**Figure 51.** *Restoration pollarding a veteran beech at Burnham Beeches (Buckinghamshire). Cutting work has been completed on this tree.*

**Figure 52.** *New holly pollards in the New Forest (Hampshire).*

**Figure 53.** *Recently cut hornbeam pollards at Knebworth (Hertfordshire).*

**Figure 54.** *A fallen veteran willow in Lincolnshire that is regrowing well.*



### 7.5.2 The management of veteran trees for fung i

There are various ways in which veteran trees and the land around them can be managed to favour fungi, including those species beneficial to the survival of the trees.

- **Avoid over collecting/damage to fruiting bodies. There has been considerable discussion and conflict over this issue in recent years.**

> ***Collection of fungi***
>
> *While picking of fruit bodies may not be harmful to the fungal organism itself, it is detrimental in other ways. First it may reduce the chance of sexual reproduction and long range dispersal of spores. Secondly it deprives many animals of a food source. While for mammals fungi may just be a supplementary part of the diet, some invertebrates rely on specific species of fungi and live only in the fruiting body. In sites where recreational pressure is high, damage to fungi may be considerable. Occasional picking is not likely to be a problem, but intense and repeated collection of certain species can be detrimental. On sites with good populations of old trees, removal of fungal fruiting bodies, especially from the old trees, should be avoided. A code of conduct has been produced for collecting fungi, giving useful guidelines (English Nature 1998).*

- **Excessive trampling by people or grazing animals is detrimental to mycorrhizal species.**
- **Fertilising of old trees should not be carried out. Inorganic fertilisers and lime have a detrimental effect on mycorrhizal fungi. Trees in fertilised areas may appear healthy for many years but in times of stress succumb more easily.**
- **Light grazing (eg by cattle, ponies or sheep) in woodland may encourage increased numbers of species and numbers of fruiting bodies of mycorrhizal fungi.**
- **Removing leaf litter from around amenity trees may encourage root disease causing fungal species. This is because their natural competitors are suppressed.**
- **Try to avoid causing urban trees any undue stress, which may upset the natural balance of fungi species and mycorrhiza, eg by trenching or laying tarmac over the roots.**
- **If an aggressive *Armillaria* species is found, trees nearby can be protected by constructing a barrier in the soil, using a phenolic soil drench, or winching out or grinding infected stumps and roots and then burning them. This is a sensible procedure only in urban situations.**
- **Excessive ivy cover on trees can smother the formation of bracket fungi (see also section 7.3).**

**Further reading:** Alexander, Green & Key (1996), English Nature (1998), Green (1991), Ing (1996), Lonsdale (1999a & b), Marren (1992), Rayner (1996).

## 7.6 Invertebrates

### 7.6.1 Introduction

**The numbers of species of saproxylic insects (ie those dependent on dead and decaying wood) are far higher than those of other groups of organisms associated with old trees and a remarkable proportion of these are of rare and uncommon species .** However, on many sites the invertebrate fauna is very poorly known in comparison to birds etc. Most groups of invertebrates have species associated with old trees but those with the largest numbers of species are the beetles and flies (figure 43). Some are active decomposers of wood, assisting with nutrient recycling, others feed on fungi and there are also predators and parasites that are specialists in the dead wood habitat. Throughout Europe, saproxylic species have been identified as the most threatened community of invertebrates.

Invertebrates have very special features making them different from other organisms.

- Their cycle is often annual; thus making populations very vulnerable to poor years and lack of continuity of habitat. (However, some saproxylic species can have long larval stages due, for example, to the poor nutritional quality of the food. Stag beetles take up to five years to reach the adult stage.)
- Different stages in the life cycle of the same species may have very different requirements and habits. Saproxylic species are often either predatory or feed on nectar or pollen as adults, usually in very different places from where the larvae develop.
- Some are extremely specialised. For some, there are likely to be very few trees with the precise conditions required, even on sites with a good veteran tree population.

***Stag beetles***

*The law prohibits the sale, and advertising for sale, of stag beetles. Guidance on what to do if larvae are found in a decaying stump is given in a leaflet* Stags in Stumps *available from the People's Trust for Endangered Species or the English Nature enquiry service.*

***A good tree for invertebrates (Figure 42):***

- Dead wood in the crown - hot dry wood supports a limited but specialised range of species.
- Decay columns - brown rot and soft white rot are especially valuable.
- Rot holes in a variety of sizes,dampnesses and stages of decay, eg some water-filled and others dry and containing tree humus.
- Partly decomposed wood, burrows and cavities,resulting form actions of other saproxylic species.
- Sap runs or fluxes, where the sap oozes out of the tree.
- Fungal fruiting bodies and fungi present under the bark etc.
- Damage to the bark, eg lightning strike.
- Broken branch stubs that are good for invertebrate access, eg for egg laying.
- Nectar source nearby.
- Fallen branches left to lie near the tree in partial shade.
- Living tissue (ie the tree is alive) so that it can continue to produce more dead wood and shade the dead wood already on the tree.



**Figure 42.** *A good tree for invertebrates.*


1 **Major Deadwood**
*Sunbaked, aerial deadwood, desiccated wood (longhorn beetles).*

2 **Upper Crown Limb - Small Cavities**
*Dry rot holes - birds, bats roost (hornets nest).*

3 **Crown Limb - Large Cavity**
*'Brown' rot (stiletto flies, cardinal click beetle, darkling beetles, barn owl roosts).*

4 **Fungal Growth on Limb**
*Fungi on bark (wood awl flies, false ladybirds).*

5 **Snag/Stub**
*Large surface area for egg laying and fungi (cardinal beetle).*

6 **Bark with Fungal Infection**
*Fungi on bark (cardinal beetles, wood awl flies, false lady birds).*

7 **Suspended Broken Limb**
*Shattered end provides large surface area for egg laying and fungi.*

8 **Weak Fork with Included Bark**
*Nest (birds, squirrels, rove beetles, micromoths).*

9 **Water-Filled Rot Hole**
*Water-filled rot hole (hoverflies, water beetles).*

10 **Flux on Bark**
*Established sap run (sap beetles, hoverflies and fungus gnats).*

11 **Scar Tissue from Old Wound**
*Damaged loose bark (bark beetle, false scorpions and spiders).*

12 **Bracket Fung i**
*Heart rot prepares wood for invertebrates; (fungus gnats, shining fungus beetles).*

13 **Delamination of Wood**
*Fungi/invertebrates (cardinal beetle, sap beetle).*

14 **Subsiding Major Limb**
*May lead to shattered stub habitat.*

15 **Fallen Limb**
*Fallen timber habitat:leave in partial shade.*

16 **Lightning Strike**
*Burnt wood (flat bugs, false weevil,smoke flies).*

17 **Fungal Colonisation of Root**
*Damaged loose bark: (bark beetles, false scorpions and spiders).*

18 **Basal Cavity**
*Hollowing trunk (cardinal beetles, lesser stag beetle, crane flies).*

19 **Rot hole in Trunk**
*Soft rot (lesser stag beetle, rhinoceros beetle, crane flies).*

20 **Root Damage from Browsing**
*Soft rot (stag beetle, hoverflies).*

**Figure 43.** *See colour plate page 91.*

### 7.6.2 Good management for in vertebrates

- Do nothing to damage those features illustrated in the diagram as being good for invertebrates (including draining or damaging decay holes).
- Keep as much dead wood as possible on site, preferably all of it.
- Leave any wood on site that shows any sign of internal decay or loose bark. (The most valuable dead wood for invertebrates is that which is decaying from the inside out rather than from the outside in (eg from rot holes and heart wood).)
- Very small diameter timber - brash, twigs and small branches - are more useful if accumulated into piles in the shade of the tree canopy or of bracken or brambles.
- If timber has, for some reason, to be removed from the site or destroyed then do not mature it on site. Remove it as soon as possible after cutting and certainly before the end of April. If timber (due to be removed eventually) must remain on site after this time it should be covered. This will speed up the seasoning process but more importantly it will prevent colonisation by invertebrates that will then be removed and destroyed.
- Be aware that some dead wood provides hibernation sites for some species and these will be affected by winter removal of wood. Some species continue to develop right through the winter period too.
- Allow some undergrowth, eg brambles or bracken, to scramble over and protect dead wood from desiccation, especially in grazed areas, but not so much that it is detrimental to the trees (eg causing a fire hazard or competing for water).
- Do not carry out management work on all the trees at the same time. Ensure that there is always a range of dry and,in particular, humid and shady conditions in the same areas. This is true of street trees and those beside rivers as well as in woodlands or parkland.
- Ensure that there are adequate nectar sources in open sunny conditions. Spring flowering shrubs are important and open structured flowers, eg hawthorn and umbellifers, are best as the insects do not need specialised mouthparts to feed from them. Be careful as some cultivated varieties (especially double flowered varieties such as red hawthorn) may either flower at different times of the year or have no nectar. Ivy is also useful as it provides nectar in the autumn and also provides a deadwood habitat in its own right, it is not parasitic and poses no threat to the trees.
- It is particularly important to retain the same tree species composition on the site when planting younger trees and encouraging the regeneration. This is because different species of tree have different invertebrate faunas associated with them.
- The translocation of dead wood invertebrates from one site to another should be considered very carefully before action is taken. Often the detailed ecological requirements are not known well enough to be sure of success. Advice needs to be sought from specialist entomologists before translocations are attempted. Note that they also confuse the true status of the species and its distribution. Guidance on establishing species on new sites is available from the Joint Committee for the Conservation of Invertebrates.

#### 7.6.2.1 A good site for invertebrates

Sites that are especially good for saproxylic invertebrates tend to have:

- A large number of old trees especially of native species. (Oak is especially important for beetles, and beech for flies.)
- Plenty of dead wood on the ground.
- A long historic continuity of dead wood and old trees (this may be established by researching historical documents).
- Trees showing signs of decay, rot holes, sap runs and dead wood in the crown, ie those features often associated with old trees. The dead wood that develops from rot holes and heart wood is especially valuable. See also comment on the location of dead wood given above.
- Trees that are native broadleaves (except in Scotland and areas such as the Breckland where Scots pine is also important). However, very old specimens of exotic species, such as sweet and horse chestnut and very large sycamores can also provide valuable habitats. Such old specimens should not be removed on conservation grounds simply because they are not native.
- A good mixture of structure - for example open grassy areas, deep woodland.
- Good nectar sources, eg trees, bushes and herbs with open accessible flowers.

If a site does not show all of these features it is still worth bearing in mind the requirements of invertebrates even in an individual, isolated tree.

#### *7.6.2.2 Insect Surveys*

*Although surveys are the best way of finding out what is living in a particular site it is more or less impossible to carry out a comprehensive survey. Nevertheless it is important that survey work is done on sites to assess their conservation value. Evaluation techniques (mainly using beetles) have been developed see Harding & Rose (1986), Fowles* et al. *(1999).*

*One of the problems of sampling saproxylic faunas is that often the habitat is destroyed or damaged whilst searching. There is an increasing number of methods available where this can be avoided (eg searching nectar sources in season or using traps such as Owen emergence, Malaise or flight interception traps). In many instances, however, a skilled entomologist searching by hand is still the most valuable way of finding important species.*

*Detailed surveys can be expensive to commission but some invertebrate societies and groups can be persuaded to visit sites with potential, and valuable information and contacts can be built up in this way. See the English Nature Species Handbook for further information.*

*A code for the entomological investigation of dead wood has been drawn up to aid managers and owners of sites and also to give guidelines for entomologists. See English Nature (1994), Fry & Lonsdale (1991) and Key & Ball (1993).*

**Further reading:** Alexander, Green & Key (1996),English Nature (1994), Fowles (1997), Fowles, Alexander & Key (in press), Fry & Lonsdale (1991), Green (1995a), Hammond & Harding (1991), Harding & Alexander (1993),Harding & Rose (1986), Key (1993, 1996),Key & Ball (1993), Kirby (1992), Marren (1990), McLean & Speight (1993), Speight (1989), Watkins (1990).

## 7.7 Birds

Wooded country in general is very important for birds,with more breeding species found than any other major habitat in Britain. The complex structure of woodland is important for birds as is the abundance of food. Many species also like the more open aspect of a parkland type habitat.Thirty five per cent of British woodland bird species require holes or crevices to nest in and this is precisely the habitat provided by ancient trees. A few birds can excavate their own holes but most rely on ready-made ones. Ivy on trees is also valuable for birds.

The main bird nesting season is between March and July and ideally no work should be done on veteran trees during this period. This time is also best avoided from the point of view of the tree but if bats are present it may be desirable to do tree surgery in March. In this instance survey work may be necessary to ensure that there are no birds nesting in the tree.

**Further reading:** Fuller (1995), Smart & Andrews (1985).

## 7.8 Reptiles and amphibians

Reptiles and amphibians make use of cavities and loose bark on veteran trees as resting places. Veteran trees are, for example, very valuable for grass snakes. General advice on management for reptiles and amphibians can be found in English Nature (1994).

## 7.9 Mammals - Bats

### 7.9.1 Introduction

All of the 16 British species of bat depend on trees to some extent although the degree of dependence varies according to the species. Some, (including the brown long-eared and the pipistrelles) have been able to adapt to roosting in houses at certain times of the year, but others such as noctule and Bechstein's bat are strongly associated with tree roosts.

### 7.9.2 Ways in which bats use veteran trees

Veteran trees provide important habitat for bats throughout the year (Figure 44) as follows:

- **summer roosts - species such as barbastelle, Daubenton's and Natterer's bats need holes and crevices in trees, for roosting in and giving birth to their young in the summer months.**
- **winter roosts - pipistrelles and brown long-eared bats tend to use trees more in the autumn and winter. Spaces beneath loose bark or ivy may be used,as well as holes and crevices.**
- **year round roosting sites - noctule,Leisler's and Bechstein's bats all need tree holes both for breeding in the summer and hibernation in winter.**
- **source of food - All British bats feed exclusively on insects, and because areas of ancient woodland and parkland are rich in insects they are particularly important to bats as foraging habitats. Even species that do not roost in trees, such as the serotine, will nevertheless forage around them.**

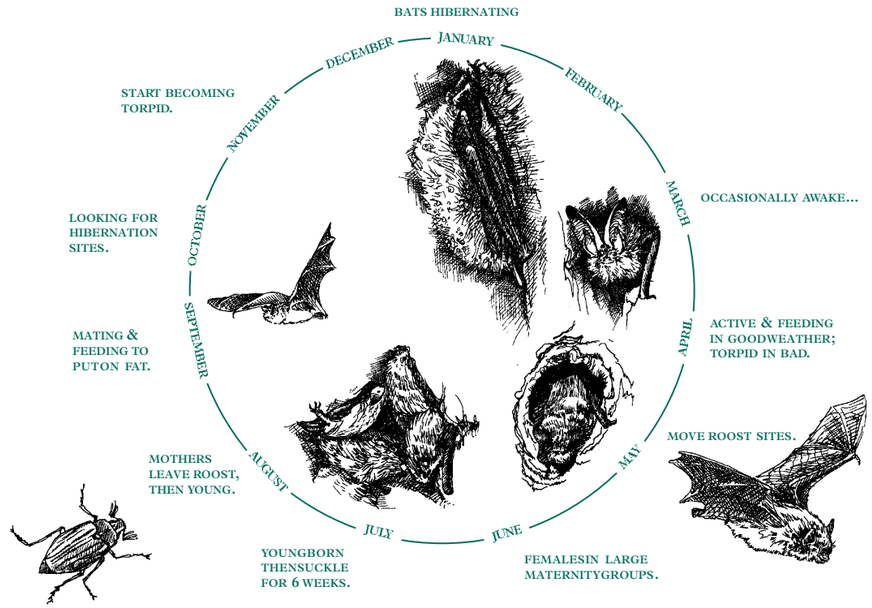
***Signs of bat occupation of trees***

*A bats'roost in an old woodpecker hole or a crevice may exhibit one or more of the following signs of bat occupation:*

- **Dark staining around the entrance from the oil in the bats' fur.**
- **A streak of dark staining running down the trunk, where the droppings have been washed out of the hole.**
- **Droppings (which crumble into a fine powder when rubbed) stuck to the trunk or on the ground below the roost.**
- **Scratch marks from the bats' claws around the edges of the hole.**
- **Bats heard squeaking in the middle of the day during warm weather.**
- **Flies and other insects buzzing round the entrance, attracted to the droppings inside the roost.**

*However, there may be no sign at all from the outside that bats are present in a tree. This is particularly true in winter, when the bats may be hibernating deep within the trunk of a hollow tree. Even in summer, telltale external signs of bat occupation are often absent. Bats can use very narrow crevices and the smaller species can fit into a crack of less than 15 mm. If in doubt, get a tree checked by an experienced bat worker.*

**Figure 44.** *A bat's year.*




### 7.9.3 Recommended procedure for working on veteran trees that may contain bats

- **If a tree is a known bat roost it is mandatory to seek advice from the relevant statutory nature conservation organisation (English Nature, Countryside Council for Wales, Scottish Natural Heritage or Environment & Heritage Service (Northern Ireland) before doing any work.**

**Note.** It is an offence to intentionally destroy a known bat roost whether or not the bats are present at the time. A roost is defined as "any structure or place which is used for shelter or protection" this includes trees used by roosting bats.

- **If the tree is not a known roost, but contains holes or crevices, has loose bark, or a thick covering of ivy, it should ideally be surveyed for bats by an experienced bat worker prior to any work. Contact the relevant statutory nature conservation organisation or your local bat group to request a survey.**
- **Sometimes, even experienced bat workers have difficulty in deciding whether a tree contains bats - particularly in situations where access to some parts of the tree for close inspection may be restricted. If the presence of bats is possible but not proven, the following precautions should be taken:**
  - Try to restrict work to the periods mid-March to May, and September to November. This is because during the summer young may be present and unable to fly, and in the winter hibernating bats will be slow to arouse and unable to escape. Also, disturbance of bats in winter depletes their fat reserves, and can reduce their chances of surviving to the following spring. Note that this coincides *exactly* with the times not recommended for cutting trees in chapter 4. This can be overcome by cutting the trees just before their leaves emerge in early spring if bats are suspected. The March - May period also clashes with peak bird nesting time.
  - Be careful that any cracks held open by the weight of a branch do not contain bats. Such cracks may close up when the branch is removed and squash the bats.
  - If a branch has holes and crevices and cannot be retained it should be lowered to the ground gently, not dropped.

**7.9.4 If bats are disco vered during the course of work:**

- You must stop all work at the first safe opportunity and seek advice from the appropriate statutory nature conservation organisation - even if the bats have managed to fly away. The statutory nature conservation organisation will normally arrange for a member of your local bat group to come out to attend to any grounded bats, but it is a good idea to know the number of your local bat group in case of emergency. If you are unable to find it, the Bat Conservation Trust should be able to give it to you.
- If any of the bats are injured or torpid, gently place them in a canvas bag or a lidded box while awaiting help. Be careful as bats are very delicate. Use soft leather gloves to handle them; bats do not normally bite but may do so if injured and in pain. Make a note of exactly where the bats were found; this is important if they are to be released after veterinary treatment.
- If bats are present inside wood felled from the tree, but thought to be unharmed, try to enclose them in their roost by covering the entrance until the bat worker arrives. It may be possible for the piece of wood containing the roost to be lodged in the crown of a nearby tree, for the bats to leave of their own accord, but the bat group will advise on this when they arrive. (They will also examine the bats to confirm that they are uninjured as it can often take considerable experience to tell.)

**Further reading:** Bat Conservation Trust (1997), Holmes (1996, 1997, 1998), Hopkins (1998), Mitchell-Jones & McLeish (1999).

## 7.10 Other mammals

Other mammals also benefit from holes in veteran trees, including holes at ground level. These include the introduced grey squirrel, which can be harmful to hole-nesting birds such as hawfinch and even tawny owl. Other native species using tree holes include red squirrel, common dormice and mustelids such as polecat, pine marten, weasel and stoat. None of these species are specific to veteran trees.

## 7.11 Time of year to work on the trees

The ideal time of year to do work on veteran trees, according to the organisms associated with them, is illustrated below:

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Trees* | ✔ | ✔ | ✔ | X | X | X | ✔ | ✔ | X | X | ✔ | ✔ |
| Bats | X | X | ✔ | ✔ | ✔ | X | X | X | ✔ | ✔ | ✔ | X |
| Birds | ✔ | ✔ | X | X | X | X | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ |
| Epiphytes | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ |
| Fung i | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ |
| Invertebrates | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ |

✔ - Suitable time
**X** - Unsuitable time

*The time of the year that is best for the veteran tree is extremely important. If the tree dies then it no longer contributes continued habitat for the other groups.