



Forestry Commission

Research Information Note 267

Issued by the Research Division of the Forestry Commission

Reducing disturbance to goshawks during the breeding season

by Steve J. Petty



Abstract

Goshawks are legally protected and susceptible to disturbance during the breeding season from forestry operations. Forestry Commission Bulletin 81 (Petty, 1989) provided background information on goshawks together with guidelines on how to reduce disturbance. Since then goshawks have expanded their range in Britain. This Note incorporates new information and modifies the guidelines so they restrict harvesting operations less but still adequately protect goshawks.

Background

Status and distribution

The goshawk (or northern goshawk) is found throughout forested habitats in the Holarctic region (Europe, Asia and North America) (Cramp and Simmons, 1980; Palmer, 1988). In Europe its range extends from the boreal forests of Scandinavia and Siberia, through the temperate broadleaved forest zone of central Europe, and south into Mediterranean habitats. In Britain, regular breeding had ceased by the 1880s, largely as a result of deforestation over previous centuries followed by intense persecution in the nineteenth century (Newton, 1972; Marquiss and Newton, 1982).

Goshawks were re-introduced into Britain by falconers (Kenward *et al.*, 1981; Marquiss and Newton, 1982). During the 1960s and 1970s large numbers were imported, and some were purposely or accidentally released. These established small, widely-scattered breeding populations. Their success was related to local levels of illegal persecution (theft of eggs and chicks, and the killing of adults); some did not survive, others just hung on, while some flourished. Subsequently, numbers have increased and populations are beginning to join up (Gibbons *et al.*, 1993).

Currently, the most successful populations are in large forests and woodlands with little or no persecution. There are possibly 200 pairs in Wales (Toyne, 1994), 120 pairs in England and 80 pairs in Scotland (S. J. Petty, unpublished data) – a total of some 400 pairs. Potentially, goshawks could become one of the most abundant medium-sized raptors in Britain, with a future population of several thousand pairs, but this depends on whether persecution continues to restrict range expansion.

Nesting habitat

Goshawks nest in a wide range of wooded habitats (Petty, 1989; Toyne, 1994). They require a tree with sufficiently strong branches to support their substantial nest, surrounded by open woodland. The openness around the nest is important as courtship, feeding and roosting activities take place below the tree canopy, and fledglings need an open nursery area in which to practise their aerial skills (Petty, 1989).

Front cover. Female goshawk feeding nestlings at a nest in a Norway spruce. (Courtesy of Forest Life Picture Library)



Figure 1. Goshawk at a nest in an oak tree. Nests can become massive structures after being reused over the years. Such nesting habitat would have been typical for goshawks before lowland forests were cleared by man. (R.J.C. Blewitt)

These structural requirements for nesting can be found in habitats ranging from old semi-natural broadleaved woods in the lowlands (Figure 1), to windthrown gaps or rides in dense conifer plantations in the uplands (Figure 2). This versatility means that few wooded areas lack nesting opportunities for goshawks, although woodland size may influence selection. Goshawks often select larger forests for breeding, possibly because disturbance is less than in small woods. However, in the absence of large woods, small ones are used, and they even breed in parks in some central European cities.



Figure 2. Many nesting areas in upland conifer forests have a structure similar to this. The windthrown gap provides access for the adults (top) with the nest being built (above the root plate) near to the edge of the gap (above) (S.J. Petty)

Table 1. Percentage prey composition during the breeding season from five European studies of goshawks

Prey groups	1 England/Scotland	2 Wales	3 Sweden	4 Holland	5 Spain
Corvids	19.6	36.3	27.2	10.5	12.1
Grouse	6.3	0.0	22.2	0.0	0.0
Other gamebirds	2.1	0.0	0.0	5.2	19.5
Pigeons	48.5	30.6	15.6	63.1	14.1
Thrushes & starlings	5.9	15.6	12.5	11.9	14.1
Waders	0.9	1.2	1.0	0.5	0.0
Other birds	8.1	3.2	7.1	5.0	17.0
<i>Total % birds</i>	<i>91.4</i>	<i>86.9</i>	<i>85.6</i>	<i>96.2</i>	<i>76.8</i>
Lagomorphs	5.2	5.3	0.7	3.5	17.0
Squirrels	1.8	7.7	13.7	0.2	4.4
Other mammals	1.6	0.1	0.0	0.1	1.8
<i>Total % mammals</i>	<i>8.6</i>	<i>13.1</i>	<i>14.4</i>	<i>3.8</i>	<i>23.2</i>
<i>Number of prey items</i>	<i>3980</i>	<i>2213</i>	<i>904</i>	<i>4821</i>	<i>1964</i>

Notes

- 1 Petty, unpublished data
- 2 Toyne, 1994
- 3 Widén, 1987
- 4 Opdam et al., 1977
- 5 Mañosa, 1994

Diet

Goshawks show a similar versatility in prey selection as they do in other aspects of their ecology. Their diet varies depending on the local availability of suitable prey. Two British studies have shown that diet of goshawks numerically comprises around 68% pigeons and corvids during the breeding season. This is similar to the diet of goshawks in the Netherlands, but different to that in Sweden and Spain (Table 1, above). In boreal forests of Scandinavia the main prey are woodland grouse. These prey are noted for their cyclic fluctuations in abundance, and as a result the breeding densities and productivity of goshawks also fluctuate (Tornberg and Sulkava, 1991; Sulkava *et al.*, 1994). This contrasts with temperate and Mediterranean zones with a more varied prey base (corvids, gamebirds, pigeons, rabbits, thrushes, etc.), where goshawks generally reach higher, more stable, breeding densities with little annual variation in breeding productivity. Goshawks in Britain fall into this latter category.

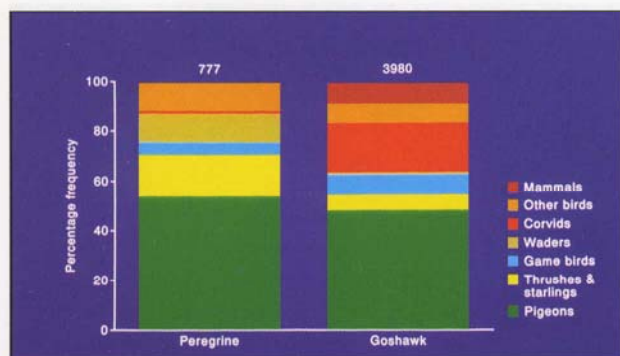


Figure 3. Comparison of diet by prey groups between peregrine falcons in the Southern Uplands, 1974–75 (Ratcliffe, 1993) and goshawks in the English/Scottish Borders, 1987–93 (Petty, unpublished data). Sample sizes are given at the top of each bar.

One reason why goshawks could potentially be so successful in Britain is because they lack competitors for the prey they can best exploit. The peregrine falcon is the only potential competitor, but the two raptors hunt in different ways, with peregrines most efficient in open habitats and goshawks in wooded landscapes. In some parts of Britain, both species exploit a similar prey base (Figure 3); however, the goshawk is more versatile because it can catch prey on the ground and so exploit mammals such as lagomorphs (Table 1).

Legislation

In a recent assessment of the conservation status of European birds, the goshawk was classified as 'secure' (Tucker and Heath, 1994). It is fully protected in most European countries (Génsbøl, 1984; Batten *et al.*, 1990), but still remains one of the most persecuted raptors in Europe.

In Britain, goshawks have the highest level of legal protection, being listed on Schedule 1 of the Wildlife and Countryside Act 1981. This imparts full protection throughout the year, with special penalties for killing, injuring or taking birds, or for taking, damaging or destroying nests or eggs. In addition, there are special penalties for intentionally disturbing nesting birds. Nests are classed as occupied from the start of nest building until the young disperse from the nesting area, not just when eggs and chicks are in the nest. The interpretation of what constitutes disturbance is less clear, but a reasonable definition would be 'that which affects normal parental activity at a nest'. Some types of disturbance can affect birds at a considerable distance from the nest. Unoccupied nests are not legally protected.

Licences may be issued by the statutory conservation bodies (Countryside Council for Wales, English Nature and Scottish Natural Heritage) for visits to

nests for scientific, conservation or photographic purposes. A licence does not confer the right of entry onto land; the landowner's consent is also required. Landowners or their agents need a licence if they knowingly disturb goshawks near nests.

Management of nesting areas

In Britain, management advice for goshawks focuses on how to limit disturbance during the breeding season, because this is when they are most vulnerable (Petty, 1989).

Key points for managing goshawk nesting areas

- *Locate nesting areas*
- *Plan to retain most nesting areas beyond the normal rotation*
- *Retain at least five hectares of timber around each nesting area*
- *Select suitable replacement nesting areas if existing ones are to be clear felled*
- *Establish 400 m radius disturbance-free zones around occupied nesting areas*

This differs from advice in the USA where goshawks obtain most of their prey from within forests, and both prey and goshawk populations can decline following large-scale clear felling (Reynolds *et al.*, 1992). In contrast, throughout Britain goshawks obtain most prey from forest edge habitats adjoining open land (mainly agricultural areas but also moorlands).

The need for a management strategy for goshawks stems from their high level of legal protection (see above), their susceptibility to disturbance and their scarcity. However, goshawks should not be viewed in isolation as most birds that breed in forests are legally protected, and other scarce raptors have the same level of protection as goshawks (Petty, 1987).

Like most raptors, goshawks often return to breed in the same areas. The term 'nesting area' is used to define a restrictive area that may contain numerous old nests, and is usually less than 5 ha. Most pairs have one nesting area within their home range, but occasionally pairs have alternatives up to 2 km apart. The distance between alternative sites is constrained by local breeding density. The tendency for pairs to return to traditionally used sites allows management strategies to be developed.

Guidelines for managing goshawk nesting areas are given by Petty (1989). These recommendations are considered robust, particularly when there is little local knowledge on goshawks. But, it is possible to restrict forest operations less when local expertise on goshawks is available. The following four steps outline a strategy for managing nesting areas.

How to locate nesting areas and nests

Goshawks are easily seen in nesting areas during two distinct periods:

- in the 2–3 weeks prior to egg laying (March–April) when much noisy courtship activity takes place within the nest wood; females spend increasing periods near their nests, often perching alongside forest roads and other openings; aerial displays occur frequently from February, but take place anywhere in the home range, and not necessarily over the nesting area; the adults are much less obvious once incubation begins and throughout the nestling period;
- after leaving the nest the chicks spend 2–4 weeks (July–August) in the vicinity of the nesting area, when they are extremely noisy as they both chase each other through the trees and take part in high aerial chases over the nesting area.

Outside these two periods it is worth checking areas for nests when birds are seen repeatedly in the same area of woodland. It may be possible to use a responsible ornithologist to locate nests.

Having located an occupied nest site it is relatively easy to confirm whether it is occupied by a goshawk or some other species (Petty, 1989). Most confusion is likely with buzzards, as they are commoner than goshawks in many areas. Be aware that often buzzards will use old goshawk nests, and occasionally vice versa. The two species can sometimes breed close together.

Goshawk nests are built on a strong whorl of branches against the trunk (front cover), or in a crotch where the main stem forks (Figure 1). Conifers are preferred to broadleaves, and larch is the favourite conifer because it provides substantial whorls for the nest and easily broken branches for nest building.

When numerous nests are present in a nesting area, the active one can be identified from the presence of:

- white down around the nest rim that accumulates from the start of incubation (Figure 4); and
- white faeces beneath the nest that accumulate after the chicks are five days old (Figure 5).



Figure 4. White down moulted from the female begins to build up on the nest soon after incubation starts. During incubation the female sits low; all that is often visible from the ground is her long tail protruding over the edge. (M.J. Richards)



Figure 5. White faeces from the chicks start to build up around the base of the nest soon after the chicks are five days old. (S.J. Petty)

The below canopy activity of adults around nests leaves many characteristic signs (Petty, 1989). White droppings, pellets, moulted feathers from the adults, and discarded skeletal remains of prey accumulate beneath favoured perches and along flight lines to the nest. During incubation and the early nestling period, the female leaves the nest to eat prey, delivered by the male at 'plucking posts', where remains of bones, feathers and fur accrue. Plucking posts are often on the top of windthrown root plates (Figure 6) or on large horizontal boughs. In sloping terrain, most of these activity centres (perches and plucking posts) are sited uphill of the nest, allowing a direct flight to the nest.

Territorial pairs of goshawks space themselves out over suitable habitat. The distance between pairs varies from locality to locality and, in the absence of persecution, is determined by food supply, pairs being closer together (sometimes less than 1km) in prey-rich habitats. Thus, once the nesting locations of some pairs are known, it is often possible to identify gaps in the distribution where other pairs could be located. In hilly terrain, nesting areas are often located on hill slopes, giving the pair a commanding view of the surrounding countryside, while valley bottoms are avoided.



Figure 6. A windthrown root used as a plucking post by goshawks. (S.J. Petty)

How to plan for the retention of nesting areas

Although it is not illegal to fell unoccupied nesting areas, the goshawk's habit of returning to breed in the same sites year after year makes it desirable to retain nesting areas beyond the normal felling age. **It is often far easier to retain nesting areas than to fell them, and then be faced with relocating pairs.**

Other things being equal, consider retentions around goshawk nesting areas, particularly when they coincide with other benefits in terms of landscaping and conservation. Retentions should be at least 5 ha with windfirm edges; they should not be isolated blocks in a sea of clear fells, but rather interlock to form a retentions network (Petty, 1989).

In forests with a high density of breeding goshawks it may not be possible to retain all nesting areas and some may have to be scheduled for clear felling each year. These should be felled outside the breeding season (mid August–January inclusive). When nesting areas are scheduled for felling, the design plan should identify areas likely to be used as alternative nesting stands.

Criteria for selecting alternative nesting stands for goshawks

Distance from existing nesting area	<500 m
Size of forest patch	> 30 ha
Tree density	200–900 stems per ha
Tree age	40–60 years
Tree species	larch > other conifers > broadleaves
Aspect	avoid west; slope 5–150°
Water	50–150 m
Forest edge	50–500 m
Housing	> 200 m
Public roads	> 200 m

This guide is based on the most frequent range of parameters measured at goshawk nesting areas. (Toyne, 1994; Petty, unpublished data)

Where some nesting areas must be felled, it is **desirable** to plan a continuity of nesting areas in the forest, including a core of long-term retentions, ideally those with high levels of breeding productivity. Data on productivity can only be obtained by monitoring breeding success over a number of years. The most important data to collect are:

- whether home ranges are occupied;
- whether pairs in occupied home ranges successfully rear chick/s; and
- the number of chicks produced per successful pair.

With training and experience, these data can be collected without climbing to nests.

How to reduce disturbance around occupied nests

The condition and experience of the pair will influence the amount of disturbance they will tolerate. Birds breeding for the first time may be more prone to desert

their nest than experienced pairs, while in poor food years all pairs may be more likely to desert than in good food years. Birds also have individual traits, with some more ready to desert than others. Goshawks are more tolerant of disturbance the further they get into the nesting cycle.

The type of disturbance most likely to affect goshawks is when a sudden change occurs in the nesting environment. Examples are, the start of harvesting operations, or heavy traffic along a previously quiet forest road. Goshawks can become conditioned to some types of more regular disturbance; for instance pairs will occasionally nest close to busy main roads or recreation areas, but in these cases disturbance was present from the start of nesting.

It is illegal to disturb occupied nests. Currently, a 400 m radius (50 ha) disturbance-free zone is recommended around occupied nests during February–July inclusive (Petty, 1989). This is considered robust and in line with other recommendations (Toyne, 1994). However, with locally available expertise it is possible to reduce the size of the disturbance-free zones in the following ways.

- **The stage of breeding.** Goshawks are most prone to disturbance early in the breeding season. Therefore zone radius can be reduced by half as breeding progresses, providing it is known when each nesting attempt started (Figure 7). There is much variation in the timing of breeding both within and between geographical areas (Figure 7), but within study areas (forests) the mean timing of breeding is remarkably consistent between years.

- **Topography.** In hilly terrain it is sometimes possible to reduce zone width when the nest and source of disturbance are shielded from one another by a hill. The amount of reduction will depend on topography in relation to the nest, but disturbance-free zones should never fall below 200 m radius. Conversely, it may be necessary to increase zone width when disturbance is on the other side of a valley, and in direct line of the nest.

To safeguard against the accidental felling of occupied but unknown nests, **all** areas should be searched for nests of goshawks and other raptors prior to the start of thinning or clear felling operations. When crops are marked and tariffed prior to harvesting, it can be helpful to have teams trained to locate and identify nests.

As the theft of eggs and chicks is an increasing problem in some localities, the locations of goshawk nesting areas should not be publicised.

How to handle accidents

Occupied nests are occasionally felled accidentally. If the nest contains eggs, little can usually be done, as either eggs break or embryos die due to chilling. If the nest contains unharmed chicks then remedial action is often successful. This involves building a nest in an adjacent tree and placing the chicks in it. Providing harvesting work and other disturbance ceases immediately, there is a good chance that parents will continue to care for the chicks.

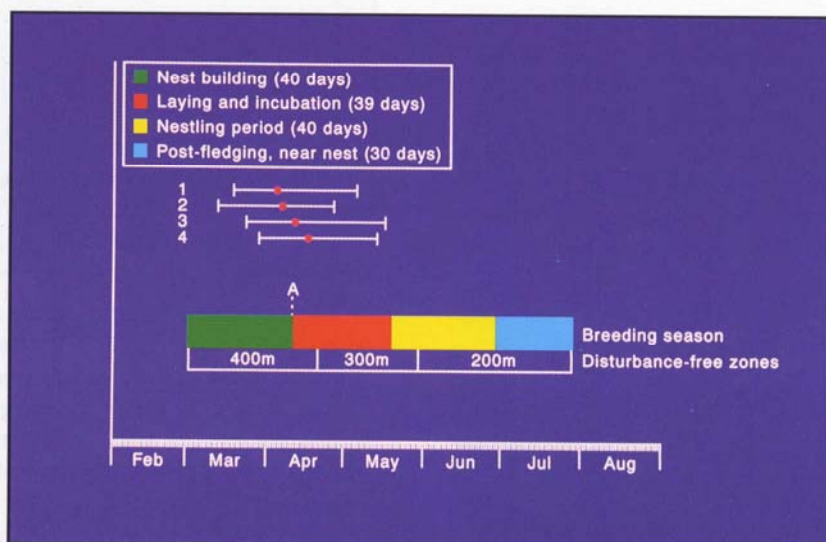


Figure 7. Knowledge about when individual goshawk nests are in use can help to modify disturbance-free zones. The coloured bar represents the breeding season broken into four distinct phases. The bar is positioned on the calendar scale at the average date, from a number of studies, when the first egg was laid (A). The actual laying dates (mean and range) from four studies are given above the bar [1: The Netherlands (Bijlsma, 1994); 2: Britain (Marquiss and Newton, 1982); 3: Wales (Toyne, 1994); 4: English/Scottish Borders

(Petty, unpublished data)]. Below the coloured bar are disturbance-free zone radii: these are 400 m (50 ha) from the start of nest building until 10 days into the laying/incubation period, when down starts to appear on the nest rim; then 300 m (28 ha) until 10 days into the nestling period when white faeces start to accumulate on the ground beneath the nest; then 200 m (13 ha) until the young have dispersed from the nesting area. The coloured bar needs to be moved right or left on the calendar scale depending on the timing of each nest.

Acknowledgements

I am grateful for comments on an earlier version of this Note from: David Anderson, Peter Clement, Nicola Crockford, Fred Currie, David Hughes, David Jardine, Dr Robert Kenward, Steve Parr, Gordon Patterson, John Ralston and Richard Toleman.

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Published February 1996
ISSN 0267 2375

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