetles, which are present in many growing trees.
- Fence-posts are particularly important in garden situations for wood-boring beetles. If practical, they should be retained *in situ* with new posts alongside when re-fencing.
- Wood-boring beetles can also cause severe damage to wooden furniture and other wooden artefacts in buildings. Environmental control is important in reducing the threat from wood-boring beetles. They require high humidity levels, so keeping important wooden pieces in an environment where the relative humidity is less than 65% will reduce the risk of damage.

INSECTS THAT MAY DAMAGE TEXTILES AND OTHER COLLECTIONS

- Prevention is better than cure when it comes to dealing with insect pests in buildings. Continuous application of chemical pesticides is neither environmentally friendly nor sustainable and other means of control are frequently more appropriate. Integrated pest management (IPM) can be effectively applied to the care of buildings and historic collections.
- Try to avoid the introduction of pests. Insects can be introduced on infected textiles and other objects. If the insects remain undetected serious problems may follow. Visual inspection is therefore important and early

warning of insect presence may allow a potential problem to be identified before serious damage results. Monitoring of pest populations across the building using sticky traps will help identify if, when and where control is needed.

- Environmental control is important. Pests thrive in warm humid conditions and so maintaining a cooler, drier environment will inhibit pests. This is not always possible in public areas, but storage should be as cool as possible. Relative humidity should be monitored, and sources of damp such as condensation or leaking pipes should be checked and rectified. Denying the pests a safe haven is also very important - strict attention to hygiene will reduce the amount of organic debris that will support pests in corners, wall/floor angles and behind fittings.
- If control is necessary there are a number of treatments available that will kill pests in all objects if carried out correctly. These include fumigation by carbon dioxide or nitrogen (such treatment is usually carried out either off-site in a special chamber or on-site in a bag or 'bubble' enclosure), and use of high and low temperature regimes to kill the insects. It is usually advisable to get expert advice. This will not only reduce further damage but may also avoid unnecessary and expensive remedial treatments.
- For more information on this subject please see David Pinniger's article "Integrated Pest Management: Beating the Bugs in Buildings" in Views issue 34, or contact the Head of Conservation for advice.

SOCIAL WASPS

- If a nest is away from direct, accidental, disturbance it is better to avoid it rather than destroy it. Nests are annual, with spring queens avoiding old nest sites. It is best to leave old nests *in situ* as a number of other insects scavenge in the base of the nest and will not emerge until the following year. Some of these scavenging insects are quite scarce e.g. the large wasp-mimic hoverflies *Volucella inanis* and *V. zonaria*, and the beetle *Metoecus paradoxus*.
- If the wasps really are causing an unavoidable problem it may be necessary to control or eliminate the colony. Domestic insecticides can dispose of individual wasps, although this is not recommended as it is not "environmentally friendly" and non-target species may be affected. Instead professional help should sought to control the whole colony, as the risk to an untrained person dealing with a wasps' nest can be significant. Contact your local authority for advice.

HONEY BEES

- If honey bees are present and the colony is away from the site of any building work it is best to leave them undisturbed. They are rarely aggressive and will only sting when provoked.
- If the bees are in the way of building work and are not swarming, contact your local authority and/or local beekeeper who will remove the bees and their nest. If the bees are swarming do not panic. When swarming, bees are reluctant to attack as they have gorged themselves with honey and cannot get their bodies into the best position to sting. Your local beekeeper should be able to take away the swarm.

CLUSTER FLIES

- Application of insecticides to control cluster flies is not recommended – this only provides some short-term relief from the problem and will not solve it. It may also cause damage to other wildlife such as bats.
- A better short-term solution is to hoover up the flies with a vacuum cleaner and then place the hoover bag in a deep freeze to kill them. The bag will need to be left in the freezer for at least several days – the flies have amazing powers of recovery!
- Longer-term solutions involve blocking off the routes that the flies use to enter the building e.g. gaps under the soffits. If such measures are used, care must be taken that access points for bats and other organisms are not obstructed and that ventilation is maintained.

HOUSE FLIES

- Application of insecticides to control domestic flies is not recommended – this only provides short-term relief from the problem and will not solve it. It may cause damage to other wildlife such as bats.
- Improved hygiene will usually reduce the number of flies. This can be achieved by removing refuse, clearing drains and cleaning areas of decomposing material.
- Other animals near a building can be a source, including poultry houses and other farm units. If the animals cannot be moved, then the routes for flies should be blocked by keeping doors and windows shut or by using fly screens.

4.4 SUMMARY OF POINTS TO CONSIDER – INVERTEBRATES IN BUILDINGS

Existing buildings

- Good hygiene practices will deter scavenging insects that feed on food scraps and other organic debris.
- Always question the need for timber treatment.
- Beetle infestations will often be naturally self regulating.
- Is the 'outbreak' still active or is the evidence indicative of past activity?
- Consider changing the environment in preference to treatment.
- Challenge the assumption that 'masonry bees' are excavating.
- Avoid wholesale repointing or surface treatments.
- Use traditional and similar materials in remedial work.
- Timber that has suffered from previous beetle infestation can be recycled as a host 'building' (stood up in the sun to provide nest sites for other invertebrates).

NEW BUILDINGS

- Use soft materials (mortar) to encourage use by wasps and bees.
- Avoid the unnecessary use of insecticides.

5. AMPHIBIANS AND REPTILES IN BUILDINGS

5.1 WHY ARE BUILDINGS IMPORTANT FOR AMPHIBIANS AND REPTILES?

Amphibians and reptiles are back-boned animals with a limited ability to regulate their body temperature internally. Amphibians can often breathe through their skin which must therefore be moist, making them prone to desiccation. They usually lay eggs in water. Certain reptiles (adder, common lizard and slow-worm) give birth to live young.
The UK's amphibians and reptiles are declining in number in many areas, partly due to the loss of habitats through development, and changes in land use. Amphibians, such as the threatened great crested newt, often hibernate in walls, ha-has, cellars or basements. Reptiles may also use man-made structures e.g. snakes and slow worms bask under corrugated iron. As more and more of their natural habitats are lost, it is becoming increasingly important that these artificial basking sites are retained.

5.2 WHAT TYPES OF AMPHIBIAN AND REPTILE ARE FOUND IN BUILDINGS?

In the uk the native amphibian and reptile fauna is small. It is even smaller in Ireland where there are no snakes, and only the smooth newt, natterjack toad (SW Ireland only), and common frog occur.

Amphibians	**Reptiles**
Common Frog	Common Lizard
Common Toad	Sand Lizard
Natterjack Toad	Slow-worm
Smooth Newt	Grass Snake
Great Crested Newt	Adder
Palmate Newt	Smooth Snake

Ponds and other water bodies are essential for breeding amphibians, but the structure of the terrestrial environment may be equally important. Woodland, rough grassland, crevices in walls and other cover are important terrestrial habitats for amphibians. The availability of suitable hibernacula can be an important factor in determining the local abundance of great crested newts.

5.3. MANAGEMENT GUIDELINES

THE LAW

All amphibians and reptiles receive some legal protection in the UK, although the extent to which each species is protected varies (see Section 9).

SURVEY AND PLANNING

NEVER RE-POINT WALLS AND HA-HAS WITHOUT FIRST SURVEYING FOR THE PRESENCE OF AMPHIBIANS AND REPTILES.
TRY TO PLAN WORKS TO PONDS AND OTHER WATER FEATURES OUTSIDE OF THE BREEDING SEASON (OUTSIDE THE SUMMER MONTHS).

CLEARING AND TIDYING

- Never clear ponds and other water features during the summer (May-September). Doing so may disturb breeding amphibians.
- Try to leave log piles and compost heaps *in situ* – these may provide important places of shelter and breeding sites for amphibians and reptiles.
- Adders often hibernate communally and may be found within cracks in walls and ha-has. They are venomous and, if inadvertently discovered, best left undisturbed. Adders' venom is particularly potent in spring after hibernation. However, their bite, whilst painful, is rarely fatal. If bitten keep calm and seek immediate medical attention.

RESTORATION AND RENOVATION

- Do not fill in voids in garden walls, ha-has and other such structures without good reason. Both amphibians and reptiles often shelter in these voids and may be entombed if they are filled in.

NEW BUILDINGS

When newts leave a pond in preparation for hibernation they look for cover. They need to find a suitable site where they are protected from frost (which rarely penetrates more than 300mm below ground) and desiccation.

- Log piles can provide important temporary newt refuges.
- Small-scale hibernacula can be built using wood e.g. log piles covered with soil to a depth of at least 300mm. The wood will slowly rot providing voids and soft spongy wood suitable for newts to hibernate within. Additional logs or plywood can be laid on the top of the structure to provide a semi-permanent roof.

During their spring mating season, amphibians may travel up to several kilometres seeking water in which to spawn. Such journeys may involve crossing roads, each time risking being run over by a car. On particularly busy roads, thousands may be killed in a single evening.

- Amphibian tunnel and fence systems are now available which have been shown to reduce amphibian road mortality by more than 95%.
- For more details see the *Herpetofauna Workers Manual* (Gent & Gibson, 1998).

5.4. SUMMARY OF POINTS TO CONSIDER – AMPHIBIANS AND REPTILES IN BUILDINGS

Existing buildings

- Do not fill in ponds (or other water features) without first surveying for the presence of amphibians.
- Do not carry out works to ha-ha's or other damp areas without surveying for the presence of amphibians and reptiles.
- Do not over restore ground contact structures (filling of all voids etc. without good reason).
- Plan operations to minimise any disruption.
- If great crested newts are known to use the pond contact the relevant Statutory Nature Conservation Organisation for advice and consent before any work is carried out (see Appendix 2 for contact details).

New buildings

- Consider the creation of hibernacula.
- Consider the creation of amphibian tunnels (or safe passage routes).
- Is there an opportunity for the creation of water bodies (such as ponds) with a rough grassland/woodland/scrub edge?

6. BIRDS ON BUILDINGS

6.1 WHY ARE BUILDINGS IMPORTANT FOR BIRDS?

Buildings provide important nesting sites for a variety of birds. Perhaps the best known is the barn owl which frequently uses buildings, especially farm outbuildings, for roosting and nesting. House sparrows, which have declined in recent years, frequently build their scruffy nests in crevices in walls or amongst ivy growing on buildings. The black redstart nests in industrial complexes, power stations, gas works, docks and warehouses. The swift nests in older buildings and monuments. With the reductions in natural ledges and cavities in old trees that have occurred over the last century, buildings are becoming increasingly valuable as nest sites. Other birds, such as song thrushes, may nest near to buildings (e.g. in gardens) and care should be taken that building works do not adversely affect these species. All birds in the UK are protected during the nesting season by the Wildlife and Countryside Act, 1981 or the Wildlife Order, 1985 in Northern Ireland (see Section 9).

6.2 WHAT TYPES OF BIRD ARE FOUND IN BUILDINGS?

BIRDS OF PREY

Barn owl

Between 1932 and 1987 the UK's barn owl population fell by 70% and, although it has stabilised over the last ten years, it remains low at 5,000 pairs. The barn owl is a bird of open country, especially low-lying open farmland, requiring extensive areas of rough ungrazed or lightly grazed tussocky grassland over which it hunts for field voles, mice and shrews. Recent changes in farming methods have resulted in the loss and fragmentation of this habitat, causing the decline of this beautiful owl. As a result the barn owl is specially protected under the Wildlife and Countryside Act 1981 (and the equivalent Wildlife Order 1985 in Northern Ireland).

When any work is planned on a barn or any other old building it is recommended that a survey is carried out to determine whether or not barn owls are present. If barn owls are using a site the beams, rafters, wall ledges and floor will display long streaks of dried 'whitewash' on them (droppings) and there will usually be a build up of pellets below the favoured roost site. Barn owl pellets are grey, black or brown cylindrical masses, usually about 6cm long, although length varies between 1 and 10cm. They may have a faint, but not unpleasant, mushroom-like odour.

The Hawk and Owl Trust offers a free, 48-hour pellet identification service for those who wish to know if barn owls are present. Collect between two and four pellets in a padded bag and send them in an envelope marked "Pellet i/d" to: Colin Shawyer, The Hawk and Owl Trust, c/o Zoological Society of London, Regent's Park, London, NW1 4RY. Enclose a stamped, self-addressed envelope and the name of the site where the pellets were collected.

Little owl

The little owl, introduced in the 19th century, is Britain's smallest owl at just 210mm tall. Its total UK population is between 4,000-8,500 pairs, and it can be found throughout England and Wales, up to the border with Scotland but is absent from Ireland. Its small size allows it to use a larger variety of nest sites than other owl species which may include hollow limbs of trees, crevices in walls and farm buildings and even rabbit burrows. Nest boxes attached to inner or outer walls of farm buildings are often successfully occupied. Little owls require a perch alongside the entrance hole which should be 70mm in diameter.

Kestrel

The kestrel is the UK's most common daytime bird of prey, numbering about 52,000 pairs. However, farmland populations have decreased and it is now more commonly seen along roadsides thus giving a false impression of its abundance. It is becoming increasingly threatened and is Amber-listed under the Birds of Conservation Concern criteria (see Section 9). Kestrels are birds of open country, including moorland, coastal areas and farmland of all types. Nest boxes can be positioned in open-fronted barns or buildings high up on the front edge of the inner or outer wall. Kestrels prefer a clear view from their nests and it is thus important that tree foliage, ivy or tall bushes do not obscure nest boxes.

Peregrine

The UK's peregrine population has now recovered from its steep decline to just 350 pairs in the 1960s due to poisoning by agricultural chemicals. Now up to 1,500 pairs, the peregrine is adapting to urban life and is increasingly found nesting on buildings from which they launch out to feed on pigeons and other birds. Peregrines are Amber-listed under the Birds of Conservation Concern criteria and are included on Schedule 1 of the Wildlife and Countryside Act, 1981 (see Section 9).

SWIFTS, SWALLOWS AND HOUSE MARTINS

Swifts

Swifts are the most aerial of all birds. They usually only come to land for nesting and even sleep on the wing. They are black-brown all over, with a pale chin and throat. The beak which is small with a wide gape, is adapted to catching flying insects at high speed. The tail is short and forked, and the wings disproportionately long in relation to the rest of the body (wingspan 42-48cm, body length 16-17cm), giving the characteristic crescent shape in flight. The call is a shrill scream. Swifts commonly choose domestic properties as nesting sites but are being excluded from their usual nesting places in roofs as a result of modern building methods, changes in building regulations and better maintenance. Their natural nest sites in caves and cliffs are now quite rare in the UK and so they are highly dependent on man-made structures, nesting between poorly fitting roof slates or tiles, under the eaves, in ventilators and in other small cavities.

Swallows

Swallows are similar in shape and size to swifts but have long and slender forked tails. They have a dark blue plumage with a red bib and white belly. Like swifts they hunt insects on the wing, usually in groups. They construct open-topped nests made of mud, bound with dried grasses and lined with feathers. The nests are usually glued to masonry or a wooden beam in a barn or outbuilding a few inches beneath the ceiling or roof lining. This small gap allows them to maintain a constant temperature in the nest. As the young mature and create more heat, the feathers are gradually removed from the nest lining to prevent overheating. Swallows will nest individually or in colonies but these are usually smaller than those of house martins.

House martins

House martins are not dissimilar in appearance to swifts and swallows especially when seen on the wing. Like swallows they have a dark blue plumage. They are most easily identified when in flight by their white rumps and a forked tail which is much shorter than that of a swallow. Unlike swallows, house martins usually build on the outside of buildings, commonly under the shelter of the eaves. They prefer to nest in quite large colonies and nests can be very closely spaced. Martins construct mud nests similar in size and appearance to swallows, usually using the wall and soffit board as the two anchor points. However, unlike swallows, their nests are not open topped and because they are constructed on the outside of buildings, maintain temperature within the nest by being fully enclosed with a small entrance hole in the side.

HOUSE SPARROWS AND PIGEONS

House sparrows

The once familiar house sparrow is exclusively found in association with buildings. It is declining as a result of agricultural intensification.

Pigeons

Domestic pigeons can cause considerable nuisance by fouling the buildings they nest on. They can also be involved in the spread of disease. Various methods have been used in the past to try and control these birds but it would seem that the only efficient measure is to deny them nest sites by barring access to cornices, closing roof-lights and so on.

6.3 MANAGEMENT GUIDELINES

BIRDS OF PREY

- All bird of prey species are protected by law.
- When any work is planned on a barn or any other old building it is recommended that a survey is carried out to determine whether or not birds of prey are present. If they are present contact your SNCO before any work begins.
- Consider providing nest boxes (which can be attached to outbuildings and trees) for birds of prey.
- For more information on barn owl windows, lofts and nest boxes see Appendix 3.

SWIFTS

- Maintenance or improvement work to buildings being used by swifts can often cause problems for the birds. Any work should be carried out prior to May or after mid-August (outside of the nesting season), because if disturbed the birds may abandon eggs or young nestlings.
- In addition, prolonged activity within a roof space will prevent adult birds from returning to eggs or young, which may lead to chilling or starvation.
- It is not always obvious when swifts are using a particular building and it is recommended that a check is carried out before any work is begun. Local ornithologists may be willing to help with this.
- For more information on swifts see Appendix 4.
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SWALLOWS

- When buildings are renovated, particularly where this involves the replacement of external doors, it is important to maintain an entry point for the birds. A 100mm wide gap between the door frame and the top of the replacement doors is usually sufficient.
- Sometimes swallows will nest in close association with people, above the covered entrances to courtyards, for example. To prevent their excrement causing a nuisance a 250mm wide plywood board can be suspended below the nest on string or lightweight chains to catch any droppings.
- In buildings which are used for the storage of valuable commodities, such as furniture or vehicles, a sheet can be suspended beneath the nests to prevent inconvenience or damage. Usually swallows will use the same part of the roof space every year and so it is usually only necessary to attend to part of the building this way and only for about three months of the year in the summer.
- Swallows can be encouraged to rebuild their nests in another part of the building, out of harm's way. Old nests can be removed in winter to encourage them to a more convenient position. This can be accomplished by nailing a couple of 60mm nails or a length of wood beading into a beam or wall support about 150-200mm beneath the ceiling. This gives swallows good basal support for constructing their mud nests.

HOUSE MARTINS

- House martins, like swallows, need a rough nesting surface to allow the wet mud to stick successfully. When old soffit boards are replaced or painted their smooth surface will often deter martins, which may have been nesting on the building for decades. To encourage martins to rebuild following renovation, soffit or facing boards with rough surfaces should be used.
- If droppings become a nuisance, on windowsills beneath the nests for example, pairs of hooks spaced at about 1m intervals can be screwed permanently into soffits from which a length of weatherproof plywood board can be suspended on lightweight chains. This will catch most of the droppings and once the nesting season is over in late summer the boards can easily be unhooked, cleaned and stored in preparation for re-hanging the following spring.

HOUSE SPARROWS

- House sparrows nest in loose colonies under the eaves, in wall cavities or in ivy. Avoid disturbing the colony in the nesting season.

PIGEONS

- Deny them nest sites by barring access to cornices, closing roof-lights and so on.

For details of nest boxes for any species of bird contact:
Wildlife Conservation Partnership, 23 High Street, Wheathampstead, Herts, AL4 8BB. Tel: 01582 832182. Email:

6.4. SUMMARY OF POINTS TO CONSIDER – BIRDS ON BUILDINGS

Existing buildings

- Consider nesting birds at the planning stage of any work.
- Do not block existing access points e.g. gaps over barn doors.
- Plan operations e.g. external repainting programmes, to avoid conflict with the nesting season.
- Consider 'temporary' hanging boards beneath nesting sites to catch droppings.
- Provide 'starter points' to encourage a change in nest sites for swallows.
- Provide nest boxes for birds of prey.

New buildings

- Consider eaves design - can martins or swallows or swifts be accommodated?
- Use 'rough' surfaces to aid nest building.
- Create 'barn owl windows' in gable ends.
- Consider the wider environment – provide feeding habitats.

7. MAMMALS IN OR ON BUILDINGS

7.1. WHY ARE BUILDINGS IMPORTANT FOR MAMMALS?

Increasingly mammals are found within the built environment as their natural habitats decline due to changes in farming practices, deforestation and urbanisation. Bats in particular are becoming more and more dependent on buildings as their natural roosting places in tree holes and caves become rarer or more disturbed. All buildings, particularly their walls, eaves and roofs are potential roost sites.

7.2. WHAT TYPES OF MAMMAL ARE FOUND IN BUILDINGS?

BATS

Bats are the only flying mammals. There are at least 16 species of bat present in the UK. Different bat species use different places for roosts.

Outside they may roost:
- Under weather boarding or hanging tiles.
- Above soffits and behind fascia and barge boarding.
- In gaps behind cladding tiles or wood.
- Between underfelt and boards/tiles.
- Inside cavity walls.
- Under lead-work – such as flashing around chimneys.
- Between/under stone tiles.
- Hibernating in the loose 'infill' in older style 'thick' walls.
- Inside mortar gaps.

Inside they may be found:
- Along the roof ridge beam and under the ridge tiles (or lead ridge).
- Hanging from roofing felt or roof supporting timbers.
- Around/on the gable end wall.
- Around the chimney breast.
- In cellars and icehouses – horseshoe bats may hang, but other species use cracks and crevices for hibernation.
- In warm boiler rooms for breeding.
- In the joints of joists, such as mortice and tenon joints that have become twisted/warped or have 'shrunk' allowing bats access.
- In splits in old timbers in roof voids.

In a sample of 201 Trust properties surveyed, only one of these had no evidence of bats. As a result the National Trust Manual of Building states "There should be a presumption that bats will be present in buildings and other structures". This means that before any work that might affect bats is begun, advice should be sought from the local bat group and statutory nature conservation organisation (i.e. English Nature, Countryside Council for Wales, Environment and Heritage Service or Scottish Natural Heritage – see Appendix 2 for contact details).

RODENTS

Rats and house mice can pose a danger to the contents of a building, and a health risk to humans. They gnaw timbers, wiring and other objects, eat stored food and can spread disease. Rats may also damage floors by digging up from underneath.

BURROWING ANIMALS

Burrowing animals such as moles, rabbits and badgers can pose a real threat for some archaeological structures and earthworks (barrows, hillforts etc.). Their burrows can undermine buildings, driveways and other structures.

BADGERS

As towns and villages expand in size, the greater the number of occasions on which an occupied badger sett is found to be in the way of a building programme. Badgers are a protected species (under The Protection of Badgers Act

1992,) and therefore developers and others must conform with statutory species protection. Their presence will be taken into account when a planning application is considered by a local authority who will consult the relevant SNCO before granting planning permission. Planning conditions may be attached when permission is granted, or planning obligations may be imposed to secure the protection of the species.

OTHERS

The built environment also provides important habitats for a variety of other mammal species. Roof voids in particular may be used by grey squirrels, pine martens, dormice etc. A few species including the dormouse, otter and red squirrel receive legal protection through inclusion on Schedule 5 of the Wildlife and Countryside Act 1981. Other mammals, such as hedgehogs and foxes, that receive little or no legislative protection, are also frequently found within the built environment.

7.3. MANAGEMENT GUIDELINES

BATS

The law and licences

- All bats and their roost sites are fully protected by law.
- If bats are known to be present the approval of the relevant statutory nature conservation organisation (SNCO) such as English Nature, Countryside Council for Wales, Scottish Natural Heritage or the Environment and Heritage Service in Northern Ireland, must be obtained before any work is started. 'Work' includes fitting loft insulation, attending to wiring or piping, storage use, new ceilings, masonry sterilisation, pest control, flashing work, cladding, new roofs and extensions. For residential buildings approval is the form of a letter giving advice on the action to be taken and only SNCOs can give this statutory advice. For non-residential buildings SNCOs should advise obtaining a license from the Department of Environment, Food and Rural Affairs (DEFRA) in England or National Assembly for Wales in Wales. This licence can only be obtained by a trained and licensed bat consultant and a full bat survey and details of mitigation will need to be sent as part of the licence application. The mitigation could be as simple as carrying out the work when the bats are absent, but may be a more costly option such as replacing a roost that is to be lost with a purpose-built structure of similar size just for the bats. If the mitigation is not judged suitable then the licence is not granted and so no work should commence. This process is far more time consuming and expensive than the system for residential buildings, so it is important to plan ahead financially and with time. The non-residential system may change again after 2003 and the issue of the licences may be devolved to local planning authorities.
- The earlier the SNCO is consulted the easier it is to accommodate bats and minimise possible inconvenience or delay to the work. Most work on Trust properties is planned sufficiently in advance that the bats can be accommodated without affecting progress.
- If bats are not discovered until after building work has begun, the work should be stopped immediately and the relevant SNCO contacted for advice. They will act quickly to help prevent any unnecessary delay in the building work and minimise any financial loss, whilst at the same time safeguarding the interest of the bats.

Planning building work

- The timing of operations is very important – bats are at their most vulnerable in buildings during the summer when large numbers may gather together and young bats, unable to fly, are present. In these situations, the SNCO (or DEFRA or NAW) may only consent for work to be conducted outside the summer season. Work should therefore be timed to avoid May – September.

Conducting building work

When carrying out work in a bat roost it is important to:

- Ensure the roost site is not made unsuitable for bats e.g. by installing large amounts of insulation material near access points.
- Try to locate new access points as close to old ones as possible to ensure they are easily found by the bats. If the main access point has to be moved, keep the old and new points available for a while until the bats become used to the new one.
- Ensure the temperature regime of a roosting area is not drastically altered e.g. it is inadvisable to install or remove central heating boilers or hot pipes near hibernation sites.

- Access holes should be kept small – for vesper bats a slit 15mm by 20mm long is often adequate and the ideal position seems to be between the soffit and wall. The bats can land on the vertical wall (as long as this is not a smooth surface – bats need to be able to grip onto something), and run up through the gap – most birds cannot manage this, thus preventing them from moving in. Building regulations specify that roofs must have adequate ventilation around the soffit – bat access can easily be incorporated into this requirement.
- Horseshoe bats need special consideration, as they require an access hole large enough to fly through. This ideally should be modelled on the size and shape of the previous hole, and at least 400mm x 300mm for greater horseshoes and 300mm x 200mm for lesser horseshoes. The hole can either be in a vertical wall or a horizontal surface such as a soffit (note that the latter may help discourage birds).
- Ridge ventilators can be adapted as bat access points (for the smaller bat species), though it may be necessary to remove internal mesh and plastic mouldings.
- A lead saddle in place of a slate will allow bats access to the ridge or roof void. Lead flashing around chimneys and other features can also be moulded to form bat access points.
- Purpose made bat bricks are available which allow the creation of bat access points when sited appropriately. Bat bricks are available from the following suppliers: Marshall's Clay Products, Howley Park, Quarry Lane, Woodkirk, Dewsbury, West Yorkshire WF12 7JJ (01132) 203535.
- Many of the chemicals used for remedial timber treatment up until very recently are lethal to bats. Alternative pesticides are available - the Trust has developed a COSHH approved list of pesticides endorsed for use in remedial building work on National Trust buildings. This list is included in the National Trust COSHH Buildings Manual and is available from Regional COSHH Co-ordinators or the National Trust Health and Safety Department. Please note that no timber treatment can take place within a bat roost site without the prior consent of the relevant SNCO. Pre-treated timber may be a suitable alternative.
- The presence of bats and fire precautions need not be in conflict. There are types of fire doors which can be kept open, closing only in the event of fire, which allow the bats access to and from their roof sites. For more details see the Fire Standards Manual, Section 3 Compartmentation Appendix 3A, Structural Fire Protection and Bat Conservation, the Bat Workers Manual (Mitchell-Jones and McLeish, 1999) and Guideline on bats and fire doors from the Conservation Directorate.

DAMAGE TO BUILDING CONTENTS BY BATS

Bat excreta may cause damage to vulnerable objects and furnishings in buildings. Droppings may cause pitting, long-term staining and etching to porous materials such as painted wall surfaces, stone and wooden monuments and sculptures, while urine causes spotting and etching of wooden, metal and painted surfaces. Urine (which is 70% urea) is chemically more aggressive and therefore of greater conservation concern.

Before any management begins it is essential to assess bat activity and its effects on the building's contents. Information needs to be gathered on the bats, vulnerable contents, rate of deposition and the seasons when it occurs, and the extent of the damage. Once these assessments have been carried out the following management techniques may be implemented:

- **Do nothing –** Bats may not be a problem if they occur in very small numbers or only use parts of a building without vulnerable or significant objects.
- **Moving objects –** If an object being exposed to bat excreta is free-standing, it may be possible to move it to a location with a lower rate of deposition.
- **Covers –** Covers may be appropriate when deposition is localised or if there are a few vulnerable objects. They are not suitable if deposition occurs throughout a room, as there would be a great aesthetic impact. Porous materials such as linen or natural carpet are suitable covers, however, polythene should not be used as this may create a moist microclimate around the object.
- **Coatings –** Synthetic lacquers offer some protection against bat damage and may be acceptable on historically and artistically insignificant metal and wooden objects. Natural organic coatings (such as beeswax) offer little protection against bat urine.
- **Deflector boards –** A wooden board 100-150mm wide and 1-2m long can be positioned at an angle beneath a roost or access point to deflect and/or catch any droppings. This can be useful to reduce rates of deposition in specific areas. The board can be erected during the summer and removed at other times of the year for cleaning.
- **Relocation of roosts or access points –** This has been used with some success in the past. Excluding bats from one roost site will reduce the impact in the immediate area, but may cause them to move to another part of the building and have an undesirable effect there. This can be avoided by blocking off potential roost sites first. Relocation should be considered carefully, with the relevant SNCO and local bat group being contacted for advice and permission.

- **Exclusion –** This decision, only to be taken by the SNCO, will depend upon a variety of criteria, including the value of the object at risk and the rarity of the bat species. Advice and permission should be sought from both the relevant SNCO and those responsible for the conservation of the historic artefacts. Exclusion may be difficult practically and may also be expensive.

For further information on bats see the Wildlife and Buildings Booklet (also on the internet, www.nationaltrust.org.uk/wildbuildings) and various Guidelines

RODENTS

In certain circumstances it may be necessary to control rodents by laying traps or using rodenticides.

- The Trust has a list of those products endorsed for use in controlling rodent pests in buildings. This list, "COSHH Professional products endorsed for use within the National Trust: gardens, woods, and countryside" is updated annually and can be obtained from Regional COSHH Co-ordinators or the National Trust Health and Safety Department.

BURROWING ANIMALS

Burrowing animals can pose a real threat for some built structures and earthworks (barrows, hillforts etc.). Particularly where rabbits are involved the control of their numbers is often necessary.

- Control should follow appropriate MAFF (Ministry of Agriculture, Fisheries and Food), now DEFRA (Department of Environment, Food and Rural Affairs) or DARD (Department of Agriculture and Rural Development in Northern Ireland) guidelines, but not include any activity that involves digging or disturbance to the soil.

Badgers

- Work that disturbs badgers without a licence may be illegal; badgers may be disturbed even if the work does not directly interfere with or cause damage to their sett.
- English Nature guidelines suggest that a buffer zone between the sett entrances and the building work is established. For example, use of heavy machinery should only be carried out at distances greater than 30m from the sett, work with lighter machinery at distances greater than 20m and light work such as hand digging or scrub clearance at distances greater than 10m.
- If it is necessary that such activities are carried out within these buffer zones, licences should be sought from the relevant SNCO.

7.4. SUMMARY OF POINTS TO CONSIDER – MAMMALS IN OR ON BUILDINGS

Existing buildings

- There is a presumption that bats will be present in all National Trust built structures.
- Advanced planning is essential to minimise disturbance.
- In some situations the provision of 'bat boxes' may be an option (for more information see Appendix 3).
- The presence of bats and fire precautions need not be in conflict.

New buildings

- Consider the roof design and access provision to encourage occupation by bats.
- Consider the wider environment e.g. will badgers be disturbed by the building work?

8. PONDS AND OTHER WATER FEATURES ASSOCIATED WITH BUILDINGS

8.1. WHY ARE PONDS IMPORTANT FOR WILDLIFE?

Water bodies such as man-made ponds and streams in gardens are often rich wildlife habitats. They provide homes for aquatic organisms and wetland species, and breeding sites for animals which lay their eggs in water (e.g. amphibians). Man-made ponds are becoming increasingly important for these organisms as more and more wetlands and natural water bodies are drained to make way for agriculture and development.

8.2. WHAT SPECIES ARE FOUND IN PONDS?

INVERTEBRATES

Various freshwater invertebrates such as beetles, water scorpions, crayfish and snails may all be found in man-made ponds and lakes. These animals are often killed when ponds are drained or filled in.

AMPHIBIANS

Amphibians lay their eggs in water, although as adults they spend the majority of their time on dry land. Some of the UK's amphibians, including the great crested newt and natterjack toad, are becoming scarce and are protected by law.

WATER VOLES

The water vole used to be a common sight on waterways and ponds throughout Britain. Unfortunately it has declined significantly over recent years – it has been lost from 90% of the sites where it was found at the beginning of the 20th century. It may be found inhabiting "designed" lakes and rivers where marginal/swamp habitat and banks for burrowing are present.

8.3. MANAGEMENT GUIDELINES

Often clearance work and/or desilting needs to be undertaken to ensure that open water isn't lost. However, sympathetic management is needed. It is important to conserve some aquatic and marginal vegetation to avoid threatening important wildlife.

INVERTEBRATES

Survey for the presence of invertebrates before beginning works on a water feature, since certain species, such as the native white-clawed crayfish, are protected by law (see Section 9). If such species are found to be present, consent needs to be sought from the relevant SNCO before the works can proceed.

AMPHIBIANS

The commoner amphibians (common newt, palmate newt, common frog and common toad), receive little legislative protection. For example, it would be legal (but undesirable!) in most circumstances to drain and infill a common toad breeding pond in the middle of the breeding season. It is difficult to prevent the loss of breeding ponds for these species, but there are measures that can be taken to help the situation. If the presence of amphibians is detected early enough it may be possible to amend the developmental plans so as to retain their pond. If the loss is unavoidable, compensatory measures may be taken, such as the construction of replacement ponds or the sympathetic management of terrestrial habitat. The timing of operations is important – ponds are best drained or cleared in autumn and winter when amphibians (and other species) are likely to be absent, or present in very low numbers.

- Never clear or drain ponds and other water features during the summer (May-September). Doing so may disturb breeding amphibians.
- If protected species are found to be present, consent needs to be sought from the relevant SNCO before the works can proceed.

WATER VOLES

Since April 1998 the water vole has received limited legislative protection through its inclusion on Schedule 5 of the Wildlife and Countryside Act 1981. Their places of shelter are protected, but the voles themselves receive no protection. This species does not occur in Ireland. It is an offence to intentionally:

- Damage, destroy or obstruct access to any structure or place which water voles use for shelter or protection.
- Disturb water voles while they are using such a place.

Where building work is likely to affect water voles or their habitat the following action may be taken:

- Planning the development to avoid water vole habitats.
- Excluding water voles from development areas (e.g. the removal of surface vegetation can cause water voles to move to alternative areas nearby).
- Trapping, removing and releasing the voles in an appropriate site.
- Incorporating habitat enhancement into the works – development sometimes provides opportunities for this (e.g. the restoration of vegetated bankside corridors to link fragmented water vole populations).

Conservation advice should always be sought from the relevant SNCO and Environment Agency staff before any riverbank or channel management work is carried out. In fact, Environment Agency consent may be necessary, in addition to planning permission, for certain actions affecting a watercourse. They should be consulted during the planning stage of any riverbank or channel management work.

8.4. SUMMARY OF POINTS TO CONSIDER – PONDS AND OTHER WATER FEATURES ASSOCIATED WITH BUILDINGS

Existing buildings

- Do not carry out any works to ponds or other water bodies before a biological survey has been carried out.
- Avoid over cleaning bank edges or destroying bankside corridors.
- Avoid changing water levels unnecessarily.
- Carry out revetment works in a manner which retains access between bank and water.

New buildings

- Is there an opportunity to create new ponds or wet areas?
- Construct new revetments etc in a sympathetic manner - avoid vertical hard surfaces and sterile environments.

9. STATUTORY AND OTHER REQUIREMENTS FOR THE CONSERVATION OF WILDLIFE IN THE BUILT ENVIRONMENT

9.1. THE WILDLIFE AND COUNTRYSIDE ACT 1981

This is the principal law protecting wildlife, habitats and species in Great Britain. It does not apply in Northern Ireland where wildlife is protected by the equivalent Wildlife Order, 1985. Both aim to protect endangered species and provide for the protection and management of important habitats through Sites of Special Scientific Interest (SSSIs) or, in Northern Ireland, Areas of Special Scientific Interest (ASSIs). This statutory instruments are the means by which the Convention on the Conservation of European Wildlife and Natural Habitats (the 'Bern Convention') and the European Union Directives on the Conservation of Wild Birds (79/409/EEC) and Natural Habitats and Wild Fauna and Flora (92/43/FFC) are implemented in the UK.

Section 13 of the Wildlife and Countryside Act identifies measures for the protection of wild plants. It prohibits the unauthorised intentional uprooting of any wild plant species and forbids any picking, uprooting or destruction of plants listed on Schedule 8. It also prohibits the sale, etc, or possession for the purpose of sale of any plants on Schedule 8 or parts or derivatives of Schedule 8 plants.

Protected plants on Schedule 8 that may be found within the built environment:

- Churchyard Lecanactis (a lichen)
- Floating water plantain
- Nowells limestone-moss
- Orange-fruited elm-lichen
- Starfruit

All birds, their nests and eggs are protected by the Act and it is thus an offence intentionally to:

- Kill, injure or take any wild bird.
- Take, damage or destroy the nest of any wild bird while it is in use or being built.
- Take or destroy the egg of any wild bird.
- Have in one's possession or control any wild bird (dead or alive) or any part of a wild bird which has been taken in contravention of the Act.
- Have in one's possession or control any egg or part of an egg which has been taken in contravention of the Act. This includes items taken or killed before the passing of the Act.
- Disturb any wild bird listed on Schedule 1 while it is nest building, or at a nest containing eggs or young, or disturb the dependent young of such a bird.

Protected birds on Schedule 1 that may be found within the built environment:

Dipper
- Dove, Collared
- Dove, Rock
- Flycatcher, Spotted
- Fulmar
- Kestrel
- Martin, House
- Martin, Sand
- Owl, Barn
- Owl, Little
- Peregrine
- Redstart, Black
- Swallow
- Swift
- Tern, Arctic
- Tern, Common
- Wagtail, Grey
- Wagtail,Pied

Schedule 5 of the Act prohibits the following on certain animal species:
- intentional killing, injuring or taking;
- possession or control (live or dead animal, part or derivative);
- damage to, destruction of, obstruction of access to any structure or place used by a scheduled animal for shelter and protection;
- disturbance of an animal occupying such a structure or place;
- selling, offering for sale, possessing or transporting for the purpose of sale (live or dead animal, part or derivative); advertising for buying or selling such things.

Protected animals on Schedule 5 that may be found within the built environment:

- Badger
- Bats (all species)
- Dormouse
- Otter
- Red squirrel
- Water Vole
- Great Crested Newt
- Natterjack Toad
- Atlantic Stream Crayfish
- Desmoulin's Whorl Snail

The protection that prohibits damage or destruction of breeding or resting places or structures used for shelter and protection (and prohibits obstructing access to these places or disturbing animals) does not apply when inside a dwelling house. In addition, development of land with planning permission that would otherwise be protected by this legislation may go ahead, provided that reasonable steps were taken to avoid or minimise the damage to protected species. In general, any predictable killing as a consequence of other activities may be considered deliberate under these regulations.

Always seek advice from the relevant Statutory Nature Conservation Organisation (i.e. English Nature, Countryside Council for Wales, Scottish Natural Heritage or the Environment and Heritage Service [Northern Ireland]) before any activity is carried out that may result in damage or disturbance of a protected species (see Appendix 2 for contact details). There may be a statutory consultation period, in some cases up to four months, between an application being made and permission being received.

9.2. THE HABITATS AND SPECIES DIRECTIVE 92/43/EEC

The Council Directive 92/43/EEC of 21st May 1992 on the Conservation of Natural Habitats and of Wild Flora and Fauna lists habitats and species which are regarded as of importance in the European Community. The main aim of the Habitats Directive is to promote maintenance of biodiversity via the creation of a network of protected wildlife areas across the European Union to be known as 'Natura 2000'. This network will consist of Special Areas of Conservation (SACs) designated under the Habitats Directive, and Special Protection Areas (SPAs) designated under the Birds Directive. The Habitats and Species Directive has been implemented in the UK via the (Natural Habitats and Species) Conservation regulations 1994 which builds upon and reinforces existing domestic law.

The following species which may be found in the built environment are European Protected Species:

- Horseshoe Bats (all species)
- Typical bats (all species)
- Dormouse
- Sand lizard
- Great Crested Newt
- Otter
- Smooth snake
- Natterjack Toad
- Floating-leaved water plantain

9.3. NEW LICENSING PROCEDURES FOR EUROPEAN PROTECTED SPECIES

For the development of existing buildings where European Protected Species are involved (see section 9.2) it is now increasingly expected that licences should be applied for from DEFRA (England) or NAW (Wales). The way this new system works is under review and varies geographically. In the first instance, contact the relevant SNCO (see Appendix 2). A consultant with experience of completing such licence application forms and holding Professional Indemnity Insurance may be required.

9.4. THE COUNTRYSIDE AND RIGHTS OF WAY ACT 2000

The Countryside and Rights of Way Act (2000) strengthens legal protection for threatened species in England and Wales and brings the Wildlife and Countryside Act 1981 up to date.

- It makes certain offences 'arrestable' - this also means that stronger search and seizure powers are available to the police.
- It creates a new offence of reckless disturbance i.e. the word "intentional" in the Wildlife and Countryside Act has now been replaced with the word "reckless" and it is now an offence if scheduled species are disturbed **without due thought**.

- It gives increased powers to the police and wildlife inspectors - they will have the power to enter premises to check species sales controls and can require tissue samples to be taken from wildlife species for DNA analysis.
- It enables Courts to impose heavier fines and prison sentences for virtually all wildlife offences.

9.5. THE PROTECTION OF BADGERS ACT 1992

Under this Act the following are criminal offences:

- To wilfully kill, injure, take or possess a badger, or to attempt to do so.
- To cruelly ill-treat badgers, to dig for any badger or use badger tongs in the course of taking or killing badgers, or attempting to do so.
- To have in one's possession any dead badger (including part or derivative,) if that badger was taken in contravention of the Act in operation at the time of death (i.e. after 1973).
- To possess or control any healthy, living badger for the purpose of sale.
- To intentionally damage, destroy or obstruct access to any part of a badger sett, to cause a dog to enter a sett or to disturb a badger when it is occupying a sett.

A badger sett is defined in the legislation as "any structure or place which displays signs indicating current use by a badger" and this includes seasonally used setts and the parts of buildings and above ground sites occasionally used by badgers. This includes garden sheds, outbuildings, culverts, land drains, hollow trees and large aboveground nests. Thus any object that forms a home of any significance for a badger is now protected, whether or not there is actually a badger in residence at the time of inspection.

9.6. PLANNING POLICY GUIDANCE NO. 9 (NATURE CONSERVATION)

Planning Policy Guidance notes set out the Government's policies on different aspects of planning. Local planning authorities must take these into account when preparing their development plans and when considering individual planning applications and appeals. Planning Policy Guidance: Nature Conservation (PPG9) was published in 1994 but is being revised at the time of writing. It gives guidance on how the Government's policies on nature conservation are to be reflected in land use planning. In Wales, TAN(W)5 – a technical advice note – provides information about nature conservation and planning. In Northern Ireland, the Planning Service has produced Planning Policy Statement No.2 – Nature conservation and planning. Both these documents comprise similar advice to that given in PPG9.

PPG9 states that the presence of protected species should be considered by planning authorities, and that they should consider using conditions in planning permissions to safeguard this interest. For example, if an area of grassland occupied by slow-worms was to be destroyed to accommodate a residential development, the planning authority could impose a condition to ensure that slow-worms were caught from the area to be developed and relocated to a suitably managed part of the site in order to help establish a nature reserve. Conditions can also be imposed to ensure a comprehensive survey of the wildlife interest of the site prior to development. PPG9 also states that certain features that function as stepping stones or linear landscape characters should be given special attention in planning issues. Therefore ponds, trees and hedges may be protected by policies in the Local Plan.

Species may also be protected by the designation of a site which they inhabit (e.g. as a Site of Special Scientific Interest [SSSI], Special Area of Conservation [SAC] etc). Although the protection afforded to these sites is not absolute, it means that the nature conservation interest receives greater consideration in planning issues.

9.7. THE BERN CONVENTION (1979)

The Convention on the Conservation of European Wildlife and Natural Habitats (1979), also known as the Bern Convention, came into force on 1 June 1982. This is the first international convention covering every aspect of nature conservation aiming to protect migratory species, such as birds or bats, consistently along their migration routes, and in places where they breed, rest or winter. It is translated into domestic legislation through the Wildlife and Countryside Act 1981. The aims of the Convention are to:

- Ensure that nature conservation requirements are taken more fully into account in the various sectoral policies, particularly planning and development policies.
- Guarantee minimum protection for most wild animal and plant species, and special protection for a number of particularly endangered species.
- To encourage co-operation between the Contracting Parties.

9.8. THE BONN CONVENTION (1979 & 1994)

The Convention on the Migratory species of Wild Animals (also known as the Bonn Convention), is intended to encourage co-operation between members in the conservation of species (such as bats) that move between range states. Appendix II lists those species for which range states are encouraged to set up beneficial agreements. One such agreement is the agreement on the Conservation of Bats in Europe which came into force in 1994. Its main provisions are to restrict the killing and capture of bats; the protection of key bat habitats; the co-ordination of research and conservation experience and increasing public awareness of bat conservation.

9.9. THE SPECIES RECOVERY PROGRAMME

Launched in April 1991 by English Nature, this Programme aims to achieve long-term self-survival in the wild of the species of plants and animals currently under the threat of extinction. It makes a vital contribution to Biodiversity: The UK Action Plan, and involves a combination of detailed survey work and ecological studies leading to an understanding of habitat requirements so that management plans can be adjusted accordingly. In some cases re-establishment of species in former sites or suitable alternatives will be promoted to ensure the long-term viability of populations.

9.10. THE CONVENTION ON BIOLOGICAL DIVERSITY: THE UK ACTION PLAN

Over 150 countries signed the Convention on Biological Diversity at the Earth Summit in Rio de Janeiro in 1992. As a result of this, in 1994 the UK Government produced Biodiversity: The UK Action Plan – a national strategy for the conservation and sustainable use of biological diversity. The Plan commits the UK Government to conservation and, where possible, enhancement of biological diversity.

9.11. BIRDS OF CONSERVATION CONCERN IN THE UK, CHANNEL ISLES AND ISLE OF MAN (1996)

Several of the leading non-governmental environmental agencies in the UK, including the National Trust, have together drawn up a list identifying the priorities for bird conservation. This list is divided into three sections: Red for species of high conservation concern; Amber for species of medium conservation concern; and Green for all other species which are of lower concern.

Red list species are those whose population or range is rapidly declining, recently or historically, and those of global conservation concern. Amber list species are those whose population is in moderate decline, rare breeders, internationally important and localised species, and those with an unfavourable conservation status in Europe. All other species are on the green list. Several bird species that are found within the built environment are Amber-listed including the barn owl, kestrel, little owl, swallow, stock dove, black redstart, starling and the spotted flycatcher.

10. WILDLIFE AND BUILDINGS - CHECKLIST

The following is applicable to both repair and maintenance operations, and new build:

Points of principle

1 The concept of repairing on a 'little and often' basis is as beneficial to the wildlife in and on buildings as it is to the preservation of historic fabric.
2 The avoidance of the use of chemicals wherever possible is environmentally sound and part of the Trust's developing general approach to conservation in the widest sense.
3 The use of traditional materials and techniques is also environmentally sound. This approach also tends toward the use of softer, natural materials, which are both more appropriate to building conservation and provide more attractive habitats for wildlife of all types.
4 Buildings should be viewed as an element of the wider environment, and both should be managed to achieve mutual benefit

The project manager should:

At the planning stage

- Consider 'wildlife' at an early stage in the planning process.
  - Is the presence of 'wildlife' known or understood?
  - Are rare or protected species present?
  - Is a survey needed for:
    - Plants?
    - Lichens?
    - Invertebrates?
    - Amphibians and reptiles?
    - Birds?
    - Mammals?
- How will their requirements be incorporated into the detailed planning?
- Are there timing constraints?
- How can the 'wildlife' interest be increased by the proposed operations?
- Is there a need to contact the relevant SNCO?

At the contract stage

- Are the 'wildlife' constraints or objectives fully documented?
- Are all parties aware of the constraints and objectives?
- Are those persons actually carrying out the work on site;
  - aware of the reasons for the approach being taken?
  - been told of the importance attributed to the subject?
  - have an understanding and sympathy for the approach being taken?

Post contract

- Has the ongoing 'wildlife' interest been built into future plans and maintenance programmes?
- Has the information generated by the process been recorded and, if so, where?
- Has the success/failure of actions been monitored and recorded?
- How can the enhanced knowledge gained be relayed to the public?

A proforma, designed by the National Trust's Yorkshire Regional Building Department, could be used to record wildlife in or on buildings (see section 11).

11. RECORDING FORM FOR WILDLIFE IN BUILT STRUCTURES

Record of wildlife in built structures

Property reference: **Grid ref:**	**Address:**		
Species in building/structure:	**Location within building/structure:**	**Recorded by:**	**Date:**

Recommendations for the management of each species:

Species	Seasonal constraints	Relative organisations contacted	Action date & initials

12. SUMMARY TABLES

Please remember that these are generic guidelines. They do not attempt to cover every situation, or list every plant or animal that may be encountered, or provide all the solutions. Rather they aim to cover the main types of wildlife that might be found, and to suggest further sources of information and guidance.

1. WALLS

Interest feature	Description	Issues	Management Guidelines	Page ref.
Herbaceous vascular plants	Small herbaceous species with soft stems such as ivy-leaved toadflax, ferns, hawkweeds, yellow corydalis, stonecrops, bellflowers, winter annuals, grasses, purple toadflax and many others.	Cause no damage.	Many are considered attractive and can be left to decorate walls, providing local character and softening otherwise hard landscape features. Ivy-leaved toadflax can become locally so dense that it obscures stonework and needs controlling by hand weeding. Piecemeal repair (little and often) recommended, allowing existing flora to spread onto new stonework.	7
Woody plants	Several of the most beautiful wall plants such as red valerian, snapdragon and wallflower. Perennials.	They have woody rootstocks and may damage stonework/mortar over long periods of time.	Often need to be removed - roots can cause damage & weight can bring down walls. Sometimes it is necessary to treat the cut stump with a systemic herbicide such as an approved glyphosate product to ensure the plant is killed.	7-8
Wisteria	An attractive plant that often grows on buildings, and one that can contribute to the general appearance of a romantic ruin.	Poses little threat on a well-maintained structure where it is artificially attached to the wall. On ruinous structures where the stems entwine around elements of the fabric, window mullions and transoms it leads to severe structural damage in just a few years.	On good well-maintained structures little control needed. On ruins, either needs an acceptance of the building's rapid demise, or the plants removed and avoidable damage rectified. Sometimes it is necessary to treat the cut stump with a systemic herbicide such as an approved glyphosate product to ensure the plant is killed.	8

WALLS CONTINUED

Interest feature	Description	Issues	Management Guidelines	Page ref.
Ivy	Common woody plant found on walls. Habitat and food source for invertebrates and birds. Important nectar source in late summer/ autumn.	Doesn't necessarily pose a threat. On good brickwork grows over surface with minimal damage. On older walls stems can enter cracks & expand & loosen blocks (though a really dense growth can help hold a wall together). Ivy may shade out valuable and attractive lichen communities and thus need controlling. Recent research suggests that ivy does not affect the humidity of walls. A dense growth at wall heads can impose additional stresses on the structure which can lead to premature failure.	If ivy does need removal it is best to cut the plant at its base and then allow it to decay naturally. If just pulled off the wall fragments of stonework may also be removed. Sometimes it is necessary to treat the cut stump with a systemic herbicide such as an approved glyphosate product to ensure the plant is killed.	7-8
Bryophytes	Mosses and liverworts. A number are protected under the Wildlife and Countryside Act, 1981 (and equivalent Wildlife Order in Northern Ireland, 1985).	Present little threat to a building – their root-like rhizoids can do no damage. They absorb and hold moisture, keeping the surfaces damp which can accelerate weathering.	Where bryophytes are causing problems, hand removal is usually sufficient. It is an offence to destroy protected species, wherever they are found, when it can be reasonably avoided.	8
Lichens	Lichens are symbiotic associations between algae and fungi. More than 600 lichens have been recorded from the built environment. A few of these that appear almost exclusively on built structures are nationally scarce. Some are protected by law. They are important in softening the appearance of many built structures.	Most lichens cause no damage. In extreme situations lichens may cause chemical erosion of friable stonework surfaces, etch stained glass and obscure inscriptions.	Chemical control should only be used in exceptional circumstances. Cleaning stonework is not recommended because it can cause more harm than good by exposing fresh layers for further weathering. Piecemeal or phased repair of walls is recommended as this allows the existing flora to colonise new stonework. On the wall top it is important to ensure that stones are replaced in the same orientation. It is an offence to destroy protected species.	12-13

WALLS CONTINUED

Interest feature	Description	Issues	Management Guidelines	Page ref.
Masonry bees	Several species of solitary bees nest in crevices or holes in masonry and are known as "masonry" or "mortar" bees.	Most species use pre-existing cavities in which to build mud nests, only excavating cavities in hard materials such as mortar when it is already cracked and weathered. Only one scarce species of bee, *Colletes daviesanus*, has the ability to dissolve the chemicals cementing sand together.	Occasionally masonry bee burrows honeycomb a particularly soft sandstone block or a region of pointing – the only solution is to replace the weakened material or re-point the worst affected areas with a lime-based mortar. This should only be done when there is a strong need, and in rotation. Spraying insecticides on walls is not recommended. It is unlikely to provide a long-term solution, as favourable sites are likely to be re-colonised from the surrounding areas.	17&20
Honey bees	Honey bees are social insects which live together in large groups. They are important pollinators of both commercial crops and garden plants. Occasionally honey bees nest in roof voids and wall crevices.	Honey bees have declined in number over recent years due to the *Varroa* mite which can result in the loss of entire colonies.	If honey bees are present and the colony is away from the site of any building work it is best to leave them undisturbed. They are not aggressive and will only sting when provoked. If the bees are in the way of building work and are not swarming, contact your local authority and/or local beekeeper who will remove the bees and their nest. If the bees are swarming do not panic. When swarming bees are reluctant to sting as they have gorged themselves with honey and cannot get their bodies into the best position to sting. Your local beekeeper should be able to take away the swarm.	19&21

WALLS CONTINUED

Interest feature	Description	Issues	Management Guidelines	Page ref.
Amphibians and reptiles	Amphibians, such as the threatened great crested newt, and reptiles, such as slow-worms, often hibernate in walls and ha-has.	The availability of suitable hibernacula can be an important factor in determining the local abundance of great crested newts. All amphibians and reptiles receive some legal protection in the UK. Both amphibians and reptiles may be encountered when walls and other structures are taken apart.	Never re-point walls and ha-has without first surveying for the presence of amphibians and reptiles. If great crested newts are known to be present contact the relevant SNCO for advice. Do not fill in voids in garden walls, ha-has and other such structures without good reason. Both amphibians and reptiles often shelter in these voids and may be entombed if they are filled in. If bitten by a snake seek immediate medical attention.	23-25
Little owls	The little owl is Britain's smallest owl at just 210mm tall.	Its small size allows it to use a larger variety of nest sites than other owl species which may include crevices in walls and farm buildings.	When any work is planned on a barn or any other old building it is recommended that a survey is carried out to determine whether or not birds of prey are present. If they are present contact your SNCO before any work begins.	26&28
Bats	Bats are the only flying mammals. There are at least 16 species in the UK, all of which are protected by law. Bats are becoming more and more dependent on buildings as their natural roosting places in tree holes and caves become rarer or more disturbed.	Roosts are commonly found in roofs and underground sites, and also in walls (e.g. inside cavity walls, hibernating in the loose 'infill' in older style 'thick' walls, around/on the gable end wall, under weather boarding or hanging tiles, and in gaps behind cladding tiles or wood).	All bats are fully protected by law. There is a presumption that bats will be present in National Trust buildings and other structures. If bats are known to be present the approval of the relevant SNCO must be obtained before any work is started. If bats are not discovered until after building work has begun, the work should be stopped immediately and the relevant SNCO contacted for advice.	31-35

2. ROOFS

Interest feature	Description	Issues	Management Guidelines	Page ref.
Bryophytes	Mosses and liverworts. A number are protected under the Wildlife and Countryside Act, 1981.	Present little threat to a building – their root-like rhizoids can do no damage. They absorb and hold moisture, keeping the surfaces of tiles and slates damp which can accelerate weathering. If the retained water freezes, the roof tiles/slates may be damaged. Drying colonies can come off the roof and block gutters and flumes.	**IF IT IS BELIEVED THAT MOSS/LIVERWORT GROWTH ON A CERTAIN ROOF SLOPE NEEDS TO BE CONTROLLED, CARE MUST BE TAKEN THAT THE PLANTS ARE NOT COMPLETELY REMOVED IF ANY ARE RARE. IT IS AN OFFENCE TO DESTROY PROTECTED SPECIES, WHEREVER THEY ARE FOUND, WHEN IT CAN BE REASONABLY AVOIDED.**	8
Lichens	Lichens are symbiotic associations between algae and fungi. More than 600 lichens have been recorded from the built environment. A few of these that appear almost exclusively on built structures are nationally scarce. Some are protected by law. They are important in softening the appearance of many built structures.	Most lichens cause no damage. In extreme situations lichens may cause chemical erosion of friable stonework surfaces, etch stained glass and obscure inscriptions.	Chemical control should only be used in exceptional circumstances. Cleaning stonework is not recommended because it can cause more harm than good by exposing fresh layers for further weathering. When re-roofing try to keep a few old, lichen-covered tiles to one side and place these evenly among the new tiles to allow the existing lichen flora to colonise them. It is an offence to	12-13

ROOFS CONTINUED

Interest feature	Description	Issues	Management Guidelines	Page ref.
Fungi, moulds and rots	Fungi are not plants although they have been classed as such for many years. They are actually more closely related to animals, but are distinct and separate life forms, and are now placed in their own Kingdom. They are heterotrophic, absorbing nutrients from the environment around them. The bulk of the fungus (mycelium) consists of a web of tiny filaments known as hyphae, which is found growing throughout the substrate on which it is feeding. The mushrooms, toadstools and moulds that we see are the fruiting bodies of the fungus.	Fungi are very diverse and can utilise a wide range of foodstuffs. Buildings present them with a range of potential food sources, from roofing timbers to wallpaper and textiles. They can cause irreversible damage to these materials.	Fungi thrive in humid conditions. It thus follows that to reduce the risk of fungal decay in buildings it is necessary to avoid a high humidity environment and ensure good ventilation. • Identify and eliminate all sources of damp. • Remove and replace any rotted wood. • Try to maintain humidity conditions below 65%RH and ensure that ventilation is good. • Maintain high standards of hygiene - dirt and dust provide havens for fungal spores.	14-16
Wood-boring insects	Wood-boring beetles are rarely seen and are difficult to identify. Usually their presence is indicated by their flight holes in colonised timber – the holes from which the adult beetles emerge.	Wood-boring beetle species present a readily identifiable threat to the integrity of a building's structure.	Badly affected timbers may need replacement. Removed timbers should not be burnt, but where possible, stood up in the sun in a suitable place. The old burrows will provide nesting sites for other invertebrates. Destruction of affected timbers is unlikely to affect the potential infective population of the beetles, which are present in many growing trees. Fence-posts are particularly important in garden situations for wood-boring beetles. If practical, they should be retained in situ with new posts alongside when re-fencing.	17&20

ROOFS CONTINUED

Interest feature	Description	Issues	Management Guidelines	Page ref.
Social wasps	Social wasps make large nest structures, using overhangs (such as under the eaves) and roof voids as nest sites.	Although social wasps are usually treated as pests, it should be taken into account that their larvae are fed vast numbers of insects, including many garden pests. Social wasps can be a nuisance and have a painful sting. However, they usually only sting if disturbed.	If a nest is away from direct, accidental, disturbance it is better to avoid it rather than destroy it. Leave old nests in situ as a number of other insects scavenge in the base of the nest. If the wasps really are causing an unavoidable problem it may be necessary to control or eliminate the colony. Professional help should sought, as the risk to an untrained person dealing with a wasps' nest can be significant. Contact your local authority for advice.	19&21
Honey bees	Honey bees are social insects which live together in large groups. They are important pollinators of both commercial crops and garden plants. Occasionally honey bees nest in roof voids and wall crevices.	Honey bees have declined in number over recent years due to the *Varroa* mite which can result in the loss of entire colonies.	If honey bees are present and the colony is away from the site of any building work it is best to leave them undisturbed. They are not aggressive and will only sting when provoked. If the bees are in the way of building work and are not swarming, contact your local authority and/or local beekeeper who will remove the bees and their nest. If the bees are swarming do not panic. When swarming bees are reluctant to sting as they have gorged themselves with honey and cannot get their bodies into the best position to sting. Your local beekeeper should be able to take away the swarm.	19&21

ROOFS CONTINUED

Interest feature	Description	Issues	Management Guidelines	Page ref.
Cluster flies	Cluster flies are large, greyish flies that can appear in buildings during the winter, though the term 'cluster-fly' may also be used to describe the autumn-fly and the green cluster-fly.	They do not pose any risks to human health. However, in some places they occur in their thousands and are a nuisance as they buzz around lamps and fall into teacups.	Application of insecticides to control cluster flies is not recommended. A better short-term solution is to hoover up the flies and then place the hoover bag in a deep freeze to kill them. Longer-term solutions involve blocking off the routes that the flies use to enter the building e.g. gaps under the soffits. If such measures are used, care must be taken that access points for bats and other organisms are not obstructed and that ventilation is maintained.	19&22
House flies	House flies are about 6mm long and grey/black in colour. Lesser house flies are superficially similar to house flies but are slightly smaller. They are associated with poor hygiene and rotting organic matter	They can cause superficial damage to surfaces, by leaving disfiguring 'flyspots' which are residues of vomit and faecal material. They are pests as they can carry diseases which can be transmitted to people when the flies rest and feed on food.	Application of insecticides to control domestic flies is not recommended – this only provides short term relief from the problem and will not solve it. It may also cause damage to other wildlife such as bats. Improved hygiene will usually reduce the number of flies - remove refuse, clear drains and clean areas of decomposing material. Routes for flies can be blocked by keeping doors and windows shut or by using fly screens.	20&22
House sparrow	The once familiar house sparrow is exclusively found in association with buildings. It is declining as a result of agricultural intensification.	Neither a significant nuisance or health hazard.	House sparrows nest in loose colonies under eaves, in wall crevices or in ivy. Avoid disturbing the colony in the nesting season.	28&29

ROOFS CONTINUED

Interest feature	Description	Issues	Management Guidelines	Page ref.
Barn owl	The barn owl is white and pale brown. It sometimes nests in the roof spaces of barns and outbuildings. Recent changes in farming methods have led to the decline of this beautiful species that needs lots of rough grassland close to its breeding site in which its favoured prey, the field vole, flourishes.	The barn owl is specially protected under the Wildlife and Countryside Act 1981.	When any work is planned on a barn or any other old building it is recommended that a survey is carried out to determine whether or not birds of prey are present. If they are present contact your SNCO before any work begins. Nest boxes can be provided for barn owls (see Appendix 3).	26&28
Other birds of prey	Little owls, kestrels and peregrines may all be found nesting in roof spaces in farm buildings. Peregrines may also be found in more urban areas.	All bird of prey species are protected by law.	When any work is planned on a barn or any other old building it is recommended that a survey is carried out to determine whether or not birds of prey are present. If they are present contact your SNCO before any work begins.	26-28
Swifts	Swifts are black-brown all over, with a pale chin and throat. The beak which is small with a wide gape, is adapted to catching flying insects at high speed. The tail is short and forked, and the wings disproportionately long in relation to the rest of the body, giving the characteristic crescent shape in flight. They are summer visitors, arriving in May and leaving by the end of August.	Swifts are highly dependent on man-made structures, nesting between poorly fitting roof slates or tiles, under the eaves, in ventilators and in other small cavities. They commonly choose domestic properties as nesting sites but are being excluded from their usual nesting places in roofs as a result of modern building methods, changes in building regulations and better maintenance.	Maintenance or improvement work to buildings being used by swifts can often cause problems for the birds. Any work should be carried out prior to May or after mid-August (outside of the nesting season), because if disturbed the birds may abandon eggs or young nestlings. It is not always obvious when swifts are using a particular building and it is recommended that a check is carried out before any work is begun.	27-28

ROOFS CONTINUED

Interest feature	Description	Issues	Management Guidelines	Page ref.
Swallows	Swallows are similar in shape and size to swifts but have long and slender forked tails. They have a dark blue plumage with a red bib and white belly.	They construct open-topped nests made of mud, bound with dried grasses and lined with feathers. The nests are usually glued to masonry or a wooden beam in a barn or outbuilding 5-10cm beneath the ceiling or roof lining.	When buildings are renovated it is important to maintain an entry point for the birds. A 100mm wide gap between the door frame and the top of the replacement doors is usually sufficient. To prevent their excrement causing a nuisance a 250mm wide plywood board can be suspended below the nest on string or lightweight chains to catch any droppings.	27-29
House martins	House martins are not dissimilar in appearance to swifts and swallows especially when seen on the wing. Like swallows they have a dark blue plumage. They are most easily identified when in flight by their white rumps and a forked tail which is much shorter than that of a swallow.	Martins usually build on the outside of buildings, commonly under the shelter of the eaves. They construct mud nests similar in size and appearance to swallows, usually using the wall and soffit board as the two anchor points. However, unlike swallows, their nests are not open topped but fully enclosed with a small entrance hole in the side.	House martins need a rough nesting surface to allow the wet mud to stick successfully. To encourage martins to rebuild following renovation or repainting of soffit boards, soffit or facing boards with rough surfaces should be used. To prevent their excrement causing a nuisance a 250mm wide plywood board can be suspended below the nest on string or lightweight chains to catch any droppings.	28&29
Pigeons	Pigeons are colonial, long domesticated, and now feral birds which are commonly found in the built environment.	Domestic pigeons can cause considerable nuisance by fouling the buildings they nest on. They are also thought to be involved in the spread of disease.	Deny them nest sites by barring access to cornices, closing roof-lights and so on. Try to restrict them to traditional dovecotes.	28&29

ROOFS CONTINUED

Interest feature	Description	Issues	Management Guidelines	Page ref.
Bats	Bats are the only flying mammals. There are at least 16 species of bat present in the UK, all of which are protected by law. Bats are becoming more and more dependent on buildings as their natural roosting places in tree holes and caves become rarer or more disturbed.	Bats are commonly found in roofs. Outside they may roost: above soffits and behind fascia and barge boarding, between underfelt and boards/tiles, under lead-work – such as flashing around chimneys, and between/under stone tiles. Inside they may be found: Along the roof ridge beam and under the ridge tiles (or lead ridge), hanging from roofing felt or roof supporting timbers, around the chimney breast, in the joints of joists, such as mortice and tenon joints that have become twisted/warped or have 'shrunk' allowing bats access, and in splits in old timbers in roof voids.	All bats are fully protected by law. There is a presumption that bats will be present in National Trust buildings and other structures. If bats are known to be present the approval of the relevant SNCO must be obtained before any work is started. If bats are not discovered until after building work has begun, the work should be stopped immediately and the relevant SNCO contacted for advice.	31-35
Rodents	Rats and house mice can pose a danger to the contents of a building, and a health risk to humans. They gnaw timbers, wiring and other objects, eat stored food and can spread disease.	In certain circumstances it may be necessary to control rodents by laying traps or using rodenticides.	The Trust has a list of those products endorsed for use in controlling rodent pests in buildings. This list, "COSHH Professional products endorsed for use within the National Trust: gardens, woods, and countryside" is updated annually and can be obtained from Regional COSHH Co-ordinators or the National Trust Health and Safety Department.	32&35

3. TIMBER

Interest feature	Description	Issues	Management Guidelines	Page ref.
Lichens	Lichens are symbiotic associations between algae and fungi. More than 600 lichens have been recorded from the built environment. A few of these that appear almost exclusively on built structures are nationally scarce. Some are protected by law. They are important in softening the appearance of many built structures.	Untreated timber provides an important habitat for certain species of lichen – 280 species of lichen will colonise timber, including a small number of nationally rare species which may be found on old wooden seats, untreated oak gates and old barn timbers.	Try to use untreated timber. In fencing, although treated timber may be more suitable for uprights, the use of local untreated wood for horizontal rails will allow the development of a natural worked timber lichen flora. It is an offence to destroy protected species.	12-13
Fungi, moulds and rots	Fungi are not plants although they have been classed as such for many years. They are actually more closely related to animals, but are distinct and separate life forms, and are now placed in their own Kingdom. They are heterotrophic, absorbing nutrients from the environment around them. The bulk of the fungus (mycelium) consists of a web of tiny filaments known as hyphae, which is found growing throughout the substrate on which it is feeding. The mushrooms, toadstools and moulds that we see are the fruiting bodies of the fungus.	Fungi are very diverse and can utilise a wide range of foodstuffs. Buildings present them with a range of potential food sources, from roofing timbers to wallpaper and textiles. They can cause irreversible damage to these materials.	Fungi thrive in humid conditions. It thus follows that to reduce the risk of fungal decay in buildings it is necessary to avoid a high humidity environment and ensure good ventilation. • Identify and eliminate all sources of damp. • Remove and replace any rotted wood. • Try to maintain humidity conditions below 65%RH and ensure that ventilation is good. • Maintain high standards of hygiene - dirt and dust provide havens for fungal spores.	14-16

TIMBER CONTINUED

Interest feature	Description	Issues	Management Guidelines	Page ref.
Wood-boring insects	Wood-boring beetles are rarely seen and are difficult to identify. Usually their presence is indicated by their flight holes in colonised timber – the holes from which the adult beetles emerge.	Wood-boring beetle species present a readily identifiable threat to the integrity of a building's structure.	Badly affected timbers may need replacement. Removed timbers should not be burnt, but where possible, stood up in the sun in a suitable place. The old burrows will provide nesting sites for other invertebrates. Destruction of affected timbers is unlikely to affect the potential infective population of the beetles, which are present in many growing trees. Fence-posts are particularly important in garden situations for wood-boring beetles. If practical, they should be retained in situ with new posts alongside when re-fencing.	17&20
Bats	Bats are the only flying mammals. There are at least 16 species of bat present in the UK, all of which are protected by law. Bats are becoming more and more dependent on buildings as their natural roosting places in tree holes and caves become rarer or more disturbed.	Bats are commonly found in and around roofing timber. Outside they may roost: above soffits and behind fascia and barge boarding, between underfelt and boards/tiles. Inside they may be found: along the roof ridge beam, hanging from roof supporting timbers, in the joints of joists, such as mortice and tenon joints that have become twisted/warped or have 'shrunk' allowing bats access, and in splits in old timbers in roof voids. Bats are rarely actually seen in roof voids - often it is their droppings that give an indication of their presence.	All bats are fully protected by law. There should be a presumption that bats will be present in National Trust buildings and other structures. If bats are known to be present the approval of the relevant SNCO must be obtained before any work is started. If bats are not discovered until after building work has begun, the work should be stopped immediately and the relevant SNCO contacted for advice.	31-35

4. UNDERGROUND SITES

Interest feature	Description	Issues	Management Guidelines	Page ref.
Bats	Bats are the only flying mammals. There are at least 16 species of bat present in the UK, all of which are protected by law. Bats are becoming more and more dependent on buildings as their natural roosting places in tree holes and caves become rarer or more disturbed.	Bats hibernate in cellars, icehouses, stone mines and caves – horseshoe bats may hang, but other species use cracks and crevices for hibernation and are unlikely to be seen except by expert close inspection. They may also use warm boiler rooms for breeding.	All bats are fully protected by law. There is a presumption that bats will be present in National Trust buildings and other structures. If bats are known to be present the approval of the relevant SNCO must be obtained before any work is started. If bats are not discovered until after building work has begun, the work should be stopped immediately and the relevant SNCO contacted for advice.	31-35
Rodents	Rats and house mice can pose a danger to the contents of a building, and a health risk to humans. They gnaw timbers, wiring and other objects, eat stored food and can spread disease.	In certain circumstances it may be necessary to control rodents by laying traps or using rodenticides.	The Trust has a list of those products endorsed for use in controlling rodent pests in buildings. This list, "COSHH Professional products endorsed for use within the National Trust: gardens, woods, and countryside" is updated annually and can be obtained from Regional COSHH Co-ordinators or the Health and Safety Department.	32&35
Burrowing animals	Includes moles, rabbits and badgers.	Burrowing animals can pose a real threat for some archaeological built structures and earthworks (barrows, hillforts etc.). Their burrows can undermine buildings, driveways and other structures.	Control should follow appropriate MAFF (now DEFRA), or DARD (Department of Agriculture and Rural Development in Northern Ireland) guidelines, but not include any activity that involves digging or disturbance to the soil.	32&35

UNDERGROUND SITES CONTINUED

Interest feature	Description	Issues	Management Guidelines	Page ref.
Badgers	Badger setts are usually situated in small clearings in woodland or copses. Well-established setts normally have several entrances which are much larger than rabbit holes, and which have large piles of earth and used bedding (dried leaves and grass etc.) otside. The sett consists of large chambers for sleeping and breeding and small ones used as latrines, interlinked by a maze of tunnels. A really big sett can have from 50 to 100 or more entrance holes.	As towns and villages expand in size, the greater the number of occasions on which an occupied badger sett is found to be in the way of a building programme. Badgers are a protected species (under The Protection of Badgers Act 1992,) and therefore developers and others must conform with statutory species protection. Work that disturbs badgers without a licence may be illegal; badgers may be disturbed even if the work does not directly interfere with or cause damage to their sett.	English Nature guidelines suggest that a buffer zone between the sett entrances and the building work is established. For example, use of heavy machinery should only be carried out at distances greater than 30m from the sett, work with lighter machinery at distances greater than 20m and light work such as hand digging or scrub clearance at distances greater than 10m. If it is necessary that such activities are carried out within these buffer zones, licences should be sought from the relevant SNCO.	32&35

5. INTERIORS

Interest feature	Description	Issues	Management Guidelines	Page ref.
Fungi, moulds and rots	Fungi are not plants although they have been classed as such for many years. They are actually more closely related to animals, but are distinct and separate life forms, and are now placed in their own Kingdom. They are heterotrophic, absorbing nutrients from the environment around them. The bulk of the fungus (mycelium) consists of a web of tiny filaments known as hyphae, which is found growing throughout the substrate on which it is feeding. The mushrooms, toadstools and moulds that we see are the fruiting bodies of the fungus.	Fungi are very diverse and can utilise a wide range of foodstuffs. Buildings present them with a range of potential food sources, from roofing timbers to wallpaper and textiles. They can cause irreversible damage to these materials.	Fungi thrive in humid conditions. It thus follows that to reduce the risk of fungal decay in buildings it is necessary to avoid a high humidity environment and ensure good ventilation. • Identify and eliminate all sources of damp. • Remove and replace any rotted wood. • Try to maintain humidity conditions below 65%RH and ensure that ventilation is good. • Maintain high standards of hygiene - dirt and dust provide havens for fungal spores.	14-16
Wood-boring beetles	Wood-boring beetles are rarely seen and are difficult to identify. Usually their presence is indicated by their flight holes in colonised timber – the holes from which the adult beetles emerge.	Wood-boring beetles can cause severe damage to wooden furniture and other wooden artefacts in buildings.	Environmental control is important in reducing the threat from wood-boring beetles. They require high humidity levels, so keeping important wooden pieces in an environment where the relative humidity is less than 65% will reduce the risk of damage by beetles.	17&20
Moths, beetles, booklice and silverfish	A variety of insects feed on, and damage, textiles and other collections. The main insect pest species in the UK are clothes moths and carpet beetles.	The most susceptible objects are those containing materials of animal origin such as wool (or wool products such as felt), animal fur, feathers and hair, and untanned leather and skins.	Prevention is better than cure when it comes to dealing with insect pests in buildings. Continuous application of chemical pesticides is neither environmentally friendly nor sustainable and other means of control are frequently more appropriate. Integrated pest management (IPM) can be effectively applied to the care of buildings and historic collections.	18-20

INTERIORS CONTINUED

Interest feature	Description	Issues	Management Guidelines	Page ref.
Cluster flies	Cluster flies are large, greyish flies that can appear in buildings during the winter, though the term 'cluster-fly' may also be used to describe the autumn-fly and the green cluster-fly.	They do not pose any risks to human health. However, in some places they occur in their thousands and are a nuisance as they buzz around lamps and fall into teacups.	Application of insecticides to control cluster flies is not recommended. A better short-term solution is to hoover up the flies and then place the hoover bag in a deep freeze to kill them. Longer-term solutions involve blocking off the routes that the flies use to enter the building e.g. gaps under the soffits. If such measures are used, care must be taken that access points for bats and other organisms are not obstructed and that ventilation is maintained.	19&22
House flies	House flies are about 6mm long and grey/black in colour. Lesser house flies are superficially similar to house flies but are slightly smaller. They are associated with poor hygiene and rotting organic matter	They can cause superficial damage to surfaces, by leaving disfiguring 'flyspots' which are residues of vomit and faecal material. They are pests as they can carry diseases which can be transmitted to people when the flies rest and feed on food.	Application of insecticides to control domestic flies is not recommended – this only provides short term relief from the problem and will not solve it. It may also cause damage to other wildlife such as bats. Improved hygiene will usually reduce the number of flies - remove refuse, clear drains and clean areas of decomposing material. Routes for flies can be blocked by keeping doors and windows shut or by using fly screens.	20&22
Bats	Bats are the only flying mammals. There are at least 16 species of bat present in the UK, all of which are protected by law. Bats are becoming more and more dependent on buildings as their natural roosting places in tree holes and caves become rarer or more disturbed.	Bat excreta may cause damage to vulnerable objects and furnishings in buildings. Droppings may cause pitting, long-term staining and etching to porous materials such as painted wall surfaces, stone and wooden monuments and sculptures, while urine causes spotting and etching of wooden, metal and painted surfaces. Urine (which is 70% urea) is chemically more aggressive and therefore of greater conservation concern.	Before management begins, assess bat activity and its effects on the building's contents. Information is needed on the bats, vulnerable contents, rate of deposition and the seasons when it occurs, the extent of the damage. Once these assessments are complete, the following management techniques may be implemented: do nothing, moving objects, covers, coatings, deflector boards, relocation of roosts or access points, or exclusion. Contact your SNCO for advice before working on a building where bats are present.	31-35

INTERIORS CONTINUED

Interest feature	Description	Issues	Management Guidelines	Page ref.
Rodents	Rats and house mice can pose a danger to the contents of a building, and a health risk to humans. They gnaw timbers, wiring and other objects, eat stored food and can spread disease.	In certain circumstances it may be necessary to control rodents by laying traps or using rodenticides.	The Trust has a list of those products endorsed for use in controlling rodent pests in buildings. This list, "COSHH Professional products endorsed for use within the National Trust: gardens, woods, and countryside" is updated annually and can be obtained from Regional COSHH Co-ordinators or the National Trust Health and Safety Department.	32&35

6. PONDS AND OTHER WATER FEATURES

Interest feature	Description	Issues	Management Guidelines	Page ref.
Invertebrates	Various freshwater invertebrates such as beetles, water scorpions, crayfish and snails may all be found in man-made ponds and lakes.	These animals are often disturbed or killed when ponds are drained or filled in. Certain species, such as the native white-clawed crayfish, are protected by law.	Survey for the presence of invertebrates before beginning works on a water feature and try to time such works to avoid the breeding season (May-September). If protected species are found to be present, consent needs to be sought from the relevant SNCO before the works can proceed.	37
Amphibians	Amphibians lay their eggs in water, although as adults they spend the majority of their time on dry land. Some of the UK's amphibians, including the great crested newt and natterjack toad, are becoming scarce and are protected by law.	Amphibians are often killed when ponds and other water features are filled in, cleared or drained during their breeding season.	The timing of operations is important – ponds are best drained or cleared in autumn and winter when amphibians (and other species) are likely to be absent, or present in very low numbers. If protected species are present, consent needs to be sought from the relevant SNCO before the works can proceed	37
Water voles	The water vole used to be a common sight on waterways and ponds throughout Britain. Unfortunately it has declined significantly over recent years – it has been lost from 90% of the sites where it was found earlier this century. It may be found inhabiting "designed" lakes and rivers. Water voles are absent from Ireland.	It is an offence (under the Wildlife and Countryside Act 1981) to intentionally: damage, destroy or obstruct access to any structure or place which water voles use for shelter or protection and to disturb water voles while they are using such a place.	Where building work is likely to affect water voles or their habitat the following action may be taken: planning the development to avoid water vole habitats, excluding water voles from development areas, trapping, removing and releasing the voles in an appropriate site or incorporating habitat enhancement into the works – development sometimes provides opportunities for this (e.g. the restoration of vegetated bankside corridors to link fragmented water vole populations). Conservation advice should always be sought from the relevant SNCO and, in England and Wales Environment Agency staff, before any riverbank or channel management work is carried out.	37&38

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13. GLOSSARY

Algae	This is a large group of diverse unicellular and multicellular aquatic plants; they grow in both fresh water and seawater.
Amphibian	Any of a class (Amphibia) of cold-blooded vertebrates (e.g. frogs, toads, or newts) intermediate in many characters between fish and reptiles, and having gilled aquatic larvae and air-breathing adults.
Antennae	One of a pair of slender movable segmented sensory organs on the head of insects and crustaceans.
Barge boards	Projecting boards on the sloping sides of the roof at the gable ends concealing the ends of the horizontal roof timbers.
Biocides	A substance that is destructive to many different organisms.
Botanical interest	The plant life of a place/structure.
Bryophyte	Any of a division (Bryophyta) of non-flowering plants comprising the mosses and liverworts.
Built environment	Encompasses all built structures including buildings, monuments, bridges and made-made ponds and rivers.
Buttress	A mass of masonry built against a wall to give added strength.
Carrion	The flesh of dead and decaying animals.
Cavity wall	External wall built with two leaves, usually of brick or blockwork, separated by a gap or cavity 50mm wide.
Cladding tile	An often vertically hung tile, acts as weather protection to the underlying structure.
Cocoons	A protective covering produced by some animals.
Colony	A distinguishable localised population within a species.
Corbelled foundations	A traditional way of creating a wider below ground base to a wall by stepping out successive (brick) courses.
Cornice	Found both externally and internally. Externally, it is any projecting ornamental moulding on the top of a building or over an architrave to a door or window. Internally, it is either a decorative band at the junction between the wall and the ceiling or a projecting detail over one of the room's features e.g. a chimneypiece or doorcase.
COSHH	Control Of Substances Hazardous to Health.
Crustacean	Any of a large class (Crustacea) of mostly aquatic arthropods that have an exoskeleton, a pair of often much modified appendages on each segment, and two pairs of antennae and that includes the lobsters, shrimps, crabs, wood lice, water fleas, and barnacles.
Culvert	A transverse drain.
Deforestation	The clearing of forests.
Desiccation	The process of drying up.
Detritivore	An organism that feeds on detritus.
Dormant	Temporarily devoid of activity.
Eaves	The overhanging edge of a roof.
Facing board	A dressed timber finishing piece, edging the face of e.g. a door opening.
Fascia	Board on edge, running horizontally and fixed to the ends of the rafters; the guttering is screwed to it.
Fauna	Animal life.
Flashing	Strips of metal (usually lead) used on roofs to protect joints against damp.
Flight holes	The exit holes made by wood-boring beetles in timber.
Flora	Plant life.
Flume	An inclined channel for conveying water.
Forage	Food for animals, particularly that taken by browsing or grazing.
Foundations	The whole masonry substructure of a building.
Frass	Excrement produced by insects.
Friable	Easily crumbled or pulverised.
Fumigation	To apply smoke, vapour, or gas for the purpose of disinfecting or of destroying pests.
Fungi	Any of a major group of saprophytic and parasitic spore-producing organisms that include moulds, rusts, mildews, smuts, mushrooms, and yeasts.
Fungicides	Substances that damage or destroy fungi.
Gable	The triangular upper portion of an end wall supporting a pitched roof.
Greenfield	Sites which have not previously been developed.

Habitats	The place or environment where a plant or animal naturally or normally lives and grows.
Ha-ha	A sunken boundary usually found between gardens and parkland designed to keep stock out of gardens, and to create the illusion that the grounds of the house continue unbroken as far as the eye can see.
Hard capping	Placing hard mortar or cement on wall tops.
Hardwood	The wood of an angiospermous tree (such as oak or beech) as distinguished from that of a coniferous tree.
Harvestman	An arachnid (order Phalangida) that superficially resembles a true spider but has a small rounded body and very long slender legs, also called *daddy longlegs* (as are craneflies).
Haustoria	Food-absorbing outgrowths of plants.
Heave	The volumetric expansion of soil caused by an increase in water content.
Herbaceous	A plant having little or no woody tissue and persisting usually for a single growing season.
Herbicides	Substances that damage or destroy plants.
Herpetofauna	Amphibians and reptiles.
Heterotrophic	A type of nutrition in which energy is obtained by absorbing nutrients from the surrounding environment. Fungi and all animals are heterotrophs.
Hibernacula	Shelters occupied during the winter by dormant animals.
Higher plants	Plants which produce flowers (see also vascular plants).
Humidity	The degree of wetness.
Hyphae	Tiny filaments that make up a fungal mycelium.
Insect	Any of a class (Insecta) of arthropods (e.g. beetles or bees) with well-defined head, thorax, and abdomen, only three pairs of legs, and typically one or two pairs of wings.
Invertebrate	Generally, any multicellular animal that does not have a spine (vertebrae).
Joist	Horizontal timbers to support ceilings, floors or both.
Keratin	The protein found in wool, feathers, fur, hair etc.
Larvae	The early form of an animal (e.g. a frog or insects) that at birth or hatching is fundamentally unlike its parent and must metamorphose before assuming the adult characters.
Lichen	A symbiotic association between an alga and a fungus.
Liverwort	Any of a class (Hepaticae) of bryophytic plants that resembles a moss.
Masonry	Stone, brick or tile.
Mildew	The name given to a type of mould, usually black, powdery growths though they may be brown, red or grey.
Mollusc	Any of a large phylum (Mollusca) of invertebrate animals (e.g. snails, clams, or squids) with a soft unsegmented body usually enclosed in a calcareous shell.
Mortar	A mixture of lime or cement with sand and water, used as a binding material for bricks and stone and as a plaster. Lime mortar consists of sand, water, and slaked lime ($Ca(OH)_2$), a white solid produced when lime reacts with water.
Mortice (joint)	The female part of a mortice and tenon joint used in traditional timber construction, e.g. often found in a roof between the collars and principle rafters.
Mould	Mould is a generic term given to a variety of fungal growths
Mycelium	A mass of interwoven filamentous hyphae that forms the bulk of a fungus and is often submerged in another body (e.g. soil or organic matter).
Niche	A habitat supplying the factors necessary for the existence of an organism or species OR the ecological role of an organism in a community especially in regard to food consumption.
Omnivorous	Feeding on both animal and vegetable substances.
Organism	A living being.
Owl pellet	Regurgitated, compact pellets containing indigestible portions of owl's food, such as bones, hair, and feathers.
Owl window	Small openings high in the gable end of buildings through which barn owls can fly and gain access to the interior.
Parasitise	To infest, or live on or with, as a parasite.
Perennial	A plant persisting for several years usually with new herbaceous growth from a perennating part.
Pheromone	A chemical substance that is produced by an animal and serves especially as a stimulus to other individuals of the same species for one or more behavioural responses.

Piecemeal repair	Repairing one piece at a time.
Plumage	The feathers of a bird.
Re-colonisation	The re-establishing of a colony.
Red List	The IUCN Red List is a list which catalogues and highlights those taxa that are facing a higher risk of global extinction (hence "Red Data" books).
Re-point	To scratch out the old mortar from the joints of a (e.g. brick) wall and fill in with new material.
Reptile	Any of a class (Reptilia) of air-breathing vertebrates that include the alligators and crocodiles, lizards, snakes, and turtles and has a body usually covered with scales or bony plates.
Rhizoid	A root-like structure.
Ridge beam	Beam at the peak of a roof to which the rafters are attached.
Ridge tile	The tile, often of a 'n' shape that fits over the apex of a roof.
Ridge ventilator	Ridge tiles that have built in 'slots' that allow air movement into/out of a roof space but do not permit water (rain) entry.
Rodenticide	An agent that kills, repels, or controls rodents
Roofing felt	Roll or sheet material used as an insulating layer and/or additional waterproof layer laid on top of the roof structure and under the tiles or slates. Sometimes referred to as 'sarking felt' or 'underfelt'.
Roof-lights	Roof 'windows' generally fitted at the same slope as the roof.
Rot	A type of fungal growth that can cause serious damage to timber.
Sapwood	The younger, softer, living or physiologically active outer portion of wood that lies between the cambium and the heartwood and is more permeable, less durable, and usually lighter in colour than the heartwood.
Sett	Any place that forms a home of significance for a badger.
Silo	A structure (usually cylindrical) used for storage (e.g. of grain).
SNCO	Statutory Nature Conservation Organisation; either English Nature, Countryside Council for Wales, Scottish Natural Heritage or the Environment and Heritage Service (Northern Ireland).
Soffit	The underside of any architectural feature; horizontal board under the eaves; under surface of an arch.
Soft capping	Placing soft, sacrificial mortar on wall tops.
Softwood	The wood of a coniferous tree (fir, pine or spruce) whether hard or soft, as distinguished from that of an angiospermous tree.
Species	A category of biological classification comprising related organisms or populations potentially capable of interbreeding.
Spore	A primitive, usually unicellular, often environmentally resistant, reproductive body produced by plants and some microorganisms and capable of development into a new individual either directly or after fusion with another spore.
Subsidence	Generally, the downward movement of part of a building caused by a change in the ground's ability to support the structure.
Substrate	The base on which an organism lives (e.g. the soil is the substrate of most seed plants).
Symbiotic association	The intimate living together of two dissimilar organisms in a mutually beneficial relationship.
Systemic herbicide	A general classification for herbicides that are able to move away from the site of absorption to other parts of the plant.
Taxa	Taxonomic groups or entities.
Temperate zones	Zones with a moderate climate.
Tenon (joint)	The male part of a mortice and tenon joint used in traditional timber construction, e.g. often found in a roof between the collars and principle rafters.
Torpid bats	Bats which are cold, sluggish and unable to immediately wake up and fly away.
Underfelt	See 'roofing felt'.
Vascular plant	A plant having a specialised conducting system that includes xylem and phloem.
Ventilation	The free passage of air into parts of building structures e.g. roof voids or under floor voids. Necessary to avoid stale environments and condensation occurring.
Weather boarding	Horizontal boards overlapped to cover a timber-framed wall.
Weathering	The action of the elements in altering the colour, texture, composition, or form of exposed objects.

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15. LIST OF ENGLISH - SCIENTIFIC NAMES

Adder	*Vipera Berus*
Badger	*Meles Meles*
Bat, barbastelle	*Barbastella Barbastellus*
Bat, Bechstein's	*Myotis Bechsteinii*
Bat, Brandt's	*Myotis Brandtii*
Bat, brown long-eared	*Plecotus Auritus*
Bat, Daubenton's	*Myotis Daubentonii*
Bat, greater horseshoe	*Rhinolophus Ferrumequinum*
Bat, grey long-eared	*Plecotus Austriacus*
Bat, Leisler's	*Nyctalus Leisleri*
Bat, lesser horseshoe	*Rhinolophus Hipposideros*
Bat, Natterer's	*Myotis Nattereri*
Bat, noctule	*Nyctalus Noctula*
Bat, common pipistrelle	*Pipistrellus Pipistrellus*
Bat, soprano pipistrelle	*Pipistrellus Pygmaeus*
Bat, Nathusius' pipistrelle	*Pipistrellus Nathusii*
Bat, serotine	*Eptesicus Serotinus*
Bat, whiskered	*Myotis Mystacinus*
Beetle	*Metoecus Paradoxus*
Beetle, Australian spider	*Ptinus Tectus*
Beetle, carpet	*Anthrenus Verbascii*
Beetle, common furniture	*Anobium Punctatum*
Beetle, deathwatch	*Xestobium Rufovillosum*
Beetle, house-longhorn	*Hylotrupes Bajulus*
Booklice	*Liposcelis Bostrychophylus*
Bramble	*Rubus Fruticosus Agg.*
Buddleia	*Buddleia Davidii*
Corydalis, yellow	*Corydalis Lutea*
Crayfish, white-clawed/Atlantic stream	*Austropotamobius Pallipes*
Dipper	*Cinclus Cinclus*
Dormouse	*Muscardinus Avellanarius*
Dove, collared	*Steptopelia Decaocto*
Dove, rock (pigeon)	*Columba Livia*
Elm-lichen, orange-fruited	*Caloplaca Luteoalba*
Fly, autumn	*Musca Autumnalis*
Fly, cluster	*Pollenia Rudis*
Fly, green cluster	*Dasyphora Cyanella*
Fly, house	*Musca Domestica*
Fly, lesser house	*Fannia Sp.*
Flycatcher, spotted	*Muscicapa Striata*
Fox	*Vulpes Vulpes*
Frog, common	*Rana Temporaria*
Fulmar	*Fulmarus Glacialis*
Hedgehog	*Erinaceus Europaeus*
Hoverfly, wasp mimic	*Volucella Inanis*
Hoverfly, wasp mimic	*Volucella Zonaria*
Ivy	*Hedera Helix*
Kestrel	*Falco Tinnunculus*
Lecanactis, churchyard	*Lecanactis Hemisphaerica*
Lichen	*Caloplaca Granulosa*
Limestone-moss, Nowell's	*Zygodon Gracilis*
Lizard, common	*Lacerta Vivipara*
Lizard, sand	*Lacerta Agilis*
Martin, house	*Delichon Urbica*
Martin, sand	*Riparia Riparia*
Masonry bee	*Colletes Daviesanus*
Masonry bee, red	*Osmia Rufa*
Mole	*Talpa Europaea*
Moth, case-bearing	*Tineola Pellionella*
Moth, clothes	*Tineola Bisselliella*

Newt, great-crested	*Triturus Cristatus*
Newt, palmate	*Triturus Helveticus*
Newt, smooth	*Triturus Vulgaris*
Otter	*Lutra Lutra*
Owl, barn	*Tyto Alba*
Owl, little	*Athene Noctua*
Peregrine	*Falco Peregrinus*
Pigeon (rock dove)	*Columba Livia*
Rabbit	*Oryctolagus Cunniculus*
Redstart, black	*Phoenicurus Ochrurus*
Rot, dry	*Serpula Lachrymans*
Rot, wet	*Donkioporia Expansa Or Phellinus Contiguus*
Silverfish	*Lepisma Saccharina*
Slow-worm	*Anguis Fragilis*
Snake, grass	*Natrix Natrix*
Snake, smooth	*Coronella Austriaca*
Snapdragon	*Antirrhinum Majus*
Squirrel, red	*Sciurus Vulgaris*
Starfruit	*Damasonium Alisma*
Stonecrop	*Sedum Sp.*
Swallow	*Hirundo Rustica*
Swift	*Apus Apus*
Sycamore	*Acer Pseudoplatanus*
Tern, Arctic	*Sterna Paradisaea*
Tern, Common	*Sterna Hirundo*
Thrush, song	*Turdus Philomelos*
Toad, common	*Bufo Bufo*
Toad, natterjack	*Bufo Calamita*
Toadflax, ivy-leaved	*Cymbalaria Muralis*
Toadflax, purple	*Linaria Purpurea*
Valerian, red	*Centranthus Ruber*
Vole, water	*Arvicola Terrestris*
Wagtail, Grey	*Motacilla Cinerea*
Wagtail, Pied	*Motacilla Alba*
Wallflower	*Cheiranthus Cheiri*
Water-plantain, floating	*Luronium Natans*
Whorl snail, Desmoulin's	*Vertigo Moulinsiana*
Wisteria	*Wisteria Sp.*

16. USEFUL ADDRESSES

1. The National Trust
Conservation Directorate
33 Sheep Street
Cirencester
Gloucestershire
GL7 1RQ
Tel: 01285 651818
Fax: 01285 657935
www.nationaltrust.org.uk/environment

Statutory Nature Conservation Organisations (SNCOs)

1. Countryside Council for Wales
Plas Penrhos
Ffordd Penrhos
Bangor
Gwynedd
LL57 2LQ
Tel: 01248 385500
Fax: 01248 355782
www.ccw.gov.uk

2. English Nature
Northminster House
Peterborough
PE1 1UA
Tel: 01733 455000
Fax: 01733 568834
www.english-nature.org.uk

3. Environment and Heritage Service (Northern Ireland)
Calvert House
23 Castle Place
Belfast
BT1 1FY
Tel: 028 90 254758
Fax: 028 90 254865
www.ehsni.gov.uk

4. Scottish Natural Heritage
12 Hope Terrace
Edinburgh
EH9 2AS
Telephone: 0131 447 4784
Fax: 0131 446 2277
www.snh.org.uk

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APPENDIX 1 - BARN OWL WINDOWS, LOFTS AND NEST BOXES

OWL WINDOWS

Before rodenticides were available, barn owls were important in pest control as the natural predators of farmyard rodents. Many older barns have owl windows included within their design. These are small openings high in the gable end through which owls can fly and gain access to the interior of the building. Since chemical rodenticides have become widely available many of these owl windows have been blocked and new buildings are built without bird access, and have no suitable cavities in which the birds can nest.

Installing an owl window is simple and inexpensive, especially if carried out at the same time as any renovation work. An adult barn owl stands at approximately 330mm tall and so the window must be at least this height to allow the bird to enter. It is also useful to incorporate a landing platform which is of much use to the birds, particularly when carrying heavy prey. The Hawk and Owl Trust recommend the following design:

- The window should be constructed using 10 standard sized house bricks.
- The two base bricks should be laid end out with half their length protruding from the wall to provide a landing platform.
- The side bricks are to be laid on their faces, ends out.
- The apex bricks are to be trimmed and laid with their faces out.

In wooden barns an entrance hole may be made simply by cutting a hole with a saw.

Owl windows should be positioned about 450mm below the apex of the gable wall, a height which allows for the construction of an owl loft or nest box within the barn. The window should be located at the end of the building which faces open countryside and where human activity is least. It is important that the entrance is not obscured by any trees or other structures – the owl's flight path to and from the window should be clear.

OWL LOFTS

Where barn owls are likely to be displaced by renovation or conversion, specially designed "owl lofts" should be incorporated in the apex of the building. The entrance into the loft may be via an owl window.

An area beneath the apex of the barn roof can be boarded off to provide a floor area which should be at least 900mm x 600mm, although it may be much larger. A half partition should be installed to provide the nesting female with greater protection from draughts and stray light entering the loft via the owl window. The back of the nesting place can then be panelled off and an inspection door at least 300mm x 300mm provided to allow the loft to be cleaned out occasionally. The base and end panel should be covered with insulation board on their outside surfaces to reduce noise levels in the loft.

Barn owls do not construct true nests – they tend just to use their own pellets as a lining on which to lay their eggs. It is therefore useful to spread a 25mm layer of wood chippings or crushed bark on the floor of the loft. Straw should not be used as this may contain spores which can be fatal to the birds.

OWL NEST BOXES

In buildings where a full attic is to be retained (e.g. in those which are to be converted into garages and workshops), a nesting box can be positioned in the roof space as an alternative to an owl loft. Tea chests make ideal nest boxes. The floor section should be reinforced with a board which also provides a ledge at the front. An access hole 150mm x 150mm should be cut in the front. Purpose built boxes may also be used (which will last longer than tea chests) – these should be a minimum of 600mm (l) x 450mm (w) x 450mm (h).

The building needs to have a permanent access point which should be no less than 150mm square. The nest-box's entrance should face at right angles to any prevailing wind, strong draught or primary light source, but generally boxes should not need a interior half partition as long as they are positioned in a sheltered, dark position within the building. They can be nailed in place or secured with long cable ties on beams or wall supports high up in the roof space, away from human disturbance.

In open steel barns it is not possible to nail nest boxes in place. In such circumstances it is possible to screw two wooden spars (50mm x 20mm) vertically on the side of the box, spaced so that they can slip down the gaps between the corrugated wall panels and the main wall support. Then box is then self-supporting. If this is inappropriate, an

alternative is to place a length of timber 50-100mm across one corner of the barn, supported at each end by the wall braces, strapped in place using cable-ties. When placing boxes in barns with metal roofs, there should be a gap of at least 1m between the top of the box and the barn roof in order to reduce the chance of the nest-box overheating during a hot summer.

APPENDIX 2 – SWIFTS

General repairs and improvements that may affect swifts

All of these procedures should be carried out outside the breeding season, i.e. between September and April. All birds in the UK are protected during the nesting season by the Wildlife and Countryside Act, 1981 or the Wildlife Order, 1985 in Northern Ireland.

- **Replacement gutters** – Swifts are easily disturbed by this type of work and it is therefore recommended that it is carried out outside the breeding season (see above). If the type of gutter is being changed it is important to check that swifts will still be able to gain access.

- **Replacement fascias/soffits** – Determine where the birds are gaining access to the roof void and allow for this in the new work e.g. include access slots next to the wall on soffits, or access holes beneath, ensuring that the dimensions of the holes are such as to exclude sparrows and starlings (i.e. 35mm in diameter).

- **Boxing in existing open soffits and gable ladders** – Include swift access points (as above).

- **Replacement roof covering** – In older properties swifts enter the roof under ill-fitting tiles and will nest in the cavities sometimes created between tiles. New roofs will not have such gaps. Where felt is added fresh access points at the eaves are needed. Research is currently being carried out into the development of ventilation tiles with a watertight nesting cavity beneath.

- **Replacement structural roof timbers** – Try to include access for swifts in areas of refurbished roof.

- **Timber preservation treatment (insect control)** – Fumes from treatment chemicals can kill birds in the confined roof space. It is important to use water-borne rather than spirit-based insecticides based on Permethrin (as bats may also be present in the roof space).

- **General masonry repairs, window replacements and roof extensions** – Before such work is carried out consider whether or not it will disturb nesting swifts e.g. avoid removal and reinstallation of windows directly adjacent to a swift colony during the nesting season.

- **Roof space insulation** – Loft space insulation should not exclude swifts from their nesting places.

Building regulations (Approved document F, Sections 1 & 2, Building Regulations 1995,) require the provision of adequate ventilation (usually a gap of 25mm is recommended,) to prevent condensation within roof voids. The gaps are covered with mesh or patent ventilator. These can be easily adapted to allow swifts in by leaving gaps of 35 x 65mm every one to two metres. An angled piece of plywood or insect mesh installed in between the joists resting on the ceiling plasterboard will prevent swifts from getting further into the roof space, though they usually only nest just inside the roof space on the closed cavity or solid brickwork ledge. The best place to allow swift access is between the rear of the soffit and the wall. Swift holes are too small to be used by pigeons or starlings.

SWIFT NEST BOXES

Nest boxes can sometimes be used to encourage swifts to nest at new sites, or more commonly to replace nest sites no longer available e.g. after replacing roof coverings (see above). It is important to remember that nest boxes will usually only attract swifts if there are breeding pairs in the area. The box can be made of any type of durable wood (ply, pine or even hardboard) providing that it has been treated so that it will not warp when exposed to the elements. Swifts need height to take off and consequently bungalows and low single storey buildings are often unsuitable sites for nestboxes. It is also important that there is a free flight path to the box – trees and shrubs blocking the way will discourage swifts, and telephone wires should also be avoided so that the birds do not fly into them and injure themselves.

There are two types of swift nestbox; one type is designed to be placed under the eaves or in the loft space with just the entrance hole visible, the other type is attached at the top of an outside wall. Nestboxes hung on outside walls should not be south facing, as this may cause overheating in the nesting chamber.

APPENDIX 3 - BAT BOXES

There are a variety of different bat boxes now available which can used to encourage bats. The box chosen will depend on a number of factors including the species of bat being encouraged (larger bats need larger boxes), where the box will be located (on a tree trunk or on the side of a building), and what time of year it is hoped to encourage bats (there are different boxes for summer roosts and winter hibernation roosts). All wooden boxes should be constructed from preservative free wood.

To increase the chance of it being used, the box should be located at a site where bats are known to feed, that is sheltered from strong winds and exposed to the sun. Ideally, two or three boxes facing in different directions should be put up to provide a range of temperature conditions. During very hot days any south facing boxes may overheat, but the other boxes should have some shade during the day. Bat boxes should be located close to a linear feature such as a tree line or hedgerow. Some bat species use these features for navigation between their roosting site and feeding ground and to avoid flying in open and exposed areas. Generally the higher the box is positioned the better (1.5 – 6m). Most species will use higher positioned boxes with the exception of brown long-eared bats, which prefer boxes 1.5m above the ground.

It is important to note that it may take several years before the bats will start to use the box. Do not be tempted to open the box to check if it is being used (a special licence is required in the UK to disturb roosting bats and to handle them). The bats may unintentionally be injured if the box is opened, for example by trapping their feet in the lid as it is closed. To check if the box is being used, look out for droppings, urine staining, listen for 'chattering' and watch the box for a few hours after sunset to observe any bats leaving to feed.

Bat boxes can also be used to accommodate bats affected by building works. The Schwegler 1FW Hibernation box is suitable for this purpose. Weighing 27kg this box is designed to provide a protected environment for bats throughout the year but particularly through the cold winter months when bats hibernate. The box can be sited outside or in places used by bats e.g. caves, roof spaces etc.

A variety of bat boxes including Schwegler 'woodcrete' boxes, hibernation boxes and standard wooden boxes are available from Alana Ecology Ltd, The Old School, Church Street, Bishop's Castle, Shropshire, SY9 5AE. E-mail: info@alana-eco.net, http://www.alana-eco.net/ Tel: 01588 630173.

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APPENDIX 4 – BATS AND HEALTH AND SAFETY

Bats in the UK are generally not associated with any life threatening diseases that humans are commonly susceptible to. However, it is recommended that one should avoid close contact with accumulated droppings and that bats are only handled by licensed bat workers.

RABIES

Rabies is not endemic to the UK. However, in 1996 a Daubenton's bat was discovered in Sussex carrying the rabies related virus, European Bat Lyssavirus 2 (EBL2). More than 2000 other bats were tested by the Ministry of Agriculture between 1987 and 1996, none of which were found to have the virus. The origin of the infected Daubenton's bat is not known – it is possible that it flew across the English Channel, or it may have been imported on a ship. In 2002 a Daubenton's bat with EBL2 was found near Lancaster and, in a separate incident, a Scottish bat worker died from rabies after a bat bite, although the details of the species involved or when the bite occurred are unknown. A Guidance note and Safety note are available.

It is recommended that all licensed bat workers have a rabies injection. Your local GP should be able to advise you on this.

HISTOPLASMOSIS

Histoplasmosis is a disease caused by the fungus *Histoplasma capsulatum*, which has been associated with large accumulations of bat droppings. The majority of people infected do not show any symptoms or even know that they are infected. If symptoms do occur, they usually appear 3 to 17 days after exposure. They vary greatly but include a general ill feeling, fever, chest pains, and a dry or non-productive cough. The disease primarily affects the lungs but occasionally other organs are affected. This form of the disease is called disseminated histoplasmosis, and it can be fatal if untreated. Disseminated disease is more frequently seen in people with cancer or HIV.

H. capsulatum grows in soil and material contaminated with bat or bird droppings. Spores become airborne when contaminated soil is disturbed. Breathing the spores causes infection. The disease is not contagious and cannot be transmitted from an infected person to someone else.

When a large accumulation of bat manure is found in a building it is not always advisable to remove it. If it is in a location where there is no human activity it is best to leave it *in situ*. In circumstances where it is desirable to remove the droppings, it is important to try to reduce dust generation and thus reduce the risk that the material (and any *H. capsulatum* spores it may contain) will become aerosolised and inhaled. Carefully wetting the material with a water spray, rather than shovelling or sweeping dry, dusty material can reduce the amount of dust aerosolised. Once the material is wetted, it can then be collected in double, heavy duty plastic bags (or some other secure container) for immediate disposal. Wear a dust mask or respirator if in doubt. Alternatively, an industrial vacuum cleaner with a high efficiency filter may be used to bag contaminated material.

Histoplasmosis is a very rare disease in the UK (all occurrences are of foreign origin) and there is no evidence that the fungus grows naturally in this country. Our present climate is generally unsuitable for this fungus, which requires a temperature of 20-35^{o}C and a high relative humidity to flourish. However, global warming could change our climate making it more suitable for the growth of this fungus.

BAT BUGS

Cimex pipistrelli is a bug from the same genus as the human bed bug. It will bite both bats and humans causing irritation (in a similar way to midge bites), but is not known to carry any disease.

ALLERGIES

If allergic to other mammals such as cats, dogs etc. a particularly sensitive person may find that being in close proximity to bats will also induce their symptoms. Similarly if allergic to dust, dust from bat droppings could cause an allergic reaction.

It is recommended that if allergic to mammals or dust, a dust mask/respirator is worn when entering an area which is, or has been, used by bats.

HEALTH AND SAFETY IN MINES

Bats often roost in disused mines. If bat licence holders wish to carry out survey work in National Trust owned disused mines there are duties under the Management and Administration of Safety and Health at Mines Regulations (MASHMR 1993) to make the area as safe as possible for the surveyors. The Trust (or other landowners) needs to demonstrate that it has:

- Identified the hazards to staff, volunteers and other authorised persons related to the bat survey work.
- Evaluated those risks.
- Taken proper precautions to protect the persons involved.

A site risk assessment should be carried out before entry to any mine for the first time. This should identify any hazards such as unstable strata, low headroom etc. The National Trust's standard procedures for risk assessment are set out in Health and Safety Guidance Note number 7.

HEALTH AND SAFETY AT WORK ACT 1974

This Act requires the National Trust to prepare a Health and safety policy for staff and volunteers. If Trust staff or volunteers are involved in bat survey work using ladders or step ladders, a site risk assessment should be carried out (see Model Risk Assessment M&E007 *Use of ladders, step ladders and trestles*). The same applies if tree climbing is involved (see Model Risk Assessment WRK002 *Tree climbing*), and if entry into dilapidated buildings is proposed (see Model Risk Assessment WRK006 *Initial entry into derelict and dilapidated buildings and structures,* and WRK007 *Survey and initial work on derelict and dilapidated buildings and structures*).