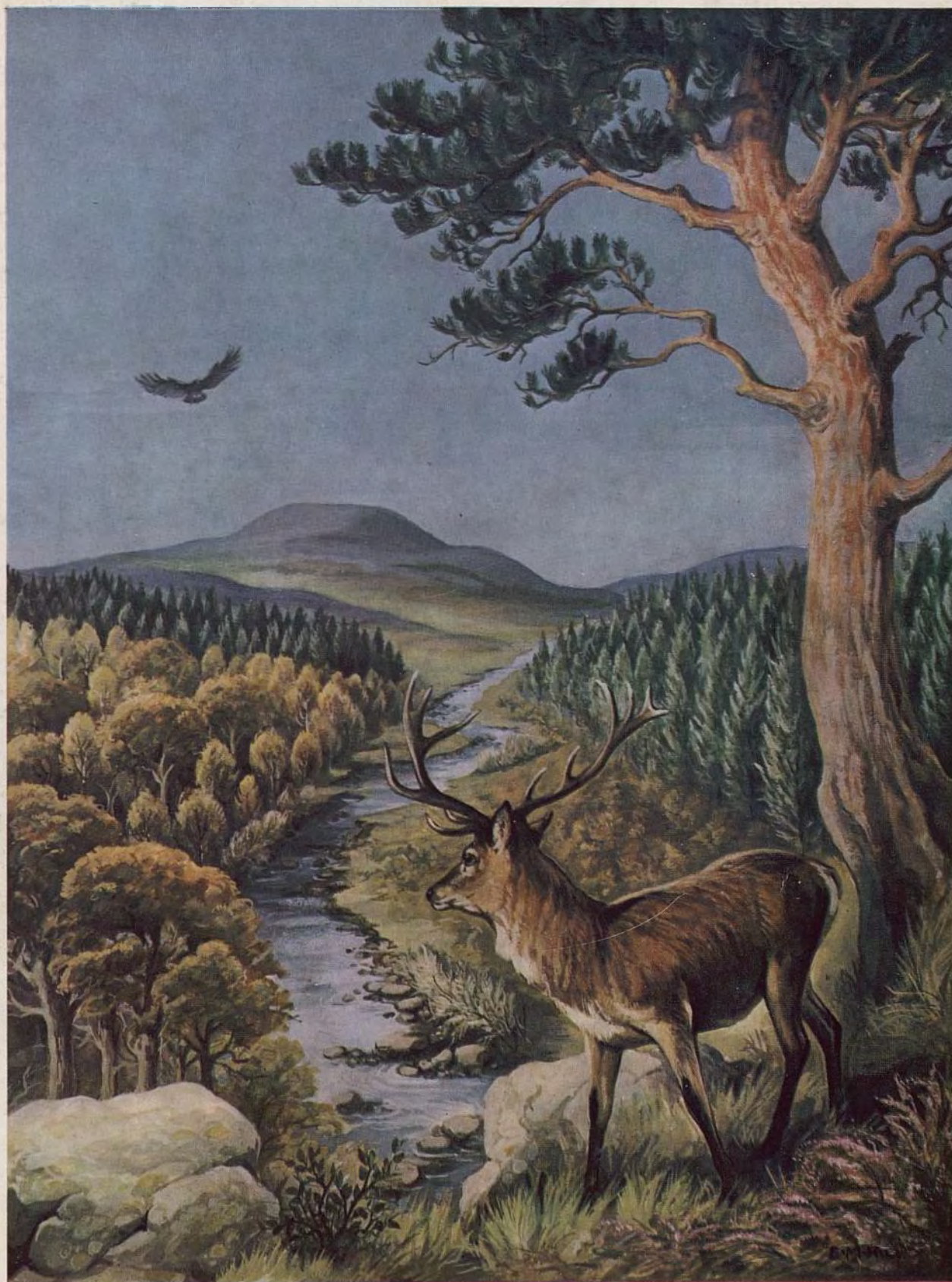


Wildlife Conservation in Woodlands

HMSO 75p net

R. C. Steele



FRONT COVER: Red deer stag beside Highland woods of oak, birch and Scots pine,
with golden eagle; autumn.

TITLE PAGE: Fallow deer buck in mixed birch and spruce woodland, winter.

FORESTRY COMMISSION

Booklet No. 29

Wildlife Conservation in Woodlands

By

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Monks Wood Experimental Station

The Nature Conservancy



LONDON: HER MAJESTY'S STATIONERY OFFICE



PLATE 1
Bramshaw Inclosure, New Forest, Hampshire.
Attractive in appearance, pleasant to be in and outstanding in the
variety of wildlife it contains.

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FOREWORD

by the Director of the Nature Conservancy

Most people who live in or visit the British countryside want to see a full variety of plant and animal life because it is part of our natural heritage and gives pleasure to all. It is also an indication of the ecological health of the country and its resilience in response to change.

We cannot safeguard wildlife adequately by setting aside and protecting a small proportion of the country as nature reserves, important as these are. Such efforts must be supplemented by thoughtful and discriminating management elsewhere.

The forests of Britain, whether in private or in public ownership, have a very important part to play; but the way they are managed can have a very great influence on the kinds and amounts of wildlife in them. Quite small modifications of management can have surprisingly large effects.

These forests could well become in the next century the greatest reservoir of wild plants and animals in the country. I am therefore especially glad that the Forestry Commission and the Nature Conservancy have co-operated to produce this practical guide to show how the variety and interest of woodlands may be enhanced.

M. E. D. POORE

FOREWORD

by the Director General of The Forestry Commission

Foresters have always recognised that the woodlands in their care provide invaluable habitats for communities of plant and animal life of interest and pleasure not only to the naturalist but also to the wider public which visits them for relaxation in peaceful surroundings.

The steady expansion of Britain's national forest estate from 60,000 acres in 1920 to 1,800,000 acres today has given the Forestry Commission a leading part to play in conservation. These woodlands are well distributed throughout the whole of Britain, and with the woodlands in private ownership, they offer a complete range of biological conditions for the study of wildlife in association with tree crops.

Hitherto there has been no guide to the practical day to day conservation in woodlands as opposed to conservation in strictly scientific reserves. The Forestry Commission therefore invited Mr. Richard Steele of the Nature Conservancy to write this booklet for the guidance of its own staff and the staff of private woodland owners, as well as for the enlightenment of the public. Mr. Steele's outline of practice is based on wide knowledge derived from the Nature Conservancy's observations and experience over a vast range of sites. I commend it as a practical guide illustrating how our woodlands' rich store of plant and animal life can be maintained for all to enjoy.

J. A. DICKSON

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INTRODUCTION

Wildlife conservation is concerned with maintaining a representative variety of plants and animals interacting freely with each other and with the environment. It thus seeks to preserve biological diversity under free-living conditions. By contrast, in botanical and zoological gardens organisms are, in the main, isolated from each other and from their natural environment.

Ill-considered management of woodlands for commercial purposes could lead to conditions which would impoverish our flora and fauna.

Wise management, on the other hand, takes account of the opportunities which woodland of all types presents for enriching wildlife, recognising at the same time that our unique heritage of woodland communities must be maintained whether they be the old pine forests of the north or the mixed broadleaf woodland of the south. If the British flora and fauna, developed when most of this country was covered in woodland, is not to be very seriously affected by the sweeping changes now occurring in forestry, active conservation measures must be taken. These entail, essentially, the retention of areas of woodland of native trees and shrubs and the integration of wildlife conservation prescriptions into the management of all woodlands.

Nature reserves are an important means of conserving wildlife. Many have been established but the area of woodland in nature reserves amounts to about 0.5% of the total

area of woodland in Britain which itself is low compared with the woodland area of many other countries. Thus, although nature reserves may contain representatives of all our native species they are, by themselves, inadequate for the large-scale conservation of woodland plants and animals and it seems unlikely that they will ever increase to the extent to make this possible. *The widespread conservation of wildlife must therefore take place in woodlands managed primarily for other purposes, the main one of which is, at present, the production of wood.*

The aim of this booklet is to show how woodlands managed mainly for wood production can be improved as habitats for wildlife. It is concerned with identifying those features of woodlands which promote wildlife conservation and suggesting how these features can be maintained or introduced by management. It suggests that wildlife conservation can and should be a management objective in all woodlands, whatever the other aims of management. The extent to which these recommendations are put into practice will depend on local circumstances but it is hoped that this booklet will be of value to every forest manager and those interested in improving woodlands as wildlife habitats.

The term *wildlife* is used throughout this booklet to mean all the plants and animals of a woodland. These include flowering plants, ferns, mosses, liverworts, fungi, lichens, mammals, birds, amphibians, reptiles and invertebrate animals.

WILDLIFE HABITATS IN WOODLAND

A woodland may contain stands of broadleaf and conifer trees, rides, glades, streams, ponds and so on which form a mosaic or horizontal pattern. There is also a vertical pattern, or layering, of a woodland into canopy, understorey, shrub layer, field layer, litter layer and soil layers. Different species of trees and shrubs, trees of different ages, and different densities of trees further elaborate the structure. Within the larger pattern there is a smaller scale of variation. Thus each tree is made up of stem, branches, leaves, flowers and fruits, and woodlands also contain nests, dead wood, carrion, dung and fruiting bodies of fungi. Each of these provides a home or food for other animals and plants.

The range of habitats in a woodland is very great but is determined largely by:

- Plant species
- Woodland structure
- Associated features
- Shelter

PLANT SPECIES

The maintenance of a variety of plants in itself achieves one of the aims of wildlife conservation. The species of trees in a woodland, under natural conditions, are determined largely by climate, soil and situation and the composition and structure of the tree flora influences the presence of other plants. For example the herbaceous plants under a dense stand of beech will differ in quantity, and to some extent in kind, from the plants under a stand of ash on a comparable site. Similarly, if the structure of a woodland is altered, say by felling, the quantity and variety of plants will also change. This is seen to dramatic effect in the great increase in spring flowering plants, such as the primrose and, in parts of East Anglia, the oxlip which follows coppicing.

The variety of insects depends to a large extent on the species composition of the vegetation. Some insects can feed on a number of different plant species; many can feed on one or a few only. In general native trees and shrubs have a far greater number of insect species dependent on them than non-native trees and shrubs. Outstanding in the richness of their associated faunas are oak, birch, willow and hawthorn followed by Scots pine, blackthorn, aspen, elm, hazel and beech. Ash, lime, hornbeam, Common

maple and juniper are less rich and holly and yew are poor. If oak is felled and replaced, say with Corsican pine, it is not simply a case of replacing one species of tree with another. A potential of hundreds of species, mainly of animals but including such plants as lichens, is replaced by a potential of a few only. Oak and other native plants are worth preserving in their own right but they are also essential for the conservation of a great variety of other organisms for which they provide food and a home. The dependence of very large numbers of our fauna on the species composition of the flora means that to keep native animals we must keep an extensive representation of native plants. If one species of tree or shrub dies out in an area then a number, in the case of oak, birch, etc., a very large number, of animals that depend on it disappear. The concept of food chains is very important in wildlife conservation; disturbance of any part of the chain may have very wide-reaching effects.

WOODLAND STRUCTURE

A single tree provides a range of habitats in itself but a woodland of many trees, particularly if they are of different ages and species, contains a much greater range. Although the variety of insects in a woodland depends to a large extent on the plant species, these have less influence on the vertebrate animals such as birds and mammals. Nuthatches, Marsh tits, Garden warblers, blackcaps, Wood warblers, chiffchaffs, nightingales, Spotted flycatchers and Lesser spotted woodpeckers occur mainly in broadleaf woodland and the nuthatch, Marsh tit, Wood warbler, nightingale and Lesser spotted woodpecker do not breed in pure conifer woods. Others, such as the bullfinch, Great tit, Blue tit and Green woodpecker are less common in pure conifer than in mixed or broadleaf woodland. The siskin, goldcrest, crossbill and Crested tit on the other hand breed mainly in conifers. In general, birds are much less affected by the species of tree than by the structure of the woodland. It is the height of the vegetation, the presence or absence of field and shrub layers, open areas, areas of scrub and old trees that are the important factors in determining the bird fauna of a woodland.

Birds often show a well marked succession through different stages of a woodland, for example when a conifer plantation is established on moorland. Birds present before forestry

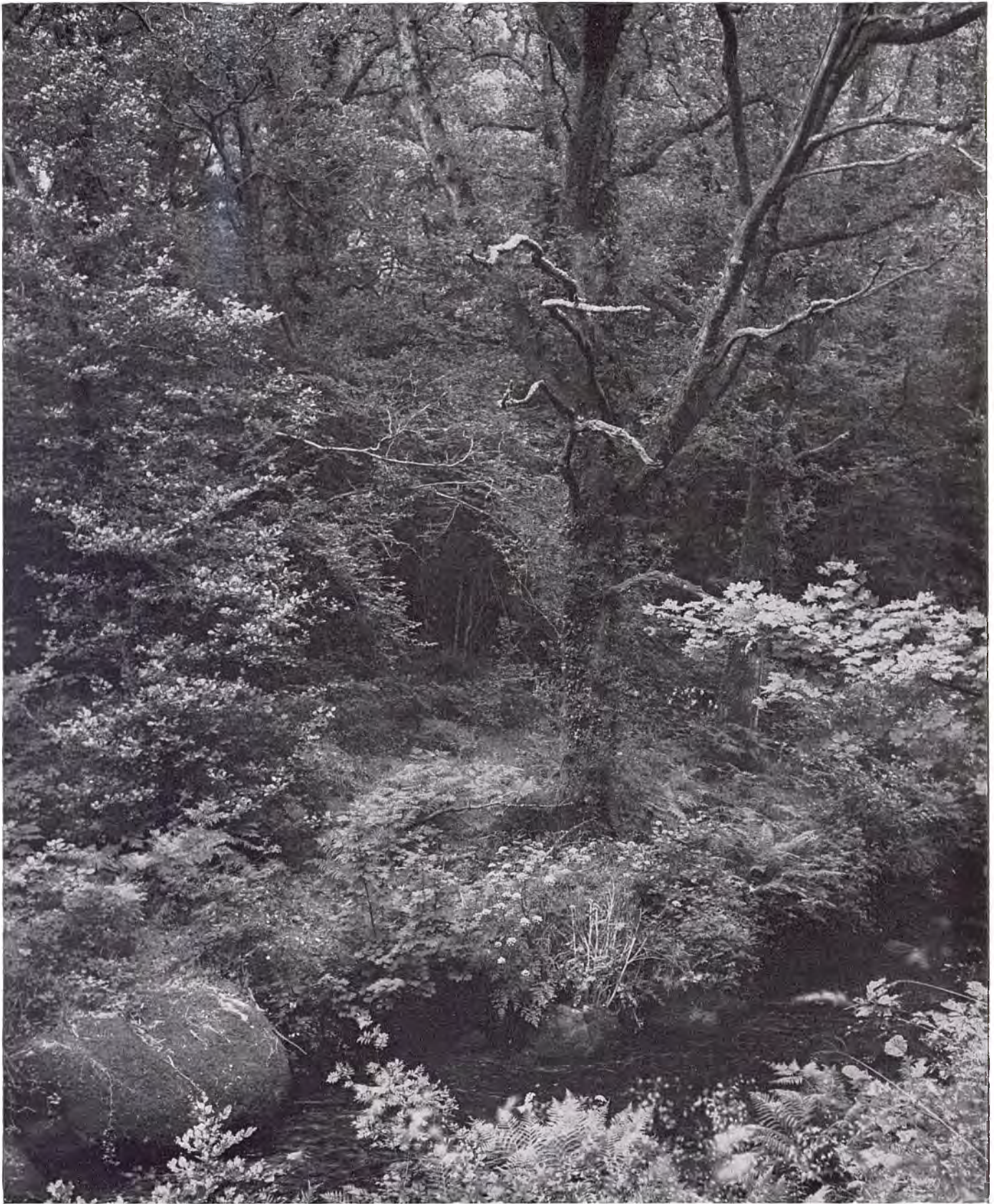


PLATE 2
Bovey Valley Woodlands National Nature Reserve, Devon.
Uneven-aged, mixed broadleaf woodland with well-developed
shrub and field layer. Woodlands like this are usually rich in plant
and animal life.

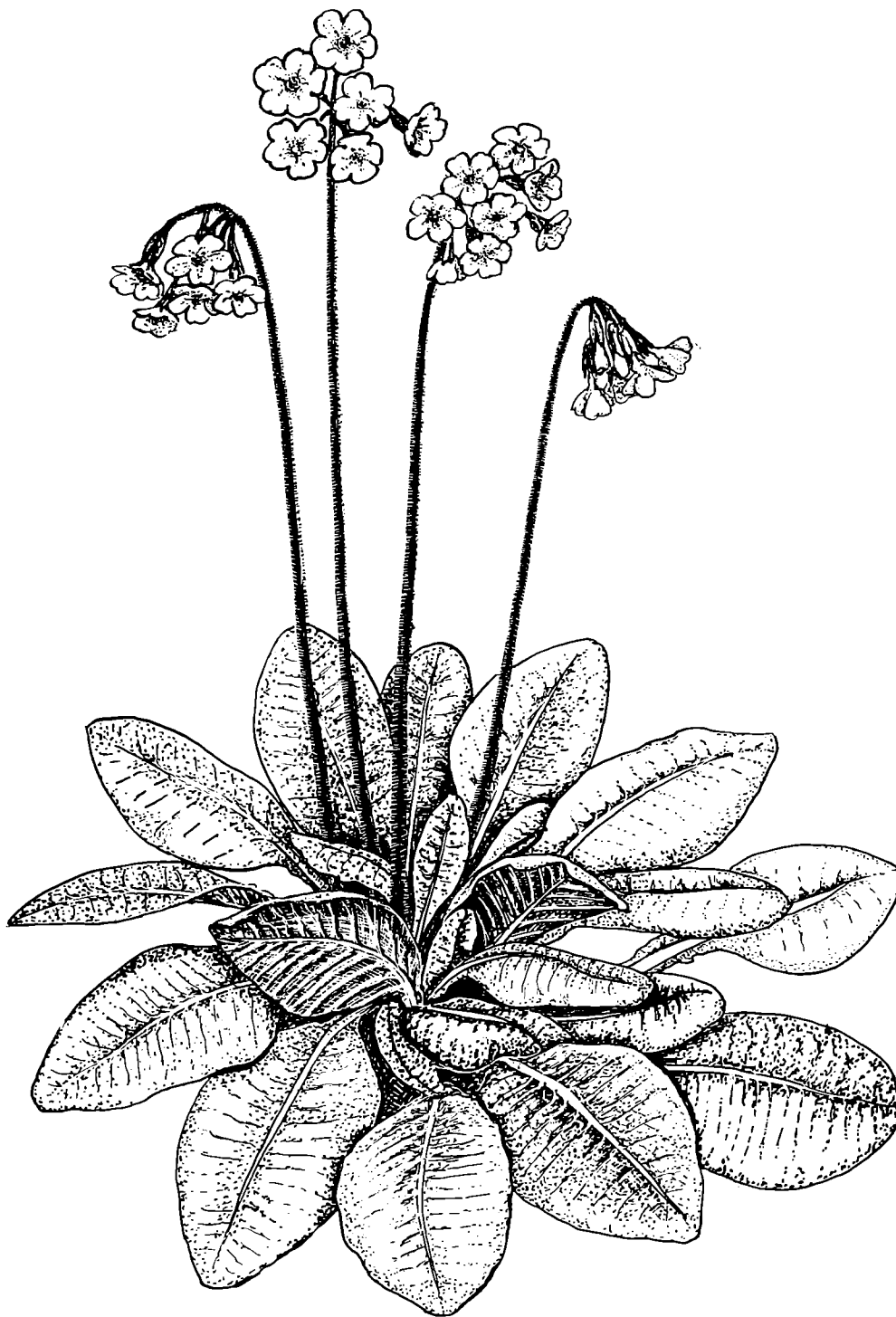


FIGURE 1
Oxlip, *Primula elatior*. Locally abundant plant of ancient woodland
on calcareous clays in parts of East Anglia.

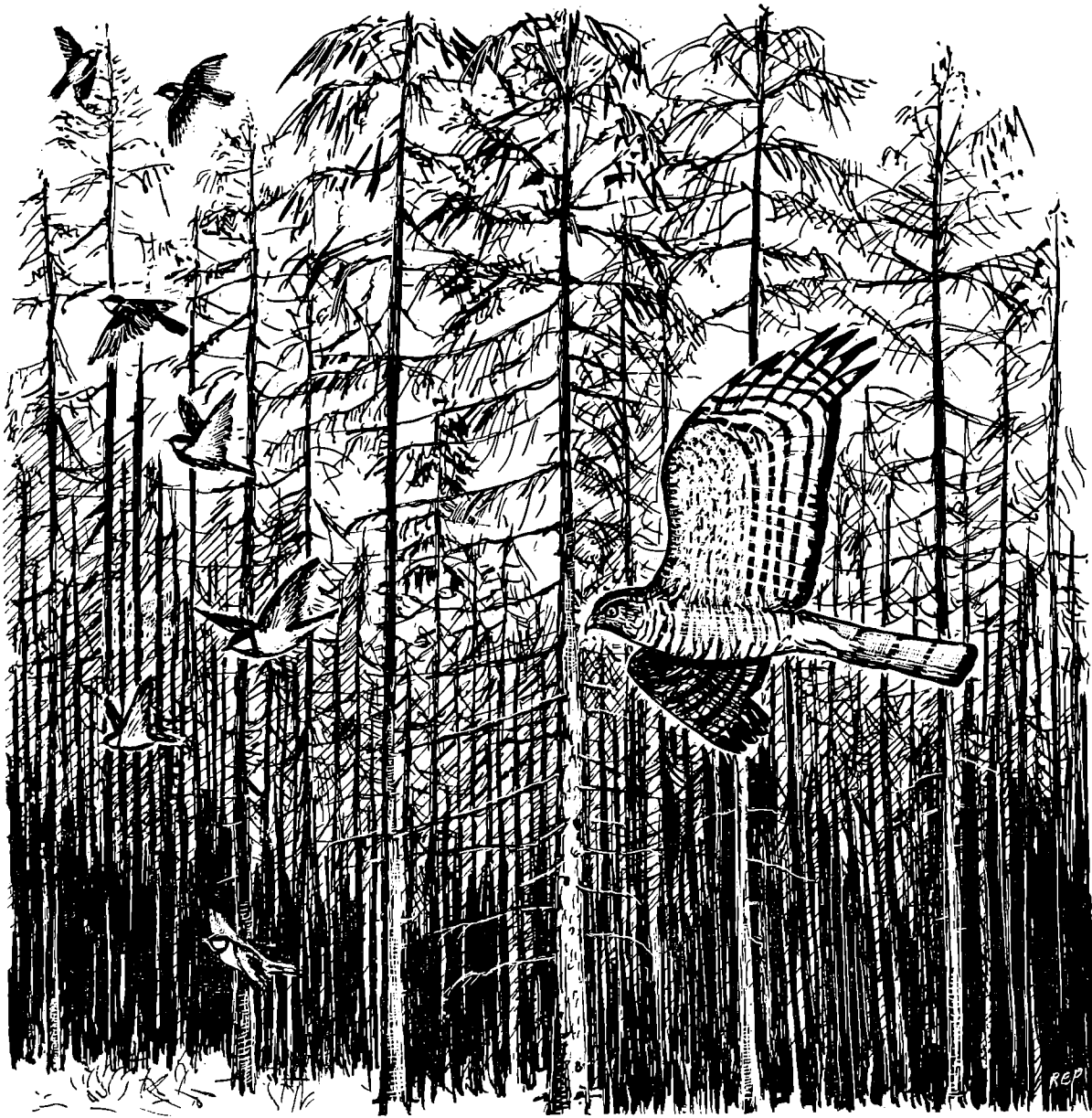


FIGURE 2
Sparrowhawk, *Accipiter nisus*, and flock of tits, *Parus* species. The sparrowhawk prefers to nest in a conifer if available. It hunts along woodland edges so is favoured by rides and open areas.



FIGURE 3
Crossbills, *Loxia curvirostra*, on Scots pine, *Pinus sylvestris*.
Formerly resident only in Scotland, the crossbill is now a regular
breeder in East Anglia and elsewhere, due to the increase of
conifer plantations.

operations start may include the skylark and Meadow pipit. The ranker vegetation, following fencing and the exclusion of grazing, attracts birds such as the whinchat, stonechat and Grasshopper warbler. As the young trees grow and some scrub appears the nesting species might include the Willow warbler, whitethroat and linnet and also the Short-eared owl, which feeds mainly on voles which increase as the herbaceous vegetation thickens. These species become less numerous as the trees get bigger and are replaced by blackbirds, Song thrushes, bullfinches and chaffinches among others. When the tree canopy is closed and little undergrowth remains most of the small birds leave. Pure conifer plantations are a poor habitat for birds or indeed for wildlife generally, from this stage until conditions become more open again. The larger birds such as the sparrowhawk, kestrel, buzzard, Tawny and Long-eared owls move in as nesting species when the trees are much larger. In winter, as the search for food becomes

more important, birds are more widely dispersed and woodland structure has less influence on their distribution. Perhaps the ideal bird habitat is uneven-aged mixed deciduous woodland, with some conifers, having an understorey and well-developed shrub and field layer and which also contains glades, scrub, old trees and a stream or pond. Table 1, page 50, lists birds which nest in woodland or trees and indicates their nesting and food requirements.

Like birds, mammals are less dependent on the species of plants in a woodland than on the structure of the woodland generally. For example, the Bank vole, active by day, is more common in woodlands with dense herbaceous vegetation but the woodmouse, active by night, is the most common rodent in woodland with an open field layer. Deer, fox, badger, polecat, Red squirrel and Pine marten live in broadleaf, conifer and mixed woodland (Table 2, page 58.)

Many animals are less mobile than birds and mammals and



PLATE 3
Forest of Ae, Dumfriesshire.

The planting of such areas can enhance the variety of wildlife especially if conservation prescriptions are incorporated into management operations. C 2018

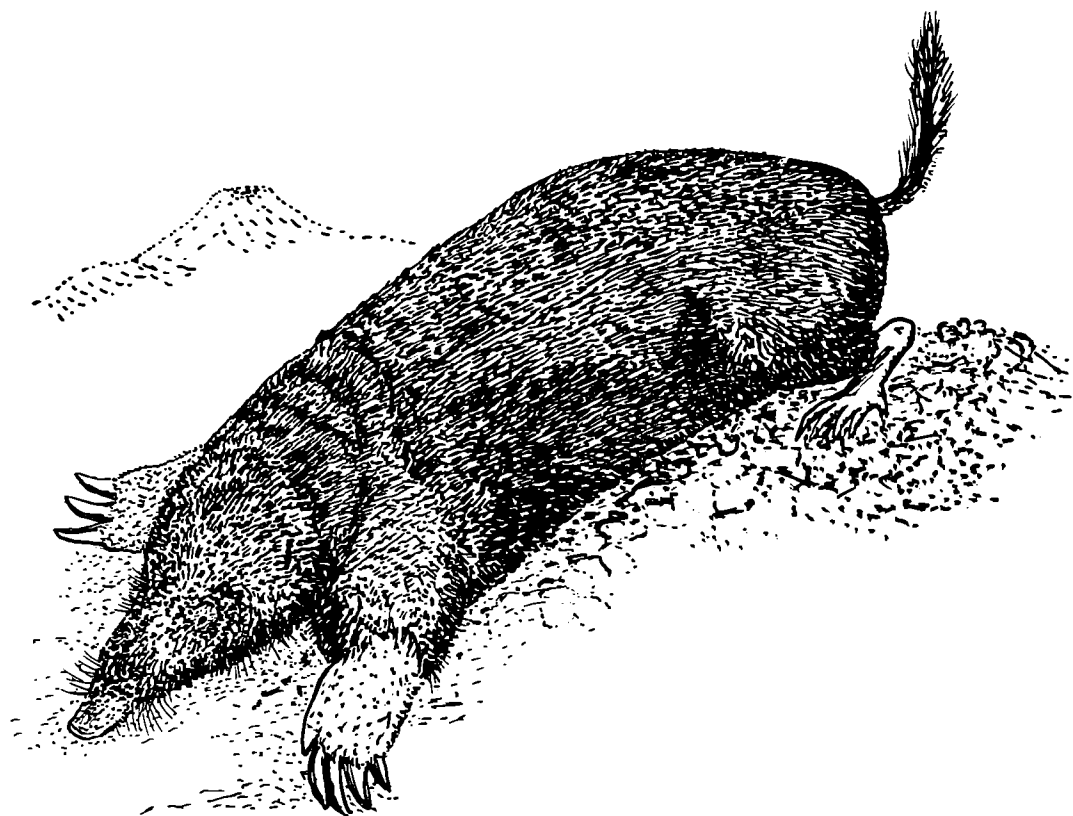


FIGURE 4
Mole, *Talpa europaea*. Widespread in Britain but most abundant in broadleaf woodland.

usually live in one or other layer of a woodland. The canopy of a woodland is rich in life and, in addition to birds and squirrels, contains both larval and adult butterflies and moths, mites, thrips, bugs, leafhoppers, aphids, gall midges, saw-flies, and beetles together with their parasites and their predators such as spiders and harvestmen. The numbers of caterpillars in the canopy in summer, particularly in oak-woods, is very great. These caterpillars are especially important as food for young birds, and the breeding of titmice is synchronised to coincide with the height of the Oak moth caterpillar season. The insects of the understorey and shrub layer are similar in their range to those of the canopy although the species may vary. The importance of a well developed shrub layer for breeding birds has already been noted.

The trunks of trees, especially broadleaf species, often carry a growth of ferns, mosses, liverworts, lichens and algae. These growths, together with crevices in the bark, harbour a variety of animals. The alga *Pleurococcus*, commonly found on stems, is grazed by a number of animals including millipedes, woodlice and caterpillars.

The field layer is the richest woodland layer in the variety of plant and animal species it contains. All plants, except the few epiphytes that grow on tree stems, grow in or through this layer where there is also a very wide assortment

of animals. Most mammals live or feed in it; many birds feed there and some, like the Wood warbler and woodcock, nest there; and the field layer also contains representatives of most of the groups of woodland invertebrate animals. A well developed field layer is thus of major importance in the conservation of woodland wildlife. Below the field layer the litter layer also contains a varied flora and fauna including fungi, worms, mites, centipedes, millipedes, pill millipedes, springtails, woodlice and molluscs together with predators such as spiders and harvestmen.

ASSOCIATED FEATURES

In addition to the habitats which depend on the species of plants and animals in a woodland and on the structure of the woodland, there are others which arise from various features associated with woodlands.

Decaying Wood

Dead and dying trees and decaying logs provide one of the greatest resources for animals in a woodland. If such material is removed it has been estimated that up to one-fifth of the fauna of a woodland may be lost. In Britain, nearly 1,000 species of animals are known to be associated with wood or to live under bark where decay has begun, and certain plants, e.g. some mosses and liverworts, are also characteristic of such situations.



FIGURE 5
Litter showing Ground beetle, *Carabus nemoralis*; Pill millipede, *Glomeris marginata*; Cherry gall made by the gall-wasp *Diplolepis quercus-folii*; Common spangle galls and Silk-button galls, made by gall-wasps *Neuroterus quercus-baccarum* and *N. numismatis* respectively; the Glass snail, *Retinella nitidula*; and oak leaves and cupule.

Bark beetles are often the first invaders of wood and ash and elm are particularly rich in the variety of bark-beetles that inhabit them. The holes made by bark-beetles provide entry for other animals and for fungi which in turn help to break down the wood and provide food for other creatures. The organisms which attack wood in the earliest stages of decay are often specific to one or a few tree species, but the later succession of organisms depends more on the stage of decay than on the species of wood. Few species attack both conifer and broadleaf wood. Typical inhabitants of rotting wood, in addition to bark-beetles and fungi, are

woodlice, millipedes, centipedes, harvestmen, spiders, False scorpions, earwigs, springtails, beetles, fly larvae, molluscs, mites and thrips. Mites and springtails are the main inhabitants of the smaller rotting logs and branches. Larger logs may also contain Stag beetle larvae, wasp nests and earthworms, as well as Longhorn beetles which leave a characteristic exit hole.

Decaying wood provides shelter as well as food. Loose bark and beetle holes shelter nocturnal species and also those which hibernate, such as ground beetles, wasps and bumble bees. Many species of small wasps and some species of bees

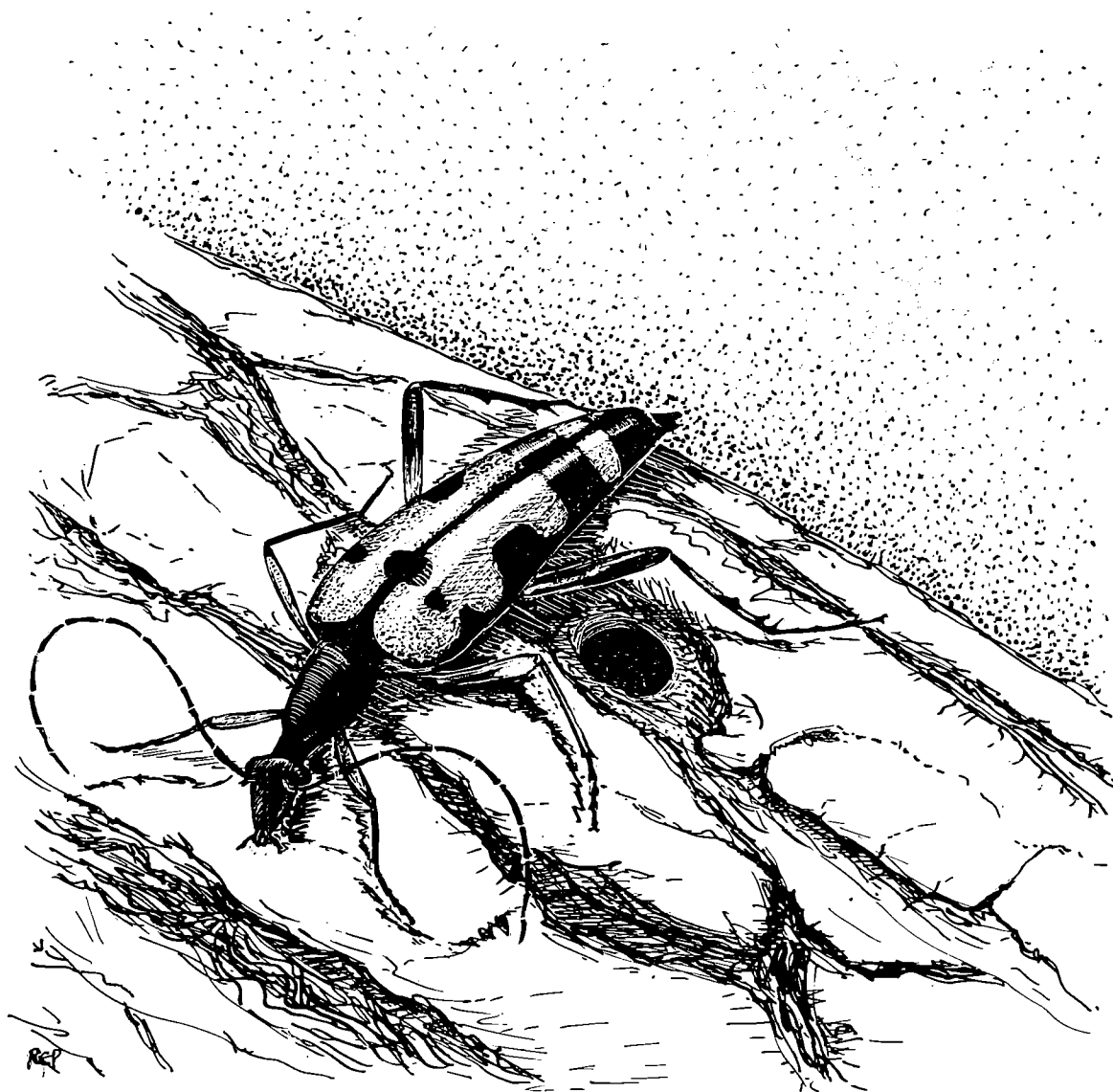


FIGURE 6

Longhorn beetle, *Strangalia maculata*, and exit hole. The eggs are laid in crevices in the bark and the larvae enter the wood in which they feed and can remain for a long time before emerging as adults.

and ants nest in empty galleries in rotten wood. Standing dead and dying wood is an important, and in some cases only, nesting site for about 20 species of birds which include woodpeckers, nuthatches, tits and Pied flycatchers. In turn these birds' nests harbour communities of animals some of which are not found elsewhere. Old nest holes in standing trees may be taken over by squirrels and dormice or used by hornets or bats. Hollows in rotting wood where sap seeps or water collects often develop special communities of animals.

Large and Old Trees

Large and old trees are of particular importance for wildlife conservation in woodlands. They support the usual range

of plants and animals associated with their species and may also provide additional and very specialised niches. Some species of lichens, for example, occur mainly on old trees in rather open woodland. Certain rare species of beetles and flies also occur only in the dead wood of large old trees. When such trees begin to decay they provide a wide range of conditions and often attract a greater variety of animals than a small decaying tree of the same species.

Parklands are particularly notable for their rare lichens and wood-living insects and it may be possible to produce similar variety in woodland by leaving a scattering of mature trees to grow through to senility and death. In all stages these trees help to enrich woodland wildlife.

Such trees also serve as nesting and perching sites for birds,

including the kestrel and buzzard. Woodpeckers feed and nest in them and their holes are later taken over and used by a variety of other birds and animals. A further use of tall trees is illustrated by the Purple emperor butterfly, now of very local occurrence in Britain. The eggs of this butterfly are laid on Goat willow on which the caterpillars feed but the adults congregate, before mating, at the tops of special tall trees. These “master oaks” as they are called are often oaks but may be other species including ash, beech and willow.

Flowers and Fruits

Many species of trees are wind-pollinated and the flowers are not important for insects, although lime is a notable exception. Most shrubs and climbers are insect-pollinated and provide nectar, which is rich in sugars and fed on by

flies, moths and butterflies, and pollen, which contains much protein and is carried away by bees, and eaten by beetles and flies. Most of the trees and shrubs that depend on insect-pollination flower in May and June. However, the flowering period extends from February to December and a variety of shrubs thus provides a much longer flowering season and so more food for insects.

Ivy is a particularly useful species as it flowers late in the season when little else is in bloom and its flowers attract many insects which in turn attract birds. The flowering period of woodland trees and shrubs is shown in Table 4, page 64.

Most shrubs have bird- or animal-dispersed seeds. By contrast, many trees have wind-dispersed seeds. Many edible fruits ripen in September-October and species such as hazel, oak and beech shed their fruits at this time.

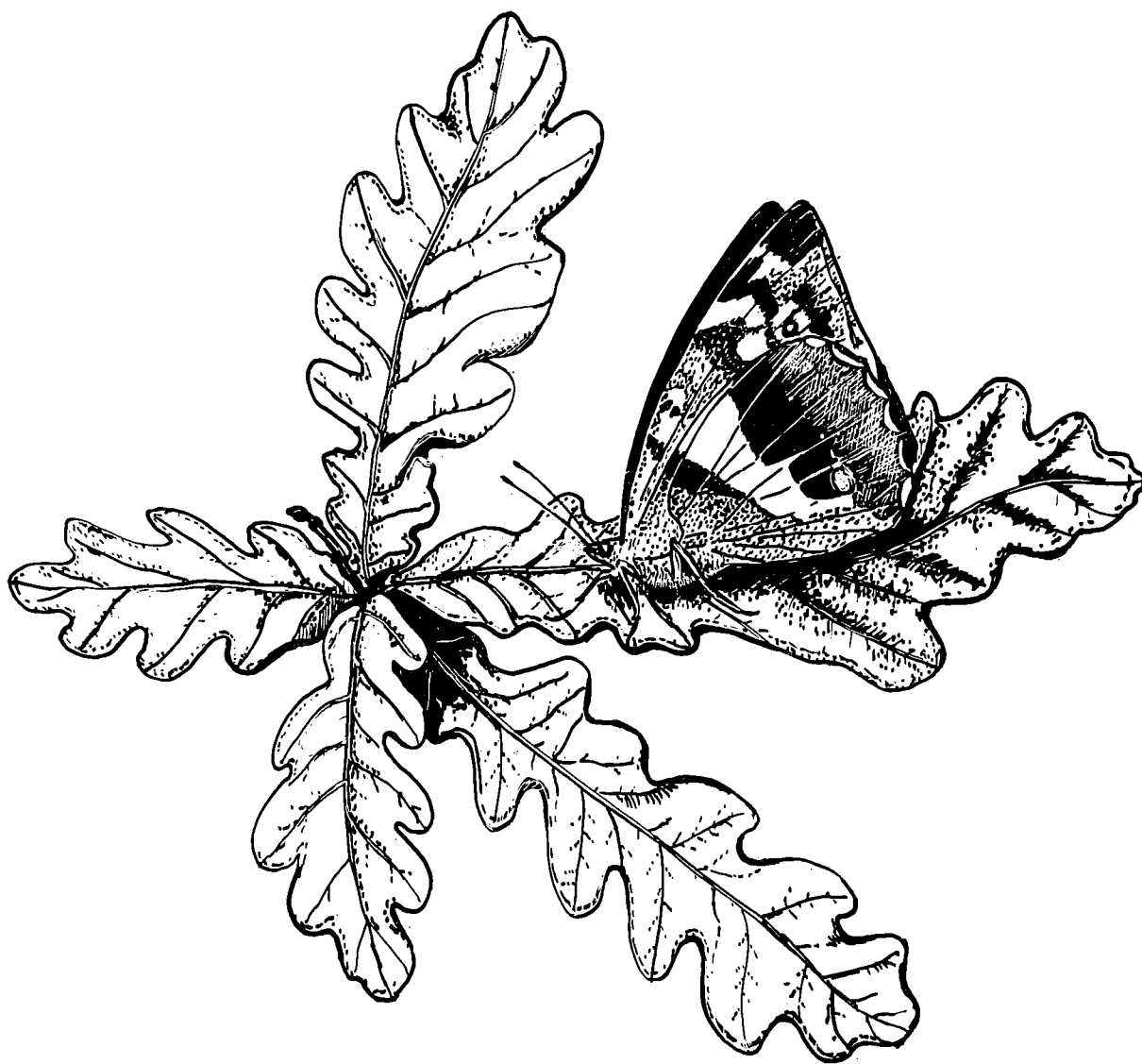


FIGURE 7
Purple Emperor butterfly, *Apatura iris*, on Pedunculate oak, *Quercus robur*. Restricted to some large broadleaf woodlands in southern England but difficult to observe as the adults frequent the tops of high trees and are most active soon after sunrise.

Others, such as hawthorn and holly, retain the ripe fruits until late into the winter or until they are taken by birds. Seed and fruit crops vary from year to year but not all species have good or bad yields in the same season so a variety of trees and shrubs helps to ensure that some food is available for birds and animals. The time of ripening of fruit and seeds eaten by birds and mammals is shown in Table 5, page 66.

Fungi

Thousands of species of fungi occur in woodlands and beechwoods often contain a particularly rich variety. Some fungi live on decaying wood, leaves or animal matter; others form associations with tree roots (mycorrhizae) or with green and blue-green algae (lichens). Many of the species with large fruiting bodies, such as the toadstools and bracket fungi, are woodland species. Over 200 species of flies, beetles and small moths breed in these large fruiting bodies, some of which breed nowhere else. Fungal hyphae and spores are eaten by a variety of insects and the

close association between fungi and the larvae of ambrosia beetles and wood wasps is well recorded. Many fungi are typically associated with one species of tree or shrub although they may be able to live on several. Thus the Fly agaric occurs mainly with birch although it is also found with Scots pine and has been recorded under spruce.

Carrion and Dung

Larger corpses, such as those of mammals and birds, provide food for foxes, badgers and crows and also for insects such as blowflies. The smaller corpses of insects are fed on by beetles and flies and the work of decomposition is often completed by bacteria. As with decaying wood there is often a succession of animals feeding on carrion. Burying beetles hide corpses underground as food stores for their larvae and dung beetles use dung in a similar way. Birds and mammals turn over dung to get at the insects breeding or living there.

Nests

Several types of animal including moles, birds, ants, wasps,

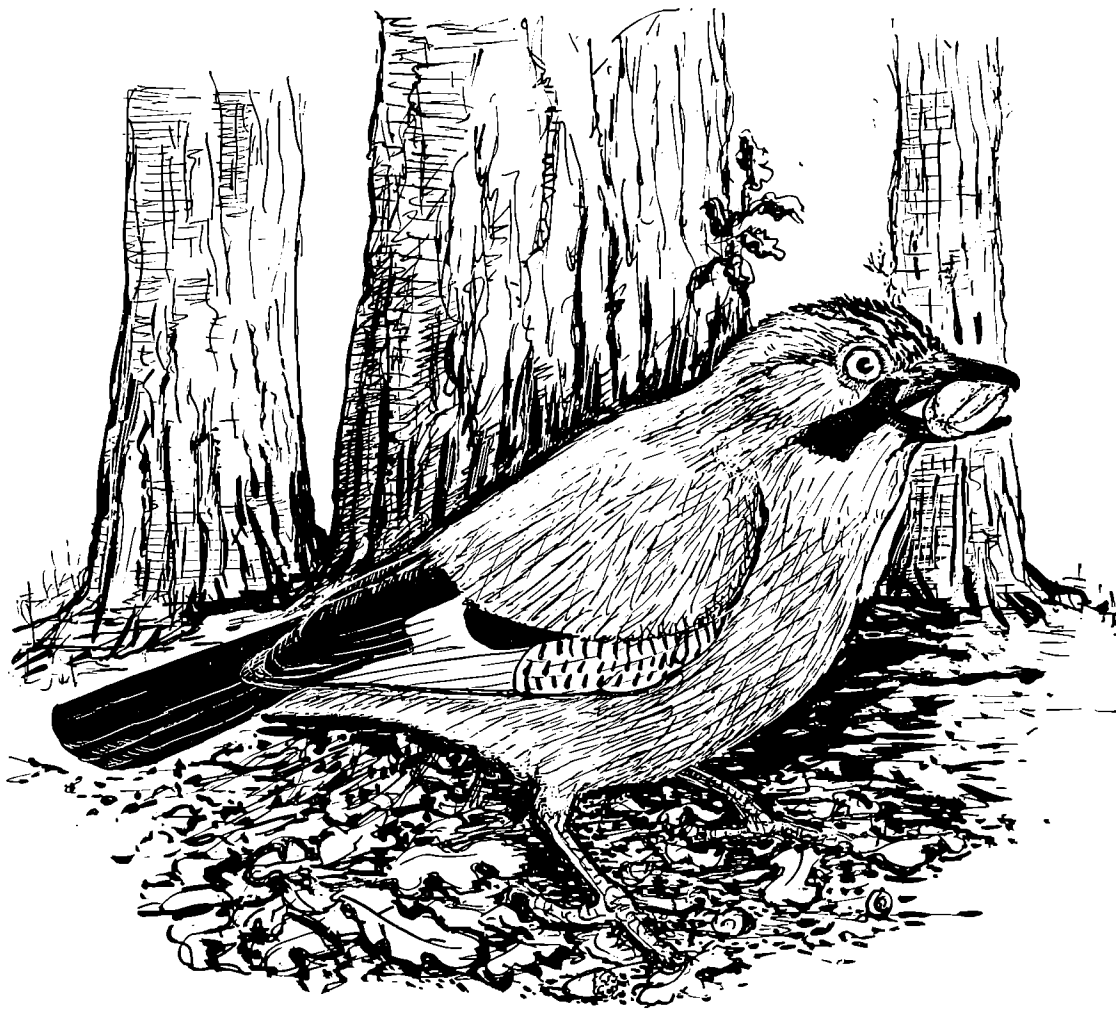


FIGURE 8
Jay, *Garrulus glandarius*, with acorn. The jay's habit of carrying off and burying acorns helps to distribute oak widely.



FIGURE 9
Fly agaric toadstool, *Amanita muscaria*. A poisonous toadstool which is common in autumn in birch and pine woodlands.

bees and gall-forming insects, make nests in woodlands. Many of these nests harbour characteristic communities of animals, some members of which are rarely found in other situations. Ants' nests are an important source of food for the Green woodpecker, the rare wryneck, and the pheasant.

Paths, Rides and Glades

Glades, including rides and wide paths which can be considered as narrow glades, provide open, light but sheltered conditions and have a very long edge in relation to the area occupied. They are thus particularly suitable for many plants and animals especially those which favour woodland margins. Birds, such as the Spotted fly-catcher come into this category as do many woodland butterflies (see Table 3, page 60). A glade or ride is of most value to wildlife if the central grassy area merges gradually through taller herbaceous vegetation and shrubs into the trees. An abrupt transition from grassy sward to trees provides less variety of habitat and shelter for both plants and animals.

Water

Water in woodlands may range from a trickle of rain down

a stem or a small water-filled hollow in a tree bole, to large ponds and streams. The configuration of a tree trunk determines the path along which rainwater flows and these water courses develop a richer variety of lichens and mosses than the remainder of the trunk. Similarly water-filled hollows in a tree develop particular communities of animals, and certain species of mosquito breed only in such holes. Sap flows on trees are an important source of food for moths and butterflies, and also for yeasts and other micro-organisms which in turn are fed on by beetles, mites and fly larvae.

Very small streams and ponds entirely shaded by trees seldom develop green water plants. They are nevertheless very rich in species which feed on dead leaves and twigs falling into the water. Small streams and ponds have faunas which include stone-flies, caddis larvae, nematodes, rotifers, water snails, water-mites, bivalves, flies of various types and water-beetles and they may also contain fish. However the species characteristic of stagnant water are different from those of running water. Ponds and streams thus house similar communities but of different species and one is not a substitute for the other.

Larger ponds and streams under more open conditions

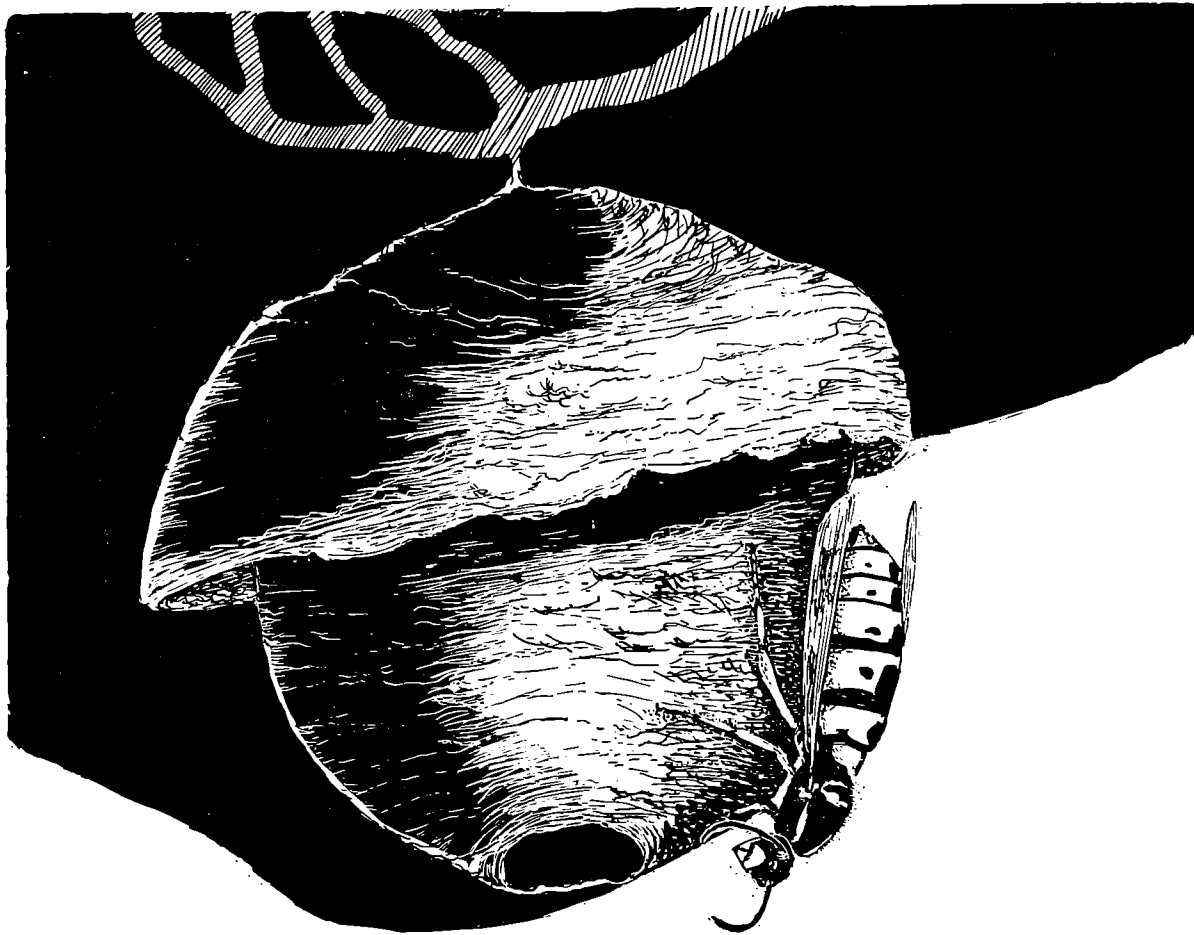


FIGURE 10

Tree wasp, *Vespa sylvestris*, on its nest which is hung from the branches of trees. The entrance is at the base.

develop a characteristic vegetation and the fauna may include amphibia such as newts and frogs. Dragonflies may breed here and they may also be important as feeding and nesting areas for wildfowl and other birds which nest on, or close to, water. Grass snakes may also occur in such situations.

Climbers

The effect of climbers on trees is a frequent subject of controversial discussion. A distinction must be drawn between honeysuckle and clematis, which twine to climb, and ivy, which does not. Clematis and honeysuckle can both cause serious damage to young trees by strangulation and smothering; ivy neither strangles nor smothers young trees although it may compete with them for water and nutrients. Clematis and honeysuckle have to be controlled in young plantations but once the trees have become established and have closed canopy climbers cause little trouble. Climbers provide food, in the form of flowers, fruit and leaves, and cover, including nesting sites, for invertebrates,

birds and mammals. They should be allowed to develop in established woodlands especially in odd corners, on the woodland edge and along the margins of rides. An ivy-clad tree is a valuable wildlife feature.

SHELTER

Woodlands modify local climate by maintaining a higher humidity, reducing wind speeds, lessening temperature fluctuations and providing shade. The sheltered situations in woodlands are favourable to many plants and animals which cannot survive the more extreme conditions found in the open. Examples include many invertebrates as well as mosses, liverworts, ferns and flowering plants. Some of these have very limited powers of dispersal and once lost, through excessive exposure, may not be able to return when conditions become suitable again. The maintenance of as much cover as possible on a woodland site is an important aid to the conservation of a wide variety of wildlife.



FIGURE 11
Honeysuckle, *Lonicera periclymenum*, and flowers, with mines in the leaf made by a fly larva, *Napomyza xylostei*.

FIGURE 12
Filmy fern, *Hymenophyllum wilsonii*.
The filmy ferns require a moist atmosphere and sheltered conditions such as are provided by woodland.





FIGURE 13
Twayblade orchid, *Listera ovata*. A characteristic orchid of wood-
lands on base-rich soils.

WILDLIFE CONSERVATION MEASURES

The aim of wildlife conservation is to preserve biological variety under free-living conditions. The preservation or creation of suitable habitats is the means of achieving this aim. Prescriptions and measures aimed at improving woodlands as wildlife habitats can be concentrated on four aspects:

- (1) Plant diversity
- (2) Structural diversity
- (3) Other features
- (4) Shelter

1 Plant diversity

- (a) Retain a wide variety of trees and shrubs and maintain or encourage the development of a field layer by opening the canopy as much as possible.
- (b) Maintain the largest area possible of broadleaf woodland of native species in conifer plantations and some conifers in broadleaf woodland.
- (c) When converting broadleaf woodland to conifers leave broadleaf trees as:
 - (i) scattered single trees.
 - (ii) as margins to roads, rides and glades; along ravines, water-courses or streams; around ponds.
 - (iii) as groups of trees or as blocks of broadleaf woodland. This is particularly important for the retention of a representative field layer.
- (d) In conifer woodland:
 - (i) Encourage or plant native trees and shrubs to form broadleaf margins to rides, glades, streams, ponds, etc.
 - (ii) Establish groups or blocks of broadleaf species among the conifers where practical. In afforestation schemes this may have to be delayed until some shelter has been built up.
- (e) Strips of broadleaf woodland around conifer plantations are comparable to hedges around agricultural crops. They have a high value in maintaining the numbers and varieties of plants and animals which may recolonise the forest crop when conditions permit.
- (f) Use native species of trees and shrubs in amenity planting. Many of them are outstandingly attractive and lose nothing by comparison with exotic species. Provision of cover and food for game can usually be achieved equally well by using native shrubs, which are biologically more productive, rather than exotic shrubs. A word of warning about rhododendron. A few scattered bushes of this shrub may provide useful cover and roosting sites but where rhododendron becomes at all extensive, and it often regenerates profusely, it impoverishes both plant and animal life.

- (g) Remember that most plants have some insects dependent on them but that some have more than others. Keep a wide variety but, if necessary, concentrate on outstanding species such as oak, birch, willow, elm, Scots pine, aspen, alder, beech, hawthorn, blackthorn and hazel.
- (h) The field layer in a woodland may become impoverished by heavy trampling or grazing. Trampling is particularly destructive in wet situations. Grazing often results in the replacement of a mixed herbaceous field layer by a grassy sward. If large numbers of people visit a woodland encourage them to follow paths, which will also reduce the disturbance to nesting birds. Woodlands which are used for grazing or shelter should have some areas fenced off to maintain the diversity of plants. Fencing may also assist natural regeneration especially if the fenced areas are rotated over the woodland.

2 Structural diversity

- (a) Retain or create structural diversity as far as possible. A woodland with an understorey, shrub and field layer is likely to be biologically much richer than one lacking these components.
- (b) In areas where a very few species of tree are being planted break up the felling and planting into small blocks so that structural diversity is provided by a mosaic of age classes. Avoid clear-felling over large areas and disperse annual coupes through the forest. In evergreen conifer plantations introduce broadleaf species, or failing this larch, as strips or blocks to vary conditions.
- (c) It is easier to provide and maintain structural diversity if some broadleaf species are planted. A mosaic of age



PLATE 4
Windsor Forest, Berkshire.
Dead and dying trees help to maintain the great entomological
interest of Windsor Forest.

classes also helps to vary the structure of mixed woodland.

- (d) Encourage the development of a shrub and field layer by thinning as heavily as practicable.
- (e) "Edges" are particularly valuable for many species of wildlife. Blocks of irregular outline have a longer edge in relation to area than regularly-shaped blocks.

3 Other Habitats

(a) Dying and dead wood

- (i) All conifer logs, unless barked, provide breeding grounds for Pine beetles of various species. These breed under dead bark and the adults attack living trees. If conifer timber is felled and left in woodlands it must be barked within six weeks. Elm and willow logs including the larger branchwood, should be removed, or barked and the bark burnt, as soon as possible because of the risk of infection by Dutch elm disease or the Watermark disease of the Cricket bat willow.
- (ii) With these exceptions leave representatives of the four main types of dying and dead wood:
 - standing dying trees
 - standing dead trees

fallen logs of various sizes
stumps

- (iii) Leave dead and dying wood of a variety of tree species but large logs of any species are particularly valuable.
- (iv) Logs should be left in shade or partial shade where possible. Logs in full sunlight develop a comparatively poor fauna.

(b) Large, old trees

- (i) Leave some trees scattered through a woodland until senility and death. This may mean that they are left for more than one rotation of the tree crop. At all stages they are important for wildlife. Large oak, beech and Scots pine are particularly valuable and so is elm but the risk of Dutch elm disease must be considered. Trees which are shaken, have butt rot, spiral grain or holes, or are becoming stag-headed, serve admirably. Such trees may be costly to fell and are often worthless when felled but they form an invaluable habitat for wildlife in woodlands.
- (ii) Many species of birds feed or nest in large, old rotting trees or perch on them. Woodland bird populations, especially the hole-nesters, are often

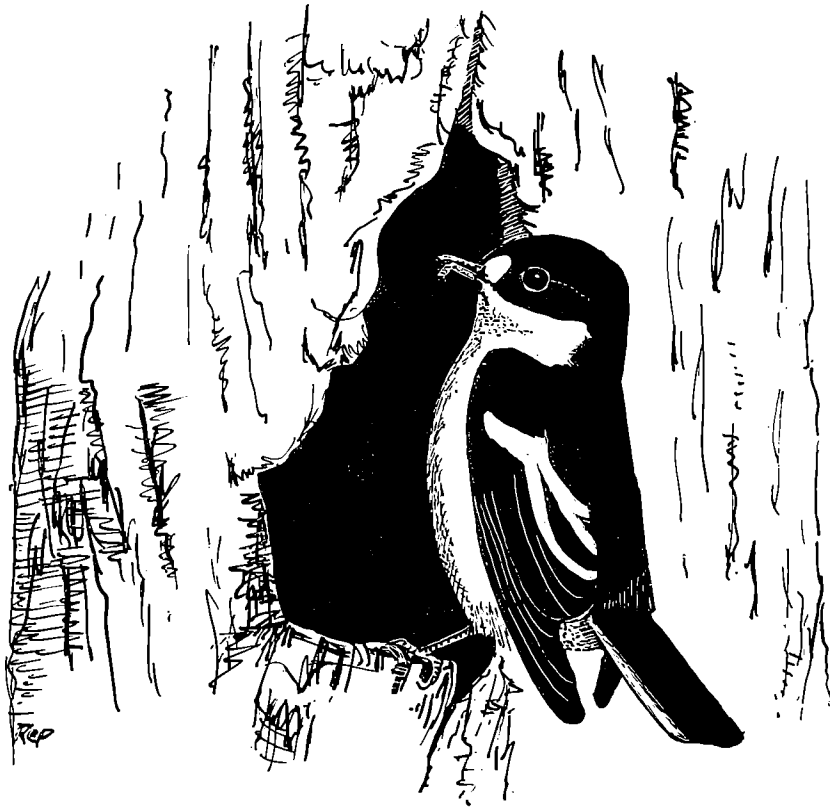


FIGURE 14
Pied flycatcher, *Ficedula hypoleuca*, with larva at entrance to nest hole. A summer visitor whose breeding population can be increased by the provision of nest boxes.

strongly limited by the number of available nest sites and can be increased by the provision of nest boxes, especially if these are of different patterns. A nest box, however, is no substitute for an old tree for the hundreds of species of insects dependent on decaying wood.

(c) *Flowers and fruits*

- (i) The maintenance of a variety of trees, shrubs and herbaceous plants will provide a longer flowering season and will help to safeguard against a failure of the seed crop of any one species. Tables 4 and 5, pages 64 to 68, show the time of flowering and fruiting of trees and shrubs.

(d) *Fungi*

- (i) Decaying wood in the form of logs or standing trees will encourage bryophytes and fungi as well as insects. The danger of a pest outbreak has

already been noted under dying and dead wood. Pests are wildlife species which have become out of balance and this instability may be caused by over-intensification of management such as the creation of large uniform areas of woodland. Ecological stability is aided by species and habitat diversity so the risk of devastating outbreaks of insect, fungus or other pests is less in mixed woodland.

(e) *Carriion and dung*

- (i) Woodlands rich in wildlife contain both these resources. If necessary carrion can be left out of sight and smell of paths or other frequented areas.

(f) *Nests*

- (i) Woodlands rich in wildlife contain many nests of different types.



PLATE 5
Matley and Denny Forest Nature Reserve, New Forest, Hampshire.
The New Forest is of exceptional importance for the conservation of many types of plants and animals.



PLATE 6
Monks Wood National Nature Reserve, Huntingdonshire.
Shrubby margins to a ride cut on alternate sides every
two years.

(g) *Paths, rides and glades*

- (i) Long, straight rides act as wind tunnels which makes them less attractive to wildlife. Rides should, where possible, be curved or bent at intervals. A ride should be angled just before it emerges from a woodland, especially on the side of the prevailing wind, so that the funnelling effect is lessened.
- (ii) Rides are much more valuable for wildlife if they have a shrubby margin. This margin must be kept in check by periodic cutting which, to add variety, can be alternated from side to side and may also be staggered along the length of the ride.
- (iii) Open firebreaks can be considered as rides and shrubs should be encouraged along the margins. In conifer plantations, firebreaks planted with broadleaf species or larch help to create structural and species diversity.

(iv) Natural glades, due perhaps to a shallow or waterlogged soil, may need little attention. Other glades will have to be cut periodically to keep them open. A shrubby margin is a valuable feature of glades as of rides.

(v) Control and observation of deer can be assisted by spreading fertiliser on selected areas in some rides to provide a better growth of vegetation and so attract deer into open ground. The fertilising of stands, especially larch in which there is often a sparse growth of grass, may improve grazing and provide a further return from increased tree growth, but this needs thorough investigation.

(h) *Water*

- (i) Maintain existing streams and ponds as far as possible. See that the feed to streams and ponds is not destroyed by excessive drainage or careless road work.



FIGURE 15

Roe deer, *Capreolus capreolus*. A native species which was once widespread but became restricted to Scotland and a few localities in England in the 18th century. Now more widespread in England.

- (ii) Leave an open or broadleaf margin to all ponds and streams and leave broadleaf species in water-courses and ravines.
- (iii) Avoid excessive drainage. Some areas, such as frost hollows or very deep peat, are quite unsuitable for tree growing and should be left undrained.
- (iv) Consider constructing ponds or small lakes on suitable sites. This can be done by excavating holes mechanically, by using explosives or by damming. All these are specialised skills and expert advice should be sought before the work is undertaken. Natural bottoms such as mud or gravel are better than concrete; gradually shelving edges better than a sheer drop. A depth of four or five feet is adequate for most wildlife purposes. Areas of water will not only improve wildlife variety generally but may improve the sporting value, if stocked with trout or by attracting duck, especially if alders and willows and other shrubs are encouraged around the margins. Such ponds may also be useful for fire-fighting.

4 Shelter

- (i) As far as possible restrict clear-felling to small blocks which are not contiguous so that at no time are large areas cleared of trees.
- (ii) Many birds and mammals breed in woodlands. Tables 1 and 2, pages 50 to 59, show that the main breeding season is from April to May with some starting as early as February and others going on into October. Woodland operations in late spring and summer should be localised to avoid disturbing breeding birds and animals and felling and thinning should be confined to the winter months, say from October to February, whenever possible.
- (iii) Some species are highly attached to traditional sites and if these are interfered with they may go elsewhere even if food and cover are still adequate. Examples are blackgame leks, fallow and red deer rutting stands, badger setts, heronries, nest trees of most of the larger birds of prey, and the "master oaks" of the Purple emperor butterfly. Leave such sites undisturbed. Winter roosts are also often

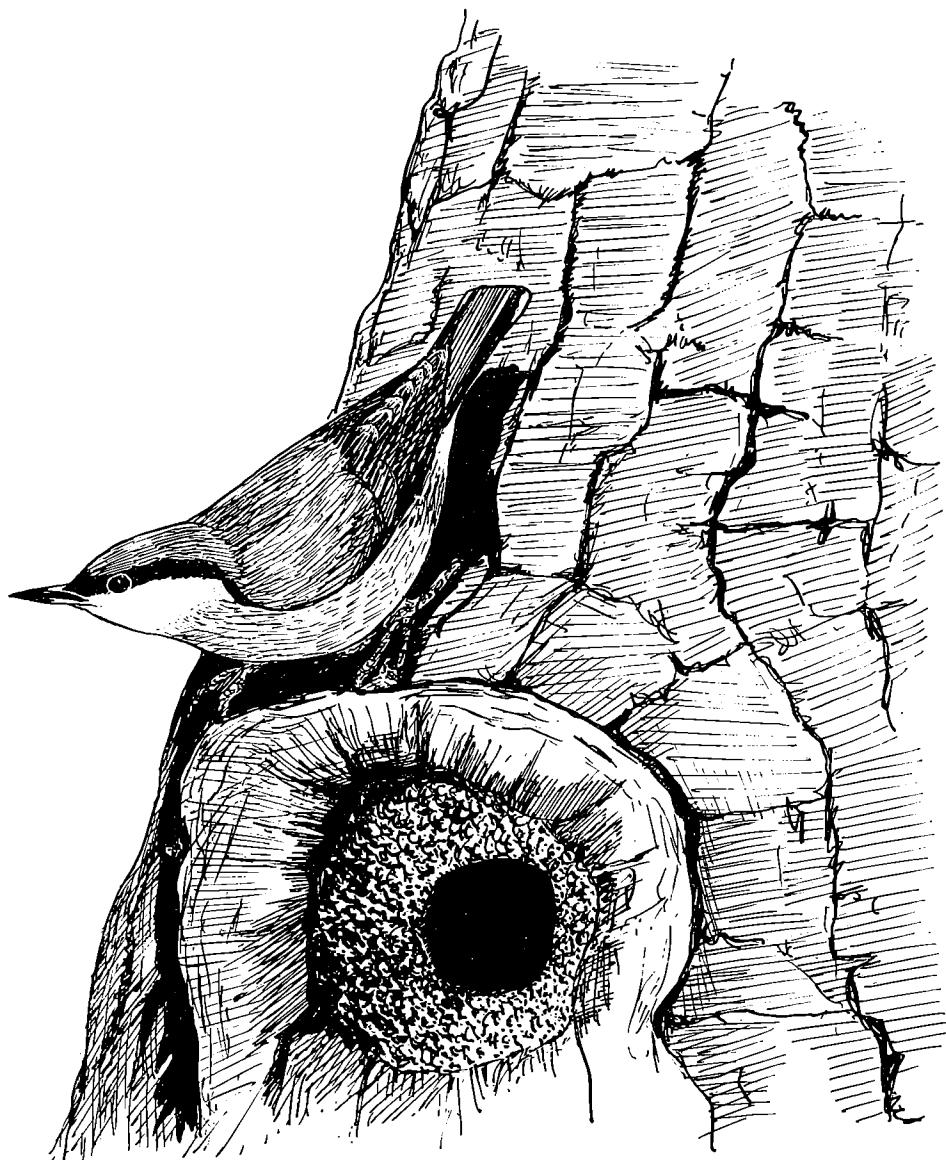


FIGURE 16

Nuthatch, *Sitta europaea*, and nest. A hole-nesting species which reduces the size of the entrance hole with mud.

traditional and disturbance may affect movement and abundance over a large area.

Pesticides, including Insecticides and Herbicides

- (i) Pesticides must be used selectively and sparingly in accordance with instructions and regulations.
- (ii) Remove unused pesticides or empty pesticide containers from the woodland and dispose of them

properly. On no account should they be dumped, especially in streams, ditches or ponds. Spraying equipment should not be washed or cleaned in the woodland.

- (iii) Herbicides must be placed carefully and only to relieve the planted trees. Patches of vegetation without trees should be left untreated.

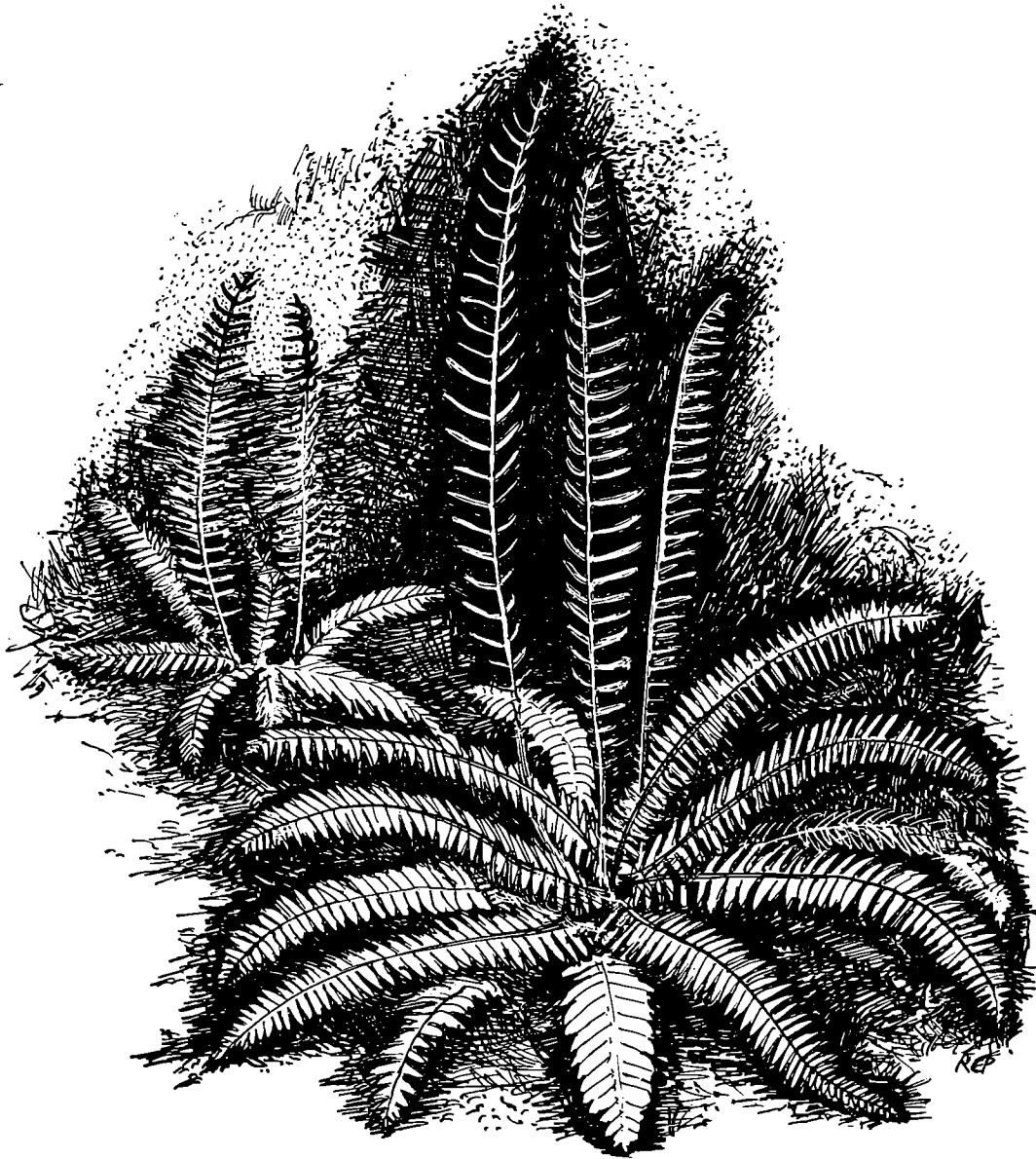


FIGURE 17
Hard fern, *Blechnum spicant*, sterile and fertile fronds. A common fern of woodlands on acid soils especially in hill areas.

General

“Tidying-up” the forest by clearing banks of bramble, patches of scrub, odd corners of woodland, piles of rotting wood and dead and dying trees costs money, usually results in little or no timber or financial return, and is nearly always detrimental to wildlife conservation. Do as little as is necessary in the way of clearing, draining, spraying, and so on to establish the new crop. If extra time or money is available, spend it on positive conservation measures and not on tidying up.

EXTENT OF WILDLIFE CONSERVATION MANAGEMENT

There is no ready answer to the question "What area of woodland must be managed for wildlife conservation in order to maintain a representative range of plants and animals?". Much depends on circumstances and the particular problems of an area. One tree may be ample for some insects; a group of oaks may be enough for certain birds; a larger area may be necessary to maintain representative plant communities. The general rule must be to maintain, after creating if necessary, a diversity of conditions including a variety of native plants.

Woodlands managed for timber, and particularly conifer woodlands, often do not achieve their full conservation potential. This can only be done if managers are aware of wildlife requirements and are prepared to implement conservation measures. In practice, the allocation of resources to wildlife conservation is likely to be on an empirical basis. As a starting point, a manager should consider the opportunities for conservation in his woodland and decide how far he is able to build on these opportunities. Some areas, for example, coppice-with-standards woodlands, have a high conservation value and require little diversion of resources from the primary commercial aim. Others, such as new plantations on deep peat, present few opportunities in the early stages for conservation management except for leaving parts unplanted and undrained. In the majority of woodlands, however, there is plenty of scope for the introduction of conservation measures with the aim of improving the whole woodland as a wildlife habitat.

Such measures may be concentrated into one or more blocks or may be scattered through the woodland. In new forests created in the uplands by planting, the conservation effort may be most usefully diffused over the whole area. In broadleaf woodland being converted to conifers it may be more valuable to leave a block of woodland so that conditions suitable for the maintenance of a broadleaf woodland flora and fauna continue. Local circumstances will determine the most appropriate method or combination of methods. These might include the maintenance or establishment of broadleaf woodland or scrub by streams, water courses, ponds and lakes; leaving blocks or strips of broadleaf woodland; encouraging scrub to develop in odd corners and along the margins of rides and firebreaks; leaving large trees to grow through to senility and death

when woodland is felled; leaving standing and lying dead wood and stumps; maintaining ponds and streams and creating new ponds; encouraging structural diversity by planting mixtures, thinning and felling, and also by planting in small blocks; and so on.

High forest, especially broadleaf high forest managed so that it is structurally diverse and contains a variety of trees and shrubs, provides habitats for many plants and animals. Coppice woodlands are usually rich in field layer plants and birds and insects but are often poor in epiphytes, and mosses and liverworts which need continuity of shade and humidity to survive. Coppice-with-standards woodlands, especially if some of the standards are allowed to become over-mature, can combine many of the good wildlife conservation features of high forest and simple coppice. Parkland is often poor in plant species, except perhaps epiphytic lichens, but may be very rich in wood-living invertebrates.

No good assessments have been made of the cost of conservation measures. Woodland areas managed specifically for wildlife need not be unproductive and can be harvested if the safeguards noted in this booklet are observed. Even if such areas produce timber at a reduced level this does not necessarily mean that the overall financial return from a woodland is reduced. Glades, formed in areas of shallow soil where trees would not grow well, can serve as focal points in a deer control plan, saving time and money. Ponds may be valuable in fire-fighting, or for fishing or wildfowling. Strips of scrub or areas of broadleaf in predominantly conifer woodlands improve the game-bird holding capacity of a forest and hence its sporting value. Trees left standing may be defective and cost more to fell than they are worth. Variety may enhance the value of a forest as a tourist attraction. Many of the measures suggested either cost nothing or actually reduce expenditure. The diversity that is retained also provides some insurance against the changes in markets and objectives that are inevitable in a long-term enterprise such as forestry. It is worth remembering that many of the prescriptions made here benefit game as well as wildlife generally. Conflict can arise between game and wildlife conservation, especially in the control of predatory animals and birds, but a more enlightened outlook and legislation now help to ensure a better balance between the two.

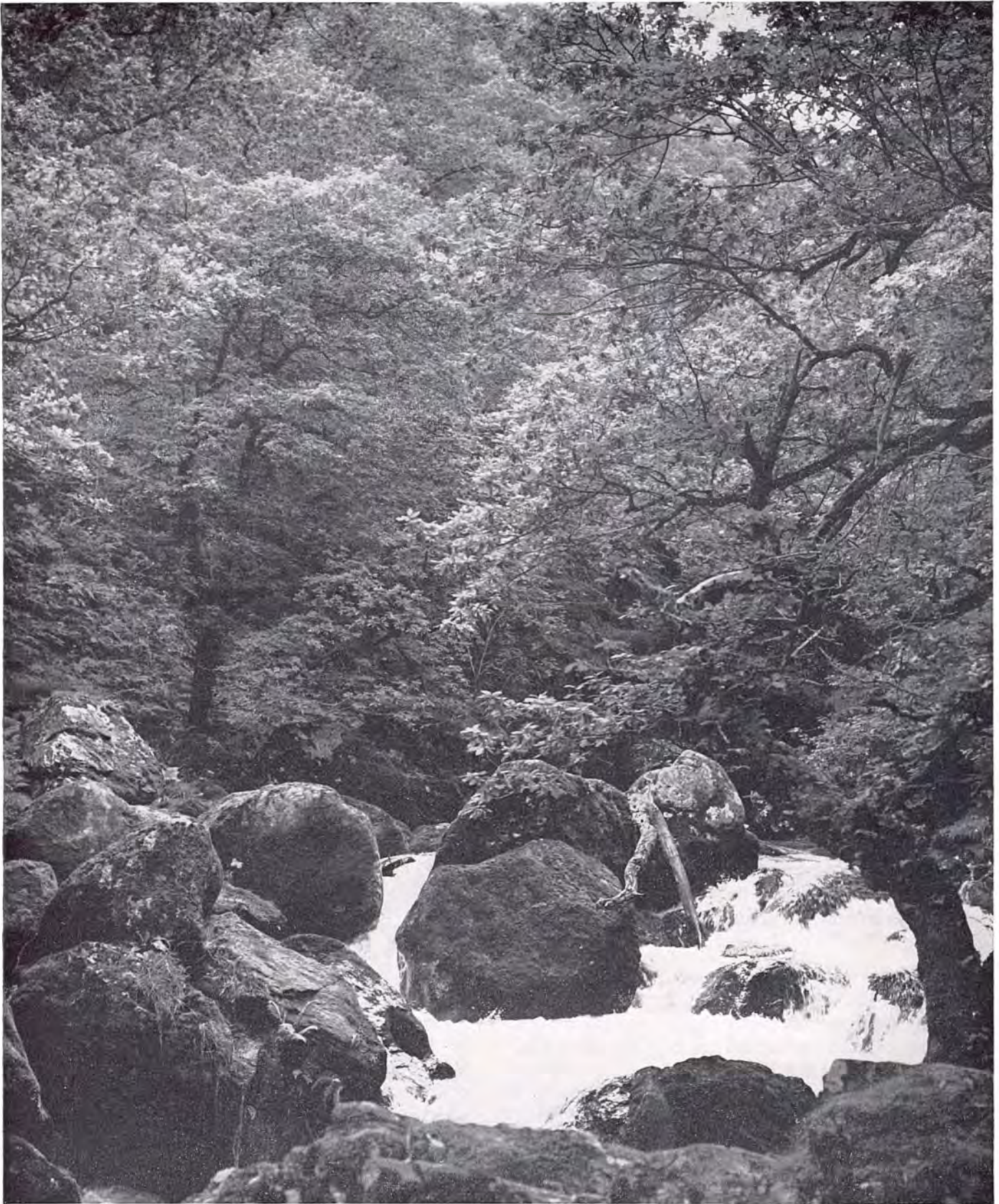


PLATE 7
Coed Ganllwyd National Nature Reserve, Merioneth.
The stream and trees help to provide the sheltered and humid
conditions required by many mosses and liverworts, particularly
the rarer species for which this reserve is noted.



PLATE 8
Windsor Forest, Berkshire.
A scattering of older trees, especially broadleaf species, left in the
areas planted with conifers.

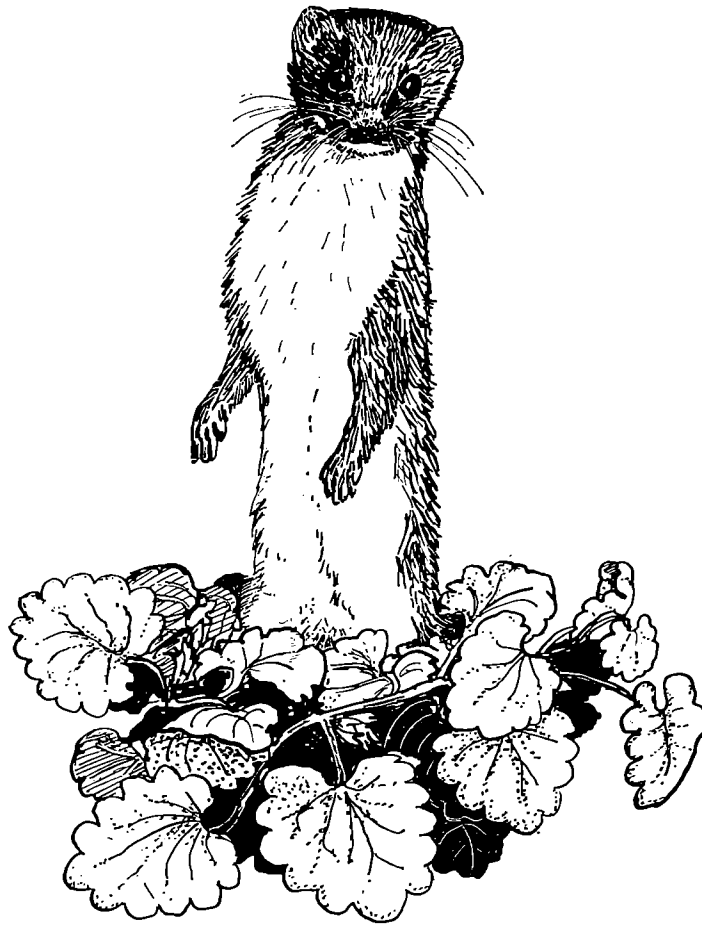


FIGURE 18
Weasel, *Mustela nivalis*, and Ground ivy, *Glechoma hederacea*.
Weasels feed mainly on voles and mice.

CONCLUSION

Every forest is important for wildlife conservation and every forester should accept that he has a key role to play in conserving woodland plants and animals. The extent and intensity of conservation management will vary from forest to forest but there are few forests managed for timber production which cannot be improved as wildlife habitats. Some expenditure is necessary but the main need is to integrate wildlife conservation prescriptions into woodland management plans. The probable effects on wildlife of every forest operation must be considered and if these are likely to be serious and long-lasting then every effort must be made to mitigate them. Conservation and woodland

management have gone hand in hand for centuries. They can continue to progress together if wildlife conservation is accepted as a responsibility by every forest manager.

Further advice on woodland conservation may be obtained through the appropriate Regional Officer of the Nature Conservancy, whose address will be found in the telephone directory or who can be contacted through the address given at the end of this booklet or from County Naturalists' Trusts, whose addresses can be obtained through the Society for the Promotion of Nature Reserves, Manor House, West Street, Alford, Lincolnshire.



FIGURE 19
Woodcock, *Scolopax rusticola*, on nest. The woodcock breeds in most counties and can be found in many woodlands all the year round. Its numbers are often increased by immigration from the Continent in autumn.

ACKNOWLEDGEMENTS

I am most grateful to those in the Nature Conservancy, Forestry Commission and elsewhere who discussed the manuscript of this booklet with me; to Miss E. M. Hill who painted the original for the cover picture, to Mrs. R. E. Parslow who prepared the line drawings, and to Mr. Colin Gibson who drew the title page decoration. I am grateful also to Mr. H. L. Edlin of the Forestry Commission for his help and advice throughout.

The Nature Conservancy provided the photographs reproduced as Plates 2, 5 and 7; Plates 3, 9 and 11 are drawn from the Forestry Commission collection; Plates 4 and 8, taken by Dr. A. D. Horrill, are reproduced by courtesy of the Crown Estate Commissioners; Dr. Horrill also provided Plates 6 and 10; Plate 1 is drawn from the Cambridge University Collection of aerial views; to all these photographers my thanks are due.



PLATE 9
Soudley Ponds, Forest of Dean, Gloucestershire.
Conifers planted well back from the water and a fringe of broadleaf
trees retained. D 5595

REFERENCES AND FURTHER READING

Forestry Commission Publications

Available from Her Majesty's Stationery Office at the addresses shown on the back cover, or through booksellers, at the prices stated. (Prices in brackets include postage.)

BOOKLETS

No. 15	<i>Know Your Conifers</i>	30p	(43p)
No. 20	<i>Know Your Broadleaves</i>	£1.00	(£1.20)
No. 38	<i>Common Trees</i>	11p	(16½p)
No. 42	<i>Field Recognition of British Elms</i>	85p	(94p)

LEAFLETS

No. 37	<i>The Capercaillie</i>	10p	(15½p)
No. 52	<i>The Fallow Deer</i>	17½p	(23p)

FOREST RECORDS

No. 64	<i>Pine Martens</i>	24p	(29½p)
No. 65	<i>Butterflies in Woodlands</i>	35p	(40½p)
No. 66	<i>Blackgame</i>	17½p	(23p)
No. 76	<i>Polecats</i>	12½p	(18p)
No. 77	<i>Hedgehogs</i>	13p	(18½p)
No. 85	<i>The Coal Tit</i>	14p	(19½p)
No. 86	<i>Crossbills</i>	14p	(19½p)
No. 89	<i>Titmice in Woodlands</i>	17p	(22½p)
No. 90	<i>Voles and Fieldmice</i>	10p	(15½p)
No. 91	<i>Birds and Woodlands</i>	40p	(45½p)
No. 92	<i>Woodpeckers in Woodlands</i>	24p	(29½p)
No. 98	<i>The Crested Tit</i>	25p	(30½p)
No. 99	<i>The Roe Deer</i>	40p	(48½p)

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- 3 *Protection of Birds Acts*. 1954-1967. London.
- 4 Woods, R. F. (1968) *Pesticides in British Forestry*. Some safety aspects of pesticides in the countryside. Joint ABMAC/Wildlife Education and Communications Committee, Alembic House, 93 Albert Embankment, London S.E.1.

NATIONAL ORGANISATIONS CONCERNED WITH THE CONSERVATION OF WOODLAND PLANTS AND ANIMALS

Botanical Society for the British Isles, c/o Department of Botany, British Museum (Natural History), London SW7.
British Deer Society, c/o 43 Brunswick Square, Hove, Sussex.
Council for Nature, Zoological Gardens, Regent's Park, London NW1.

Forestry Commission, 231 Corstorphine Road, Edinburgh EH12 7AT.

National Trust for places of Historic Interest or Natural Beauty, 42 Queen Anne's Gate, London SW1.

National Trust for Scotland, 5 Charlotte Square, Edinburgh.

Nature Conservancy, 19 Belgrave Square, London SW1.

Royal Society for the Protection of Birds, The Lodge, Sandy, Bedfordshire.

Scottish Wildlife Trust, 8 Duke Street, Edinburgh 2.

Society for the Promotion of Nature Reserves, Manor House, West Street, Alford, Lincolnshire. This is the national association of County Naturalists, and Conservation Trusts, which now cover all England, Scotland and Wales.

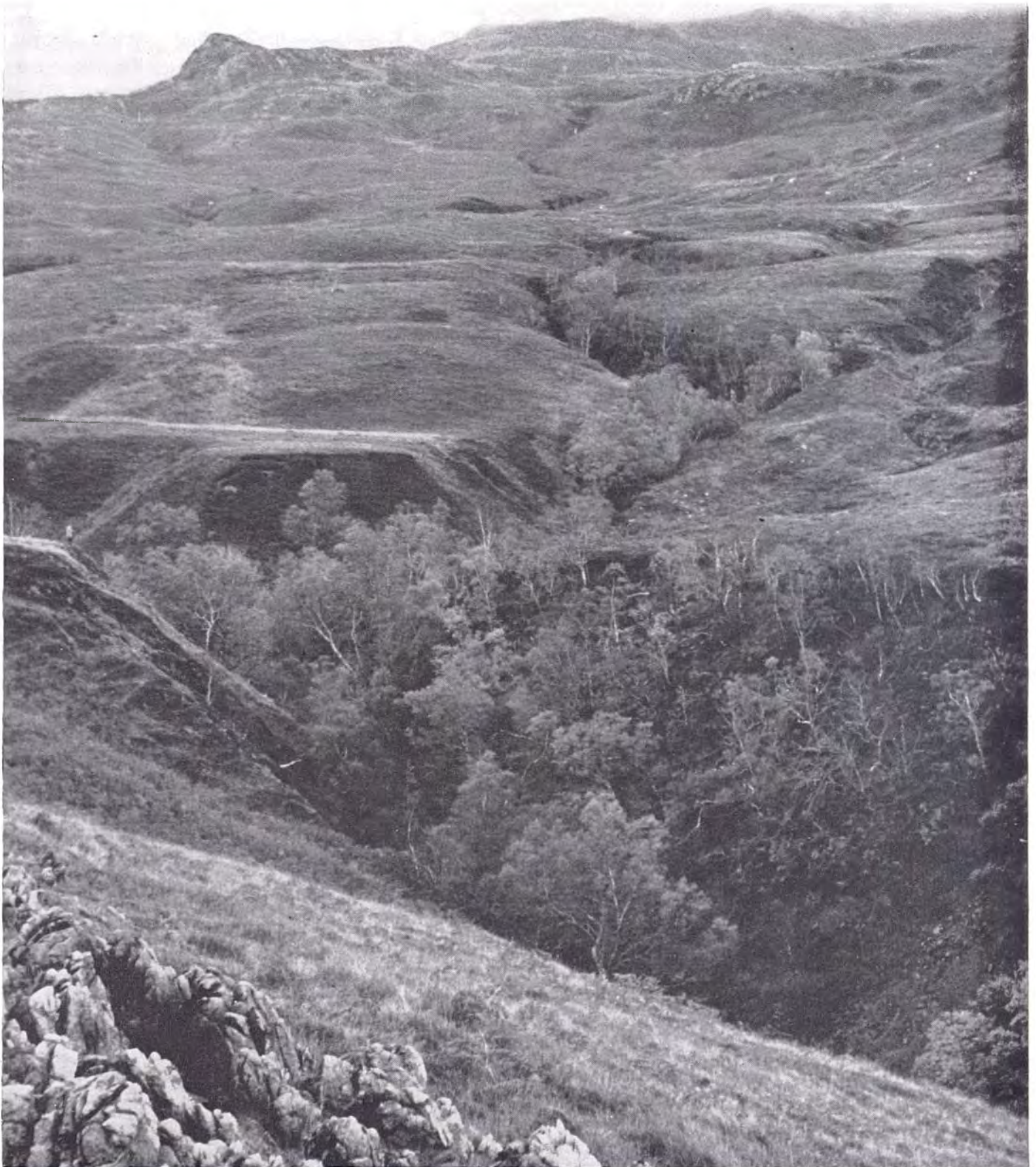


PLATE 10
Allt Nan Carnan Gorge National Nature Reserve, Ross-shire,
North Scotland. Woodlands such as this, although small in area,
are rich in species and should be retained in any upland planting
scheme.

APPENDIX AND TABLES

ANNOTATED LIST OF NATIVE WOODLAND TREES, SHRUBS AND CLIMBERS

	<i>Pages</i>		<i>Pages</i>
Alder . . .	40	Ivy .	44
Alder buckthorn	40		
Ash .	40	Juniper	44
Aspen .	40		
		Lime	44
Barberry . . .	40	Ling	44
Beech . . .	40		
Bilberry, Blaeberry .	40	Maple, Common or Field .	44
Birch .	40		
Bird cherry .	40	Oak .	44
Blackthorn .	41		
Box .	41	Pine, Scots	46
Broom .	41	Poplar .	45
Bramble . . .	41	Privet	45
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Currant, Red and Black	43	Spindle tree .	46
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Dogwood	43		
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Gean, Wild cherry	43	Wild service tree	46
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Hazel	43		
Heather .	44		
Holly .	43		
Honeysuckle	43		
Hornbeam	44		

ANNOTATED LIST OF NATIVE WOODLAND TREES, SHRUBS AND CLIMBERS

INTRODUCTION

The main native trees, shrubs and climbers are listed together with notes on distribution and wildlife interest. Some species are outstandingly rich in the wildlife they support; others are much poorer. However even the relatively poor species may be the sole food plants for some insects. Management for wildlife conservation should seek to encourage and maintain a variety of trees and shrubs. If only a limited amount of planting for wildlife is carried out then it is best to concentrate on species such as oak, willow, birch, hawthorn, blackthorn, aspen and Scots pine which are rich in associated species.

Tables 4 and 5, pages 64-67, show the flowering and fruiting times of native and commonly planted tree and shrub species. Again variety ensures that flowers and fruit are available to wildlife over a long period and lessens the risk of a food failure. Table 5 may also be useful in indicating when seed should be collected for conservation and amenity planting.

ALDER, *Alnus glutinosa*

Commonly along streams and rivers but also on waterlogged soils and on flushed sites. It forms extensive woodlands in the East Anglian "carrs". Reed buntings frequent stream-side alders and alderwoods are a favourite haunt of redpolls and siskins, especially in winter. They also attract woodpeckers and the tree-creeper and nuthatch. In general the birds of alderwoods are like those of birchwoods under similar conditions. A rich variety of insects feed on alder.

ALDER BUCKTHORN, *Frangula alnus*

A shrub of damp and often peaty soils mainly in England and Wales. Its berries are eaten by birds, for example fieldfares, and the woodmouse. Comparatively few insects feed on it but they include the Brimstone butterfly larva.

ASH, *Fraxinus excelsior*

Widespread in Britain under a variety of conditions but naturally dominant on the hard limestone and calcareous soils of western and northern Britain. Ash seeds or keys are eaten by small mammals and birds and form the most important food for the bullfinch in winter. Ash has fewer insects associated with it than most other native trees. It casts a light shade and its litter decomposes rapidly so the field layer under ash is often rich in species.

ASPEN, *Populus tremula*

Occurs extensively over Britain and withstands cold and sea winds. It is short-lived but maintains itself by suckering freely which enhances its value as an excellent browse for deer. Aspen is rich in associated insects.

BARBERRY, *Berberis vulgaris*

Doubtfully native but has been extensively planted for its edible fruit and is still grown for ornament. A related shrub, *Mahonia aquifolium*, the Oregon grape, has been widely planted as cover for game birds and is naturalised in many areas. Barberry has a sparse insect fauna but is the alternate host for the Black or Stem rust (*Puccinia graminis*) of cereals.

BEECH, *Fagus sylvatica*

A common tree of the chalk and soft limestone of south and south east England but on the continent more characteristic of acid sands and gravels. It has been widely planted. Beech casts a dense shade and has a very persistent litter so even-aged beechwoods often have a poor herbaceous flora which may however contain characteristic species including rare orchids and may be very rich in fungi. Beech mast is eaten by small mammals and many species of birds, especially titmice and particularly the Great tit, chaffinches and bramblings. A fair variety of insects feed on beech. Large old beech are often particularly rich in lichens and wood-living insects and also provide food and nesting holes for birds.

BILBERRY or BLAEBERRY, *Vaccinium myrtillus*

A common small shrub of woodlands on acid soils particularly in the north and west, often very heavily browsed by sheep and deer. Its berries are much sought by birds in autumn. A number of rare northern and mountain insects feed on bilberry in Scotland. In south England, Wood warblers are associated with a bilberry layer.

BIRCH, *Betula pubescens* and *B. pendula*

Birch is common throughout Britain and occurs in most woodlands. *B. pubescens* is perhaps more characteristic of the wetter north and west and of mountains, and *B. pendula* of the drier south and south-east England, but both species are widespread. Both are outstandingly rich in the numbers of insects which feed on them and which include rarities such as the caterpillar of the Kentish Glory moth. The Tree pipit and Great spotted woodpecker are characteristic insectivorous birds of birchwoods and the chaffinch and redpoll are characteristic seed-eaters. Black grouse nest in open Highland birchwoods.

BIRD CHERRY, *Prunus padus*

A shrub native mainly in north England, Wales and Scotland but also locally in East Anglia. It has however been widely planted. Its flowers are attractive to many insects and its berries are sought by birds.

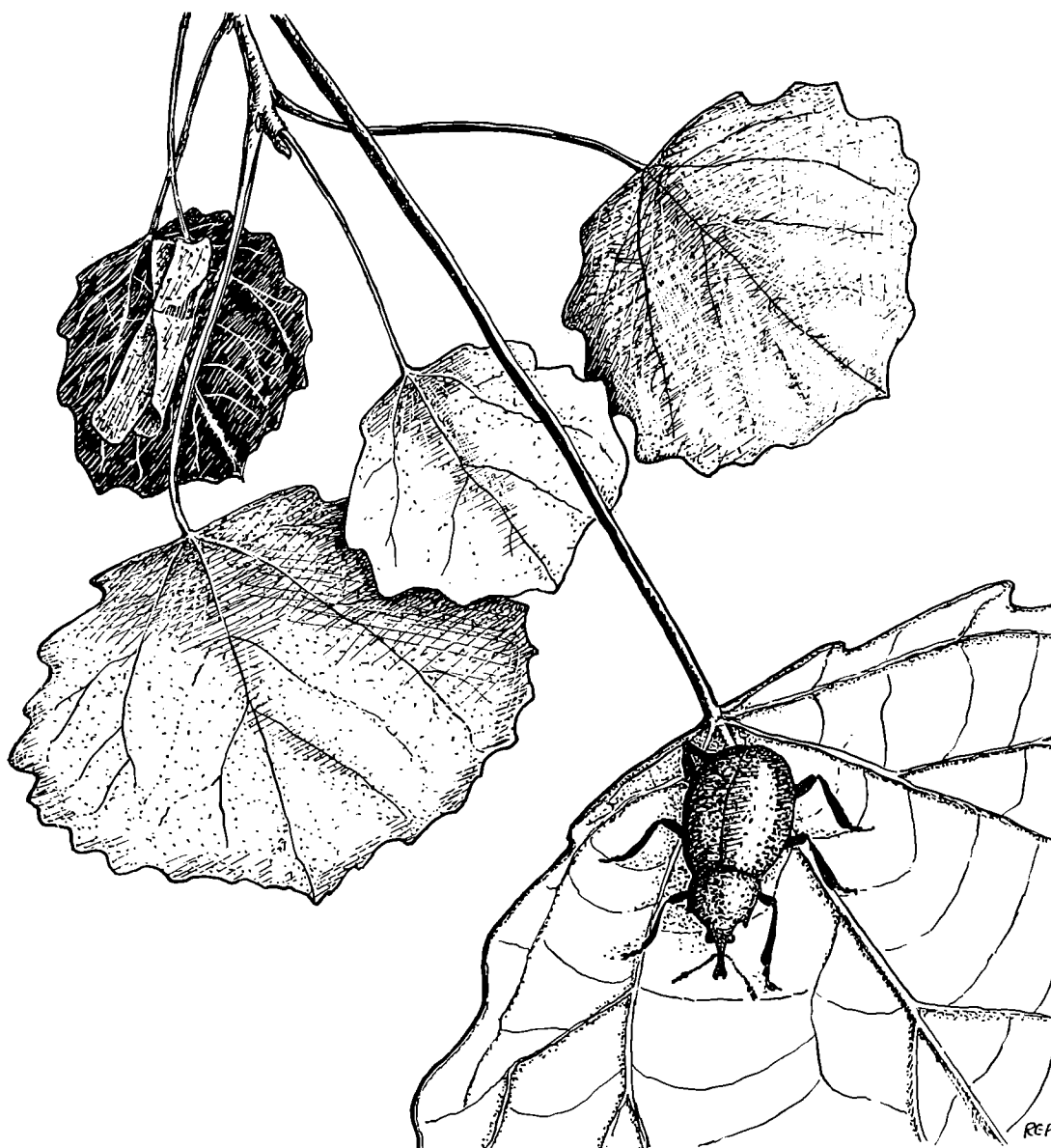


FIGURE 20

Aspen, *Populus tremula*, and the weevil, *Byctiscus populi*. Aspen poplar is a widespread species which has a particularly rich insect fauna associated with it.

BLACKTHORN, *Prunus spinosa*

A common and widely occurring shrub, tolerant of most soils and often forming dense thickets which provide good nesting cover. It is rich in insects feeding on it which include caterpillars of both the Brown hairstreak butterfly on low blackthorn and the Black hairstreak butterfly on taller blackthorn.

Box, *Buxus sempervirens*

Certainly native only on a very few sites on the chalk and oolitic limestone of south England but it has been planted in many woodlands in this area as game cover, and provides nesting sites for small birds. It has a sparse but interesting invertebrate fauna associated with it.

BROOM, *Sarothamnus scoparius*

This widely-occurring shrub is most characteristic of heaths and open land but also occurs in woodlands on sandy soils. Its large insect fauna, which includes the larva of the Green Hairstreak butterfly, has been intensively studied.

BRAMBLE, *Rubus fruticosus* agg.

Common in many woodlands throughout Britain and often forming a dense layer, especially in woods which have been opened. Brambles provide excellent nesting cover for many species of birds including the nightingale, blackcap, and Garden warbler. Many species of birds also seek its fruit in the autumn, including some summer migrants, such as the whitethroat which otherwise feed on insects. Many insects

are associated with it, and its flowers are visited by a wide variety of butterflies and other insects. Banks of brambles are a very valuable wildlife resource in woods. Bramble is a favourite browse for Roe and Fallow deer, and it is an important winter browse plant.

BUCKTHORN, PURGING, *Rhamnus catharticus*

A shrub with a similar geographical distribution to the Alder buckthorn but which is more strongly calcicole and extends to drier sites. Like the Alder buckthorn it is host plant for the Brimstone butterfly but the fruit appear to be less favoured by birds.

BUTCHER'S BROOM, *Ruscus aculeatus*

Native in southern Britain on dry soils but it has been intro-

duced over a much wider area. It has a very poor invertebrate fauna associated with it, but it is used for nesting by chiffchaffs.

CLEMATIS, *Clematis vitalba*

A woody climber of calcareous soils in south England and Wales. It has a good insect fauna, and provides nest sites for a variety of passerine birds.

COWBERRY, *Vaccinium vitis-idaea*

An evergreen dwarf shrub in woodlands on acid soils in Scotland, north England and Wales, and also on moorland. Like bilberry, it is an important food plant for the arctic-alpine lepidoptera and its fruit is taken by birds.



FIGURE 21
Blackcap, *Sylvia atricapilla* and nest in bramble, *Rubus fruticosus* agg. Blackcaps favour woodland with a dense shrub layer in which they can nest.

CRAB APPLE, *Malus sylvestris*

A small tree occurring throughout Britain but less common in central and north Scotland. Many insect species are associated with it and the fruits are eaten by birds, notably thrushes and blackbirds, and small mammals. A most attractive tree in form and flower which is worth using more widely for amenity planting. Commonly planted in the past as a food source for game birds.

CURRENTS, *Ribes* species

Red currant, *Ribes rubrum* (agg.) and Black currant, *R. nigrum*. Found locally near streams and in fen carr. Host plants of the Magpie moth.

DOGWOOD, *Thelycrania sanguinea*

In woods and scrub on calcareous soils mainly in England and west Wales but also in south Scotland. Its flowers are insect pollinated but it has a poor insect fauna.

ELDER, *Sambucus nigra*

Widespread and common in many woods but especially characteristic of disturbed nitrogen-rich sites such as old rabbit warrens. Like the hawthorn, it is resistant to rabbits. Elder flowers are attractive to many insects and the berries are sought by many different species of birds. Holes in the stems and branches are favoured nest sites for marsh and willow tits; finches find nest-sites in forked branches. It has a sparse insect fauna.

ELM, *Ulmus* species

The main species are the Wych elm (*U. glabra*), the English elm (*U. procera*) and the Smooth elm (*U. carpinifolia*). All have a rich variety of insects feeding on them including larvae of the Whiteletter hairstreak, Comma and the Large tortoiseshell butterflies. Old elms attract a variety of nesting birds including Stock dove, kestrel and jackdaw which use the epicormic shoots and cavities.

GEAN or WILD CHERRY, *Prunus avium*

Widespread in Britain on the better soils; has also been widely planted. Its fruits are taken by a variety of birds and the seeds are especially favoured by hawfinches.

GOOSEBERRY, *Ribes uva-crispa*

Closely related to the currants but more widely distributed and like them commonly cultivated. The flowers attract insects and the fruits are eaten by birds.

GORSE, FURZE or WHIN, *Ulex* species

Ulex europaeus, Furze, Gorse or Whin is widely distributed throughout Britain on the lighter soils; *U. gallii* and *U. minor*, Dwarf furze, occur on acid soils in England, Wales and south Scotland. All have insect-pollinated flowers and

a fair insect fauna, particularly associated with the pods and seeds. They are intolerant of shade and found in open woodland or in young plantations where they provide cover and nesting sites for birds particularly the linnets. The very rare Dartford warbler, which is virtually restricted in Britain to the New Forest and the Dorset heaths, is always associated with gorse.

GUELDER ROSE, *Viburnum opulus*

A shrub which is widespread in England on damp soils but less common in Scotland. The flowers are attractive to insects and the fruits eaten by birds and small mammals, notably the woodmouse.

HAWTHORNS, *Crataegus* species

C. monogyna, the Hawthorn, is a common shrub throughout woodlands and scrub in Britain but becoming rarer in north west Scotland. *C. laevigata*, the Midland thorn, is more tolerant of shade and is found mainly in woodlands on better soils in midland and south-east England. Hybrids between the two species occur. A very rich variety of insects feed on hawthorn; the flowers attract large numbers of insects; the fruits are sought by birds, particularly the thrush family but also many others including finches and tits. The fruits are an important winter food for the woodmouse. Under more open conditions it forms a dense crown which provides good nesting cover for many species.

HAZEL, *Corylus avellana*

A shrub occurring naturally over most of Britain but which has also been extensively planted and tended as coppice. It will grow on most soils except those that are very acid and is tolerant of salt air. A good variety of insects feed on it. Its nuts are valuable food for small mammals, including the dormouse, and for birds such as the nuthatch. Nightingales may nest in the coppice shoots.

HOLLY, *Ilex aquifolium*

Holly occurs widely in Britain except on wet soils. It has a very poor associated fauna which includes the Holly blue butterfly whose alternate host is ivy. Holly berries are taken by many birds especially thrushes, woodpigeons and starlings. The leaves and bark are good browse for deer, especially in the winter. The dense foliage provides good nesting cover early in the season.

HONEYSUCKLE, *Lonicera periclymenum*

Widespread in the British Isles both as a climber and in the field layer. The flowers are attractive to hawk-moths and bumble bees and the fruits are eaten by birds which also nest in the dense tangles it often forms. It has a fair invertebrate fauna feeding on it, including larvae of the White admiral butterfly.

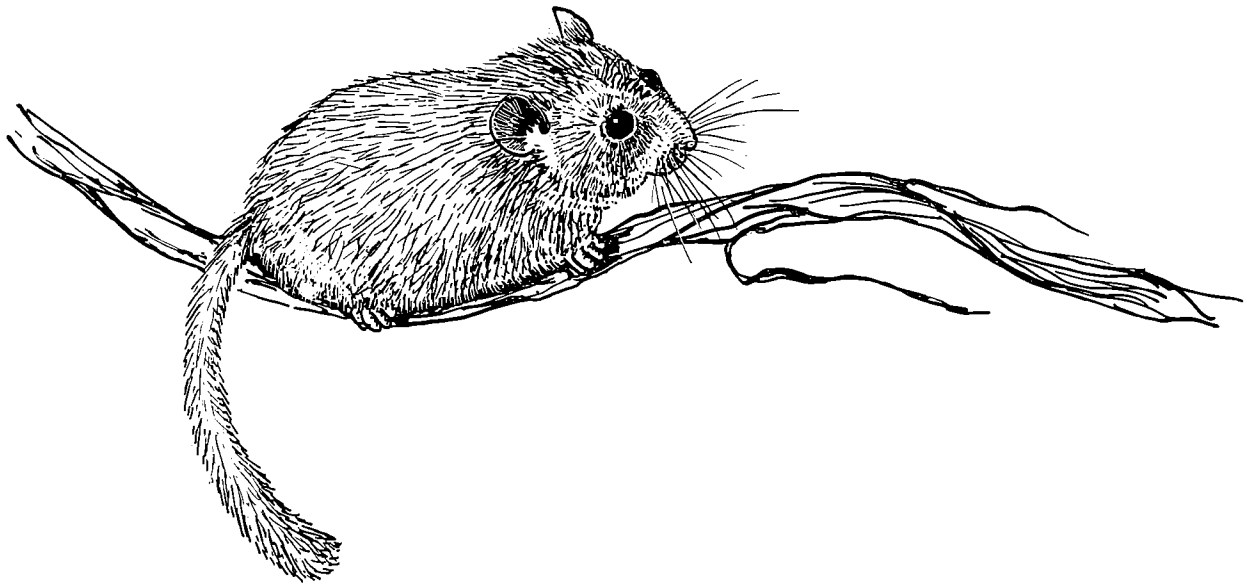


FIGURE 22

Dormouse, *Muscardinus avellanarius*. Prefers shrubby growth. It is the only native rodent that hibernates, often on the ground in the shelter of roots or under leaves.

HORNBEAM, *Carpinus betulus*

Native mainly in south-east England but it has been widely planted and was formerly often managed as coppice. It is more tolerant of wet clays than beech, which it superficially resembles. Like beech it casts a heavy shade so the field layer under hornbeam is sparse. Hawfinches are particularly associated with this tree which has comparatively few insects feeding on it.

IVY, *Hedera helix*

A widespread evergreen plant which, like honeysuckle, may be a climber or in the field layer. Climbing ivy provides nesting sites and cover for birds and also cover and hibernation sites for various insects. Its flowers, which appear late in the year when little else is in bloom, attract a variety of insects. The berries are taken by birds which are also partial to the numerous insects. It is a useful winter browse for deer.

JUNIPER, *Juniperus communis*

Occurs mainly in south-east and north England on chalk downs, heaths and moors and, in Scotland, in pine and birch woods. It has a moderate number of insects associated with it. As the shrub layer in some pine and birch woods in Scotland, juniper provides nesting cover for a variety of birds from thrushes to the goldcrest. It is a useful winter browse for deer.

LIME, *Tilia* species

There are two species and the hybrid between them. *T. platyphyllos*, the Large-leaved lime, is a rare woodland tree on calcareous soils over limestone mainly in the Wye

Valley and the south Pennines. *T. cordata* the Small-leaved lime, is more widespread but confined mainly to a belt across England and Wales, on fertile soils often over limestone in the west or more acid soils in the east. The hybrid *T. vulgaris*, the Common lime, has been extensively planted as a roadside and amenity tree although it is not altogether suitable for town planting as it produces a copious rain of honey-dew resulting from infestation of its leaves by aphids.

The flowers are freely visited by insects although comparatively few invertebrates, with the notable exception of aphids, feed on the leaves. Stems, especially of *T. cordata*, appear particularly attractive to woodpeckers who make regular horizontal rows of holes in the bark to suck the sap. The dense basal shoots often thrown up provide useful nesting cover.

LING OR HEATHER, *Calluna vulgaris*

Widespread in open woodlands on well-drained soils. It has a fair insect fauna including the Emperor and Oak egg moth. As the field layer in old pine woods it shelters the nests of capercaillie, Black grouse, woodcock and duck.

MAPLE, COMMON or FIELD, *Acer campestre*

Widespread and common in woodlands in England and Wales but becoming rarer in the west and north. Its fruits are eaten by small mammals. Its flowers are attractive to insects but not many species of insect feed on the leaves.

OAK, *Quercus* species

Both native species of oak have been widely cultivated and planted and their natural distribution has become confused.

In general *Q. robur*, the Pedunculate oak, is more characteristic of heavy and calcareous soils of the south and east and *Q. petraea*, the Sessile oak is more typical of the lighter and acid soils of north and west.

Both species of oak are outstandingly rich in the variety and numbers of insects which feed on them including about 240 species of lepidoptera. The caterpillars of some of those species, e.g. the Oak-leaf roller moth (*Tortrix viridana*) occur in vast numbers and are especially important for birds, e.g. tits, in the breeding season as they form the main source of food for their young. Large trees often carry lichens on the bark and contain many wood-living insects in the stem, which may include rarities. Woodpeckers feed and nest in older trees. The acorns provide food for larger birds, notably jays and woodpigeons, mammals and insects.

Oaks have the richest associated fauna of any British plant and the importance of oak for wildlife conservation cannot be over-emphasised. It is a species which should be planted and maintained wherever possible.

POPLARS, *Populus* species

The native status of the Grey poplar (*P. canescens*) and the Black poplar (*P. nigra*) is uncertain. Poplars have a good fauna including some insects which are specific to one or other species. See also aspen.

PRIVET, *Ligustrum vulgare*

A common shrub of woodlands, particularly on calcareous soils, and it has also been widely planted. Birds feed on the fruit and nest in the dense tangles it forms. The flowers

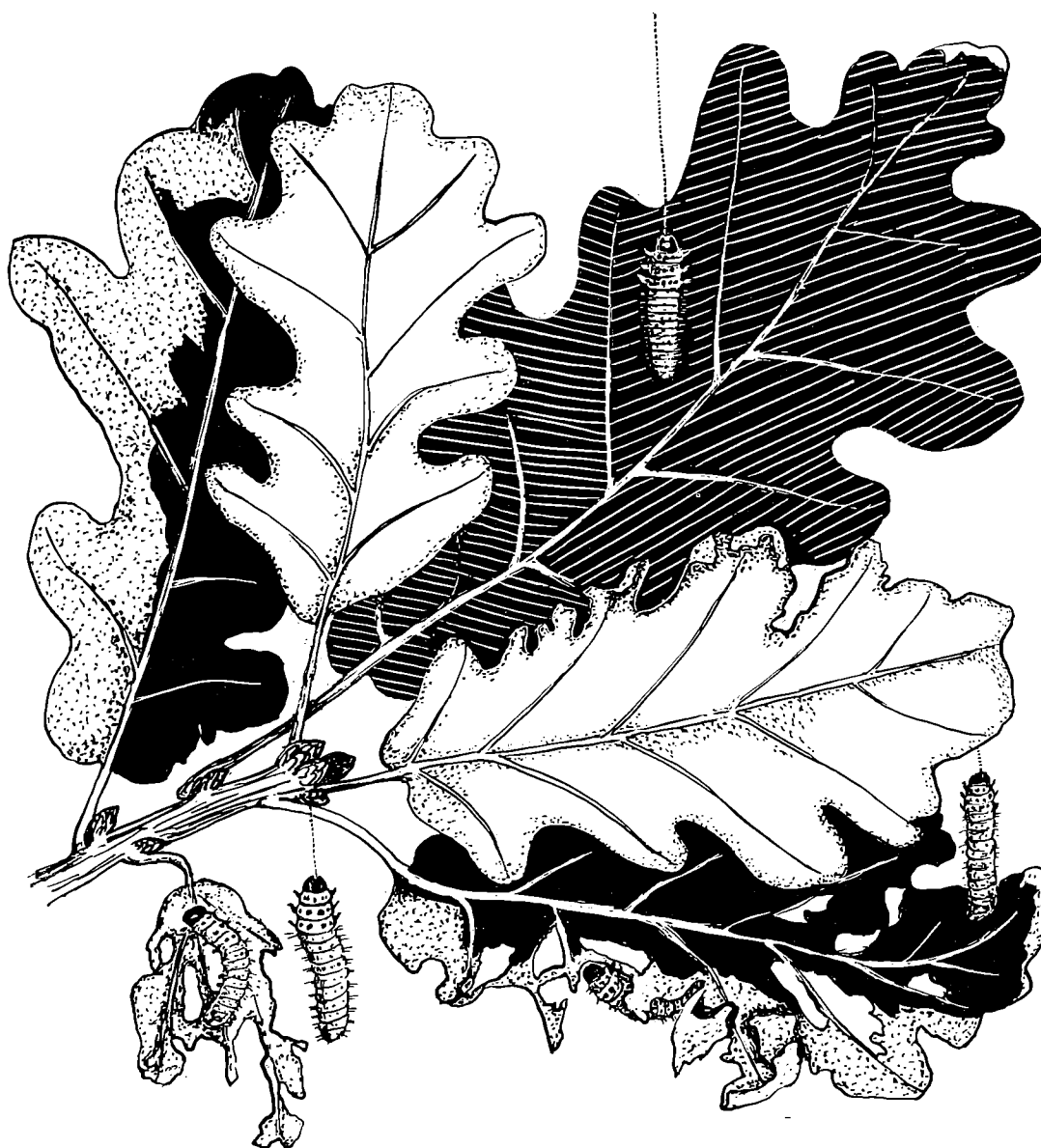


FIGURE 23
Oak-roller moth larvae, *Tortrix viridana*, on Sessile oak, *Quercus petraea*. Occur abundantly each year and are an important food for tits and other birds in the breeding season.

attract insects but it has only a fair invertebrate fauna feeding on the leaves. Very useful as game cover but its tendency to form thickets may need controlling if replanting is to take place.

RASPBERRY, *Rubus idaeus*

A suckering shrub which is of widespread occurrence. It has a fair invertebrate fauna associated with it and its fruits are taken by birds.

ROSES, *Rosa* species

Several species of rose occur in woodlands throughout Britain. Birds feed on the fruit and nest in the tangles formed by the stems. It has only a fair insect fauna associated with it although its flowers attract insects.

ROWAN, *Sorbus aucuparia*

A very hardy shrub or small tree, widespread, but mainly on the lighter soils. It has only a fair insect fauna but its flowers attract insects and its fruits are eaten by pine martens, as well as thrushes and other birds.

SCOTS PINE, *Pinus sylvestris*

Survives in strength as a truly wild tree only in the Scottish Highlands, but is naturalised in many other parts of Britain, and is also extensively planted. It has a good variety of insects which feed on it. Many species are restricted to Scots pine in the highlands of Scotland, particularly in the Caledonian relict forests. By far the richest conifer in the variety of its associated wildlife.

SPINDLE TREE, *Euonymus europaeus*

A shrub or small tree of woods and scrub on calcareous soils mainly in southern England but extending into Wales, north England and south Scotland. It has a comparatively small insect fauna but its flowers attract insects and its fruit are taken by birds. It is the alternate host of the Bean aphid (*Aphis fabae*).

SPURGE LAUREL, *Daphne laureola*

A small evergreen shrub, locally common on calcareous soils in south England but rarer in Wales and north England. Its flowers, produced very early in the year, attract butterflies, moths and bumble bees and its fruits are taken by birds. Its insect fauna does not appear to be well recorded.

A relative, *D. mezereum*, or Mezereon, is a rare and very local shrub of woods on calcareous soils in England; it is commonly grown in gardens for its bright early spring flowers, lilac in colour, which open before the leaves.

TUTSAN, *Hypericum androsaemum*

A semi-evergreen small shrub in damp woods throughout Britain. It appears to have rather a poor insect fauna.

WAYFARING TREE, *Viburnum lantana*

A common shrub of woods and scrub on calcareous soils in southern England but rarer in Wales and in the north. The flowers attract insects and birds take the fruit. It is a handsome shrub in flower and fruit, with leaves which take on rich colours in autumn, but it is relatively poor in the invertebrates associated with it.

WHITEBEAM, *Sorbus aria* agg.

A large shrub or small tree in woods or scrub, usually on calcareous soils. It is common in southern England and less so in the north, Wales and Scotland, but it has been widely planted. It has a relatively poor insect fauna but its flowers attract insects and its fruit are taken by birds.

As well as rowan, whitebeam and Wild service listed here, there are several other species of *Sorbus* and hybrids, many of which are native only to Britain and occur in rocky, limestone areas.

WILD SERVICE TREE, *Sorbus torminalis*

A tree widespread in the midlands and south England but usually very local in occurrence. It occurs mainly on clays. Little appears to be recorded concerning its insect fauna, but its flowers attract insects and its fruits (which are fleshy and in earlier days were made into a preserve) are taken by birds. Its presence often indicates very ancient woodland.

WILLOWS, *Salix* species

There are several species and hybrids. The more common woodland species are Bay willow (*S. pentandra*), White willow (*S. alba*), Crack willow (*S. fragilis*), Goat willow (*S. caprea*), Common sallow (*S. cinerea*) and Eared sallow (*S. aurita*). All are rich in the number of species of insects which feed on them which includes the larvae of the Purple emperor butterfly. Willow saplings are favoured fraying stocks for roe and fallow bucks and their presence will reduce the likelihood of such damage to crop trees.

YEW, *Taxus baccata*

Native, often as scattered trees in woodlands and scrub on chalk and limestone, but sometimes forming pure woods. Very few insects are associated with yew. The fruits are taken by thrushes and many other species of birds. The sculptured trunks and epicormic shoots of large yews are favoured by thrushes, finches, robin, dunnoek, wren and Spotted flycatcher for nesting; goldcrests hang their nests at branch-tips. Browsed by deer in winter.



FIGURE 24
Wild service tree, *Sorbus torminalis*, leaves and fruit. A native tree
whose presence often indicates ancient woodland.



PLATE 11

Maen Arthur Wood, Myherin, Cardiganshire

The balanced integration of conifer plantations into a broadleaf woodland. A 4078



FIGURE 25
Black grouse, *Lyrurus tetrix*, on hawthorn, *Crataegus monogyna*.
Formerly widespread but now only generally distributed in
Scotland. A bird of open woodland, particularly birch.

TABLE 1
WOODLAND BIRDS
Including birds nesting in trees

Note

“Breeding season” covers the months in which eggs and young, in the case of nest-dwelling species, may be expected in the nest. The period of territorial occupation and nest building, which extends to the month before the season indicated in the table, is also important and disturbance during this time should be kept to a minimum.

Family and ENGLISH NAME	SCIENTIFIC NAME	BREEDING SEASON, MONTHS											
		J	F	M	A	M	J	J	A	S	O	N	D
<i>Ardeidae</i>													
HERON	Ardea cinerea		×	×	×	×	×	×	×				
<i>Anatidae</i>													
MALLARD	Anas platyrhynchos	×	×	×		×	×						
RED-BREASTED MERGANSER	Mergus serrator					×	×	×					
GOOSANDER	Mergus merganser				×	×	×	×					
SHELDUCK	Tadorna tadorna					×	×	×					
<i>Falconidae</i>													
GOLDEN EAGLE	Aquila chrysaetos			×	×	×	×	×	×				
BUZZARD	Buteo buteo				×	×	×	×					
SPARROWHAWK	Accipiter nisus					×	×	×					
*GOSHAWK	Accipiter gentilis				×	×	×	×					
*KITE	Milvus milvus				×	×	×	×					
*HONEY BUZZARD	Pernis apivorus					×	×	×	×				
HEN HARRIER	Circus cyaneus					×	×	×					
*MONTAGU'S HARRIER	Circus pygargus					×	×	×					
*OSPREY	Pandion haliaetus				×	×	×	×	×				
*HOBBY	Falco subbuteo						×	×	×				
MERLIN	Falco columbarius					×	×	×					
KESTREL	Falco tinnunculus				×	×	×	×					
<i>Tetraonidae</i>													
BLACK GROUSE	Lyrurus tetrix					×	×	×					
CAPERCAILLIE	Tetrao urogallus				×	×	×						
<i>Phasianidae</i>													
PHEASANT	Phasianus colchicus				×	×	×	×					
<i>Rallidae</i>													
MOORHEN	Gallinula chloropus		×	×	×	×	×	×	×				
<i>Scolopacidae</i>													
WOODCOCK	Scolopax rusticola		×	×	×	×	×						
<i>Columbidae</i>													
STOCK DOVE	Columba oenas		×	×	×	×	×	×	×	×	×		
WOOD PIGEON	Columba palumbus		×	×	×	×	×	×	×	×	×	×	
TURTLE DOVE	Streptopelia turtur					×	×	×	×				
COLLARED DOVE	Streptopelia decaocto		×	×	×	×	×	×	×	×	×	×	

Table 1, continued

Key * Rare as a breeding bird in Britain

Nesting sites

- 1 On ground or in hole in ground
- 2 Herbaceous vegetation or low shrubs
- 3 Tall shrubs
- 4 Trees
- 5 Holes in trees

NESTING SITE IN WOODLAND					WOODLAND TYPE	MAIN FOOD
1	2	3	4	5		
			×		Broadleaf and conifer	Fish; also frogs; small mammals; insects
×			×	×	Broadleaf and conifer often some distance from water	Grain; seeds
×					Woodland edge occasionally	Small fish; frogs; shrimps; insects
×			×		Woodland edge; isolated trees	Small fish; eels; shrimps; insects
×			×		Woodlands very occasionally, isolated trees; usually near coast	Marine molluscs and crustaceans, also vegetable matter
			×		Conifer; also broadleaf; usually on cliffs	Birds; mammals; carrion
×			×		Broadleaf and conifer	Small mammals; carrion; insects
	×	×	×		Broadleaf and conifer	Small birds; also small mammals; insects
			×		Broadleaf and conifer	Birds and mammals
			×		Mainly broadleaf	Small birds and mammals; carrion
			×		Broadleaf	Wasp grubs; bees; ant pupae; honey
×					Young plantations	Small animals; also small birds
×					Young plantations	Small mammals; birds; frogs; insects
			×		Conifer	Fish
			×		Broadleaf and conifer; isolated trees and clumps	Insects; small birds
			×		Usually on ground in open; sometimes in scattered trees and bushes	Small birds; insects; also mammals
			×	×	Broadleaf and conifer	Small mammals; birds; insects; frogs; worms
×					Young conifers; open woodland	Conifer shoots; birch buds; insects
×					Mainly conifer	Conifer shoots; berries; insects
×					Woodland edge; broadleaf and conifer	Fruits; seeds; leaves; insects
×	×	×	×		Near water; conifer and broadleaf	Water-weed; insects; worms; fruit; seeds
×					Conifer and broadleaf	Earthworms; insects; seeds
×				×	Woodland edge; scattered trees; mainly broadleaf	Seeds; grain
		×	×		Conifer and broadleaf	Clover; seeds; grain; berries
			×		Conifer and broadleaf edges	Weed seeds
		×	×		Conifer and broadleaf near habitations	Grain; weed seeds; berries

Table 1, WOODLAND BIRDS, continued

Family and ENGLISH NAME	SCIENTIFIC NAME	BREEDING SEASON, MONTHS											
		J	F	M	A	M	J	J	A	S	O	N	D
<hr/>													
<i>Cuculidae</i>													
CUCKOO	Cuculus canorus							×	×	×			
 <i>Strigidae</i>													
BARN OWL	Tyto alba					×	×	×	×	×	×		
LITTLE OWL	Athene noctua					×	×	×	×				
TAWNY OWL	Strix aluco					×	×	×	×	×			
LONG-EARED OWL	Asio otus					×	×	×	×				
SHORT-EARED OWL	Asio flammeus							×	×	×			
 <i>Caprimulgidae</i>													
NIGHTJAR	Caprimulgus europaeus							×	×	×	×		
 <i>Picidae</i>													
GREEN WOODPECKER	Picus viridis					×	×	×	×				
GREAT SPOTTED WOODPECKER	Dendrocopos major							×	×	×			
LESSER SPOTTED WOODPECKER	Dendrocopos minor					×	×	×	×				
*WRYNECK	Jynx torquilla							×	×	×			
 <i>Alaudidae</i>													
WOODLARK	Lullula arborea					×	×	×	×	×	×		
 <i>Corvida</i>													
RAVEN	Corvus corax		×	×	×	×	×	×					
CARRION CROW	Corvus corone corone					×	×	×					
HOODED CROW	Corvus corone cornix					×	×	×	×				
ROOK	Corvus frugilegus					×	×	×	×				
JACKDAW	Corvus monedula					×	×	×	×				
MAGPIE	Pica pica					×	×	×					
JAY	Garrulus glandarius					×	×	×	×				
 <i>Paridae</i>													
GREAT TIT	Parus major					×	×	×					
BLUE TIT	Parus caeruleus					×	×	×					
COAL TIT	Parus ater					×	×	×					
CRESTED TIT	Parus cristatus					×	×	×					
MARSH TIT	Parus palustris					×	×	×					
WILLOW TIT	Parus montanus					×	×	×					
LONG-TAILED TIT	Aegithalos caudatus					×	×	×					
 <i>Sittidae</i>													
NUTHATCH	Sitta europaea					×	×	×					
 <i>Certhiidae</i>													
TREECREEPER	Certhia familiaris					×	×	×	×				
 <i>Troglodytidae</i>													
WREN	Troglodytes troglodytes					×	×	×	×	×			

Table 1, continued

NESTING SITE IN WOODLAND					WOODLAND TYPE	MAIN FOOD
1	2	3	4	5		
					Broadleaf; very open conifer; hedges. Main hosts are dunnock, Reed warbler, Meadow pipit, Pied wagtail, robin, and Sedge warbler	Insects; worms; etc.
					× Open with large trees	Small mammals and birds; insects
×					× Woodland edge; scattered trees	Insects; small mammals and birds
×		×	×		Broadleaf; also conifer	Small mammals and birds; insects
×		×			Conifer; also broadleaf	Small mammals and birds; insects
×					Young conifer plantations	Small mammals and birds; insects
×					Large clearings; felled areas; young plantations	Flying insects
					× Open woodland; nests in broadleaf trees	Insect larvae; ants
					× Broadleaf and conifer	Insect larvae
					× Broadleaf	Insect larvae; fruit
					× Open broadleaf or mixed woodland	Ants and pupae; other insects
×					Felled woodland; young plantations	Insects; seeds in winter
			×		Broadleaf and conifer; usually on cliffs	Carrion; small animals; etc.
			×		Broadleaf and conifer; scattered trees	Carrion; grain; insects; eggs; etc.
			×		Broadleaf and conifer; scattered trees	Carrion; insects; eggs; and young birds
			×		Small woods in agricultural land	Insects; grain; seeds; fruits; etc.
			×	×	Broadleaf and conifer; often on cliffs	Insects; grain; seeds; fruit; eggs; etc.
×	×	×			Woodland edge; hedges; isolated trees and bushes	Insects; grain; seeds; fruit; eggs and young birds
×	×	×			Mainly broadleaf; also conifer	Acorns; eggs and young birds; insects
			×		Mainly broadleaf	Insects; some buds and fruit
			×		Mainly broadleaf	Insects; some seeds and fruit
×			×		Mainly conifer; scrub oak and birch woods	Insects; seeds
			×		Mainly conifer with birch or alder	Insects; seeds
			×		Broadleaf	Insects; seeds; buds
			×		Damp broadleaf	Insects; seeds
×	×	×			Broadleaf; also conifer	Insects; seeds
			×		Broadleaf; also scattered trees	Nuts; acorns; etc.; insects
			×	×	Broadleaf; also conifer	Insects
×	×				Broadleaf; conifer and scrub; also many other habitats	Insects; seeds

Table 1, WOODLAND BIRDS, continued

Family and ENGLISH NAME	SCIENTIFIC NAME	BREEDING SEASON, MONTHS											
		J	F	M	A	M	J	J	A	S	O	N	D
<i>Turdidae</i>													
MISTLE THRUSH	Turdus viscivorus		×	×	×	×	×	×					
SONG THRUSH	Turdus philomelos			×	×	×	×	×	×				
*REDWING	Turdus iliacus					×	×	×	×				
BLACKBIRD	Turdus merula			×	×	×	×	×	×				
STONECHAT	Saxicola torquata			×	×	×	×	×	×				
WHINCHAT	Saxicola rubetra					×	×	×					
REDSTART	Phoenicurus phoenicurus					×	×	×					
NIGHTINGALE	Luscinia megarhynchos					×	×						
ROBIN	Erithacus rubecula		×	×	×	×	×	×					
<i>Sylviidae</i>													
GRASSHOPPER WARBLER	Locustella naevia						×	×	×	×	×		
BLACKCAP	Sylvia atricapilla					×	×	×	×				
GARDEN WARBLER	Sylvia borin						×	×	×				
WHITETHROAT	Sylvia communis						×	×	×	×			
LESSER WHITETHROAT	Sylvia curruca						×	×	×				
WILLOW WARBLER	Phylloscopus trochilus					×	×	×	×				
CHIFFCHAFF	Phylloscopus collybita					×	×	×	×				
WOOD WARBLER	Phylloscopus sibilatrix						×	×	×				
<i>Regulidae</i>													
GOLDCREST	Regulus regulus					×	×	×	×	×	×		
*FIRECREST	Regulus ignicapillus					×	×	×	×				
<i>Muscicapidae</i>													
SPOTTED FLYCATCHER	Muscicapa striata						×	×	×	×	×		
PIED FLYCATCHER	Ficedula hypoleuca						×	×	×				
<i>Prunellidae</i>													
DUNNOCK (HEDGE SPARROW)	Prunella modularis			×	×	×	×	×	×	×	×		
<i>Motacillidae</i>													
TREE PIPIT	Anthus trivialis						×	×	×				
<i>Laniidae</i>													
*RED-BACKED SHRIKE	Lanius collurio						×	×	×	×	×		
<i>Sturnidae</i>													
STARLING	Sturnus vulgaris					×	×	×					
<i>Fringillidae</i>													
HAWFINCH	Coccothraustes coccothraustes					×	×	×					
<i>Carduelidae</i>													
GREENFINCH	Carduelis chloris					×	×	×	×	×	×	×	
GOLDFINCH	Carduelis carduelis						×	×	×	×	×	×	
SISKIN	Carduelis spinus					×	×	×	×				
LINNET	Acanthis cannabina					×	×	×	×	×			
REDPOLL	Acanthis flammea						×	×	×				
BULLFINCH	Pyrrhula pyrrhula					×	×	×	×	×			
CROSSBILL	Loxia curvirostra	×	×	×									
CHAFFINCH	Fringilla coelebs					×	×	×	×				
YELLOWHAMMER	Emberiza citrinella					×	×	×	×	×	×	×	
CIRL BUNTING	Emberiza cirulus						×	×	×	×	×	×	
<i>Passeridae</i>													
HOUSE SPARROW	Passer domesticus					×	×	×	×	×	×	×	
TREE SPARROW	Passer montanus					×	×	×	×	×			

Table 1, continued

NESTING SITE IN WOODLAND					WOODLAND TYPE	MAIN FOOD
1	2	3	4	5		
		×	×		Broadleaf and conifer	Fruit; insects; worms; snails
×	×	×	×		Broadleaf and conifer; hedges	Snails; worms; insects; fruit
×	×	×	×		Broadleaf and conifer	Fruit; worms; insects
×	×	×			Broadleaf and conifer; hedges	Insects; worms; fruit; seeds
×	×				Young plantations; gorse	Insects
×	×				Young plantations	Insects
			×		Broadleaf and conifer	Insects; worms; fruit in autumn
×	×				Mainly broadleaf with dense shrubs	Insects; worms; fruit in autumn
×			×		Broadleaf, conifer and scrub; many other habitats	Insects; worms; fruits; seeds
×	×				Young plantations	Insects
	×				Mainly broadleaf; with shrubs and brambles	Insects; fruit in autumn
	×	×			Mainly broadleaf; also conifer with shrubs	Insects; fruit in autumn
	×				Scrub; felled woodland; hedges; young plantations	Insects; fruit in autumn
	×	×			Scrub; hedges	Insects; fruit in autumn
×	×				Mainly woodland; also scrub including rides	Insects
	×				Mainly broadleaf; also mixed	Insects
×					Mainly broadleaf; also mixed	Insects; fruit in autumn
		×	×		Mainly conifer and also mixed	Insects
		×	×		Conifer, mixed	Insects
		×	×	×	Woodland edge; scattered trees	Insects
			×		Open woodland; broadleaf and mixed	Insects
	×	×			Scrub; broadleaf and conifer; hedges	Insects; seeds in winter
×					Open woodland; young plantations; scattered trees	Insects
×	×				Scrub	Insects; small birds and young; snails; small mammals; worms
			×		Broadleaf and conifer; many other habitats	Insects; fruit; seeds; snails; etc.
	×	×			Broadleaf and mixed	Fruit stones; seeds; mast, especially horn- beam; insects
	×	×			Scrub; trees; usually near cultivation	Seeds; fruit
	×	×			Open woodland; orchards	Seeds; insects when breeding
	×	×			Conifer in summer; mainly broadleaf in winter	Seeds; insects when breeding
×	×				Young plantations; scrub; hedges	Seeds; insects when breeding
	×	×			Mainly birch/alder; young conifers	Seeds; insects when breeding
	×				Scrub; thick hedges	Seeds; fruit; buds; insects
	×	×			Mature conifer, especially pine	Conifer seeds
×	×				All types of woodland; hedges	Seeds; beech mast
×	×				Hedges; scrub; felled woodland; young conifer	Seeds; fruit; insects
×	×	×			Hedges; felled woodland; woodland edge	Seeds; fruit; insects
		×	×	×	Woodland edge; hedges; usually near man and cultivation	Seeds; insects
		×	×		Woodland edge; scattered trees	Seeds; insects



FIGURE 26
Long-tailed tits, *Aegithalos caudatus*, on European larch, *Larix decidua*. A bird of open woodland with bushes in which it builds an elaborate domed nest.



FIGURE 27

Badgers, *Meles meles*, and sett. Badger setts occur typically in woodlands in well drained soils. The most important item in the badger's diet is the earthworm.

TABLE 2
WOODLAND MAMMALS

* Indicates an introduced species

Family and ENGLISH NAME	SCIENTIFIC NAME	MAIN BREEDING SEASON, MONTHS											
		J	F	M	A	M	J	J	A	S	O	N	D
<i>Insectivora</i>													
HEDGEHOG	Erinaceus europaeus						×	×	×	×	×	×	
MOLE	Talpa europaea			×	×	×							
COMMON SHREW	Sorex araneus				×	×	×	×	×	×			
PYGMY SHREW	Sorex minutus				×	×	×	×	×	×			
WATER SHREW	Neomys fodiens				×	×	×	×	×	×			
<i>Chiroptera</i>													
Many species of BATS occur in woodlands where they roost in holes or cracks in trees.													
									×	×			
<i>Lagomorpha</i>													
*RABBIT	Oryctolagus cuniculus	×	×	×	×	×	×	often later					
BROWN HARE	Lepus capensis					×	×	×					
MOUNTAIN HARE	Lepus timidus		×	×	×	×							
<i>Rodentia</i>													
RED SQUIRREL	Sciurus vulgaris			×	×	×			×	×	×		
*GREY SQUIRREL	Sciurus carolinensis	×	×	×					×	×	×		
BANK VOLE	Clethrionomys glareolus				×	×	×	×	×	×	×	×	
FIELD VOLE	Microtus agrestis			×	×	×	×	×	×	×	×		
WOOD MOUSE	Apodemus sylvaticus				×	×	×	×	×	×	×		
YELLOW-NECKED MOUSE	Apodemus flavicollis					×	×	×	×	×	×		
*BROWN RAT	Rattus norvegicus	Year round under suitable conditions											
*EDIBLE DORMOUSE	Glis glis								×	×	×		
DORMOUSE	Muscardinus avellanarius								×	×	×	×	
<i>Carnivora</i>													
FOX	Vulpes vulpes			×	×	×	×	×					
PINE MARTEN	Martes martes			×	×	×	×						
STOAT	Mustela erminea				×	×							
WEASEL	Mustela nivalis					×	×	×	×	×			
POLECAT	Mustela putorius						×	×	×	×	×	×	
BADGER	Meles meles	×	×	×	×	×	×						
OTTER	Lutra lutra	Young born in any month											
WILD CAT	Felis silvestris						×	×	×	×	×		
<i>Artiodactyla</i>													
*MUNTJAC	Muntiacus muntjak									?	?		
FALLOW DEER	Dama dama						×	×					
*SIKA DEER	Cervus nippon						×	×					
RED DEER	Cervus elaphus						×	×					
*CHINESE WATER DEER	Hydropotes inermis						×	×					
ROE DEER	Capreolus capreolus						×	×					

Table 2, continued

WOODLAND TYPE	FOOD
Open woods and scrub	Invertebrates; some berries and acorns
Less common in pure conifer woods	Soil invertebrates; carrion
Open woods with dense herbaceous layer	Invertebrates
Open woods with dense herbaceous layer	Invertebrates
Near streams	Invertebrates
Need holes and hollows in large trees	Invertebrates, usually taken on the wing
Widespread	Herbage; bark and twigs in winter
Mainly broadleaf	Herbage; bark and twigs in winter
Open woodland, especially in winter	Herbage; bark and twigs in winter
Conifer and broadleaf; preferably dense	Seeds of conifers; seeds and fruits; buds; shoots; etc. occasional eggs and young of birds
Mainly broadleaf or mixed	Acorns; seeds and fruits; buds shoots; etc. occasional eggs and flesh
Broadleaf and scrub with dense ground cover	Fruits; seeds; bark; herbage; etc. invertebrates
Dense grass, e.g. young plantations and open woods	Grass; wider range of herbage in winter
Widespread; most common rodent in woods with open field layer; scrub	Fruit; seeds; buds; etc. invertebrates
Broadleaf and conifer woods	Fruit; seeds; buds; etc. invertebrates
Woods especially in summer	Wide range of plant and animal food
Mature broadleaf woods in the Chilterns	Fruit; seeds; bark; invertebrates
Woods with dense shrubs; also scrub	Tree fruits; seeds; shoots; and bark; invertebrates
Widespread in woods and scrub	Small mammals; birds; invertebrates; fruit; carrion
Conifer and broadleaf	Small mammals; birds; fruit; invertebrates
Widespread	Small mammals; birds; some fruit; insects
Widespread; needs water	Small mammals; small birds
Woods and scrub mainly in central Wales	Small mammals; birds and eggs; snakes; frogs
Mainly broadleaf woods	Earthworms; large insects; small mammals; eggs and young of groundnesting birds; fruit; grain
Near water	Fish, frogs, small mammals; aquatic insects and crustacea
Now only in Scottish Highlands	Small mammals; birds
Woods with dense shrubs and herbs	Browse and graze
Open woods with dense undergrowth preferred	Mainly graze but also browse
Broadleaf and conifer	Graze; rarely browse
Broadleaf and conifer	Browse and graze
	Mainly grass and crops
Open woods with dense thickets	Browse

TABLE 3
BUTTERFLIES FOUND IN WOODLANDS

Family and ENGLISH NAME	SCIENTIFIC NAME
<i>Satyridae</i>	
SPECKLED WOOD	Pararge aegeria
SCOTCH ARGUS (NORTHERN BROWN)	Erebia aethiops
MEADOW BROWN	Maniola jurtina
GATE-KEEPER (HEDGE BROWN)	Maniola tithonus
SMALL HEATH	Coenonympha pamphilus
RINGLET	Aphantopus hyperantus
<i>Nymphalidae</i>	
SMALL PEARL-BORDERED FRITILLARY	Argynnis selene
PEARL-BORDERED FRITILLARY	Argynnis euphrosyne
HIGH BROWN FRITILLARY	Argynnis adippe
SILVER-WASHED FRITILLARY	Argynnis paphia
MARSH FRITILLARY	Euphydryas aurinia
HEATH FRITILLARY	Melitaea athalia
RED ADMIRAL	Vanessa atalanta
SMALL TORTOISESHELL	Aglais urticae
LARGE TORTOISESHELL	Nymphalis polychloros
PEACOCK	Nymphalis io
COMMA	Polygonia c-album
PURPLE EMPEROR	Apatura iris
WHITE ADMIRAL	Limnitis camilla
<i>Riodinidae</i>	
DUKE OF BURGUNDY FRITILLARY	Hamearis lucina
<i>Lycaenidae</i>	
HOLLY BLUE	Celastrina argiolus
GREEN HAIRSTREAK	Callophrys rubi
BROWN HAIRSTREAK	Thecla betulae
PURPLE HAIRSTREAK	Thecla quercus
WHITE-LETTER HAIRSTREAK	Strymonidia w-album
BLACK HAIRSTREAK	Strymonidia pruni
<i>Pieridae</i>	
WOOD WHITE	Leptidea sinapis
GREEN-VEINED WHITE	Pieris napi
ORANGE-TIP WHITE	Anthocharis cardamines
BRIMSTONE	Gonepteryx rhamni
<i>Hesperiidae</i>	
DINGY SKIPPER	Erynnis tages
GRIZZLED SKIPPER	Pyrgus malvae
CHEQUERED SKIPPER	Carterocephalus palaemon
SMALL SKIPPER	Thymelicus sylvestris
LARGE SKIPPER	Ochlodes venata

+ Indicates species overwintering as butterflies

Table 3, continued

BUTTERFLIES FLYING SEASON: MONTHS	LARVAL FOOD PLANTS
J F M A M J J A S O N D	
<p> × × × × × × × × × × × × × × × × × × × × × × × × × × </p> <p> × × (×) × × (×) × × × × × × × × × × × × × × × × + + + × × × × × × + + + + + × × × × × + + + + + × × × × × × × + + + + × × × × × × × × + + × × × × × </p> <p> × × </p> <p> × × × × × × × × × × × × × × × × × × × </p> <p> × × × × × × × × × × × × + + × × × × × × × + + </p> <p> × × × (× ×) × × × (× ×) × × × × × × × × </p>	<p> Grasses Grasses Grasses Grasses Grasses Grasses Violets Violets Violets Violets Devil's bit scabious Common cowwheat; plantains Stinging nettle Stinging nettle Elm Stinging nettle Stinging nettle; elm; hop; currants Goat willow Honeysuckle Cowslip, primrose Holly; ivy; dogwood; spindle; etc. Broom; gorse; bilberry; dogwood; bramble; etc. Blackthorn Oak Elm Blackthorn Leguminous plants Cruciferous plants Cruciferous plants Buckthorn; Alder buckthorn Bird's foot trefoil Wild strawberry Grasses esp. False brome Grasses Grasses </p>

() indicates second broods in favourable seasons.



FIGURE 28
Black hairstreak, *Strymonidia pruni*, butterflies and larvae on
blackthorn, *Prunus spinosa*. First described in Britain from what
is now Monks Wood National Nature Reserve in Huntingdonshire.



FIGURE 29
Hawthorn, *Crataegus monogyna*, in flower. Widespread in wood-
lands and agricultural lands and very valuable for a wide variety
of wildlife.

TABLE 4
FLOWERING PERIOD OF INSECT-POLLINATED TREES AND SHRUBS

ENGLISH NAME	SCIENTIFIC NAME	FLOWERING PERIOD, MONTHS											
		J	F	M	A	M	J	J	A	S	O	N	D
*OREGON GRAPE	Mahonia aquifolium	×	×	×	×	×							
SPURGE LAUREL	Daphne laureola		×	×	×								
GOAT WILLOW	Salix caprea			×	×								
SALLOWS	Salix cinerea			×	×								
BLACKTHORN	Prunus spinosa			×	×	×							
GOOSEBERRY	Ribes uva-crispa			×	×	×							
GORSE or WHIN	Ulex europaeus			×	×	×	×						
BOX	Buxus sempervirens				×	×							
CURRENTS	Ribes species				×	×							
*NORWAY MAPLE	Acer platanoides					×	×						
WILD CHERRY	Prunus avium					×	×						
WILLOWS (OTHER)	Salix species					×	×						
BILBERRY or BLAEBERRY	Vaccinium myrtillus					×	×	×					
*CHERRY LAUREL	Prunus laurocerasus					×	×	×					
*SYCAMORE	Acer pseudoplatanus					×	×	×					
BIRD CHERRY	Prunus padus						×						
CRAB APPLE	Malus sylvestris						×						
BARBERRY	Berberis vulgaris						×	×					
BROOM	Sorothamnus scoparium						×	×					
BUCKTHORN, PURGING	Rhamnus catharticus						×	×					
COMMON MAPLE	Acer campestre						×	×					
HAWTHORN	Crataegus monogyna						×	×					
MIDLAND THORN	Crataegus laevigata						×	×					
*RHODODENDRON	Rhododendron ponticum and R. luteum						×	×					
ROWAN	Sorbus aucuparia						×	×					
SPINDLE	Euonymus europaeus						×	×					
WAYFARING TREE	Viburnum lantana						×	×					
WHITEBEAM	Sorbus aria						×	×					
WILD SERVICE	Sorbus torminalis						×	×					
HOLLY	Ilex aquifolium						×	×	×	×			
ALDER BUCKTHORN	Frangula alnus						×	×	×	×	×		
BRAMBLE	Rubus fruticosus agg.						×	×	×	×	×		
LARGE-LEAVED LIME	Tilia platyphyllos							×					
DOGWOOD	Thelycrania sanguinea							×	×				
ELDER	Sambucus nigra							×	×				
GUELDER ROSE	Viburnum opulus							×	×				
PRIVET	Ligustrum vulgare							×	×				
ROSES	Rosa species							×	×				
COWBERRY	Vaccinium vitis-idaea							×	×	×			
RASPBERRY	Rubus idaeus							×	×	×			

Table 4, continued

ENGLISH NAME	SCIENTIFIC NAME	FLOWERING PERIOD, MONTHS											
		J	F	M	A	M	J	J	A	S	O	N	D
*SNOWBERRY	Symphoricarpos rivularis							×	×	×			
TUTSAN	Hypericum androsaemum							×	×	×			
HONEYSUCKLE	Lonicera periclymenum							×	×	×	×		
SMALL-LEAVED LIME	Tilia cordata							×					
*HYBRID LIME	Tilia vulgaris							×					
*SWEET CHESTNUT	Castanea sativa							×					
CLEMATIS	Clematis vitalba							×	×				
DWARF FURZE	Ulex gallii, U. minor							×	×	×			
LING or HEATHER	Calluna vulgaris							×	×	×			
IVY	Hedera helix										×	×	×

* Introduced species

TABLE 5
PERIOD WHEN TREE AND SHRUB FRUITS AND SEEDS TAKEN BY ANIMALS RIPEN

ENGLISH NAME	SCIENTIFIC NAME	RIPENING PERIOD: MONTHS											
		J	F	M	A	M	J	J	A	S	O	N	D
DWARF FURZE	<i>Ulex gallii</i> , <i>U. minor</i>						×	×					
CURRANTS	<i>Ribes species</i>							×	×				
BIRD CHERRY	<i>Prunus padus</i>								×				
GORSE or WHIN	<i>Ulex europaeus</i>								×				
WILD CHERRY	<i>Prunus avium</i>								×				
BIRCH	<i>Betula species</i>								×	×			
BILBERRY	<i>Vaccinium myrtillus</i>								×	×	×		
*CHERRY LAUREL	<i>Prunus laurocerasus</i>								×	×	×		
WAYFARING TREE	<i>Viburnum lantana</i>								×	×	×		
RASPBERRY	<i>Rubus idaeus</i>								×	×	×		
GOOSEBERRY	<i>Ribes uva-crispa</i>									×			
*DOUGLAS FIR	<i>Pseudotsuga menziesii</i>									×	×		
ELDER	<i>Sambucus nigra</i>									×	×		
*FIRS	<i>Abies species</i>									×	×		
HONEYSUCKLE	<i>Lonicera periclymenum</i>									×	×		
YEW	<i>Taxus baccata</i>									×	×		
BRAMBLE	<i>Rubus fruticosus agg.</i>									×	×	×	
COWBERRY	<i>Vaccinium vitis-idaea</i>									×	×	×	
ALDER BUCKTHORN	<i>Frangula alnus</i>									×	×	×	×
BOX	<i>Buxus sempervirens</i>										×		
BROOM	<i>Sarothamnus scoparius</i>										×		
DOGWOOD	<i>Thelycrania sanguinea</i>										×		
HAWTHORN	<i>Crataegus monogyna</i>										×		
MIDLAND THORN	<i>Crataegus laevigata</i>										×		
*LARCH, HYBRID	<i>Larix eurolepis</i>										×		
*LARCH, JAPANESE	<i>Larix kaempferi</i>										×		
*OREGON GRAPE	<i>Mahonia aquifolium</i>										×		
ROSES	<i>Rosa species</i>										×		
ROWAN	<i>Sorbus aucuparia</i>										×		
*SPRUCE, SITKA	<i>Picea sitchensis</i>										×		
SPURGE LAUREL	<i>Daphne laureola</i>										×		
WHITEBEAM	<i>Sorbus aria</i>										×		
WILD SERVICE	<i>Sorbus torminalis</i>										×		
BARBERRY	<i>Berberis vulgaris</i>										×	×	
BEECH	<i>Fagus sylvatica</i>										×	×	
BUCKTHORN, ALDER	<i>Rhamnus catharticus</i>										×	×	
GUELDER ROSE	<i>Viburnum opulus</i>										×	×	
HAZEL	<i>Corylus avellana</i>										×	×	
JUNIPER	<i>Juniperus communis</i>										×	×	
MAPLE, COMMON	<i>Acer campestre</i>										×	×	

Table 5, continued

ENGLISH NAME	SCIENTIFIC NAME	RIPENING PERIOD, MONTHS											
		J	F	M	A	M	J	J	A	S	O	N	D
*MAPLE, NORWAY	Acer platanoides									×	×		
OAK	Quercus <i>species</i>									×	×		
*PINE, LODGEPOLE	Pinus contorta									×	×		
PRIVET	Ligustrum vulgare									×	×		
SPINDLE	Euonymus europaeus									×	×		
*SYCAMORE	Acer pseudoplatanus									×	×		
HOLLY	Ilex aquifolium									×	×	×	×
BLACKTHORN	Prunus spinosa										×		
*CHESTNUT, SWEET	Castanea sativa										×		
CRAB APPLE	Malus sylvestris										×		
LIMES	Tilia <i>species</i>										×		
*SPRUCE, NORWAY	Picea abies										×		
TUTSAN	Hypericum androsaemum										×		
ALDER	Alnus glutinosa										×	×	
ASH	Fraxinus excelsior										×	×	
HORNBEAM	Carpinus betulus										×	×	
*LARCH, EUROPEAN	Larix decidua										×	×	
IVY	Hedera helix											×	×
PINE, SCOTS	Pinus sylvestris	×										×	×
*PINE, CORSICAN	Pinus nigra <i>var.</i> maritima	×											×

* Introduced species



FIGURE 30

The moss, *Brachythecium rutabulum*. A common moss of woodland in the lowlands, growing on stones, soil and tree stumps and other decaying wood.

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