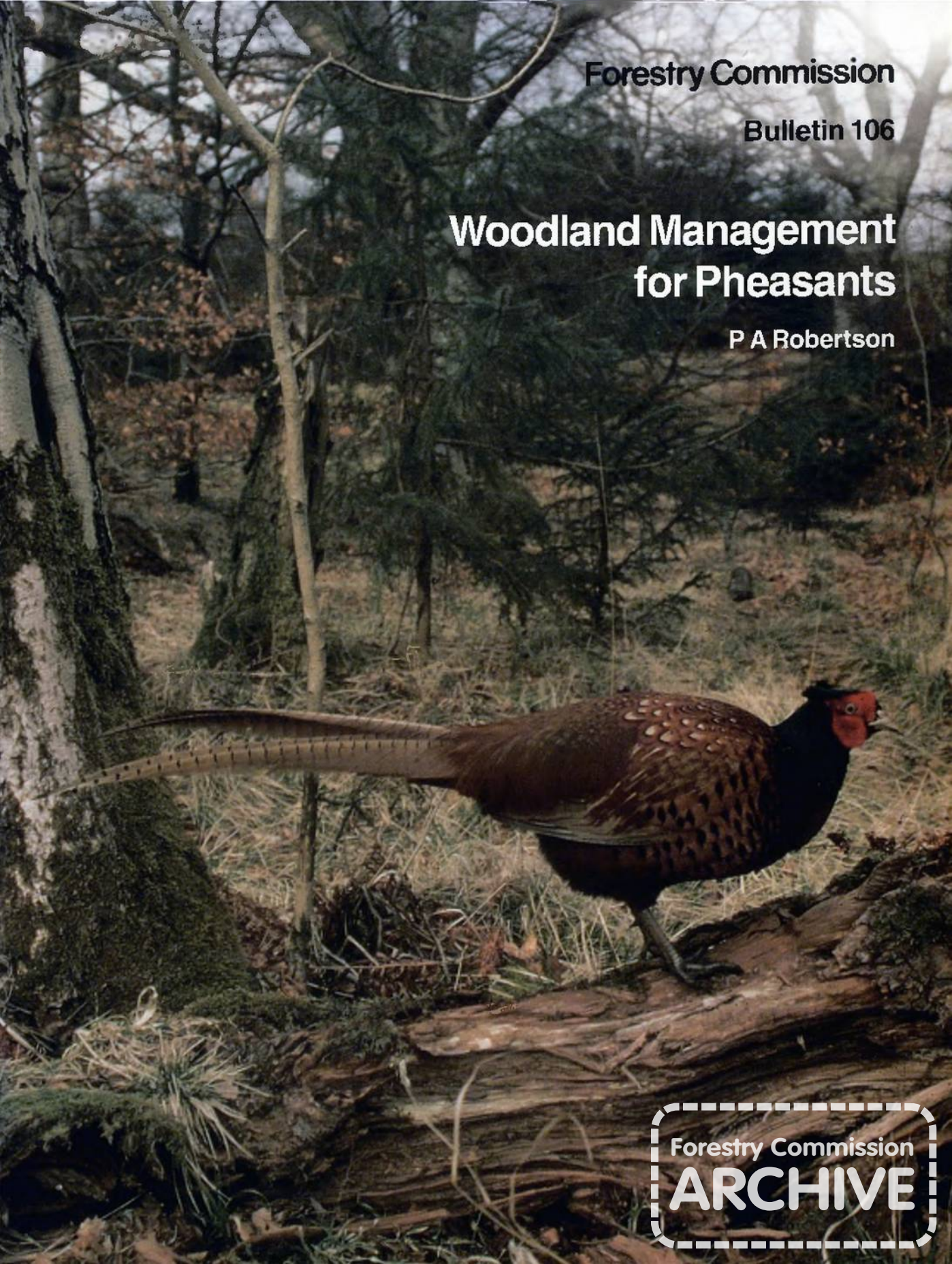

Forestry Commission

Bulletin 106

Woodland Management for Pheasants

P A Robertson

FORESTRY COMMISSION BULLETIN 106

Woodland Management for Pheasants

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Front cover: Male pheasant in a small mixed woodland managed for game *(© RSPB / W. S. Paton)*

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Woodland Management for Pheasants

Summary

This Bulletin summarises the findings of a 3-year study sponsored by the Forestry Commission and carried out by the Game Conservancy. The study undertook to quantify habitat requirements of pheasants, to assess the benefits or disadvantages to pheasants of different forms of woodland management and to investigate the effects of managing woods for pheasants on other wildlife. The Bulletin aims to present management guidelines that will benefit not just winter populations, but also increase natural breeding densities of wild pheasants.

L'Aménagement des Bois pour les Faisans

Résumé

Ce Bulletin résume les résultats d'une étude trois ans sous le parrainage de la Forestry Commission (Commission Forestière) et exécutée par la Game Conservancy (Commission de Conservation Cynégétique). Le but de l'étude était quantifier les exigences des faisans quant à l'habitat, estimer les avantages ou les désavantages aux faisans des formes différentes d'aménagement forestier, et examiner les effets d'aménagement forestier pour les faisans sur l'autre faune sylvestre. Ce Bulletin a pour but présenter les instructions pour l'aménagement qui vont favoriser pas seulement les populations d'hiver, mais qui aussi vont augmenter les densités naturelles des populations réproductrices des faisans sylvestres.

Forstwirtschaft für Fasane

Zusammenfassung

Dieser Bericht erfasst die Ergebnisse einer 3-jährigen Studie die von der Forstbehörde gefördert und von der Game Conservancy ausgeführt wurde. Die Studie setzte sich vor, die Standortbedingungen für Fasane zu beschreiben, die Vor-und Nachteile von Fasanen in verschiedenen Formen der Forstwirtschaft zu beurteilen und die Auswirkungen von fasanförder fasanfördernder Forstwirtschaft auf andere Lebewesen zu untersuchen. Der Bericht stellt forstwirtschaftliche Richtlinien vor, die nicht nur den Winterbevölkerungen helfen, sondern auch natürliche Brutdichte von wilden Fasanen erhöhen.

Foreword

Since Saxon times woodlands and forests in Britain have been managed for game. Throughout the history of managed woodlands in this country, foresters have been called upon to exercise their skills in providing habitats for game animals and birds. It would be wrong to imagine that these skills are redundant in our contemporary culture, which is so concerned with the conservation of wildlife. In fact, the richly diverse woodland which favours many game animals and birds frequently benefits other wildlife and incidentally, is also likely to foster landscapes of mixed woodlands and agriculture which are traditional in lowland Britain and which are greatly appreciated by visitors to the countryside.

This Bulletin springs from the Forestry Commission's interests in these issues and the research that is being undertaken to promote forest and woodland management which can obtain a wide range of benefits. The Forestry Commission sponsored the Game Conservancy to investigate habitat requirements of pheasants, to look at the ways in which different forms of woodland management would affect these and to investigate the effects of managing woods for pheasants on other wildlife. This Bulletin summarises the findings of the 3-year study. Its publication is timely, when new grant schemes for woodlands are encouraging as never before the creation and management of small woodlands on land released from food production. For many owners an increase in pheasant numbers will be an important element among the many and varied benefits that are being sought under the Woodland Grant Scheme. This Bulletin will provide guidance on good practice to all those engaged in these exciting new ventures.

Brian G. Hibberd
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Woodland Management for Pheasants

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Aims of this Bulletin

Although there are numerous anecdotal accounts of the types of woodlands preferred by pheasants there has been little detailed research to quantify their habitat requirements; to assess the benefits or disadvantages of different forms of woodland management; or to investigate the effects of managing woods for pheasants on other wildlife.

The Forestry Commission therefore sponsored The Game Conservancy to investigate these issues. This Bulletin summarises the findings of the 3-year study. It concentrates on what pheasants need from woodland, how management can be designed to benefit this bird and what implications these have for the conservation value of a wood. It is not intended to cover the practicalities of pheasant production, either of wild or reared birds, or the management necessary to ensure birds can be shot effectively, details of these can be found elsewhere (Coles, 1975; Gray, 1986; McCall, 1988). Similarly it aims to present management guidelines that will benefit not just winter populations, which often largely comprise hand-reared birds, but also increase natural breeding densities of wild pheasants. Full details of the methods and analyses are contained within the project report to the Forestry Commission (Robertson *et al.*, 1989).

Background

Pheasants are now one of our most common birds. They were introduced to this country by the Normans or possibly even the Romans and have since formed large feral populations. Part of the reason for this success has been the pheasant's value as a sporting bird. Since the middle of the nineteenth century, pheasants have been intensively managed for shooting.

Nowadays the pheasant is the most numerous gamebird in Britain. It comprises over 80% of all quarry species shot and is the mainstay of lowland game shooting. Although there are healthy populations of wild pheasants, especially in the east and south of the country, a large proportion of the birds shot each year are hand reared. These birds are released in July and August to increase autumn populations for shooting.

The Game Conservancy, a research and advisory organisation working for the well-being of game species, has monitored changes in the number of birds released and shot per km^2 on over 600 shooting estates since 1961 (Figure 1). Over this period the number of birds released and, as a consequence, the total number shot

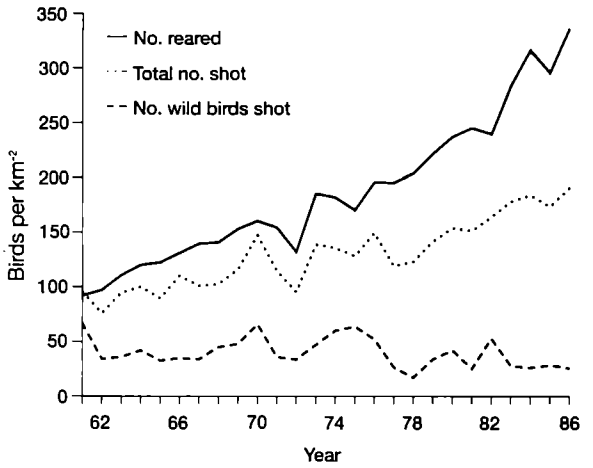


Figure 1. Changes in the numbers of pheasants reared and shot on estates replying to the National Game Census.

have been steadily increasing while the number of wild birds shot has been stable or has slightly declined.

New woodlands

In recent years a range of grants for establishing and managing new woodlands has been introduced. These encourage the creation of small woodlands, broadleaved or mixed in character on land taken out of food production. The new woodlands offer a wide range of possible benefits in the landscape, for wildlife conservation and game management. To ensure that full advantage is taken of these new opportunities, an understanding of woodland design related to habitat requirements of the desired species, is essential.

The design and management of this type of woodland is addressed in the Forestry Commission's publications Bulletin 62 *Silviculture of broadleaved woodlands*, Handbook 3 *Farm woodland practice* and Handbook 8 *Establishing farm woodlands*, and these are recommended as supplements to the reading of this Bulletin. Further information on the Woodland Grant Scheme and the Farm Woodlands Premium Scheme are available at local offices of the Forestry Authority, MAFF, WOAD and SOAFD.

Pheasant shooting and woodlands

The shooting season runs from 1st October to 1st February although few birds are shot until November. In typical circumstances a line of beaters flush pheasants from an area of cover, usually a wood, over a line of standing hunters armed with shotguns.

Although woodlands are the most common overwintering sites for pheasants they also live in areas of rough ground, reed filled dykes, wetlands and arable crops left standing during the winter. Pheasant shooting can be an important incentive for landowners to plant, manage and retain small farm woodlands. Estimates of the extent of pheasant shooting and its influence on woodland management vary. Piddington (1980) estimated that shooting took place on 58% of agricultural properties with this increasing to 88% of those of more than 400 ha. She also found that 33% of owners had planted or retained coverts, belts or spinneys for game and 18% had let their choice of trees for recent planting be influenced by shooting considerations.

The Standing Conference on Countryside Sports commissioned a report from Cobham Resource Consultants (1983) which asked members of the Country Landowners Association to indicate which of a list of potential incentives for the planting or retention of woodlands of less than 10 ha in size they considered relevant. This showed that 67% of respondents claimed game interests were a reason for retaining existing woodland while 56% claimed game was also a reason for planting new woods. Game was second only to beauty in the landscape as an incentive for woodland management, being cited more frequently then either timber production or wildlife conservation.

In 1988 The Game Conservancy sent a questionnaire to 400 contributors to its National Game Census, a sample of estates with a keen interest in pheasant shooting, requesting details of woodland management carried out to encourage pheasants. From the 150 replies received, 81% conducted some form of woodland management for pheasants with over 30% using new woodland planting, felling, replanting or coppicing as game management tools.

Applicants to the Forestry Commission for financial aid under the Broadleaved Woodland Grant Scheme were asked to rank a series of aims for planting new woods. Sporting interest constituted one of the first three objectives in 61% of cases and some, at least, feel that listing shooting may limit the likelihood of their getting a grant.

Pheasant shooting can provide an additional source of income from woodland. In Britain the rights to shoot any game living on an area belong to the landowner. These can be sold and the landowner receives a sporting rent. The value of this rent varies considerably, being affected by the quality of the woodland on the area; the topography of the ground (rolling ground can produce higher flying pheasants); proximity and access to an urban centre and the density of game. However, on an area with

woodland well laid out for pheasant shooting the income received from sporting rents can often equal or exceed the value of the standing timber when considered over the period of a wood's rotation. Furthermore, the capital value of a well planned pheasant estate is often 25% higher than for a similar area without the scope for shooting.

In summary, pheasant shooting occurs in approximately 60% of lowland woods and is an important incentive for planting, management and retention. It also provides a considerable extra income from well designed woodland.

Pheasant ecology and management

Although pheasants spend most of the winter in woodlands they demonstrate seasonal changes in habitat selection. Pheasants spend the winter in loose flocks in areas of suitable cover. During February the males begin to compete for breeding sites, usually along woodland edges. Not all males are successful in gaining breeding sites and these remain non-territorial. During March and April the successful males display to attract a harem of females. On average successful males will attract two or three females although harems of ten or more do occur. The females lie up in dense cover during the day, coming out to feed in the open at dawn and dusk. The males guard the females from predators, intruding males or other disturbance while they feed in the open.

The females begin to disperse to their nesting sites at the end of April and the male territories begin to break down. Females will nest in woodland during April and May but late nests and renests are usually found in the growing crops. The male plays no part in nesting or chick rearing.

After hatch the well-developed young are led away from the nest by the female to insect-rich areas where they feed. Most pheasant broods are found in cereal fields although some use large woodland rides, young plantations or newly cut coppice. In general pheasants make little use of woodland during the late spring and summer.

As farm crops are cut the birds begin to move back into woodland where they remain for the winter. Large numbers of reared birds are released each year. These are typically raised from a captive laying stock by a gamekeeper or purchased from a game farm. Typically they are placed in large, open-topped release pens in woodland during July and August at 6 weeks of age. Their wings are clipped to restrict their flight but as their feathers regrow they leave the pens in August or September and disperse into the wild.

Pheasant habitat requirements in woodland

There are two critical times of year when woodland is an important habitat for pheasants. During the winter it provides cover, food and shelter, while in the spring it comprises a vital component of the breeding territory. Correctly managed woodland can increase both winter densities with benefits for shooting, and the number of breeding birds in the spring. The features selected by pheasants during these two periods are broadly similar.

Woodland edges

Pheasants are primarily birds of the woodland edge. Studies of radiotagged birds have shown that during the winter they spend the majority of their time within 30 m of open ground (Figure 2). Winter pheasant density within woodland is also related to the length of edge in a given wood. One consequence of this is that small woodlands tend to hold higher pheasant densities than larger ones as they have a greater edge to area ratio. Figure 3 gives observed winter pheasant densities in 154 woods of different sizes, the data collected by counting numbers of birds flushed from each area on shoot days. Woods of less than 3–5 ha appear to be the best in terms of holding high densities of birds.

The length of edge for a wood of a given size is determined by its shape. Figure 4 demonstrates the effect of changing the shape of a 1 ha wood on the average number of pheasants it would be expected to hold. Irregular or long, thin woodlands have an increased length of edge and hold more birds.

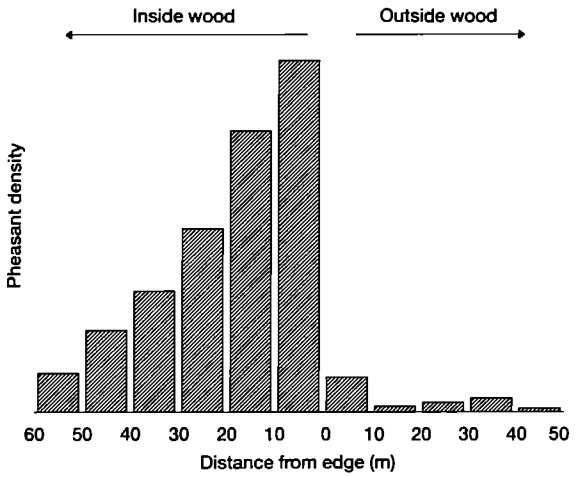


Figure 2. During the winter, radiotagged pheasants spend most time within 30 m of the woodland edge.

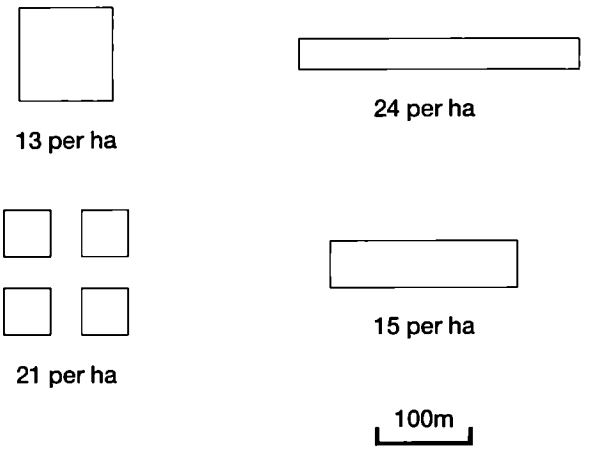


Figure 4. The influence of shape on winter pheasant density in a series of 1 ha woods.

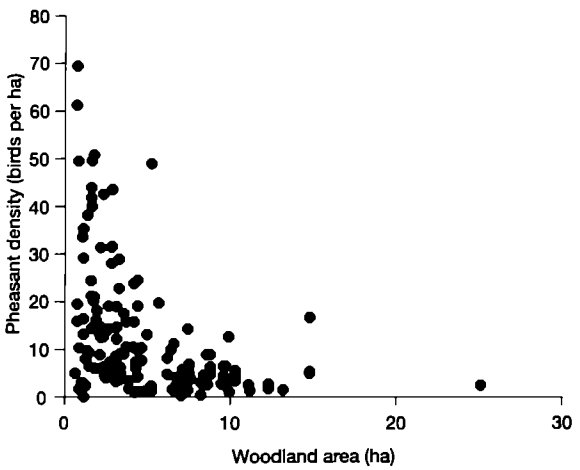


Figure 3. During the winter, small woods contain higher pheasant densities.

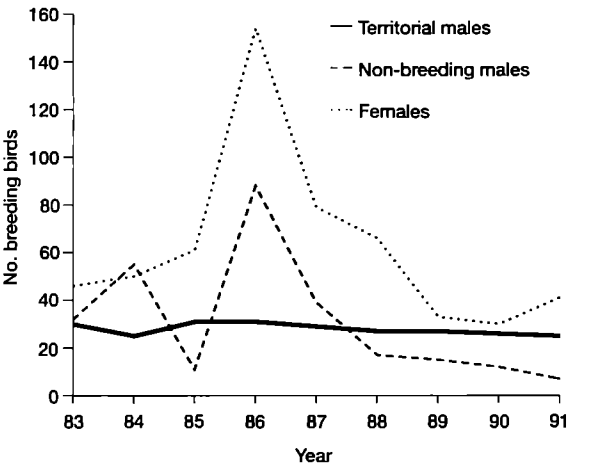


Figure 5. Annual changes in pheasant breeding numbers on a 267 ha farm in Dorset.

Woodland edges are also important features of pheasant breeding territories in the spring. Although some birds will establish territories along hedgerows, ditches or in areas of rough ground, the majority are set up along woodland edges. The number of male territories in a given area is limited by the availability of suitable sites. Once these sites are full further males are forced to become non-breeders. The number of females and non-breeding males changes from year to year in response to the level of hand rearing, shooting and natural productivity while the number of suitable territories remains relatively constant (Figure 5). Territorial male density appears to reflect the limitations of the habitat rather than year-to-year changes in total pheasant density. As such the number of male territories in an area can provide an index of habitat quality.

Surveys of breeding male density were carried out on a series of 1 km^2 blocks on 155 different sites around the country. These found that one of the major factors influencing territory density was the quantity of woodland edge (Figure 6).

The length of woodland edge in a given area

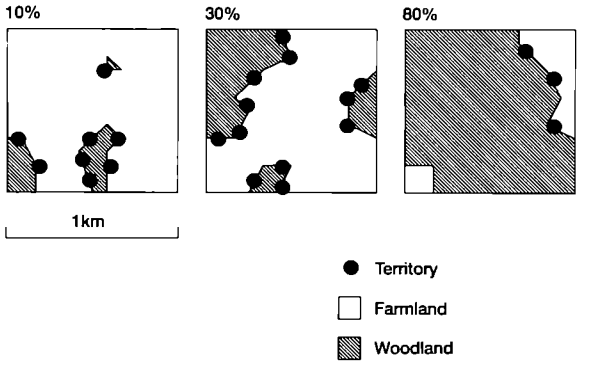


Figure 6. Pheasant breeding densities within a range of different square kilometres with increasing amounts of woodland.

is largely determined by the percentage of that area planted with woodland. In areas with no woodland pheasant territories occur along hedges, ditches and in rough corners. As the percentage of woodland increases, so too does the length of edge and the number of territories until around 20% of the land is under trees. Between 20 and 40% tree cover, increasing the area of woodland has relatively little effect. Over 40% woodland leads to a decline in the length of edge and with it the number of territories. Once above 80% of an area is under trees the length of edge is minimal and suitable territories are virtually absent (Figure 7).

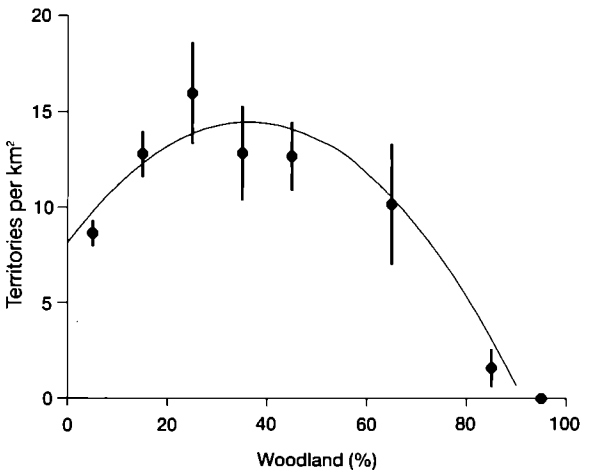


Figure 7. The percentage of an area planted with woodland affects the number of suitable male pheasant territories in the spring.

The quantity of woodland edge influences both winter pheasant density and the number of potential sites for breeding males. Apart from quantity, the quality of edge is also an important factor, in particular the amount of shrubby cover it provides.

Shrubby cover

Pheasant density, during both the winter and the breeding season, is also affected by the availability of shrubby cover, particularly along the woodland edge. Woods with abundant shrubby cover contained higher densities of pheasants during the winter. Shrubby cover in this context meaning woody vegetation between 0.3 m and 2 m in height. Cover of this sort at both woodland edge and in its interior had a positive effect on density (Figure 8).

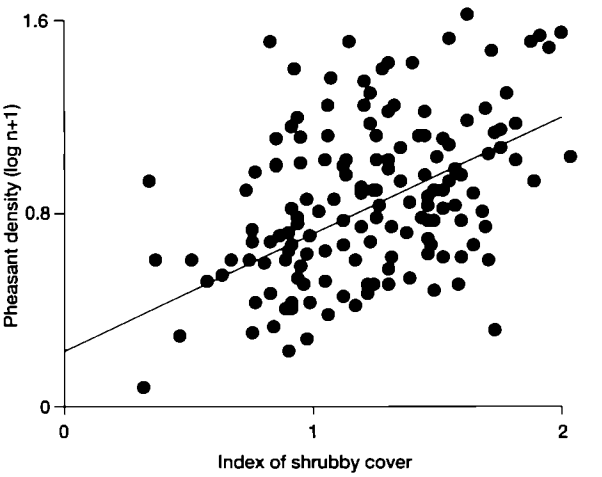


Figure 8. Woods with abundant shrubby cover contain higher pheasant densities during the winter.

The data collected from pheasant shoots during the winter allowed a model of the effects of shrubby cover on winter pheasant density to be constructed. Although not intended to give accurate predictions of density within individual woods it did allow the relative attractiveness of different stand types to be compared.

Within blocks of woodland the extent of shrubby cover can be influenced by a great many factors. The age, species type, spacing, previous management and site conditions can all affect the extent of cover at the appropriate

height. However, in terms of the shrubby cover they provide, pheasants do not appear to be attracted to specific species of tree or shrub; thicket stage conifers can be just as good as 3–5-year-old hazel coppice regrowth or naturally regenerated scrub, so long as they provide suitable cover.

To illustrate the shrubby conditions provided by a range of stand types, Plate 1 gives indices of winter pheasant density for a series of different woods. These assume that each stand was a square 1 ha wood in the middle of open ground, in order to remove the effects of woodland edges described above.

In this set of examples the new planting on bare ground contained virtually no shrubby cover and was the least attractive area for pheasants. Mature beech monoculture also lacked shrubs and was little better. The third example of 25-year-old larch was rather better but not as attractive as the two examples of thicket stage pine or larch. In this set of examples the best shrubby conditions were provided by 4-year-old hazel coppice regrowth.

Shrubby cover is also important at the woodland edge, particularly as this is where pheasants spend most of their time. The extent of shrubby cover at the edge is related to two features: the slope of the edge and the presence of a hedge. Plate 2 presents three different woodland edge types. Firstly, an edge with less than 25% shrubby cover where the open ground changes almost immediately into full canopy trees. Secondly, an edge with 25–50% shrubby cover is shown, typical of many of the edges found in existing small woodlands. Again the transition from open ground to full canopy woodland is rapid and the standard trees are shading the shrub species. The third example shows an edge with over 50% shrubby cover where there is a gradual slope from the field through dense medium height growth to the standards. Using the same model as earlier it was possible to estimate the effect of including an edge of each sort to a 1 ha wood. A typical wood surrounded by an edge of the first sort would hold an average of 12 birds per ha; 17 birds in the second and 27 in the last.

Shrubby cover at the woodland edge also influenced breeding density. Using the data from spring counts of territorial males, Figure 9 gives the average number of breeding males per kilometre of edge for each of the three different edge types. Apart from increasing breeding male density, shrubby edges also provide more attractive territories for the females. On a long-term study site in Ireland, the harems of males breeding along edges rich in shrubby cover were significantly larger than for males breeding in areas with low levels of cover (Figure 10).

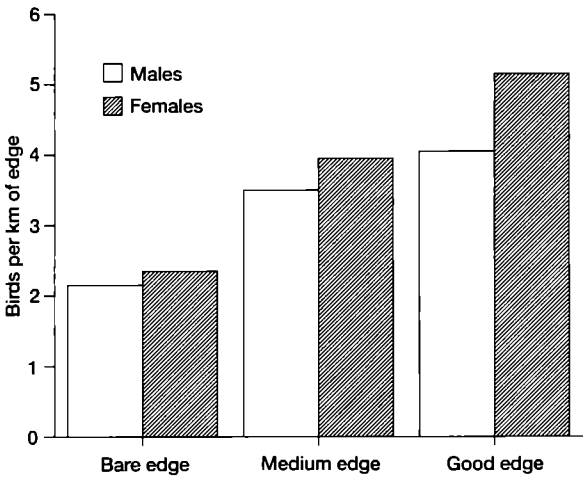


Figure 9. Pheasant breeding numbers are higher along wooded edges rich in shrubby cover.

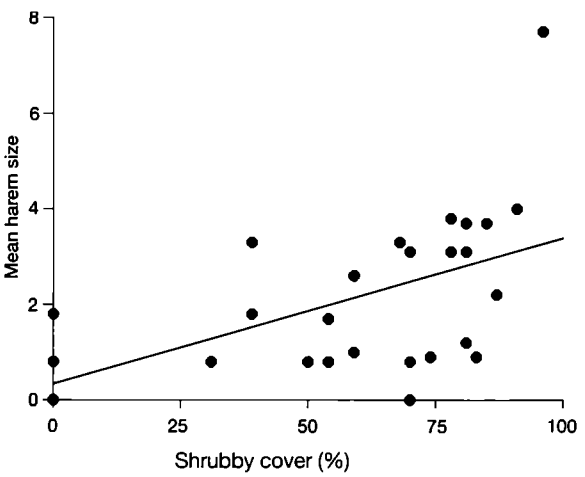


Figure 10. Male pheasant territories along edges rich in shrubby cover attract larger harems of females.

Plate 1. *Indices of winter pheasant density in a range of different woodland types. Relative indices of attractiveness given top left in each case.*

New plantation

Mature beech monoculture

25-year-old larch

8-year-old Corsican pine

12-year-old larch and birch regeneration

4-year-old hazel coppice

Plate 2. *The three different categories of woodland edge used in this study separated on the basis of percentage shrubby cover.*

A bare woodland edge, less than 25% shrubby cover

A medium woodland edge, 25–50% shrubby cover

A good woodland edge, more than 50% shrubby cover

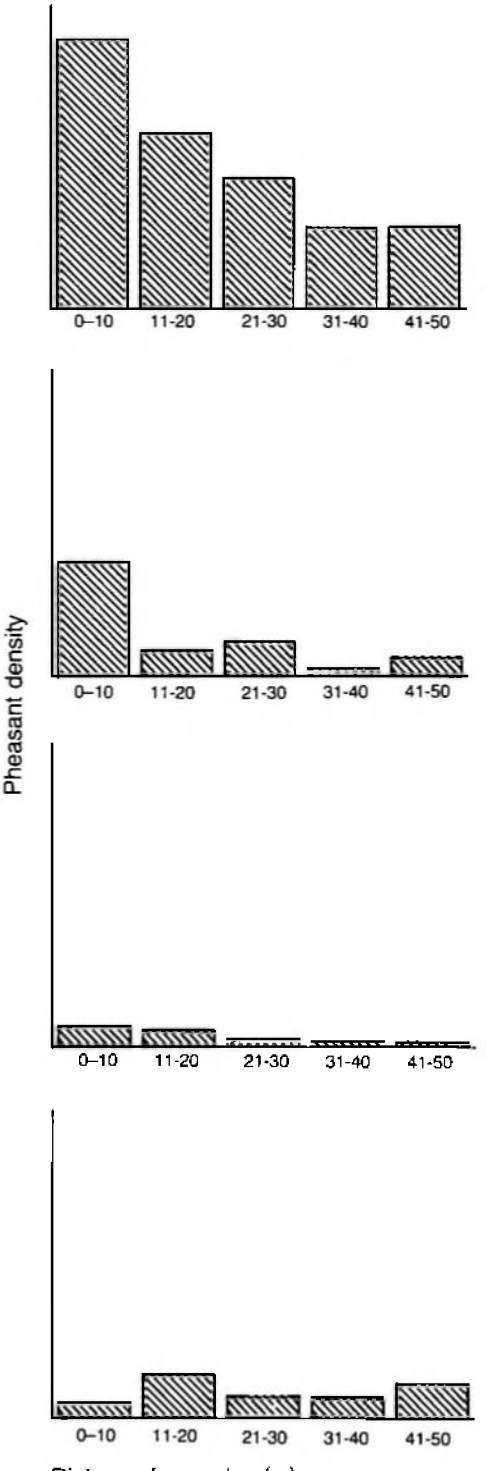
Plate 3. *The relative use of different woodland rides by radiotagged pheasants during this winter.*

True woodland edge

30–50 m wide ride

15 m wide ride

5 m wide ride



Woodland rides

Although the edges where woodland bordered open ground were a critical feature affecting pheasant distribution, rides cut through existing woods provided alternative 'edges' for birds in larger blocks of woodland. Using the data from birds fitted with radiotransmitters it was possible to compare the effects of three different types of ride on winter pheasant distribution.

This compared true edges with three different types of ride within woodland. Firstly, rides of around 5 m in width, which in practical terms are access routes through mature stands under a complete canopy. Secondly, rides 15 m wide where the surrounding trees shaded the ride but did not form a complete canopy. Lastly, wide rides of 30–50 m in width with a distinct break in the canopy and of sufficient size to provide light penetration throughout the year. Plate 3 illustrates all three ride types and the use made of them by the radiotagged birds. The 5 m wide rides produced no obvious effect on bird distribution. The 15 m rides led to a slight edge effect for the birds but few used them. The 30–50 m rides produced a pronounced edge effect and were used to as similar an extent as the true woodland edges. As such, rides greater than 30 m in width appeared to provide extra 'edges' from a pheasant's viewpoint and their inclusion in large stands would increase the holding capacity for pheasants during the winter.

Rides, even of 30–50 m in width, did not appear to provide suitable conditions for the establishment of breeding territories. In fact, only woodland edges facing open ground at least 70 m away from a facing edge appeared to hold any reasonable number of male territories. Although beneficial for increasing the attractiveness of an area for overwintering birds, rides did not appear to encourage pheasants during the spring.

Stand diversity

When comparing individual stand types it was possible to provide estimates of which were best for overwintering pheasants. However, mixed stands of different ages and species of trees appeared to be preferred to uniform areas of any one type.

Using radiotagged birds it was possible to gain a detailed picture of an individual bird's movements. From this could be calculated an estimate of its home range – the area covered by its movements in a given month. By comparing the habitat types within 142 home ranges with the total available it was possible to determine in which areas they concentrated their time. Pheasant home ranges contained greater lengths of large ride and included more boundaries between different ages or species of conifer/conifer, conifer/broadleaf and broadleaf/broadleaf than would have been expected by chance. The ranges also contained less hedgerow than expected by chance, indicating that these were relatively unattractive as wintering sites. This demonstrated that areas of mixed woodland were more attractive than uniform stands.

Roosting cover

Radiotagged birds showed clear preferences for certain areas for roosting, particularly post-thicket larch and spruce as well as mature oak/hazel. In other areas they are also known to select firs and western hemlock. These provided dense, windproof cover for birds during the night and numerous horizontal branches on which the birds could perch.

Food availability

In most woodlands managed for pheasant, supplementary food is provided during the autumn and winter. This takes three typical forms: gamekeepers daily spreading grain along straw covered woodland rides; in feed hoppers placed throughout the wood; or by dumping piles of grain spoil. All three techniques lead to higher winter pheasant densities. On average, woods where food was provided contained 1.4 times the density of pheasants as similar unfed areas. Similarly, radiotagged birds spent a larger proportion of time near feed sites than would be expected by chance.

In the absence of supplementary feeding, two factors appear to be important. Firstly, in unfed areas the radiotagged birds showed a preference for areas of beech and mature oak/hazel which presumably reflected the availability of mast during the winter. Secondly, woods surrounded

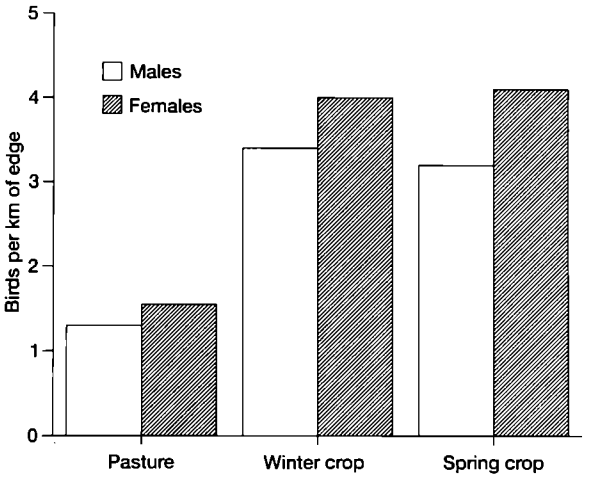


Figure 11. Pheasants breed in higher numbers along woodland edges bordering winter or spring cereals compared to pasture.

by arable land contained, on average, 1.8 times the bird density of those surrounded by grassland. In the absence of supplementary feeding, mast-bearing tree species and arable crops appeared to increase winter pheasant densities.

During the spring the availability of supplementary food and arable land also affected breeding density. Woodland edges bordering either winter or spring cereals contained higher densities of both breeding males and females than those bordering grassland (Figure 11). Furthermore, edges where food was provided for the birds held more territories and those territorial males attracted larger harems.

In summary, pheasants were found in areas rich in woodland edges, shrubby cover and food. The boundaries between different ages and species of trees also appeared to be preferred while conifers and mature oak/hazel were used as roosting sites.

Managing woodland to increase pheasant density

A variety of forms of woodland management can be used to increase the attractiveness of an area to pheasants during the winter and spring.

The quantity of woodland edge

The effect of woodland shape on its edge to area ratio and hence attractiveness to pheasants has been demonstrated in Figure 4. When planting new woodland consider creating a number of small woods, each less than 3–5 ha in size rather than one large one. Design these with long, thin or irregular shapes to maximise their length of edge.

When dealing with existing woodlands less can be done to change their shape but consider how a programme of felling and re-planting may be adapted to create new edges. In existing woodland, creating large rides is probably the simplest method of increasing the length of edge.

In general, sites with 20–40% of their area comprising woodland have the greatest length of edge. Such areas provide the best habitat for pheasants during both the winter and spring. However the efficient driving of pheasants from one wood to another seems to work best on areas with 10–20% woodland, this allowing the woods to be spaced in such a way that birds can be driven across 200–300 m of open ground on shoot days. When planning to run a successful shoot it may be preferable to aim for 10–20% woodland.

The quality of woodland edge

The extent of shrubby cover along the woodland edge was found to have a direct effect on both winter and spring pheasant densities. While management to provide shrubby cover in the woodland interior was important, cover at the woodland edge should be the first priority.

The aim should be to create a varied hedge around the wood, which gradually slopes from open ground, through shrubs, medium height trees to full canopy trees. The sloping edge avoids the main timber crop overhanging the edge and shading out the shrub species. This design also has an important visual effect in the landscape. For more details see the Forestry Commission's *Forest landscape design guidelines* (1989; second edition in preparation).

When planting a new woodland it is important to plan the edge with care. Figure 12 gives an example plan to create a shrubby edge. The two outermost rows of shrubs planted at 0.5 m spacing create a hedge around the wood. The

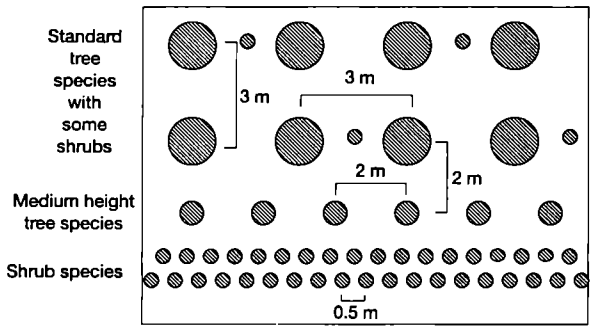


Figure 12. An example planting design to create a sloping, shrubby woodland edge.

rows should be offset to ensure dense cover. Suitable species for this section include hawthorn, dogwood, guelder rose, holly, privet, field maple, hazel and elder, gorse and broom in the uplands, as well as a variety of non-natives such as Japanese honeysuckle, cotoneaster, snowberry and laurel. Although native species are preferable from a conservation viewpoint the non-natives mentioned here tend to be resistant to grazing. Non-natives should not be used in areas of existing conservation value. All shrubs must be adequately protected from rabbit, hare and deer damage. Rabbit fencing should be avoided as this also discourages pheasants. Once established most of the native species suggested will need periodic topping or laying to ensure they retain a dense, shrubby bottom. Avoid blackthorn and rhododendron which can become invasive.

The row of medium height timber species can include hazel, dogwood, field maple, aspen, rowan, cherry, crab apple, ash, yew, goat willow, privet, juniper, sea buckthorn, cotoneaster, holly as well as the firs, pines, spruces and cypresses. These should be planted 2 m in from the shrub species and at 2 m spacing. All should be individually guarded. To ensure some of these species do not become too tall it may be necessary to coppice the ash and hazel. Similarly, removing the leaders from the conifers can create more dense growth. The species chosen for the edge are not of great importance for pheasants provided the right shrubby conditions are created. The choice of species should be determined by prevailing local conditions. These examples give the minimum necessary to create a good edge. Extra rows of shrubs or medium height species will all help ensure good conditions for pheasants. Inside the row of medium height species the main timber trees can be planted, preferably at a 3 m spacing as will be discussed later.

When managing existing woodland edges it is often the case that some shrubs are present but shaded by the outermost trees. Here two options exist, either to plant the species described above along the edge of the wood or to manage the existing edge to increase its shrubbyness. Felling a proportion of the standards along the edge and then coppicing any shrubs can create good shrubby conditions. In many cases the edge may be grazed by farm livestock, in this case construct a stockproof fence 2 m away from the woodland edge to allow the shrubs to regenerate. As mentioned, shrubby cover at the edge is extremely important. However, similar cover within the wood also increases the attractiveness of an area to pheasants.

Returning to the design of a new woodland, it must be borne in mind that a pure crop of broadleaved trees may take 15–20 years from planting (up to 50 years in the uplands) before suitable shrubby conditions for pheasants develop. Two solutions exist; firstly planting the trees at wide spacing, up to 3 m, allows the areas between the rows to be sown with a game cover crop such as kale, canary grass or maize/millet mixture. These can provide cover for the birds in the first year and allow the site to be used for shooting before the trees have reached any appreciable size. The second option is to plant a nurse crop of conifers which will provide shrubby cover at an earlier stage than can broadleaves. The majority of the conifers can be removed once the broadleaved trees have grown up. This second option is preferred when broadleaves are being grown for quality timber.

Apart from plans to provide shrubby cover during the early years of a new wood it is also necessary to include a proportion of shrubs among the standards so that the wood continues to provide suitable conditions through to maturity. A proportion of shrubs and medium height species from the list mentioned earlier should be included, planted if necessary be-

tween the standards (see Figure 12). The continued existence of these shrubs once the canopy of standards has closed requires them to be either shade tolerant or the standards not to cast dense shade. As such, ash, field maple, cherry, birch, oak and sweet chestnut (if coppiced) are the preferred standards. Avoid beech, sycamore and Norway maple if possible but if using them plant holly, box, laurel or snowberry to provide an understorey at maturity. Conifers are preferred roosting sites for pheasants and can provide extra cover during the winter. The larches, firs, spruces and cypresses are particularly valuable in this respect and ideally 5% of the eventual timber crop should be of these species.

In existing woodland the extent of shrubby cover is usually limited by the density of the canopy and the species involved. Simply planting shrubs under a dense canopy is unlikely to be successful. Ideally a proportion of shrubs should be included when an area is felled and replanted allowing them to become firmly established before canopy closure. Otherwise, heavy thinning can encourage any existing shrubs while the creation of glades or skylights by felling small parts of the woodland can create patches of shrubs. Glades should be at least 1½ times as wide as the canopy is high to ensure sufficient light penetrates to allow natural regeneration or planted shrubs to grow. Many small lowland woods were once managed as coppice with standards but have since fallen into neglect. The resumption of a coppice regime can be a very effective method of creating open, shrubby conditions for pheasants in what have often become dark, cold and inhospitable woods. The early years of coppice regrowth can provide among the best shrubby conditions for pheasants (see Plate 1) while the mixture of age classes creates numerous edges for this bird. See Fuller and Warren (1990) for details on reintroducing coppice management. It is important for pheasants that many small blocks are coppiced in a rotation to create a mixture in regrowth and cover conditions.

Woodland rides

The simplest method of creating extra edges within existing woodland is to cut a series of wide rides. These must be greater than 1½ times as wide as the height of the trees along either edge to provide good conditions for pheasants. In most mature stands this means a minimum width of around 30 m. Another implication is that smaller rides may be useful in young plantations but the same ride may be of little benefit once the trees have grown.

There has been a considerable amount of research into the effects of ride width and management (Ferris-Kaan, 1991). Figure 13 presents three of the suggested regimes of ride management from Warren and Fuller (1990). Although specifically designed for their conservation benefits they also provide ideal conditions for pheasants.

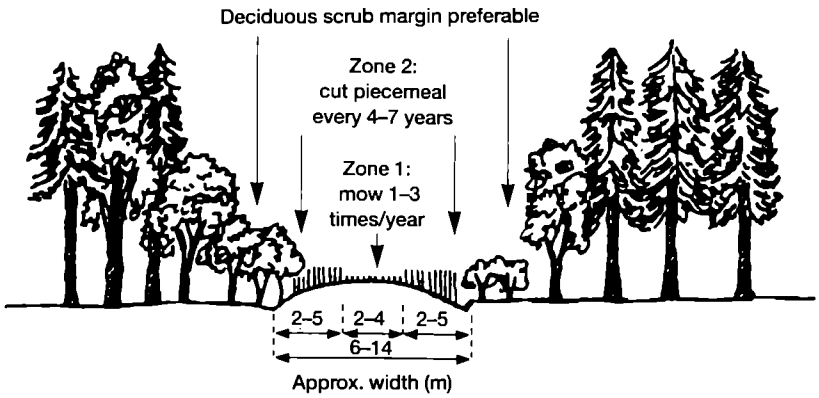
Do not create rides that run through to the edge of the wood as this can create a wind funnel. Leave a barrier of woodland between the end of a ride and the edge of the wood. For further information on detailed woodland ride design see the following Forestry Commission publications: Research Information Note 126 *Enhancement of lowland forest ridesides and roadsides to benefit wild plants and butterflies* (1987), Occasional Paper 28 *Edge management in woodlands* (1991), *Forest landscape design guidelines* (1989), *Forest nature conservation guidelines* (1990), *Lowland landscape design guidelines* (1992).

Wood diversity

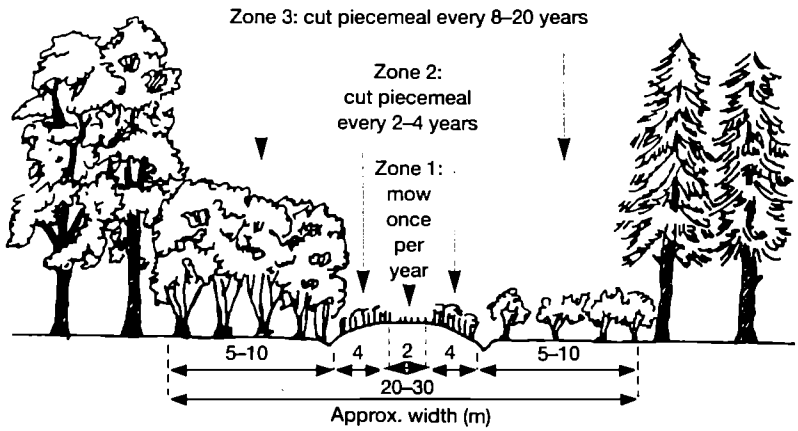
As already described, pheasants prefer woodlands containing numerous boundaries between different ages and species of trees. These features can be encouraged in a number of different ways. In new woodlands plant groups of different species in blocks of at least 3 x 3 of each type. In existing woods avoid large-scale clear felling and uniform replanting. Small-scale management can lead to a more diverse woodland structure and increase the length of boundary between different stand types. Small-scale selective felling, a regime to ensure a mixture of old stands and young plantings and rotational coppicing can all be of great benefit.

Food availability

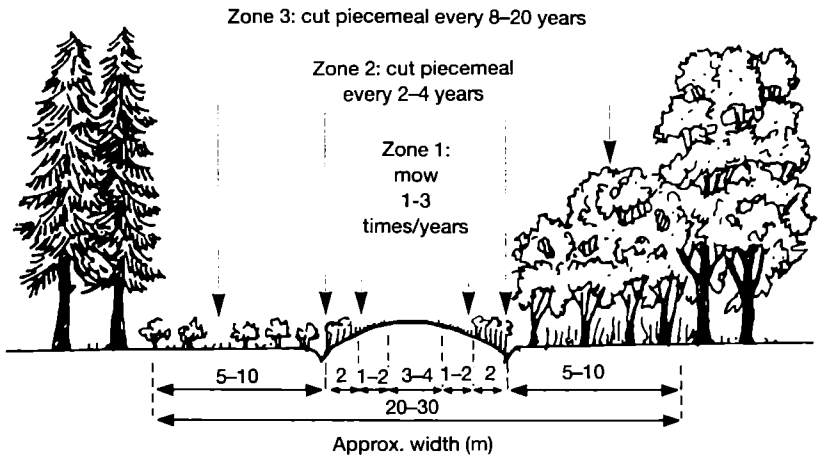
In most areas where pheasants are managed



System 1: simple two-zone system



System 2: three-zone system



System 3: forest roads (three-zone system)

Figure 13. Three different management plans for the creation and maintenance of large woodland rides. (Reproduced from Warren and Fuller (1990) with permission of the authors and of English Nature.)

supplementary food will be provided and natural food sources are of low importance. However, mast bearing tree species and berried shrubs will help if artificial feeding is not being used. Of more importance appears to be the presence of arable land for both winter and breeding populations of pheasants. This can be of relevance when siting new woodlands. Planting on an area surrounded by arable land should create better conditions for pheasants than a similar planting on grassland.

These guidelines are all aimed towards increasing winter and spring pheasant densities. For a wood to achieve its potential for holding birds there must obviously be sufficient pheasants in the area to use it. These can be provided by having a large, productive wild breeding population or by releasing reared birds. However, the number of birds that use a wood appears to be limited by the quality of the habitat and the extent of supplementary feeding, not the number of reared birds released into the area. If too many birds are released into an unsuitable habitat with insufficient feeding they will disperse. Rearing or good wild bird production can ensure a wood holds its full complement of birds but the limiting factors are food and habitat quality. Methods of rearing and feeding birds are also described elsewhere (Coles, 1975; McCall, 1988). Good wild bird production also requires secure nesting sites, predation control and insect-rich brood feeding areas. Providing suitable conditions for wild pheasant populations requires both sympathetic woodland management and farming practices (Hill and Robertson, 1988).

Providing quality pheasant shooting is also not just a question of providing attractive habitat for the birds. The production of fast, high flying pheasants requires careful use of ground contours and the provision of strategically located flushing points to ensure the birds take flight at the best place. Birds must also be driven from one area of cover to another if they are to fly predictably. These factors are all discussed elsewhere (Coles, 1975; Gray, 1986; McCall, 1988) as are further details of the forms of woodland management outlined here.

The effects of woodland management for pheasants on insects and songbirds

Managing an area of woodland for pheasants creates a number of features uncommon in many tree plantations. In particular these include large (>30 m) wide rides and shrubby cover along the woodland edge and in its interior. Studies were carried out to examine the effects of creating these features on other species of wildlife within a wood.

Butterflies

Many species of woodland butterfly are declining. To a large extent this has been attributed to a decline in the area of light, open woodland as can be created by coppicing. Ride creation and the management of existing dense stands to increase light penetration can benefit both pheasants and many species of butterfly (Warren and Fuller, 1990).

The butterfly populations within a large wood were compared between four different habitat types, two of which were managed specifically for pheasants. The habitat types included areas of mature oak over old hazel coppice; stands of post-thicket conifers; areas of oak/hazel where the standards had been thinned and the hazel coppiced to provide shrubby cover for the pheasants and lastly, large woodland rides 30–50 m wide. Butterflies were counted along transects in each habitat type throughout one summer and the average number of individuals seen per kilometre walked, together with the range of species recorded.

Figure 14 presents the transect counts in each of the four habitat types. Overgrown oak/hazel and conifer plantations contained few species and only low butterfly densities. In the managed oak/hazel and along large rides the number of individual butterflies and species was higher.

Songbirds

The second study examined the bird communities found in 1200 different woodland plots in Sussex and related these to the structure of the habitat. This found that bird communities could

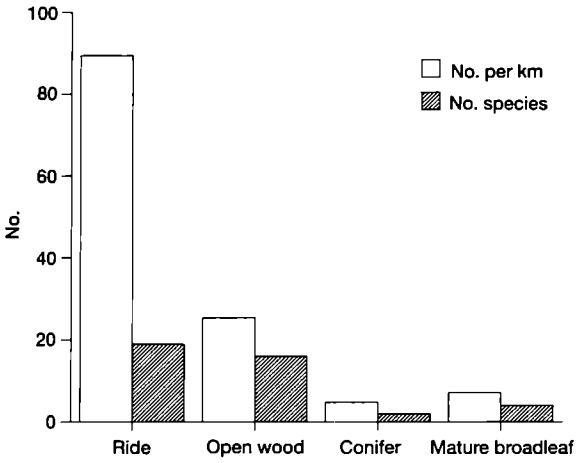


Figure 14. Butterfly species abundance and density in different woodland types; pheasant ride, open wood, conifer and mature broadleaf.

Table 1. The two main bird communities of farm woodlands separated by their habitat preferences

Birds of mature deciduous woodland
Nuthatch
Woodpigeon
Greater spotted woodpecker
Magpie
Bullfinch
Wren
Robin
Blackbird
Chaffinch
Goldcrest
Treecreeper
Marsh tit
Blue tit
Coal tit
Long-tail tit
Great tit
Jay
Carrion crow
Cuckoo
Birds of woodland with open areas, shrubby edges and low cover
Pheasant
Willow warbler
Spotted flycatcher
Chiffchaff
Songthrush
Blackcap
Garden warbler
Nightingale

be split into four distinct groups on the basis of their habitat requirements.

The two largest bird communities were those associated with mature deciduous woodland containing scattered mature conifers and those found in woods with open areas, shrubby edges and low cover (Table 1). The first group included the majority of common woodland birds, such as the tits, woodpeckers, nuthatch and treecreeper. The second group, the one which included the pheasant, was comprised mainly of warblers together with songthrush and spotted flycatcher. Songbirds in this second group (such as the nightingale) are in decline and the creation of conditions suitable for pheasants would be expected to increase the area of suitable habitat for many of these species.

Potential damaging effects of management for pheasants

Apart from encouraging forest managers to create habitat features that will benefit other species of wildlife, there are a number of aspects of pheasant management that may be detrimental unless planned with care.

Firstly, the release of pheasants from pens during the summer can have damaging effects on the ground flora. This is only a concern in areas with a rich ground flora such as ancient semi-natural woodland. Placing high densities of birds within a pen in successive years can lead to the loss of a number of ancient woodland species and an increase in weeds. This occurs through trampling, nutrient enrichment and disturbance. With care it is possible to avoid this problem by limiting the number of birds held in each pen to below 600 birds ha^{-1} (20 square yards per bird); by placing pens away from areas of high botanical interest and moving pens as rarely as possible to limit the area affected.

The second feature of pheasant management which can cause concern is the spreading of straw along woodland rides as feeding points. Straw on rides can smother many species of woodland plants, lead to nutrient enrichment and introduce weeds. To avoid this problem con-

sider feeding the birds from hoppers. Avoid spreading straw on existing botanically rich rides or rake up the straw at the end of the winter.

Conclusion

In summary, pheasant shooting provides a social and/or economic incentive for landowners and forest managers to create and retain a number of features of recognised benefit to conservation (Warren and Fuller, 1990; Fuller and Warren, 1990). These include large rides, shrubby woodland edges, small-scale forestry operations, coppicing, glades and clearings in existing woodland, and the planting of small farm woodlands as an economic proposition. With care to avoid conflicts with conservation, pheasant management can work together with timber production to improve the quality of the countryside.

Practical advice on all matters relating to game management can be obtained from:

The Advisory Service
The Game Conservancy,
Fordingbridge,
Hampshire,
SP6 1EF.
Tel: 0425 652381

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