

## The breeding bird community of Balrath Wood in 2007

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### Abstract

Balrath Wood is a small mixed broadleaf/conifer plantation which is managed with a view to enhancing biodiversity. Two ridelines were created in the 1970s to increase the attractiveness of the wood to both resident and migrant bird species. In order to assess the effectiveness of ride management, avian species richness, abundance and diversity in three discrete habitats at the site were estimated from data collected during a survey of the site in the summer of 2007, and compared with similar data collected in 1996.

The break in the canopy arising from the two ridelines at Balrath has allowed for the growth of a variety of herbaceous species and shrubs that provide additional cover and food for birds and enhance the positive edge effect on species diversity in the woodland as a whole. Bird species richness increased from 20 to 23, and bird diversity at the site increased from 12.2 to 13.4 by inclusion of ride habitats. These results indicate that current management practices, including ride management, have been successful in maintaining and enhancing avian diversity at Balrath Wood. Continued management of rides is essential to preserve their conservation value as the effects of forest management on bird communities are often short in duration.

### Keywords

bird diversity, conservation, forest management, ridelines

### Introduction

Balrath Wood (locally known as Knockcomra wood) extends over 21 ha and is located 40 km north of Dublin City in Co Meath (National Grid reference N 99 64). It is a young mixed conifer/broadleaf woodland dominated by native broadleaf species such as oak (*Quercus* spp), ash (*Fraxinus excelsior*) and alder (*Alnus glutinosa*). Conifer species include Norway spruce (*Picea abies*) and grand fir (*Abies grandis*). The forest was planted in 1969 on the site of a former mixed broadleaf woodland. Some trees from the original crop, such as horse chestnut (*Aesculus hippocastanum*) and oak are scattered throughout the site.

The Tree Council of Ireland and Meath County Council are responsible for the management and upkeep of the woodland. A management plan (2005-2014), aimed at maintaining a quality broadleaf woodland for nature conservation and as a recreational resource, has been agreed by Balrath Woods Preservation Group, Coillte, Forest Service and Meath County Council.

Mixed conifer/broadleaf woodlands, such as Balrath, are important habitats for birds and allow the development of more diverse avian communities than those

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supported by conifer-dominated plantations (Donald et al. 1998, O'Halloran et al. 1998, Walsh et al. 2000, Díaz 2006, Archaux and Bakkaus 2007). Structural features in woodlands are of particular significance for bird diversity and include rides, open ground, margins and buffer zones and specimen trees. Ridelines – rides – are (usually) straight-line paths or tracks within woodland, primarily opened to compartmentalise forest for management purposes; they are also valuable for biodiversity due to their capacity to enhance the plant and animal diversity when maintained as open habitats (Warren and Fuller 1993, Peterken and Francis 1999, Oxbrough et al. 2006, Smith et al. 2007).

Birds are an important component of overall biodiversity, and rides increase their diversity due to their enhancement of positive edge effects on species richness (McCollin 1998, Mitchell et al. 2006). Management at Balrath has emphasised sustainable biodiversity, and the attraction of a greater variety of bird species. To promote avian species diversity two rides (each c. 20 m wide) running diagonally across the site and intersecting at its centre were created during the early 1970s (Figure 1). These have remained unplanted since their creation to provide habitat diversity within the site and are a focus of attention in the current management plan (Barron and Perrin 2007).

Open areas make up 10% of Irish forests, with rides comprising almost 18% of open area (Forest Service 2007). Assessment of the avian diversity at Balrath Wood provided an opportunity to quantify the bird diversity associated with rides in a mixed conifer/broadleaf woodland and to assess the effectiveness of habitat management practice at Balrath. To this end, a monitoring schedule was established with a 10-year survey interval to improve understanding of the bird community and how it will be affected by management. The avian community was initially surveyed during the 1996 breeding season; the 2007 survey reported here being the second of the planned series.



*Figure 1: Open area at the intersection of the two rides at Balrath Wood.*

The objectives were to assess the bird population of three managed sub-habitats during the 2007 breeding season, to compare results with the 1996 survey and to assess the management implications of the findings.

## Methods

The methods used followed those used by Duffy et al. (1997) during a preliminary investigation of the site. The three habitat types surveyed during the summer of 2007 were as follows:

1. ride – two open, unplanted linear stretches running north-west to south-east and south-west to north-east through the site,
2. wooded – the internal woodland where canopy cover was unbroken,
3. edge – the boundary between woodland and surrounding farmland.

Ten line transects (Bibby et al. 1993) were identified to estimate bird communities in the habitats (Figure 2). Transects varied between 300 and 560 m, depending on the length of the section being sampled. Four transects were located along the rides (R1, R2, R3 and R4), four traversed the woodland between the rides (W1, W2, W3 and W4) and two followed the external boundary of the wood (E1 and E2) (Figure 2). Breeding bird surveys were conducted on the mornings of 29 April and 10 June 2007 in order to detect both early and late breeding birds, and to ensure that late-arriving migrants were included (Coombes et al. 2006). On each sampling occasion all line transects were surveyed between 0600 and 1030 hrs BST. Separate dusk surveys were conducted on the 28 April and 9 June in order to detect nocturnal species. Only the ride transects were walked on these occasions due to the difficulty

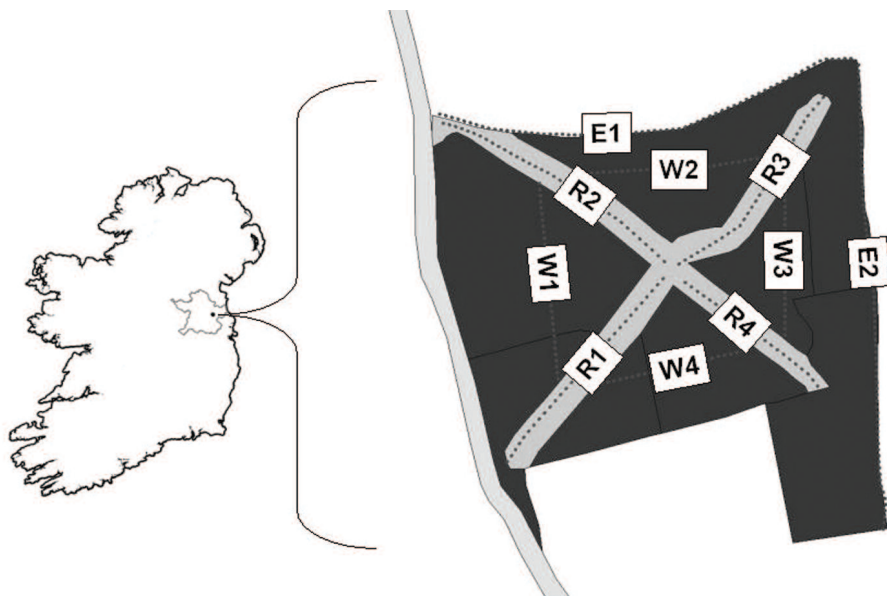


Figure 2: Map of Balrath Wood showing the survey transect locations (R = ride habitat, W = wooded habitat, E = edge habitat). Site area 22.3 ha.

of navigating through woodland at night. All surveys were conducted in good weather conditions (dry with light winds), within the range of conditions suitable for bird surveys as defined by Bibby et al. (1993). All birds seen or heard within 30 m of either side of the transect line were recorded. On transects which followed the woodland edge (E1 and E2), only birds on the woodland side were recorded. Flying birds were excluded unless obviously using the site. Due to the close proximity of the different habitat types it was not feasible to use the band system recommended by Bibby et al. (1993). Binoculars (10 x 40 magnification) were used to aid species identification.

The maximum count value of each species from the two survey days was used in data analysis. This provided a realistic representation of numbers present, as underestimation is likely when working with mean values. The density of birds recorded in each habitat type was calculated by dividing the maximum number of birds in each habitat type by the transect area surveyed (i.e. transect length multiplied by transect width) and expressed as mean number of birds per hectare in each habitat type.

Bird diversity was estimated using the Shannon Index (H) and Simpson's Index of Diversity (Reciprocal  $1/p_i$ ) which account for both abundance and evenness of the species present. These were calculated as follows:

$$H = -\sum p_i \ln p_i \quad (1)$$

$$D = \sum p_i^2 \quad (2)$$

Where  $p_i = n/N$ , and  $n$  = number of birds of each species and  $N$  = total number of birds.

## Results

Twenty three bird species were recorded at the site during the 2007 breeding season, with 18 individual species recorded in the ride habitat, 20 in the wooded habitat and 16 in the edge habitat (Table 1). The most abundant species at the site were Wren (*Troglodytes troglodytes*), Blackbird, (*Turdus merula*), Woodpigeon (*Columba palumbus*) and Chaffinch (*Fringilla coelebs*) all of which occurred in 100 % of the survey transects in all habitat types. Robin (*Erithacus rubecula*) and Goldcrest (*Regulus regulus*) were also common at the site, occurring in 90% of all transects. Dusk surveys revealed that Long-eared Owl (*Asio otus*) were present at the site, with a single individual recorded on ride R2, close to the centre of the site. In total, 17% of the bird species recorded at the site across all three habitats were migrant species. These were Blackcap (*Sylvia atricapilla*), Chiffchaff (*Phylloscopus collybita*), Willow Warbler (*Phylloscopus trochilus*) and Whitethroat (*Sylvia communis*). Just one individual Whitethroat was recorded, in a ride habitat.

The mean density of each species per habitat type is shown in Table 2, together with the densities of each species recorded during the 1996 survey. The highest overall density of birds was recorded in the edge habitat (16.5/ha), followed by the wooded habitat (13.6/ha) with the lowest density recorded in the ride habitat (9.6/ha).

Table 1: Maximum numbers of birds recorded on the 10 survey transects in Balrath Wood during the 2007 breeding season (R = ride habitat, W = wooded habitat, E = edge habitat).

Species	Transect									
	R1	R2	R3	R4	W1	W2	W3	W4	E1	E2
<i>Blackbird</i>	4	1	2	4	3	1	2	4	2	1
<i>Blackcap</i>	0	0	0	0	3	0	1	2	0	1
<i>Blue Tit</i>	0	0	2	1	0	0	2	0	1	1
<i>Bullfinch</i>	1	0	0	0	0	0	0	1	1	0
<i>Chaffinch</i>	1	1	2	1	3	2	3	2	2	2
<i>Chiffchaff</i>	1	1	1	1	1	2	1	0	0	0
<i>Coal Tit</i>	0	1	0	3	1	0	0	0	0	0
<i>Dunnock</i>	0	0	0	0	1	0	1	0	1	0
<i>Goldcrest</i>	0	1	1	1	2	1	1	1	2	1
<i>Great Tit</i>	0	1	0	0	0	0	2	0	0	0
<i>Jackdaw</i>	0	0	1	0	1	2	3	1	8	2
<i>Long-eared Owl</i>	0	1	0	0	0	0	0	0	0	0
<i>Long-tailed Tit</i>	0	0	0	0	0	0	0	1	0	0
<i>Magpie</i>	0	1	1	0	0	0	0	0	1	1
<i>Pheasant</i>	0	0	0	0	0	1	1	0	3	0
<i>Robin</i>	1	1	1	3	1	3	0	2	2	1
<i>Rook</i>	0	0	2	2	0	0	1	0	3	1
<i>Song thrush</i>	0	4	0	0	1	1	0	1	1	0
<i>Whitethroat</i>	0	1	0	0	0	0	0	0	0	0
<i>Treecreeper</i>	0	0	0	0	0	0	1	0	0	0
<i>Willow Warbler</i>	1	0	0	1	0	0	0	1	0	1
<i>Woodpigeon</i>	1	2	1	2	2	4	1	1	6	3
<i>Wren</i>	1	2	2	1	4	3	3	1	3	3

The highest density of birds recorded in any transect (22.6/ha) was also in an edge transect and the largest contribution to this density value was made by the sighting of 8 Jackdaws during one transect walk. It is important to note that the density at the second edge transect was less than half this value at 10.7/ha. The next highest density of birds (14.5/ha) was recorded in a ride transect. Maximum bird densities in all three habitat types were slightly lower than reported during the 1996 survey. The five most abundant species (birds/ha) in the three habitat types were similar with Wren, Chaffinch and Woodpigeon occurring in the top five at all sites (Table 3). A high proportion of corvid species (Jackdaw, *Corvus monedula* and Rook, *Corvus frugilegus*) occurred in the edge habitat, while Robin and Blackbird dominated the species assemblage in the ride habitat.

The Shannon Index revealed a similar diversity for the three habitats ( $H = 2.7$ ,  $2.7$  and  $2.5$  in ride, wooded and edge habitats respectively). Diversity in Balrath Wood as a whole (including data from all three habitats) was  $2.8$ . Avian Species Diversity in the wooded habitat, as estimated using Simpson's Reciprocal Index ( $1/D$ ), was  $12.2$

Table 2: Mean maximum bird density (birds/ha) in the three habitats sampled (using maximum counts from the two survey dates) for each species in 2007, compared with data from Duffy et al. (1996).

Species	Ride Habitat		Wooded Habitat		Edge Habitat	
	2007	1996	2007	1996	2007	1996
Blackbird	1.62	1.27	1.62	0.83	0.92	1.30
Blackcap	0.00	1.11	0.97	0.00	0.31	0.00
Blue Tit	0.44	1.00	0.32	0.74	0.61	0.95
Bullfinch	0.15	0.00	0.16	0.32	0.31	0.00
Chaffinch	0.74	3.10	1.62	1.93	1.22	2.24
Chiffchaff	0.59	0.66	0.65	0.32	0.00	0
Coal Tit	0.59	0.53	0.16	1.24	0.00	0.96
Dunnock	0.00	1.88	0.32	1.19	0.31	2.23
Goldcrest	0.44	2.23	0.81	3.26	0.92	1.92
Great Tit	0.15	0.00	0.32	0.00	0.00	0.32
Jackdaw	0.15	0.00	1.13	0.00	3.06	0.00
Long-eared Owl	0.15	0.15	-	-	-	-
Long-tailed Tit	0.00	0.00	0.16	0.64	0.00	0.00
Magpie	0.29	0.17	0.00	0.00	0.61	0.00
Pheasant	0.00	0.00	0.32	0.00	0.92	0.32
Robin	0.88	1.88	0.97	1.19	0.92	2.23
Rook	0.59	0.00	0.16	0.00	1.22	0.00
Song Thrush	0.59	1.58	0.49	1.15	0.31	0.33
Whitethroat	0.15	0.00	0.00	0.00	0.00	0.00
Treecreeper	0.00	0.00	0.16	0.00	0.00	0.00
Willow Warbler	0.29	0.14	0.16	0.00	0.31	0.33
Woodpigeon	0.88	2.02	1.29	1.56	2.75	2.90
Wren	0.88	3.31	1.78	1.52	1.83	2.91
Total	9.59	19.67	13.59	15.25	16.51	17.35

which was slightly higher than that of the ride and edge habitats (12.1 and 9.8 respectively). Species Diversity in Balrath Wood as a whole including transects from all habitats ( $1/D$ ) was 13.4.

Table 3: Species rank in descending order of abundance for the three habitat types. Compared with data from Duffy et al. (1996).

Ride Habitat		Wooded Habitat		Edge Habitat	
2007	1996	2007	1996	2007	1996
Blackbird	Wren	Wren	Goldcrest	Jackdaw	Wren
Robin	Chaffinch	Blackbird	Chaffinch	Woodpigeon	Woodpigeon
Woodpigeon	Goldcrest	Chaffinch	Woodpigeon	Wren	Chaffinch
Wren	Woodpigeon	Woodpigeon	Wren	Chaffinch	Robin
Chaffinch	Robin	Jackdaw	Coal Tit	Rook	Goldcrest



## Discussion

Plant species found on the ride margins at Balrath Wood included willow (*Salix* spp.), bramble (*Rubus fruticosus*) and rosebay willowherb (*Chamerion angustifolium*). The edges of the woodland itself lacked any transitional vegetation zones as the wood terminated abruptly where it abutted the surrounding agricultural land (improved grassland and tillage). The internal woodland was dominated by semi-mature or mature broadleaf trees, with almost continuous canopy cover and a dense understorey of young saplings, bramble and ivy. Therefore the canopy break created by the rides provided the only suitable habitat within the wood for sun-loving plants normally associated with forest edges. The periodic mowing operations carried out in the centre of the ride (Barron and Perrin 2007) promoted high numbers of plant species by controlling competition (Warren and Fuller 1993) in the margins of the rides, which are known to be important for deciduous trees and shrubs (Díaz 2006). The rides at Balrath Wood varied considerably in width from 5-22 m (Barron and Perrin 2007). Rides greater than 5 m are considered most valuable for birds (Warren and Fuller 1993), with those over 15 m supporting the greatest diversity (Smith et al. 2007). Wide rides also hold open grassland species for which other available habitats are in decline (Peterken and Francis 1999). In woods such as Balrath, which has only small areas of ephemeral open habitats, carefully designed and managed rides can help to enrich the bird life (Warren and Fuller 1993).

The composition of the avian community at Balrath Wood has changed little since the 1996 survey carried out by Duffy et al. (1997) and species richness remains much higher than in commercial plantations (O'Halloran et al. 1998, Smith et al. 2005) and is comparable with native woodlands (Batten 1976, Wilson 1977, Nairn and Farrelly 1991). None of the bird species recorded at this site were among those identified as species of conservation concern in Ireland (Newton et al. 1999, Lynas et al. 2007). Bird community structure was assessed using species richness (S), which was higher in the 2007 survey (23) than it was at the site during the 1996 survey (20). Species richness was highest (20) in the wooded habitat in 2007 and lowest (16) in the woodland edge habitat, while 18 species were recorded in the ride habitat. In 1996, species richness was similar in all three habitats (14 in rides and 13 in both wooded and edge habitats) (Duffy et al. 1997). The inclusion of the rides at Balrath Wood effectively increased the species richness at the site from 20 to 23 in 2007. This is typical of the positive association widely reported between rides and woodland bird communities (Mitchell et al. 2006), which is likely to be mediated through the provision of suitable habitat for nesting and feeding through increased structural diversity (Fuller 1995, Peterken and Francis 1999). The increased species richness of the wooded habitat itself is likely to be related to its maturation, and associated increases in structural diversity, making this area more attractive (Hobson and Bayne 2000, Díaz 2006) to a range of bird species since the 1996 survey.

The list of species detected differs only slightly between the two surveys, with the resident Sparrowhawk, *Accipiter nisus*, recorded in 1996, absent in 2007 and the resident Treecreeper, and migrant Whitethroat recorded in 2007 but not in 1996. Although these species may not be detected during surveys of short duration, the

presence of Whitethroat, not recorded during the 1996 survey, in the ride habitat in 2007 is consistent with the development of shrub growth typical of managed rides, as this species breeds in open habitats with high levels of shrub cover (Mullarney et al. 1999, Smith et al. 2006). The presence of Treecreeper, which nests and forages in the bark of mature trees (Mullarney et al. 1999), probably reflects the more advanced growth stage of the wood in 2007 compared to 1996. This phenomenon is further demonstrated by the absence of Blackcaps, which were exclusively recorded in the ride habitat in 1996, from this habitat in 2007. This species typically breeds in shady woodland with dense undergrowth (Fuller 1995) and it is likely that the development of the understorey vegetation in Balrath through new planting (Barron and Perrin 2007) has resulted in a wider availability of undergrowth throughout the site, allowing Blackcaps to occupy territories away from the rides.

While Jackdaws, Rooks, Hooded Crows (*Corvus corone*) and Starlings (*Sturnus vulgaris*) overflowed the study area in 1996 they did not appear to utilise the site itself at that time. Both Jackdaw and Rook were recorded roosting at the site during the 2007 survey. It may be that this apparent change in the use of Balrath Wood by these species is due to changes in the surrounding landscape rather than in the wood itself. These species typically use farmland and other intensively managed areas for feeding, and traditionally nest and roost in woodland (Waite 1984).

The study used a standard methodology that captures only those species seen or heard during the visits at the particular at the time of the surveys. Informal sightings of other less common bird species such as Buzzard (*Buteo buteo*), Grey Heron (*Ardea cinerea*) and Kingfisher (*Alcedo atthis*) have been reported at this site (John Simpson pers. comm.).

Mean bird densities differed between the three habitat types with the woodland edge habitat holding the highest density of birds and the ride habitat the lowest density (Table 2). This was not the case in 1996, when the ride habitat held higher densities of birds than the other habitat types (Duffy et al. 1997). The reason for this appears to be the presence of high numbers of roosting Jackdaws and Woodpigeons in 2007, two species which may favour the edge of woodlands due to ease of access to surrounding farmland (Waite 1984) and that were present in high numbers in the 2007 survey. Pheasants (*Phasianus colchicus*) were mainly recorded in the woodland edge habitat in both survey years, also possibly related to the proximity of farmland foraging habitat (Wilson et al. 1996).

The five most abundant species in the three habitat types were similar to general patterns observed in Irish woodlands (Coombes et al. 2006) and to those reported in 1996 (Table 3), with the notable inclusion of Jackdaw in the 2007 list. Goldcrest appeared in the top five list in all habitats in 1996 but not in 2007. This is possibly related to the relatively high numbers of Jackdaw at the site (which were not present in 1996) rather than an actual drop in Goldcrest abundance. Jackdaws were recorded in 90% of survey transects in 2007.

The ride habitat, while not holding the highest density of birds, did hold a high diversity of species ( $1/D = 12.1$ ) similar to that of the wood itself ( $1/D = 12.2$ ) and higher than the edge habitat ( $1/D = 9.8$ ). The inclusion of the ride and edge habitats in



the woodland resulted in a total diversity at the site of  $1/D = 13.4$ . This was also the case in 1996 where diversities of  $1/D = 9.4, 8.5$  and  $9.0$  were recorded in the ride, wooded and edge habitat respectively. The total diversity at the site estimated during the 1996 survey was  $1/D = 9.6$ . These results provide further evidence for the hypothesis that the inclusion of rides as a management tool in forests is an effective means of increasing the diversity of birds associated with the woodland (Mitchell et al. 2006). The variety of early successional scrub species and availability of mature trees in this habitat attract a diverse range of species. The low species diversity in the woodland edge habitat observed during the 2007 survey may be related to the dominance of Jackdaws and Woodpigeons here which creates an uneven species distribution.

### **Management implications**

The decline in woodland birds across Europe is related to the decrease in early successional and understorey vegetation (Warren and Fuller 1993, Fuller et al. 2005). The inclusion of rides within woodlands presents the opportunity to offset the effect of such habitat loss and this study demonstrates that the presence of the rides positively influenced the bird species diversity at Balrath Wood. These rides should be retained and managed to ensure that the scrub layer is maintained as the diversity in terms of cover and height of the shrub layer is particularly important for forest birds (Díaz 2006).

The maturation of trees in wooded habitats has been implicated in the addition of new species to woodland avifaunas (Fuller 1995), and appears to be responsible for the appearance of species (e.g. Treecreeper and Blackcap) that were not present in 1996. Any mature/semi-mature native trees in this habitat should be retained.

The woodland edge habitat supports a high density of birds, although a proportion of the species present exploit agricultural lands. The creation of a buffer zone of scrub and other early successional species between the woodland and the surrounding agricultural land would likely attract a higher diversity of species than the current abrupt boundary.

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