CASTLEBANNY WIND FARM: WOODCOCK SURVEYS, 2019

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CONTENTS

1. INTRODUCTION

Woodcock surveys were carried out in the Castlebanny Wind Farm study area in 2017 and 2018 (Gittings, 2019). Roding Woodcock were recorded throughout the study area and there is clearly a strong population present in this area. Woodcock is red-listed in Birds of Conservation Concern Ireland 2014-2019 (Colhoun and Cummins, 2013) for its breeding populations. However, it may be more widespread than current distribution records indicate due to its crepuscular habits. There is nothing particularly special about the forestry habitat within the Castlebanny study area, so similar Woodcock populations are likely to occur in other large forestry plantations in this region. The roding Woodcock recorded during the Woodcock surveys were all flying below the potential collision height zone so any collision risk from the proposed wind farm development is likely to be minor. However, a German study (Dorka et al., 2014) reported a decrease in abundance from about 10 males/100 ha to about 1.2 males/100 ha after construction of a wind farm. A review of this, and other information, recommended buffer distances of at least 500 m around the flight paths of roding birds to avoid impacts (LAG VSW, 2014).

This report presents the results of Woodcock surveys that were carried out in the summer of 2019. The purpose of the surveys was to provide context for Woodcock surveys that had been carried out within the Castlebanny Wind Farm study area in the summers of 2017 and 2018.

The objectives of the surveys were to:

- To provide a better evaluation of the significance of the Castlebanny Woodcock population by surveying other similar areas of forestry habitat in the general vicinity.
- To obtain some information on Woodcock interactions with wind turbines by surveying forestry habitat adjacent to a small wind farm.

2. METHODOLOGY

2.1. SURVEY DESIGN

The survey methodology was based on Heward et al. (2015) but, as in the 2017-2018 surveys, instead of using a fixed point for the survey, used transects rather than fixed points. This allowed large areas of habitat to be surveyed each night, which, for the same survey effort, provides more information on Woodcock distribution over large areas compared to fixed point surveys. In particular, for the purpose of comparing Woodcock distribution in relation to distance bands from turbines, transects are a much more efficient method. A comparable fixed point survey would have required a much more intensive survey effort involving multiple observers on each night.

2.2. SURVEY AREAS

Two survey areas were selected for this study: Ballymartin / Bishopsmountain (adjacent to the southern edge of the Castlebanny study area); and Mount Alto (to the north-east of the Castlebanny study area). Two transects were located in the Ballymartin / Bishopsmountain survey area and one in the Mount Alto survey area (Figure 1). Note that while transect BM2 extends into the Castlebanny Wind Farm boundary as currently mapped, it is well outside the study area that was covered by the 2017-2018 Woodcock surveys and is 1.3 km from the nearest currently proposed turbine location.

The forestry in the Ballymartin / Bishopsmountain survey area is adjacent to a small wind farm with seven turbines (Plate 1). This wind farm was constructed in two phases, with three turbines commissioned in 2009 and the other four commissioned in 2013[1]. The turbines are Enercon E82/2300, with hub heights of 78 m and rotor diameters of 82 m[1]. Therefore the lowest edge of the rotor swept volume is 37 m above ground level. The bases of the three turbines closest to the forest edge are 10-20 m above the ground level of the adjacent forestry habitat.

[1] www.thewindpower.net/windfarm_en_1713_ballymartin.php

The transect routes (Figure 1) were chosen to sample areas of suitable habitat throughout the survey areas, and, at Ballymartin / Bishopsmountain, to sample areas within distance bands of 0-250 m, 250-500 m and > 500 m from turbines. They were all along forest roads and public roads, except for a short section along a thinning line in transect BM2, as these provided the only practicable way of walking long transect routes through the study area in poor light conditions. The transects were 2,710-2,870 m long. The wind farm adjacent to the Ballymartin / Bishopsmountain transects included three turbines within around 100-200 m of the transects. Overall, 14-25%, and 18-28%, of the Ballymartin / Bishopsmountain transects were within 250 m, and 250-500 m, of the turbines (Table 2.1).

The forestry along the Ballymartin / Bishopsmountain transect routes was mainly 20-30 year old Sitka Spruce with a few recently clear-felled areas (Figure 2 and Figure 3). The forestry edges along the public roads generally had wide bands of willow scrub and/or planted broadleaves. Sitka Spruce was also the dominant species in the forestry along the MA1 transect, but there was a more varied mix of other conifer species, and a more varied mix of age classes (Figure 4 and Figure 5).

Table 2.1. Transect details.

Survey area	Transect	Total length	Lengths within turbine buffers	
			0-250 m	250-500 m
Ballymartin / Bishopsmountain	BM1	2870 m	390 m	510 m
	BM2	2670 m	680 m	750 m
Mount Alto	MA1	2710 m	-	-

2.3. SURVEY METHODS

The Woodcock surveys were carried out in May-July 2019. The survey methodology was based on Heward et al. (2015): the survey began 15 minutes before sunset and lasted for 75 minutes, and all aural and/or visual detections of Woodcock were recorded.

After completion of the first round of surveys, I decided to focus on the Ballymartin / Bishopsmountain transects to maximise the dataset of roding birds for analysis of potential displacement effects from the turbines. This allowed me to complete four rounds of each of the Ballymartin / Bishopsmountain transects. Therefore, the Ballymartin / Bishopsmountain transects were surveyed four times between 29th May and 6th July 2019, while a single survey was carried out of the Mount Alto transect. To comply with the Heward et al. (2015) survey methodology, and for comparability with the 2017-2018 Castlebanny surveys, three of the surveys of each of the Ballymartin / Bishopsmountain transects were carried out before the end of June, with each of these surveys being at least one week apart. The fourth survey of each of these transects was an extra survey to obtain more data on Woodcock distribution in relation to turbines.

The transect route was walked twice during each survey and the starting position and the sequence in which the transect was walked was alternated between each survey (Table 2.2). All Woodcock registrations were recorded, with the time and flight height (if a visual registration) being noted and the flightline (visual observation), or approximate position (aural observation) being mapped. Flight heights were categorised in 5 m height bands, using the position of the bird relative to the canopy height as a guide.

Table 2.2. Starting position and direction of the transect surveys.

Date	Transect	Starting position	Direction walked
29/05/2019	BM1	middle	middle→ northern end → southern end → middle
30/05/2019	BM2	middle	middle → southern end → northern end → middle
31/05/2019	MA1	eastern end	eastern end→ western end→ eastern end
15/06/2019	BM1	northern end	northern end → southern end→ northern end
18/06/2019	BM2	southern end	southern end → northern end → southern end
28/06/2019	BM1	southern end	southern end → northern end → southern end
29/06/2019	BM2	northern end	northern end → southern end→ northern end
02/07/2019	BM1	middle	middle → southern end → northern end → middle
06/07/2019	BM2	middle	middle→ northern end → southern end → middle

The timing of, and weather conditions during, the surveys are shown in Table 2.3. Note that, while there was no wind at ground level on two of the survey dates, the turbines were turning during all the surveys.

Table 2.3. Survey details.

Date	Transect	Sunset	Start	Finish	Duration	Wind	Cloud	Temp	Rain
29/05/2019	BM1	21:37	21:22	22:39	01:17	SW3	3	15°C	1
30/05/2019	BM2	21:38	21:23	22:40	01:17	SW3	3	14°C	1
31/05/2019	MA1	21:40	21:25	22:44	01:19	SW2	2	14°C	1
15/06/2019	BM1	21:52	21:42	23:01	01:19	SW2	2	10°C	1
18/06/2019	BM2	21:53	21:38	23:01	01:23	still	2	11°C	1
28/06/2019	BM1	21:55	21:40	23:03	01:23	SW3	3	16°C	1
29/06/2019	BM2	21:54	21:39	22:57	01:18	SW3-4	2	15°C	1
02/07/2019	BM1	21:53	21:38	23:02	01:24	N1	2	15°C	1
06/07/2019	BM2	21:51	21:36	22:54	01:18	still	3	15°C	2

Cloud: 1 = 0-33% cloud cover; 2 = 34-66% cloud cover; 3 = 67-100% cloud cover. Rain: 1 = no rain; 2 = drizzle/showers.

2.4. DATA PROCESSING

All Woodcock registrations were mapped in GIS with flightlines mapped as polylines and aural detections mapped as points. The centroids of the polylines were then added to the aural detections to give point mapping of all the Woodcock registrations. This point mapping was then used to classify each Woodcock registration along the Ballymartin / Bishopsmountain transects in relation to distance bands from the turbines.

2.5. DATA ANALYSIS

Woodcock roding activity shows a strong temporal pattern even within the relatively short survey period from 15 minutes before sunset to around 60 minutes after sunset, with the peak roding activity occurring around 10-20 minutes after sunset (Hoodless et al., 2006; Text Figure 3.1). This means that the probability of recording a roding Woodcock will vary across the survey period, so the distribution of roding Woodcock recorded along the transect routes will depend, in part, on the sequence in which the transect was walked. The alternation of the starting point and sequence between each transect survey was designed to reduce this effect, but there will still be some degree of bias. Therefore, to analyse the distribution of roding Woodcock in relation to distance bands from the turbines a randomisation procedure was used.

The analysis tested the null hypothesis that at any particular time there would be an equal probability of detecting a roding Woodcock at any point along the transect routes. Therefore, the actual probability of detecting roding Woodcock in specific sections of the transects on any particular survey will depend on the time at which that section was surveyed. For each transect survey, the time periods relative to sunset during which the 0-250 m and 250-500 m distance bands were surveyed were tabulated. The time distribution of roding Woodcock reported by

Hoodless et al. (2003), which is very similar to the time distribution recorded in the 2017-2018 Castlebanny surveys (Text Figure 3.1), was then used to calculate the percentage of the roding Woodcock recorded on the transect survey that would be expected to occur in these time periods (p_{db}). These factors were then used to simulate random datasets of the distribution of roding Woodcock for each transect survey, taking the observed number of Woodcock recorded and using p_{db} as the probability of each individual roding Woodcock occurring within distance band db. The total numbers of roding Woodcock recorded in each distance band was then summed across all the transect surveys for each run of the simulation. The mean number of roding Woodcock recorded in each distance band across 1000 simulations, and the 95% confidence intervals, were then compared with the observed total numbers recorded in each distance band.

3. RESULTS

3.1. GENERAL RESULTS

Totals of 3-7 and 1-5 roding Woodcock were recorded on transects BM1 and BM2, respectively, with 2 roding Woodcock recorded on the single MA1 transect survey (Table 3.1). The mean and maximum numbers recorded on transects BM1 and BM2 were lower than those recorded on any of the Castlebanny transects in 2017 and 2018 (Table 3.2)

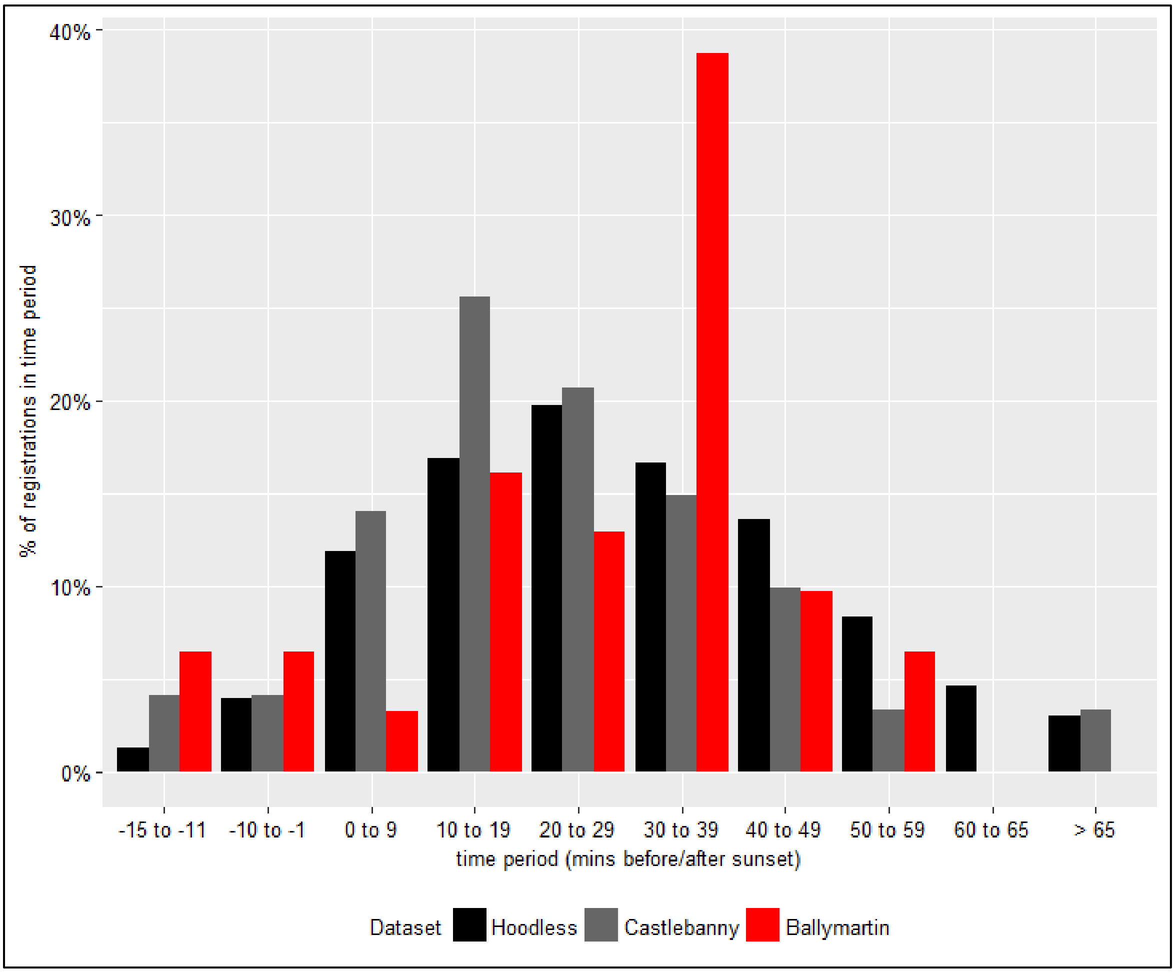
Table 3.1. Survey results.

Transect	Date	Woodcock registrations			
		0-250 m	250-500 m	> 500 m	Total
BM1	29/05/2019	0	0	4	4
	15/06/2019	0	1	2	3
	28/06/2019	2	1	4	7
	02/07/2019	0	0	3	3
BM2	30/05/2019	0	3	2	5
	18/06/2019	0	0	3	3
	29/06/2019	0	3	1	4
	06/07/2019	0	0	1	1
MA1	31/05/2019	-	-	-	2

Table 3.2. Comparison of the Ballymartin / Bishopsmountain survey results with the 2017-2018 Castlebanny survey results.

Survey area	Transect	Length	Year	Woodcock registrations			
				numbers		registrations/km	
				mean	max	mean	max
Ballymartin	BM1	2870 m	2019	4.7	7	1.6	2.4
	BM2	2670 m	2019	4.0	5	1.5	1.9
Castlebanny	WK1	2803 m	2017	6.3	10	2.2	3.6
			2018	6.0	9	2.1	3.2
	WK2	2371 m	2017	8.3	11	3.5	4.6
			2018	6.3	8	2.7	3.4
	WK3	2500 m	2017	10.7	13	4.3	5.2
			2018	10.0	14	4.0	5.6

The mean and max figures for the Ballymartin transects are calculated using data from the first three surveys only, for comparability with the Castlebanny surveys.



Text Figure 3.1. Comparison of the time distribution of Woodcock registrations recorded in the Ballymartin / Bishopsmountain transects, with those recorded in a survey of 46 British sites (Hoodless et al., 2003), and in the Castlebanny surveys in 2017-2018.

The time distribution of the Woodcock registrations recorded in the Castlebanny transects in 2017-2018 was very similar to that recorded in a large-scale British survey (Text Figure 3.1). However, the time distribution of the Woodcock registrations recorded in the Ballymartin / Bishopsmountain transects in 2019 showed a strong deviation from that recorded in the large-scale British survey (Text Figure 3.1), indicating that roding Woodcock had a very uneven distribution across the transect routes.

The height distribution of roding Woodcock recorded on the Ballymartin / Bishopsmountain transects was similar to that recorded on the Castlebanny transects, with most registrations within the 15-25 m height bands (Table 3.3). There were fewer registrations below 15 m on the Ballymartin / Bishopsmountain transects, reflecting the absence of pre-thicket forestry along these transects.

Table 3.3. Height of roding Woodcock recorded in the 2017-2018 Castlebanny and 2019 Ballymartin / Bishopsmountain Woodcock surveys.

Height band	Castlebanny	Ballymartin	Overall
5-10	9%	6%	9%
10-15	10%	0%	9%
15-20	43%	50%	44%
20-25	35%	44%	37%
25-30	2%	0%	2%

Sample sizes of 96 observations for Castlebanny and 18 observations for Ballymartin / Bishopsmountain.

3.2. DISTRIBUTION PATTERNS

On transect BM1, 12% of registrations were within 250 m of the turbines, and a further 12% were between 250 and 500 m of the turbines (Table 3.1), compared to 14% of the transect route within 250 m, and 18% between 250 and 500 m, of the turbines. All the registrations were either along the forest road in the northern/eastern part of the transect, or towards the southern end of the transects (Figure 6).

On transect BM2, there were no registrations within 250 m of the turbines, but 46% of the registrations were 250 and 500 m of the turbines (Table 3.1), compared to 25% of the transect route within 250 m, and 28% between 250 and 500 m, of the turbines. All the registrations were in the northern two-thirds of the transect (Figure 7).

The two Woodcock registrations on the single survey of the MA1 transect were both near the western end of the transect (Figure 8)

On the Ballymartin / Bishopsmountain transects, the number of registrations recorded within 250 m of the turbines was significantly less than predicted assuming random distribution of roding Woodcock along the transect routes (Table 3.4). The number of registrations recorded between 250 m and 500 m from the turbines was higher than predicted, but within the 95% confidence interval (Table 3.4).

Table 3.4. Comparison of the distribution of Woodcock registrations recorded in distance bands from the turbines, with that predicted assuming random distribution of Woodcock along the transect routes.

Distance band	Total registrations recorded	Predicted registrations	
		mean	95% interval
0-250 m	2	6.4	3-11
250-500 m	8	5.2	2-9
> 500 m	20	18.4	13-23

4. DISCUSSION

4.1. SURVEY RESULTS

This survey has shown that, as expected, Woodcock distribution in this area extends outside the Castlebanny wind farm site.

The numbers recorded in 2019 on the Ballymartin / Bishopsmountain transects, and on the single transect at Mount Alto, were lower than those recoded in the Castlebanny surveys in 2017-2018. As the Castlebanny transects were not repeated in 2019, the possibility that there was an overall reduction in the Woodcock population in this region in 2019 cannot be completely excluded. However, given the close similarity of the Woodcock transect results in 2017 and 2018, this seems unlikely. There is little specific information on Woodcock habitat preferences within forestry plantations. Compared to the Ballymartin / Bishopsmountain transects, the forestry along the Castlebanny transects was more heterogeneous with a greater mixture of age-classes and had a more upland character, with heath vegetation along the forest roads and in pre-thicket plantations. The highest Woodcock activity in the Castlebanny transects appeared to be associated with an area of unplanted bog/heath near the northern end of transect WK3.

In contrast to the Castlebanny transects, the distribution of Woodcock registrations along the Ballymartin / Bishopsmountain transects was very uneven, with large sections where no Woodcock were recorded. In part this will reflect the lower overall number of registrations which mean that random effects have greater influence on the distribution patterns. This is illustrated by comparing the map of the Woodcock registrations on the Castlebanny transects for the individual years, with the map showing both years together. However, it seems likely that there were real differences in Woodcock distribution along the Ballymartin / Bishopsmountain transects.

Only two Woodcock registrations were recorded within 250 m of the turbines, representing 7% of the total number of registrations along the Ballymartin / Bishopsmountain transects, while 19% of the total length of the transect routes occurred within 250 m of the turbines. However, eight Woodcock registrations were recorded between 250 m and 500 m from the turbines, representing 27% of the total number of registrations along the Ballymartin / Bishopsmountain transects, while 23% of the total length of the transect routes occurred between 250 m and 500 m from the turbines. The randomisation analysis, which takes into account the time distribution of roding Woodcock in relation to the times at which each distance band was surveyed on each date, indicated that significantly fewer than expected Woodcock were recorded within 250 m of the turbines, while the numbers recorded between 250 m and 500 m from the turbines were higher than expected but within the 95% confidence interval. These results could, therefore, be taken as indicating an avoidance effect extending around 250 m from the turbines, while the higher numbers in the 250-500 m band could indicate an edge effect.

However, the above interpretation assumes that the presence of the turbines was the only factor influencing the distribution patterns. Due to the configuration of the forestry habitat in relation to the wind farm, and the availability of suitable transect routes, the transects included long sections along public roads with forestry on one side of the road and open habitats on the other side of the road. While roding Woodcock will fly out over open ground from the forest edge, no roding Woodcock were recorded in these sections of the transect routes on any of the surveys. Most of the sections of the transect routes within the 0-250 m distance band were along such roads. Therefore, the apparent avoidance of the 0-250 m distance band could be due to avoidance of forest edge habitat rather than avoidance of the turbines. It is also possible that other habitat factors could have affected the distribution of the roding Woodcock along the transect routes, although, apart from the presence of a couple of recently clear-felled areas there was little variation in the forestry habitat along the routes.

4.2. WOODCOCK INTERACTION WITH WIND FARMS

The only published study of Woodcock interactions with wind farms appears to be the study by Dorka et al. (2014). They reported a decrease in abundance from about 10 males/100 ha to about 1.2 males/100 ha after construction of a wind farm, which may have been due to the barrier effect of the turbines and acoustic effects interfering with display flights and mating. A review of this, and other information, recommended buffer distances of at least 500 m around the flight paths of roding birds to avoid impacts (LAG VSW, 2014).

The Dorka et al. study was criticised by Schmal (2015) on a number of grounds. In particular, she suggested that habitat changes (closure of the forest canopy) could have occurred at the same time as the wind farm construction, reducing the habitat suitability for Woodcock, while the presumed lack of Woodcock females in the vegetation free areas around the turbines may have affected the roding flights as these are presumed to be influenced by the presence of females. She also notes that one of the two post-impact years surveyed was during the wind farm construction period, so the low numbers of roding Woodcock could be due to construction disturbance rather than permanent displacement. These, and other criticisms, were vigorously rebutted by Straub et al. (2015). They dispute the evidence presented by Schmal (2015) indicating habitat changes concurrent with the wind farm development, note the small size of the vegetation-free areas around each turbine (2000 m^2; Dorka et al., 2015) and note that there was not any significant difference in the Woodcock numbers in the two post-impact year surveys.

Overall, I consider that the response by Straub et al. (2015) successfully rebuts the main criticisms made by Schmal (2015). However, there are some weaknesses in their study design. In particular, all their survey locations in the wind farm site were located immediately adjacent to the turbine locations. This means that the results of their study cannot be used to estimate the distance over which any displacement effect occurs. They report that, at one of the survey locations, which was in a clearfell area, the roding Woodcock in the post-impact surveys were all estimated to be at distances of over 300 m from the turbines, but this is an anecdotal observation.

The results of the Ballymartin / Bishopsmountain transect surveys are in broad agreement with the Dorka et al. study with an apparently large reduction in Woodcock roding activity within 250 m of the turbines. However, the Ballymartin / Bishopsmountain transect surveys do not provide any evidence to support a 500 m displacement effect as suggested by LAG VSW (2003). A 250 m buffer around the current turbine layout would include around 25% of the forestry habitat within the Castlebanny Wind Farm site (Figure 9). Based on the reductions in roding activity reported by Dorka et al. and derived from this study (see Table 2.1), this could cause an 18-23% decrease in the Woodcock population. The impact on Woodcock may be higher as the turbines are concentrated in the northern part of the wind farm site where higher levels of roding activity were recorded (Figure 9). However, as discussed above, the configuration of the forest edge in relation to the Ballymartin / Bishopsmountain transects may have been a confounding factor. Therefore, the Ballymartin / Bishopsmountain transects do not provide conclusive evidence about the impact of wind turbines on roding Woodcock. Conversely, it is theoretically possible that habitat factors could have obscured any potential displacement effect in the 250-500 m distance band. However, this seems unlikely given the relatively high numbers recorded in this distance band and the lack of variation in the forestry habitat.

There are also specific factors that may affect the applicability of Dorka et al.'s results to assessment of the Castlebanny Wind Farm. The forestry in their study area had a canopy height of 30-40 m, and roding Woodcock were regularly observed flying at a height of 60-100 m (Straub et al., 2015). The mature forestry in both the Castlebanny study area and along the Ballymartin / Bishopsmountain transects has a height of around 20 m and roding Woodcock were never observed flying higher than the 25-30 m height band. Therefore, as well as effectively eliminating the collision risk (for modern turbines), the potential for displacement of roding Woodcock by wind turbines may be reduced due to the vertical separation between the operational part of the wind turbine and the Woodcock flight paths.

5. CONCLUSIONS

The Woodcock surveys show that the local Woodcock distribution extends outside the Castlebanny Wind Farm site although the numbers recorded were lower than in the Castlebanny Wind Farm site. The Ballymartin / Bishopsmountain transects indicate that a displacement effect may occur within 250 m of wind turbines, although there are confounding factors that affect the interpretation of the results. The surveys did not find any evidence of a displacement effect extending over the 250-500 m distance band. The potential displacement within the 0-250 m distance band is in line with the results of the study by Dorka et al. (2014), although there are some issues with interpreting the results of that study. A 250 m buffer around the proposed turbines in the Castlebanny Wind Farm site would include around 25% of the forestry habitat within the site.

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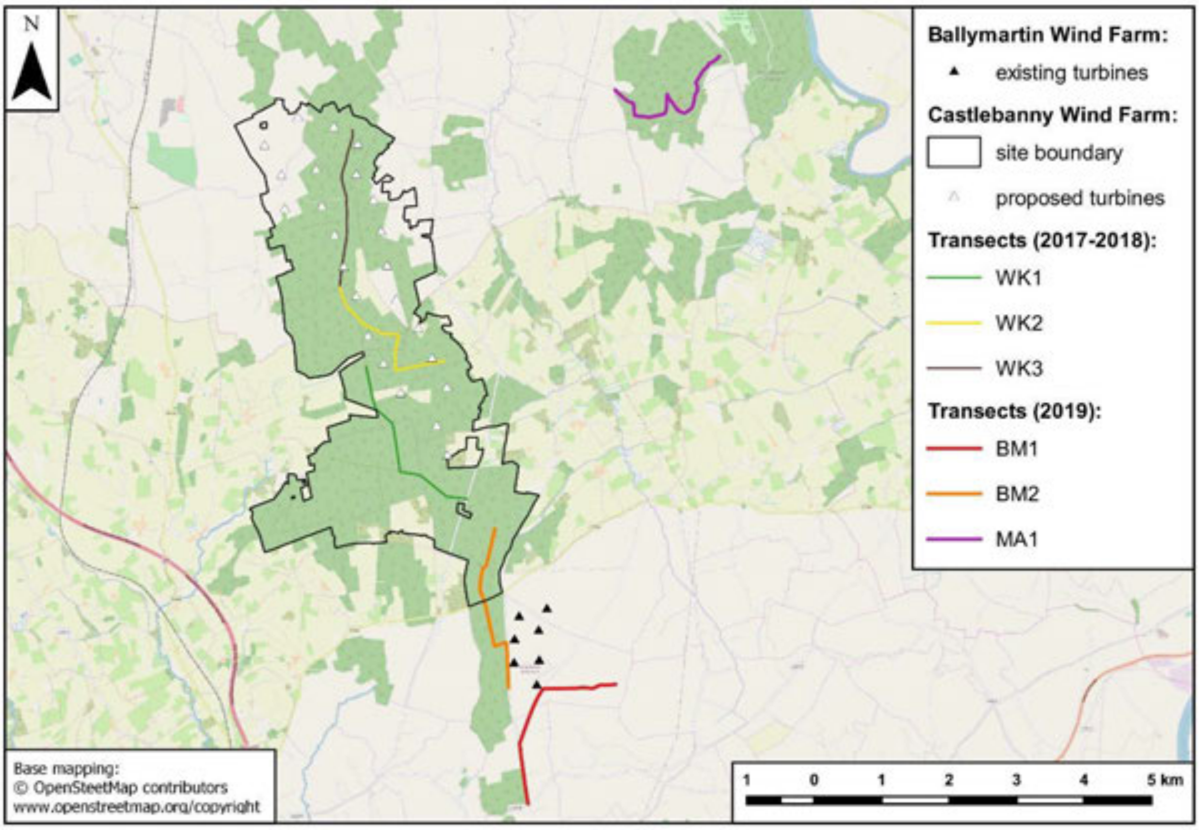

Figure 1. Location of the Woodcock transects surveys in 2019.

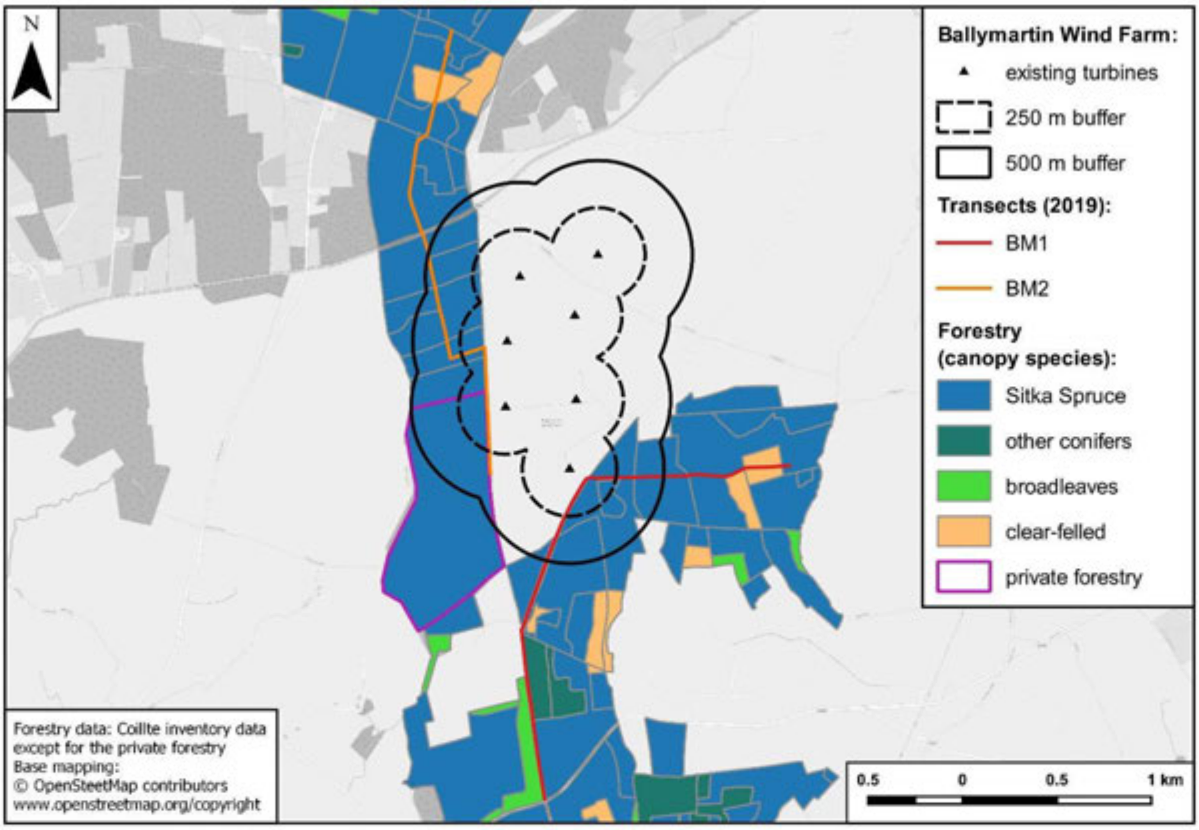

Figure 2. Forestry types along the Ballymartin / Bishopsmountain transects.

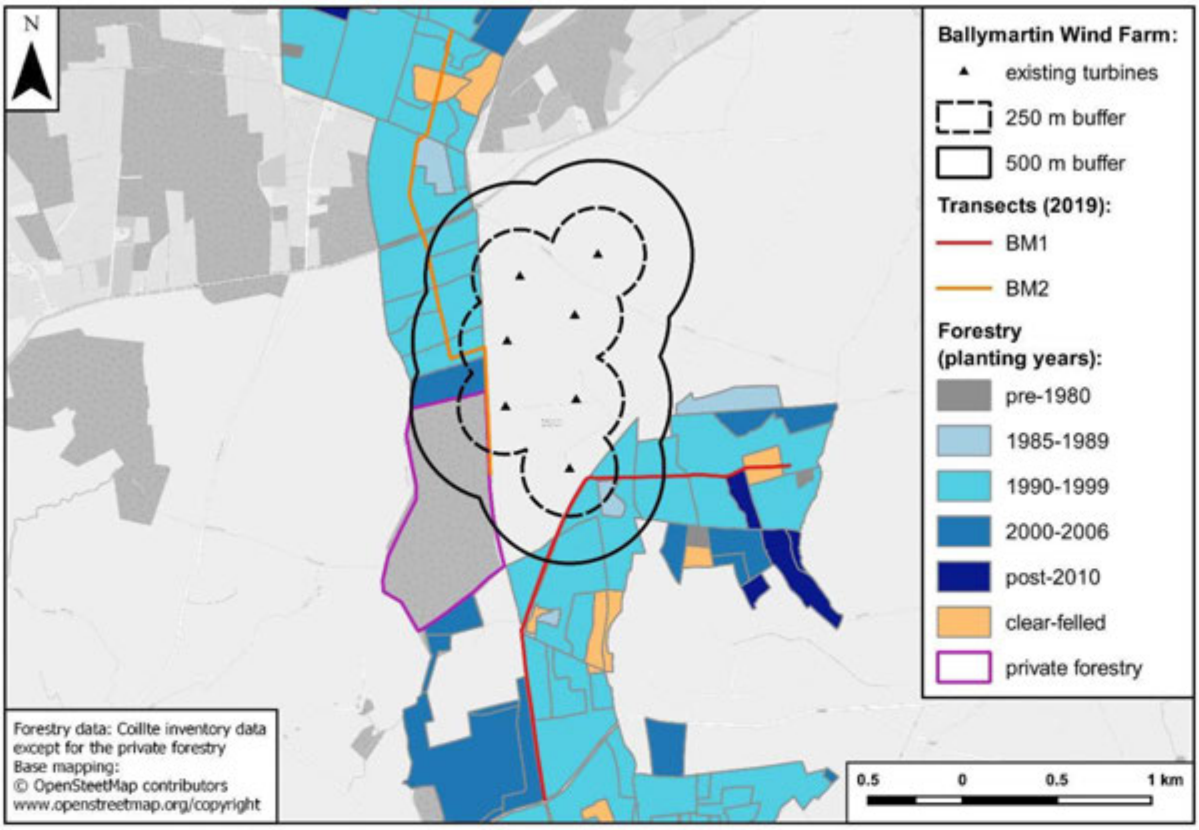

Figure 3. Forestry planting years along the Ballymartin / Bishopsmountain transects.

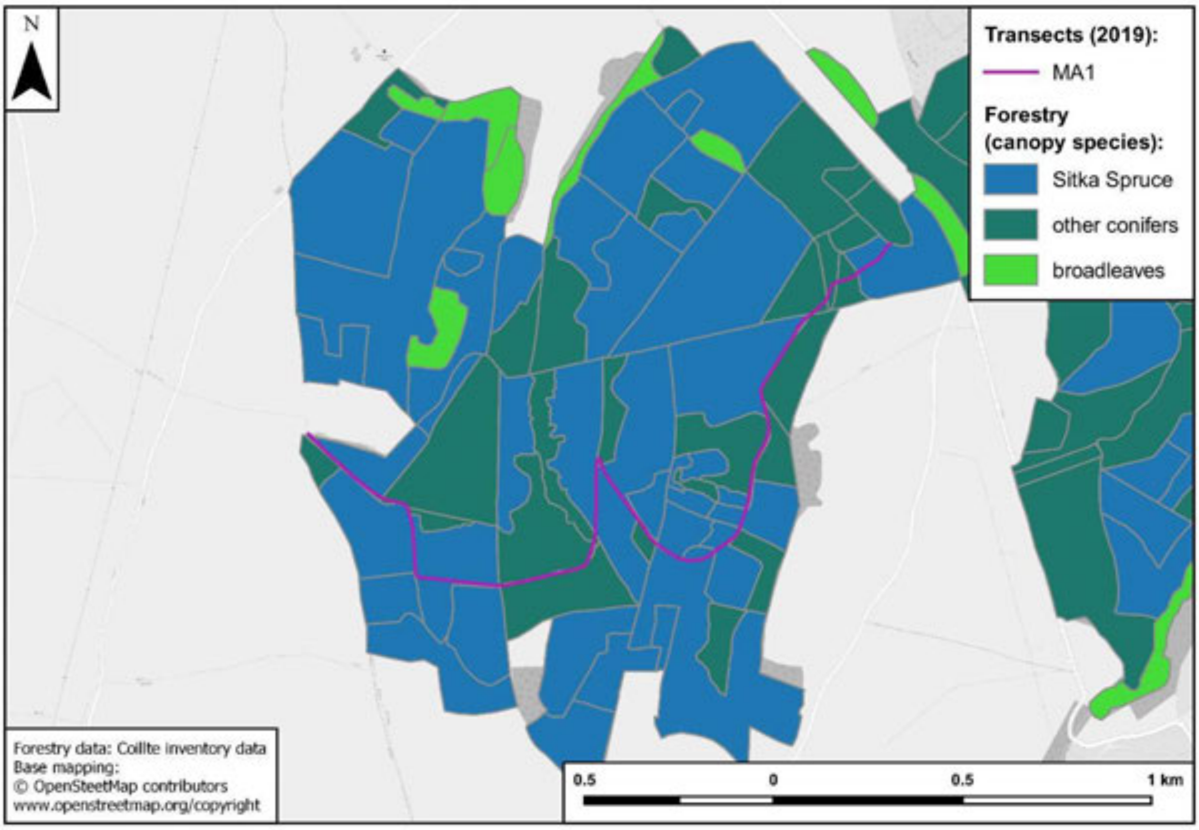

Figure 4. Forestry types along the Mount Alto transect.

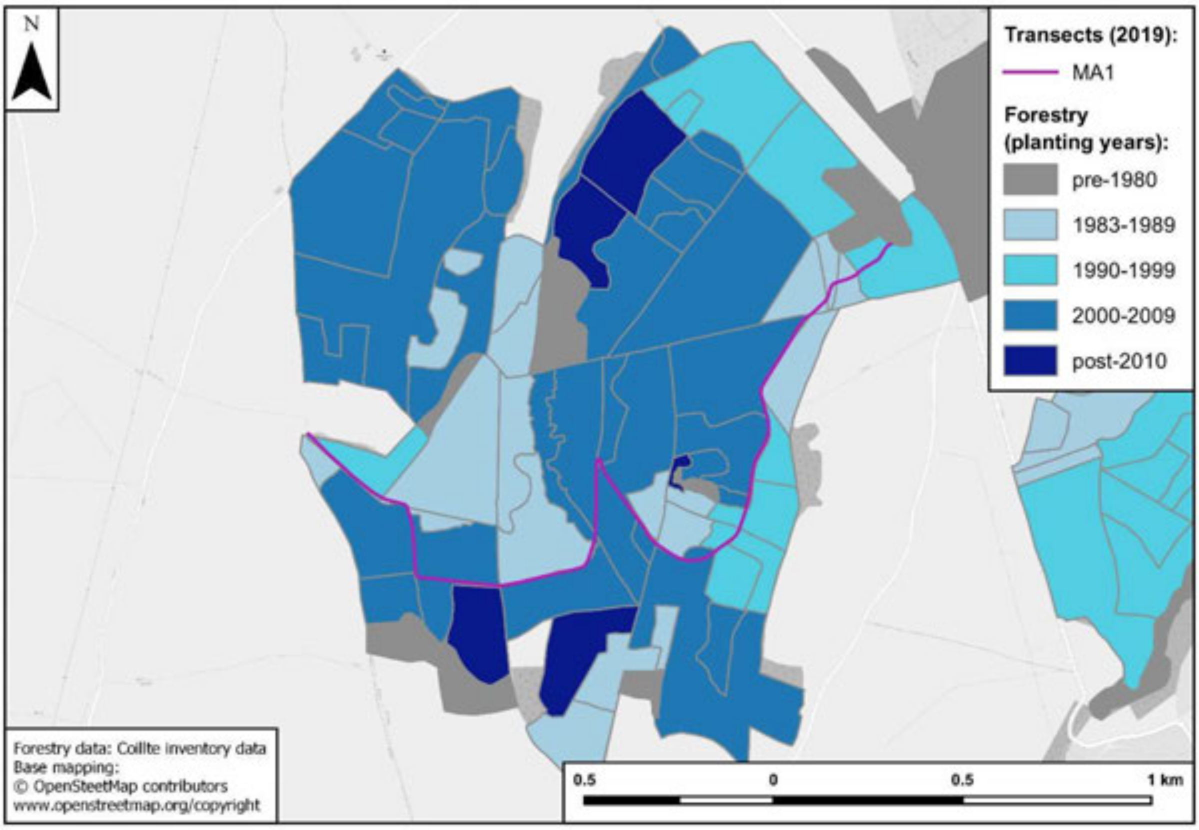

Figure 5. Forestry planting years along the Mount Alto transect.

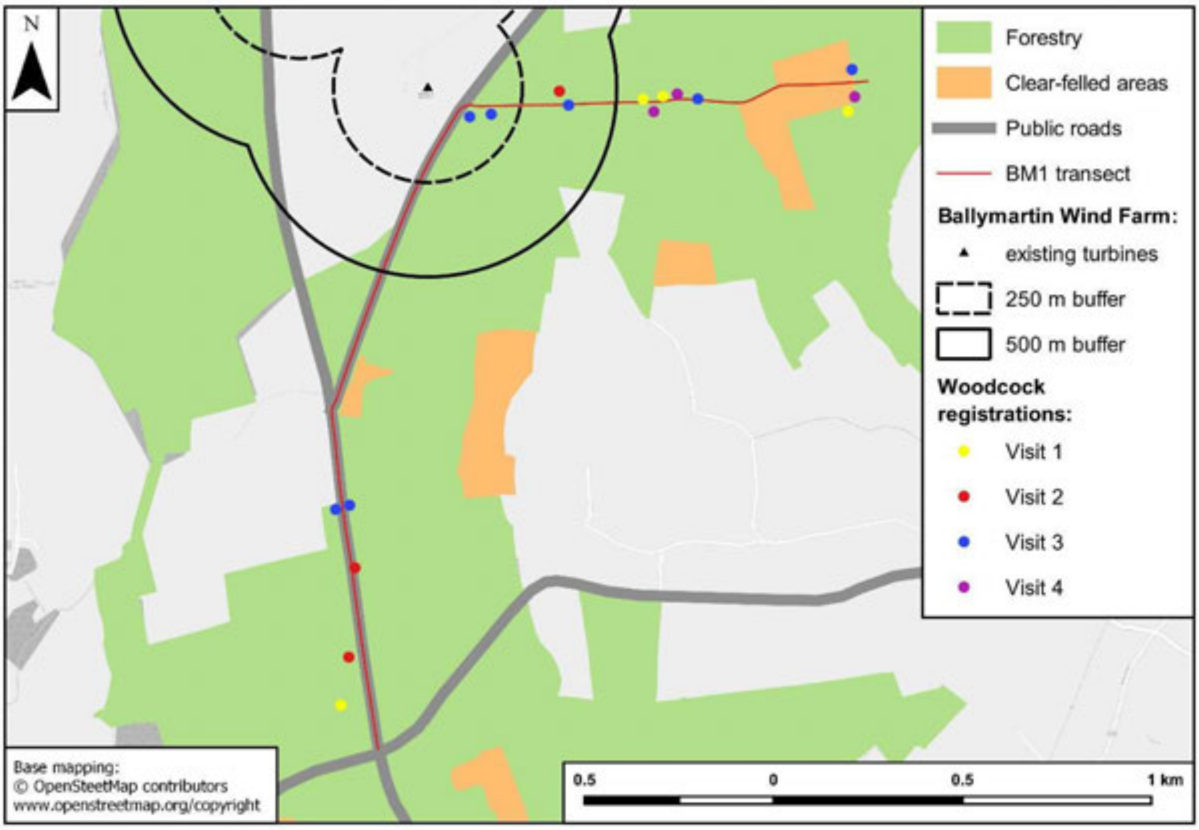

Figure 6. Woodcock registrations along transect BM1.

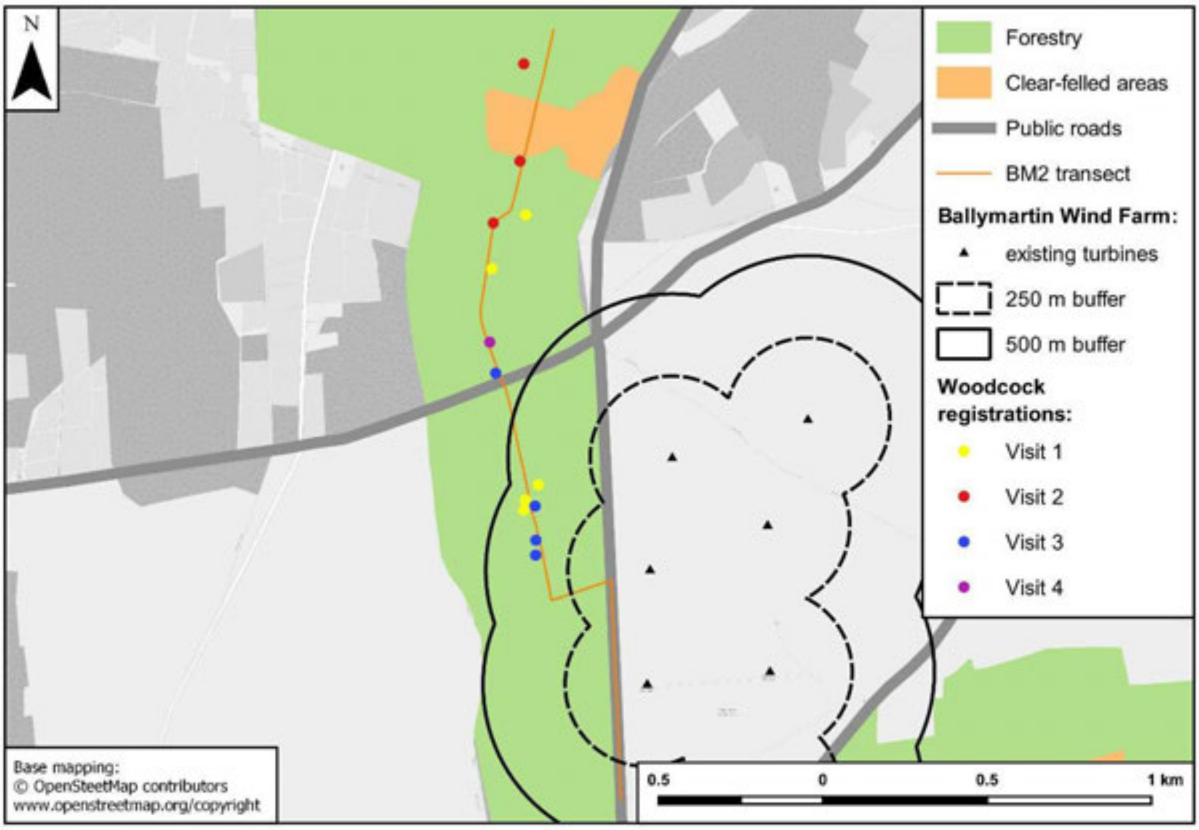

Figure 7. Woodcock registrations along transect BM2.

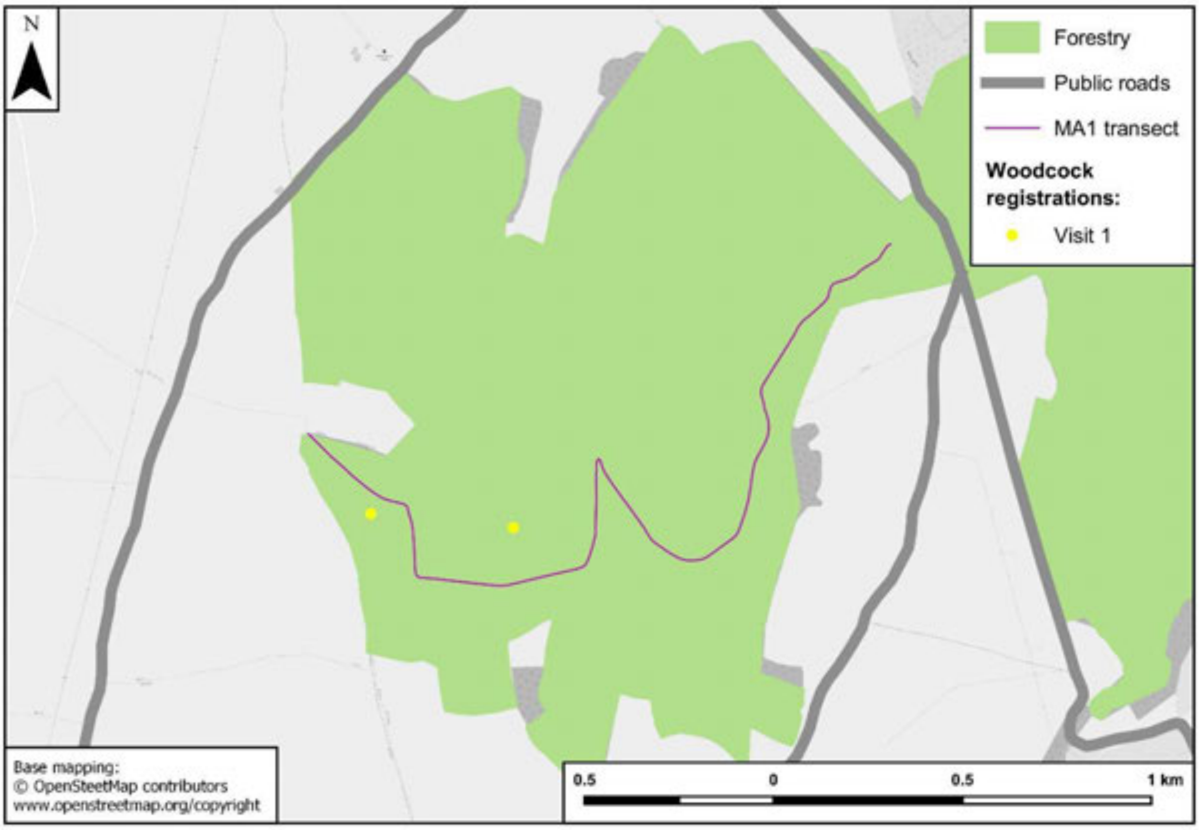

Figure 8. Woodcock registrations along transect MA1.

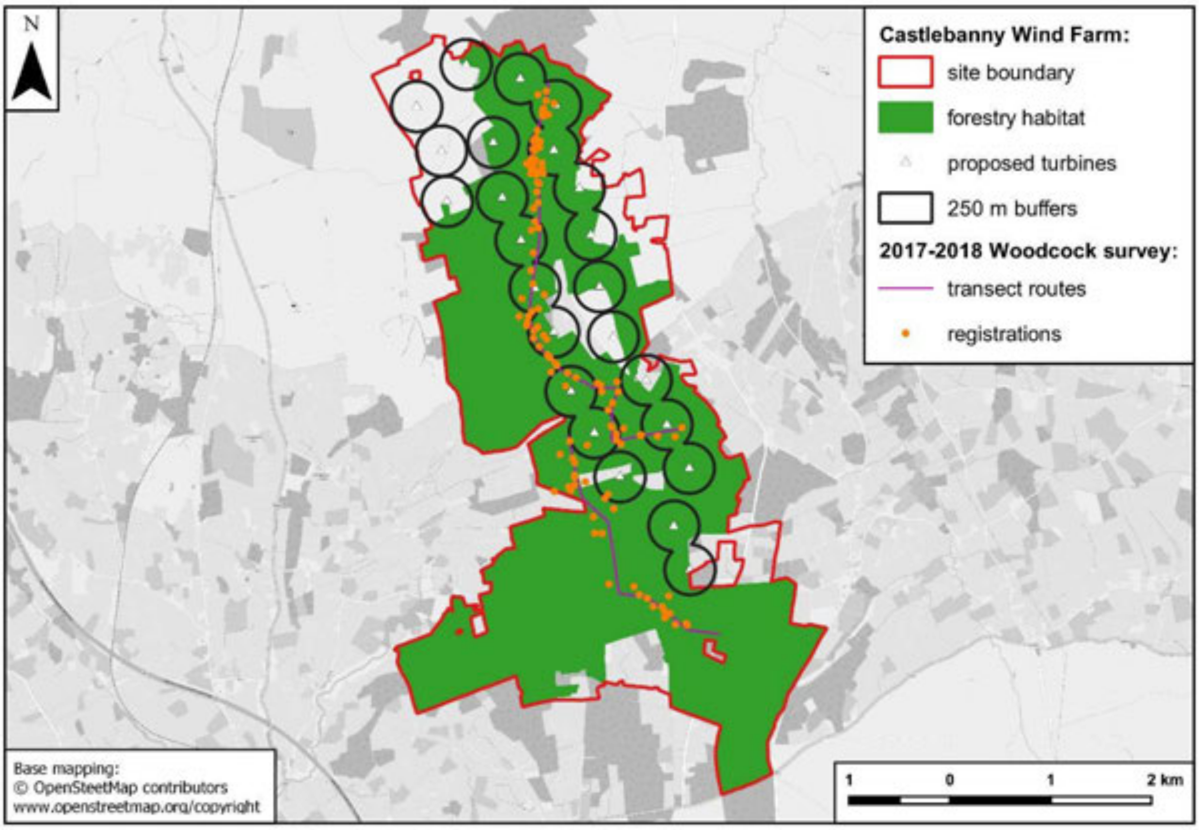

Figure 9. Forestry habitat within the Castlebanny Wind Farm site.

Plate 1. View across the forestry along the BM2 transect to the Ballymartin Wind Farm.