



Impacts of Raised Bog Restoration on Bird Populations

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Presentation of Results

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1. INTRODUCTION

Although present at low densities, bog habitats contain some of the most threatened bird species in Ireland, such as Red Grouse, Golden Plover, Curlew and Ring Ouzel (BirdWatch Ireland, 2010; BirdWatch Ireland, 2011). Even species regularly encountered in these habitats, such as Teal, Snipe and Skylark are all Birds of Conservation Concern in Ireland (BoCCI; Colhoun & Cummins, 2007). The likely reason that many species associated with bog habitats in Ireland are threatened is due to changes in land use, such as peat extraction, agricultural intensification (including drainage and over-grazing) and tree planting. Many bird species that are closely associated with peatlands favour open landscapes, with few trees. Restoration of peatland habitats, particularly the removal of trees, has been shown to benefit many of these species, allowing them to re-colonise parts of their former range (Stroud *et al.*, 1987).

Coillte approached BirdWatch Ireland to undertake baseline bird survey work in 2012 on four raised bog sites where restoration work is currently being undertaken through the EU LIFE09/222 Project “*Demonstrating Best Practice in Raised Bog Restoration in Ireland*”. The four sites identified are scattered across the Midlands:

- Girley Bog, Co. Meath (32ha)
- Lough Forbes Complex, Co. Longford (16ha)
- Scohaboy Bog, Co. Tipperary (71ha)
- Ballygar Bog, Co. Galway (29ha)

In 2015, these four sites were re-surveyed, using identical methods, to evaluate the impacts of EU-LIFE Project actions on bird species using the habitats occurring within the project areas.

2. METHODS

2.1 Transect selection and habitat recording

A continuous transect, divided into several sections, was identified and established at each site. Each transect section was selected as far as possible so that it passed through a single habitat type, allowing bird records to be allocated to the habitats present. The habitat types on the study sites were often mosaics related to previous management (planting, clearfell, etc.), and the transect sections were selected to best represent the habitats available at each site. An initial transect route was identified using aerial photographs of each site, but due to the ongoing management associated with the restoration work, these were often inaccurate in relation to the habitats present. Therefore the final transect route, and location of different sections, were determined during visits to the actual site itself. In some cases waypoints were added into otherwise homogenous habitat to allow the transect to be more easily identified on future visits (e.g. at a road junction). Waypoint locations were recorded using a *Garmin etrex* handheld GPS unit. The lengths of each section (i.e. the distance between waypoints bounding each transect section) were similarly recorded using handheld GPS.

2.2 Bird recording

All birds seen or heard within 25m (on each side) of the transect line were recorded. This limited recording distance reflected the difficulty in detection of birds in densely-wooded habitats that existed on many of the sites, enabling bird densities to be compared between both open areas (where birds could easily be detected several hundred metres away) and densely-vegetated habitats. However, to ensure that any important species occurring at the sites were not completely excluded from being recorded, a full list of all bird species present on each site was recorded separately during fieldwork visits.

Bird surveys were undertaken using binoculars (8.5 times magnification), and conducted when weather conditions were considered suitable (i.e. surveys were not undertaken when it was raining, when the wind exceeded Beaufort Force 4, or if visibility was poor). Evidence of breeding behaviour for each species on each transect section was also recorded, following the methods and conventions used for the Bird Atlas 2007-2011 (BTO, 2009).

2.3 Habitat Recording

The habitats for each transect section was recorded during the field survey. On subsequent analysis, these were grouped into five habitat types. For one transect section, the habitat type changed from visit one to visit two (at Scohaboy Bog, where some felling took place). As a result, this transect section has been excluded from any habitat analysis, although the data were included for the analysis of bird occurrences.

For habitat analysis, five habitat types were selected representing the main habitat types present on the survey sites (note that not all habitat types were present on each site) that seem likely to have an impact on bird occurrence. A description of these habitat types is provided below:

2.3.1 Wood

All transects where trees (or tall, woody shrubs) dominated the habitat were considered to be woodland, with the exception of those covered by the *Conifer* description below. These habitats included a variety of willow-birch woodlands, typically at the edge of bog sites, and mixed broadleaf-conifer woodland. Areas with very young trees (typically naturally regenerating birch, pine or willow) were included within the *Dense Clearfell* category, unless the tree growth dominated the transect route (which did not occur on any of transects surveyed).

2.2.2 Conifer

Commercially-planted stands of pure conifers were allocated to this habitat class. A tolerance of up to 10% of broadleaves present within the stand (such as self-seeded birch or willow) was permitted within the category, but areas where broadleaf species had become more widely established were allocated to the Wood habitat category.

2.3.3 Dense Clearfell

Areas of clearfell where the ground vegetation cover was good (usually heather or moss on bog areas) and there was either some natural regeneration of trees (usually conifers or self-seeded birch or willow, but also including *Rhododendron* in Girley Bog), or where brambles or other shrub/scrub species were present.

2.3.4 Open Clearfell

Recently cut woodland where there was little or no ground vegetation and no regeneration of trees or other woody plant species (such as brambles or other shrubs)

2.3.5 Bog

Areas of open raised bog were included in this category. The quality of the bog habitat (active or degraded) was not differentiated

3. RESULTS

The results presented here outline the bird and habitat data collected over the two years of the project. Sections 3.1 and 3.2 look at the broad bird and habitat data respectively, with Section 3.3 seeking to present combined aspects of the bird-habitat data together.

3.1 Bird Data

Two aspects of the bird data are presented: an overview of all bird species recorded from each site, followed by a look at the bird data recorded from the transect sections. The bird-transect data is considered as individual species occurrence and through an assessment of the bird community structure at each site

3.1.1 Overall site bird communities

Table 3.1 shows the complete species lists for each site according to year of survey. Girley Bog had the highest number of individual species present (35) over both survey periods, followed by Lough Forbes with 33 species. Scohaboy Bog and Ballyugar Bog both had 32 species recorded over the two years.

Meadow Pipit were recorded at all sites in each year. Curlew and Redshank were the only other BoCCI Red-listed species recorded, with both present at Scohaboy Bog (the former in both years of the survey). The only other breeding wader species observed were Snipe, which were recorded at all four sites in either 2012 or 2015, with this species present in both years, again at Scohaboy Bog. A total of 15 Amber-listed species were recorded at the various sites, with Kestrel at Scohaboy and Ballygar Bogs and Skylark at Lough Forbes and Scohaboy and Ballygar Bogs. In addition to the Kestrel records, a further two raptor species were recorded – Sparrowhawks at Girley Bog and Lough Forbes, and Buzzards (also at Girley Bog).

Table 3.1: Complete species list (showing presence) for each site (all habitats and areas)

Species	Girley Bog		Lough Forbes		Schoaboy Bog		Ballygar Bog	
	2012	2015	2012	2015	2012	2015	2012	2015
Teal						X		
Mallard		X				X		
Pheasant		X		X		X	X	X
Sparrowhawk		X	X					
Kestrel					X			X
Buzzard	X							
Snipe		X	X		X	X		X
Curlew					X	X		
Redshank						X		
Woodpigeon	X	X	X	X	X	X	X	X
Cuckoo		X	X	X		X		
Magpie			X				X	
Jay			X		X			X
Rook		X					X	
Hooded Crow	X	X	X		X	X		X
Raven	X	X	X					X
Goldcrest	X		X		X		X	X
Blue Tit	X	X	X	X			X	X
Great Tit		X	X	X	X			
Coal Tit	X	X	X		X		X	X
Skylark			X		X	X	X	X
Sand Martin	X	X				X		
Swallow	X		X	X	X	X	X	X
Long-tailed Tit	X		X	X			X	X
Wood Warbler							X	
Chiffchaff	X	X	X	X			X	X
Willow Warbler	X	X	X	X	X	X	X	X
Blackcap	X	X	X	X			X	X
Whitethroat	X	X	X	X	X		X	X
Treecreeper							X	
Wren	X	X	X	X	X	X	X	X
Starling				X				
Blackbird	X	X	X	X	X	X	X	X
Song Thrush	X	X	X	X	X	X	X	X
Mistle Thrush	X	X					X	X
Robin	X	X	X	X	X	X	X	X
Stonechat		X		X		X		X
Dunnock	X	X	X	X	X	X	X	X
Pied Wagtail		X						
Meadow Pipit	X	X	X	X	X	X	X	X
Chaffinch	X	X	X	X	X	X	X	X
Greenfinch					X	X		
Goldfinch	X							
Linnet		X			X	X		
Siskin			X					
Lesser Redpoll	X	X	X	X	X	X	X	X
Crossbill			X		X			
Reed Bunting		X	X	X	X	X		X
Total Species	24	30	30	22	25	25	25	28

NOTE: Colour denotes status (Red, Amber or Green) on the Birds of Conservation Concern in Ireland (BoCCI) lists (Colhoun & Cummins, 2013)

3.1.2 Bird transect data

Table 3.2 shows the numbers of individual birds of each species recorded from the transects at each site. Collectively, the four sites had a total of 37 species recorded across the two survey periods, with a total of 247 birds from 27 species were recorded on these transects in 2012, and 295 birds from 29 species when the transects were re-surveyed in 2015. Between the two survey years, Ballygar Bog held the highest number of species (24). Lough Forbes had 23 species, Scohaboy Bog had 21 species and Girley Bog had 20 species.

Meadow Pipit was the commonest species recorded, present at all sites in both survey years. The records of Curlew during the nesting season at Scohaboy Bog are particularly noteworthy, particularly as two pairs were likely to be present in 2015. Ten Amber-listed species were recorded, including a pair of Teal (at Scohaboy Bog), Snipe (at Girley, Scohaboy and Ballygar Bogs), Skylark (at Lough Forbes and Scohaboy and Ballygar Bogs) and Wood Warbler (at Ballygar Bog). Only a single raptor was recorded on transects – a Sparrowhawk at Lough Forbes in 2012.

Table 3.2: Number of individuals for each species recorded at each site from transects

Species	Girley Bog		Lough Forbes		Schoaboy Bog		Ballygar Bog		All Sites	
	2012	2015	2012	2015	2012	2015	2012	2015	2012	2015
Teal						2				2
Mallard						2				2
Pheasant								1		1
Sparrowhawk			1						1	
Snipe		1			1			1	1	2
Curlew					1	3			1	3
Woodpigeon	1	1	1		3		3		8	1
Cuckoo		1								1
Jay								2		2
Hooded Crow	1								1	
Goldcrest	1		6		4		2		13	
Blue Tit			1						1	
Great Tit			9	1					9	1
Coal Tit			29		3		5	2	37	2
Skylark			1		11	9	1	2	13	11
Long-tailed Tit	2		2	2				1	4	3
Wood Warbler							1		1	
Chiffchaff			1	1			2	1	3	2
Willow Warbler	1	4	5	5	1		9	9	16	18
Blackcap	1	2	1	2				1	2	5
Whitethroat		1	1					1	1	2
Treecreeper							2		2	
Wren	16	19	7	13	7	7	4	19	34	58
Blackbird	6	4	2	2		1	1	1	9	8
Song Thrush		1		3	1	1	1	1	2	6
Mistle Thrush								1		1
Robin	4	5	5	5	4	1	5	6	18	17
Stonechat				2		1		4		7
Dunnock	1	4	1	2	2	3			4	9
Pied Wagtail		1				1				2
Meadow Pipit	4	23	5	5	29	45	2	14	40	87
Chaffinch	6	3	3	1	1		5	2	15	6
Siskin			1						1	
Linnet		6								6
Lesser Redpoll		8	6			3	3	6	9	17
Crossbill					1				1	
Reed Bunting		4		1		4		4		13
Total Species	12	17	20	14	14	14	15	20	27	29
Total Birds	44	88	88	45	69	83	46	79	247	295

NOTE: Colour denotes status (Red, Amber or Green) on the Birds of Conservation Concern in Ireland (BoCCI) lists (Colhoun & Cummins, 2013)

Table 3.3 shows the densities of birds recorded for each site in the two survey years. These data are expressed as birds per 200m. Since birds were recorded up to 25m from the transect route, these data should approximate to birds per hectare. However, due to differences in detection rates (it is easier to see and hear (and therefore record) birds in open habitats such as clearfell and bog than in closed habitats such as woodland), birds/200m is used.

Table 3.3: Densities (expressed as birds/200m of transect) for each species recorded at each site from transects (total transect length for each site also shown)

Site	Girley Bog		Lough Forbes		Schoaboy Bog		Ballygar Bog		All Sites	
Transect (m)	1672m		1771m		2197m		2253m		7893m	
Species	2012	2015	2012	2015	2012	2015	2012	2015	2012	2015
Teal						0.18				0.05
Mallard						0.18				0.05
Pheasant								0.09		0.03
Sparrowhawk			0.11						0.03	
Snipe		0.12			0.09			0.09	0.03	0.05
Curlew					0.09	0.27			0.03	0.08
Woodpigeon	0.12	0.12	0.11		0.27		0.27		0.20	0.03
Cuckoo		0.12								0.03
Jay								0.18		0.05
Hooded Crow	0.12								0.03	
Goldcrest	0.12		0.68		0.36		0.18		0.33	
Blue Tit			0.11						0.03	
Great Tit			1.02	0.11					0.23	0.03
Coal Tit			3.27		0.27		0.44	0.18	0.94	0.05
Skylark			0.11		1.00	0.82	0.09	0.18	0.33	0.28
Long-tailed Tit	0.24		0.23	0.23				0.09	0.10	0.08
Wood Warbler							0.09		0.03	
Chiffchaff			0.11	0.11			0.18	0.09	0.08	0.05
Willow Warbler	0.12	0.48	0.56	0.56	0.09		0.80	0.80	0.41	0.46
Blackcap	0.12	0.24	0.11	0.23				0.09	0.05	0.13
Whitethroat		0.12	0.11					0.09	0.03	0.05
Treecreeper							0.18		0.05	
Wren	1.91	2.27	0.79	1.47	0.64	0.64	0.36	1.69	0.86	1.47
Blackbird	0.72	0.48	0.23	0.23		0.09	0.09	0.09	0.23	0.20
Song Thrush		0.12		0.34	0.09	0.09	0.09	0.09	0.05	0.15
Mistle Thrush								0.09		0.03
Robin	0.48	0.60	0.56	0.56	0.36	0.09	0.44	0.53	0.46	0.43
Stonechat				0.23		0.09		0.36		0.18
Duncock	0.12	0.48	0.11	0.23	0.18	0.27			0.10	0.23
Pied Wagtail		0.12				0.09				0.05
Meadow Pipit	0.48	2.75	0.56	0.56	2.64	4.10	0.18	1.24	1.01	2.20
Chaffinch	0.72	0.36	0.34	0.11	0.09		0.44	0.18	0.38	0.15
Siskin			0.11						0.03	
Linnet		0.72								0.15
Lesser Redpoll		0.96	0.68			0.27	0.27	0.53	0.23	0.43
Crossbill					0.09				0.03	
Reed Bunting		0.48		0.11		0.36		0.36		0.33
All Species	5.26	10.53	9.94	5.08	6.28	7.56	4.08	7.01	6.26	7.47

NOTE: Colour denotes status (Red, Amber or Green) on the Birds of Conservation Concern in Ireland (BoCCI) lists (Colhoun & Cummins, 2013)

3.1.3 Bird Community Structure

Table 3.4 shows the structure of the bird communities at each of the four study sites, from the transect data. The numbers for each species at each site are simply the proportion (expressed as a percentage) that that species contributed to the overall number of birds present at the site. For example, at Girley Bog in 2012, the 16 Wrens recorded (see Table 3.3) represent 36.4% of the 44 birds recorded at this site in that year.

Table 3.4 Bird Community structure at each study site

Species	Girley Bog		Lough Forbes		Schoaboy Bog		Ballygar Bog		All Sites	
	2012	2015	2012	2015	2012	2015	2012	2015	2012	2015
Teal						2.4				0.7
Mallard						2.4				0.7
Pheasant								1.3		0.3
Sparrowhawk			1.1						0.4	
Snipe		1.1			1.4			1.3	0.4	0.7
Curlew					1.4	3.6			0.4	1.0
Woodpigeon	2.3	1.1	1.1		4.3		6.5		3.2	0.3
Cuckoo		1.1								0.7
Jay								2.5		0.7
Hooded Crow	2.3								0.4	
Goldcrest	2.3		6.8		5.8		4.3		5.3	
Blue Tit			1.1						0.4	
Great Tit			10.2	2.2					3.6	0.3
Coal Tit			33.0		4.3		10.9	2.5	15.0	0.7
Skylark			1.1		15.9	10.8	2.2	2.5	5.3	3.7
Long-tailed Tit	4.5		2.3	4.4				1.3	1.6	1.0
Wood Warbler							2.2		0.4	
Chiffchaff			1.1	2.2			4.3	1.3	1.2	0.7
Willow Warbler	2.3	4.5	5.7	11.1	1.4		19.6	11.4	6.5	6.1
Blackcap	2.3	2.3	1.1	4.4				1.3	0.8	1.7
Whitethroat		1.1	1.1					1.3	0.4	0.7
Treecreeper							4.3		0.8	
Wren	36.4	21.6	8.0	28.9	10.1	8.4	8.7	24.1	13.8	19.7
Blackbird	13.6	4.5	2.3	4.4		1.2	2.2	1.3	3.6	2.7
Song Thrush		1.1		6.7	1.4	1.2	2.2	1.3	0.8	2.0
Mistle Thrush								1.3		0.3
Robin	9.1	5.7	5.7	11.1	5.8	1.2	10.9	7.6	7.3	5.8
Stonechat				4.4		1.2		5.1		2.4
Duncock	2.3	4.5	1.1	4.4	2.9	3.6			1.6	3.1
Pied Wagtail		1.1				1.2				0.7
Meadow Pipit	9.1	26.1	5.7	11.1	42.0	54.2	4.3	17.7	16.2	29.5
Chaffinch	13.6	3.4	3.4	2.2	1.4		10.9	2.5	6.1	2.0
Siskin			1.1						0.4	
Linnet		6.8								2.0
Lesser Redpoll		9.1	6.8			3.6	3	7.6	3.6	5.8
Crossbill					1.4				0.4	
Reed Bunting		4.5		2.2		4.8		5.1		4.4
Total Species	12	17	20	14	14	14	15	20	27	29
Total Birds	44	88	88	45	69	83	46	79	247	295

NOTE: Colour denotes status (Red, Amber or Green) on the Birds of Conservation Concern in Ireland (BoCCI) lists (Colhoun & Cummins, 2013)

3.2 Habitat Data

Two facets of habitat data are presented here: an overview from all sites (Section 3.2.1) and a more detailed look at the habitats present on each site individually (Section 3.2.2). In both cases, data from 2012 and 2015 are presented together.

3.2.1 Overall Habitats Characteristics

Table 3.5 shows the overall habitat data (represented as metres of transect section) from each study site. Note that the Total (Habitat) column refers to the total for each habitat type summed across all four sites; the Total (Site) column sums the total transect length recorded at each site. As noted in section 2.3, one transect section at Scohaboy Bog was excluded from the habitat data analysis as it changed from conifer plantation to open clearfell during the 2012 survey period. A full description of the characteristics of each habitat type is included in Section 2.3.

Table 3.5 Transect lengths (m) for the five habitat groups on all study sites

	Girley Bog		Lough Forbes		Scohaboy Bog		Ballygar Bog		Total (Habitat)	
	2012	2015	2012	2015	2012	2015	2012	2015	2012	2015
Wood			360	241			268	268	628	509
Conifer			1,176				672		1,848	0
Dense Clearfell	821	821		119			519	1,223	1,340	2,163
Open Clearfell	851	851		1,176	619	432	486	454	1,956	2,913
Bog			235	235	1,367	1,554	308	308	1,910	2,097
Total (site)	1,672		1,771		1,986		2,253		7,682	

Figure 3.1 shows the proportion of each habitat type at all sites, derived from the data in Table 3.5. In 2012, approximately one-quarter of all transect routes passed through conifer plantation (25.1%), open clearfell (25.5%) and bog (24.9%), with 17.4% of the transect route surveying dense clearfell and 8.2% passing through woodland. In 2015, all conifer habitats had gone and the level of woodland habitat dropped slightly to 6.6%. The length of transect surveying bog had increased slightly to 27.3%, and had increased substantially for both dense clearfell (now 28.2%) and open clearfell (up to 37.9%).

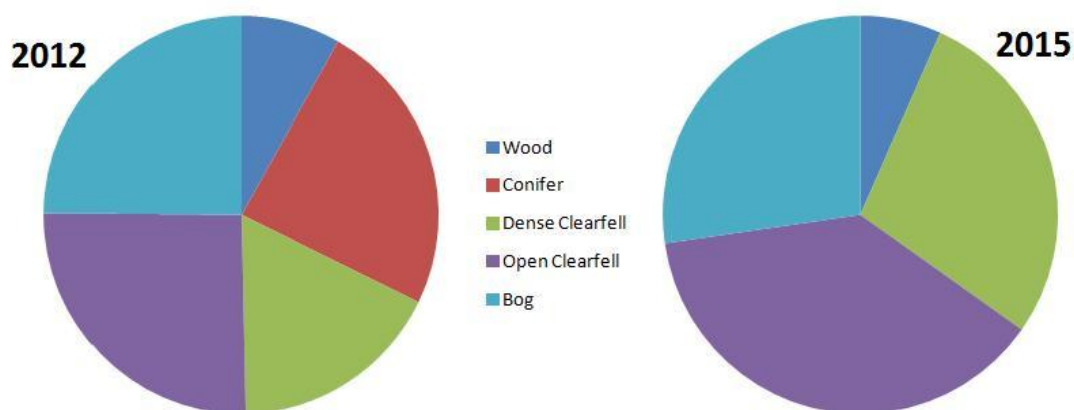


Figure 3.1 Habitat composition (%) of transect routes at all survey sites in 2012 and 2015

The main thing to note from these data is the absence of conifer habitats in 2015, following their removal, which have largely been replaced by the clearfell habitats.

3.2.1 Individual site habitat characteristics

Figure 3.2 – 3.5 show the proportion (expressed as a percentage) of the differing habitat types covered by the survey transects at the four survey sites. The percentages displayed in these figures are derived from the data in Table 3.5.

Figure 3.2. shows the habitats present on the transect survey route at Girley Bog. This site had been completely felled prior to fieldwork in 2012, and no differences to the broad habitat categories were noted in 2015. Typically, the dense clearfell areas were where broadleaf trees (*Rhododendron* and Birch) had been removed with the open

clearfell areas where conifers had been removed. Some recolonisation of the open clearfell was underway, with Cotton Grass (*Eriophorum*) and Rush (*Juncus sp.*) present, but large areas were still absent from re-vegetation.

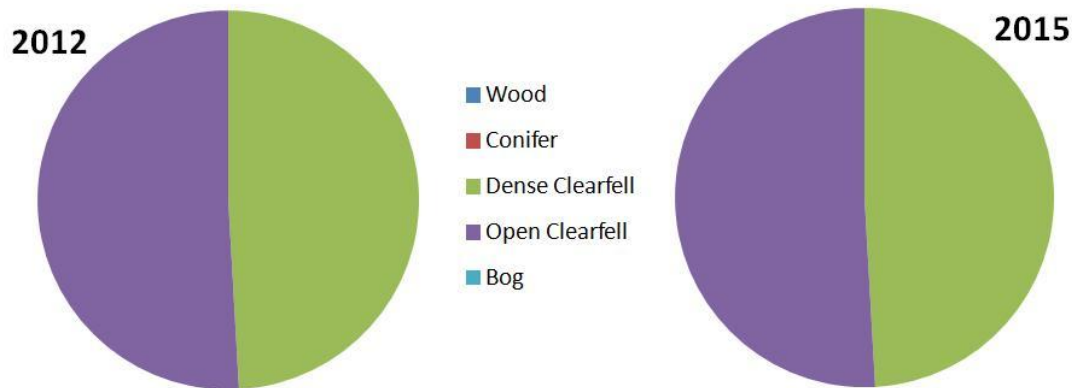


Figure 3.2 Habitat composition (%) of transect routes at Girley Bog in 2012 and 2015

The habitat categories recorded on transects at Lough Forbes in 2012 and 2015 is shown in Figure 3.3. The major difference between the two survey periods is that all the transect sections that contained conifers (coloured red on the left-hand chart) in 2012 were now classed as open clearfell (colored purple on the right-hand chart) - areas with little or no ground vegetation yet established. One section that had been classed as woodland in 2012 had been felled to leave an area of clearfell with dense ground vegetation. Other woodland transect sections had seen some trees felled to some extent, but the habitat structure at these sites remained dominated by woody vegetation and continues to be classed as woodland according to the methodology described here. The area of bog remained the same between 2012 and 2015.

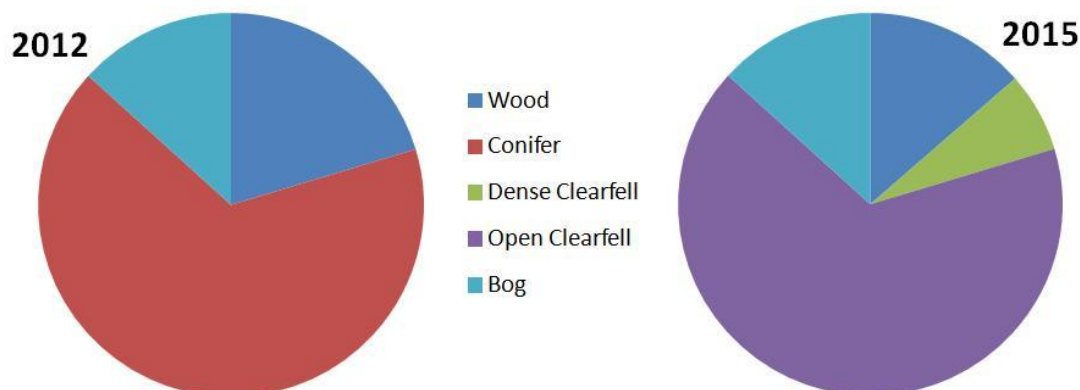


Figure 3.3 Habitat composition (%) of transect routes at Lough Forbes in 2012 and 2015

Figure 3.4 shows the habitat classes on the survey transect at Scohaboy Bog. Note that one transect section was removed in 2012 due to the habitat changing between the early and late survey visits in that year. This section was therefore also excluded in 2015 to allow easier comparison between the two years to be made. The only difference between 2012 and 2015 is that one transect section classed as open clearfell in 2012, was classed as bog in 2015. This section had seen substantial re-colonisation of apparently typical bog vegetation communities (mostly *Sphagnum*, *Eriophorum* and Rush *Juncus sp.* species), and the water level had risen substantially.

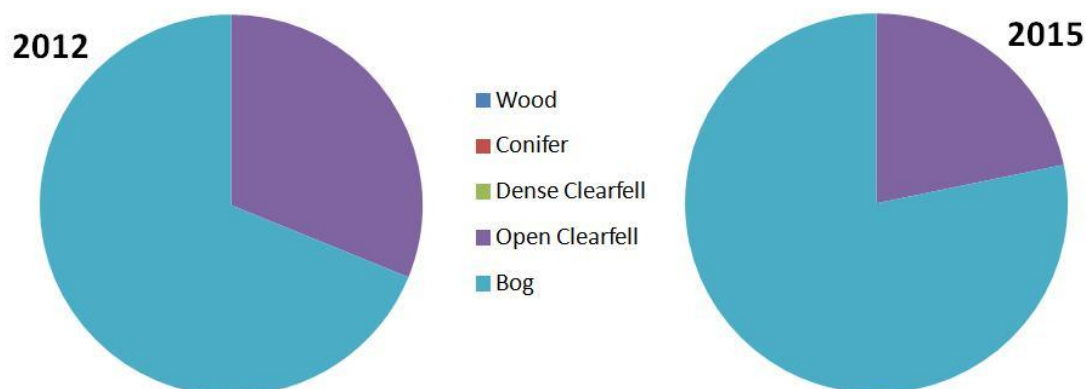


Figure 3.4 Habitat composition (%) of transect routes at Scohaboy Bog in 2012 and 2015

The habitats recorded along the transect survey route at Ballygar Bog are shown in Figure 2.5. The transect sections recorded as bog and woodland remained the same between the two survey visits. In 2015, all the conifer habitats had been removed, and were largely replaced by open clearfell, although one section was classed as dense clearfell due to the presence of substantial ground vegetation in the form of Brambles *Rubus fruticosus* and Bracken *Pteridium* sp. In addition, some transect sections recorded as open clearfell in 2012, were classed as dense clearfell in 2015.

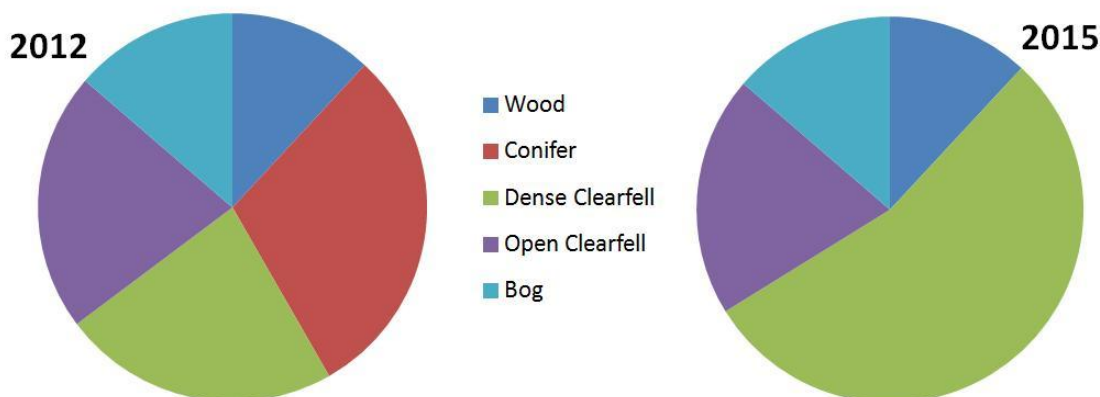


Figure 3.5 Habitat composition (%) of transect routes at Ballygar Bog in 2012 and 2015

The changes in the proportions (expressed as a percentage of the total habitat recorded in 2012) of habitats occurring at each site and for all sites combined for the five habitat classes between 2012 and 2015 are summarised in Figure 3.6. For example, at Lough Forbes, the proportion of the transect passing through conifer plantations in 2012 was 66.4%, but 0% in 2015 (hence a decline of 66.4%). Similarly, the proportion of transects passing through dense clearfell increased from 13.6% in 2012 to 20.3% in 2015 (an increase of 6.7%).

As noted above, there were no changes in habitat composition at Girley Bog, and little change at Scohaboy Bog. More notable, are the loss of conifer from the survey areas where they occurred in 2012 (at Lough Forbes and Ballygar Bog), to be replaced with clearfell (largely open clearfell at Lough Forbes and through a slightly more complex succession at Ballygar Bog with most of the conifer transects moving into the open clearfell category, with some of the open clearfell recorded in 2012 becoming classed as dense clearfell in 2015).

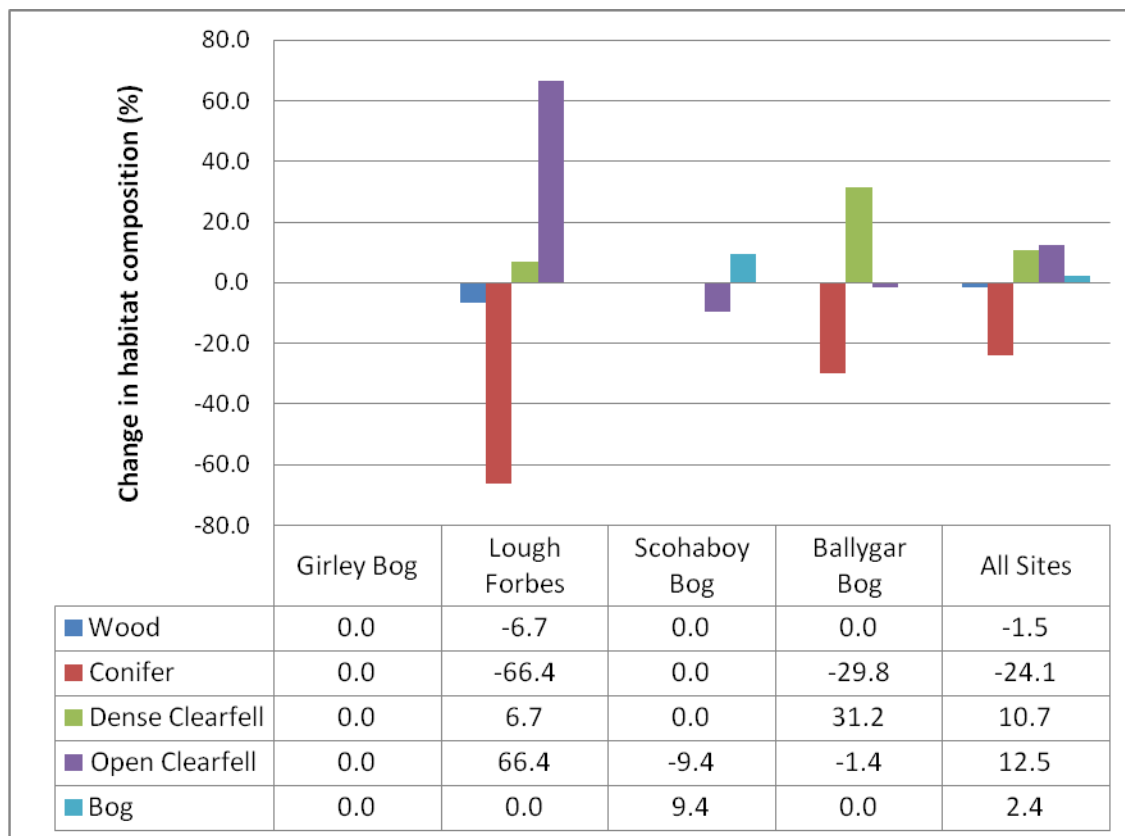


Figure 3.6 Changes in habitat composition at survey sites between 2012 and 2015

3.3 Bird-Habitat Data

Table 3.6 shows the density of birds in each of the five habitats classes surveyed on transects. As before, these data are expressed as birds per 200m. Since birds were recorded up to 25m from the transect route, these data should approximate to birds per hectare. However, due to differences in detection rates (it is easier to see and hear (and therefore record) birds in open habitats such as clearfell and bog than in closed habitats such as woodland), birds/200m is used.

Table 3.6 Bird density (expressed as birds per 200m of transect) for each of the major habitat classes from transect surveys, with overall transect length (in metres) for each habitat and overall densities also shown for the two years of fieldwork.

	Wood		Conifers		Dense CF		Open CF		Bog		Overall	
Year	2012	2015	2012	2015	2012	2015	2012	2015	2012	2015	2012	2015
Habitat (m)	628	509	1848	0	1340	2163	1956	2913	1910	2097	7682	7682
Teal										0.21		0.05
Mallard										0.21		0.05
Pheasant								0.06				0.03
Sparrowhawk	0.32										0.03	
Snipe								0.06	0.10	0.10	0.03	0.05
Curlew									0.10	0.31	0.03	0.08
Woodpigeon	0.96		0.11		0.15	0.09					0.13	0.03
Cuckoo						0.09						0.03
Jay		0.32						0.06				0.05
Hooded Crow					0.15						0.03	
Goldcrest	0.32		0.76		0.15						0.23	
Blue Tit	0.32										0.03	
Great Tit	0.32	0.32	0.87								0.23	0.03
Coal Tit	1.59	0.64	3.14				0.12				0.91	0.05
Skylark								0.13	1.26	0.94	0.31	0.28
Long-tailed Tit	0.64	0.64			0.30			0.06			0.10	0.08
Wood Warbler	0.32										0.03	
Chiffchaff	0.32	0.32	0.22					0.06			0.08	0.05
Willow Warbler	2.87	2.55	0.43		0.15	0.55	0.12	0.26			0.42	0.46
Blackcap	0.32	0.64			0.15	0.28					0.05	0.13
Whitethroat	0.32					0.09		0.06			0.03	0.05
Treecreeper			0.22								0.05	
Wren	1.91	3.82	0.54		1.79	1.85	0.96	1.66			0.81	1.47
Blackbird	0.64	0.64	0.11		0.75	0.37	0.12	0.13			0.23	0.20
Song Thrush	0.32	1.27				0.09		0.06			0.03	0.15
Mistle Thrush								0.06				0.03
Robin	1.27	1.59	0.65		0.60	0.46	0.60	0.45			0.39	0.43
Stonechat		0.32				0.28		0.13		0.10		0.18
Dunnoek	0.32	0.32			0.15	0.18	0.15	0.38			0.08	0.23
Pied Wagtail						0.09		0.06				0.05
Meadow Pipit					0.45	0.74	0.48	2.05	3.35	4.92	1.04	2.20
Chaffinch	1.27	0.96	0.43		0.60	0.09	0.24	0.13			0.36	0.15
Siskin			0.11								0.03	
Linnet								0.38				0.15
Lesser Redpoll	0.96	0.64	0.54			0.09		0.89			0.23	0.43
Reed Bunting		0.32				0.28		0.51		0.10		0.33
All Species	15.29	18.86	8.12	0	5.37	5.64	2.27	7.67	4.82	6.31	5.91	7.47
No. species	19	16	13	0	12	16	8	21	4	8	26	29

NOTE: Colour denotes status (Red, Amber or Green) on the Birds of Conservation Concern in Ireland (BoCCI) lists (Colhoun & Cummins, 2013)

In both years, overall bird densities are highest in the woodland habitats as would be expected. It is interesting to note that the overall bird density in open clearfell habitats in 2015 is approximately the same as for dense clearfell and bog habitats. In 2012, the open clearfell habitat was substantially lower than for these other habitats (see Figure 3.7). This may be due to some level of habitat stability of perhaps recolonisation of these habitats in 2015 – in 2012 all would have been very new areas of clearfell. This is echoed by the number of species recorded in open clearfell, which is the highest for any habitat. This suggests that open clearfell may be offering a very wide range of habitat requirements from woodland- type habitat (for woodland or scrub species such as Willow Warbler and Lesser Redpoll), to open landscapes the suit species such as Meadow Pipit, Linnet or Stonechat.

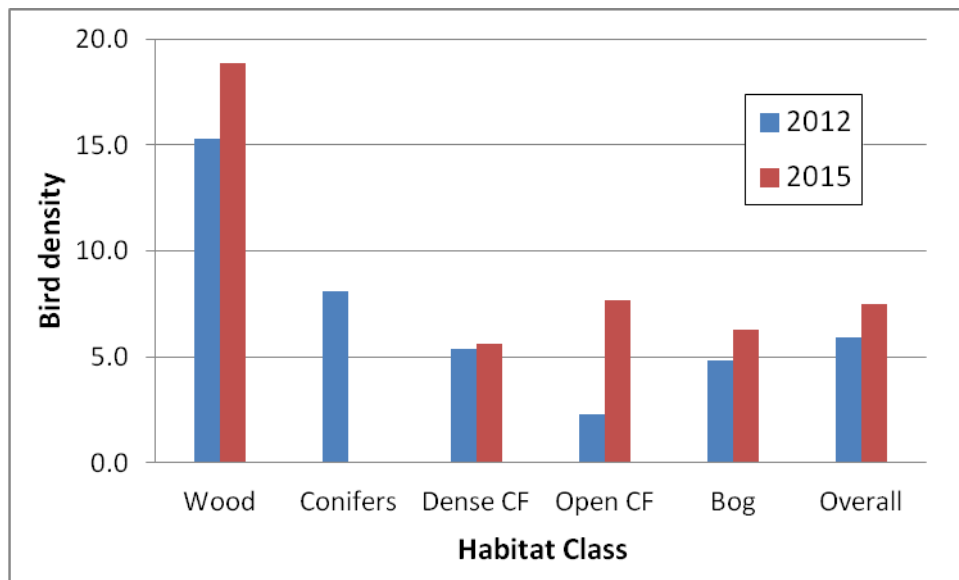


Figure 3.7 Overall bird densities (birds/200m) on survey transects for the five habitat classes

As might be expected, individual species show substantially different densities depending upon the habitat type. Table 3.7 shows the composition of bird communities within the five habitat classes. the data presented here are the proportion (%) that each species contributes to the total number of all birds present within that habitat. For example, in 2012, Wren made up 12.5% of all birds recoded in the *Wood* habitat type.

When comparing the bird data from the two survey periods, it is useful to use both the density data for each species with the habitat as well as the contribution that each species makes to the overall total of birds for that habitat. For example, for Meadow Pipit, although overall density in *Bog* habitat increased from 3.35 birds/200m to 4.92 birds/200m between 2012 and 2015, their contribution to the total number of birds recorded on *Bog* habitats remained virtually unchanged (69.57% in 2012 compared to 71.21% in 2015).

Table 3.7 Community structure (expressed as proportion (%) for each bird species) on transects in each habitat

Habitat	Wood		Conifers		Dense CF		Open CF		Bog	
Species	2012	2015	2012	2015	2012	2015	2012	2015	2012	2015
Teal										3.03
Mallard										3.03
Pheasant								0.83		
Sparrowhawk	2.08									
Snipe								0.83	2.17	1.52
Curlew									2.17	4.55
Woodpigeon	6.25		1.33		2.78	1.64				
Cuckoo						1.64				
Jay		2.08						0.83		
Hooded Crow					2.78					
Goldcrest	2.08		9.33		2.78					
Blue Tit	2.08									
Great Tit	2.08	2.08	10.67							
Coal Tit	10.42	4.17	38.67				5.26			
Skylark								1.67	26.09	13.64
Long-tailed Tit	4.17	4.17			5.56			0.83		
Wood Warbler	2.08									
Chiffchaff	2.08	2.08	2.67					0.83		
Willow Warbler	18.75	16.67	5.33		2.78	9.84	5.26	3.33		
Blackcap	2.08	4.17			2.78	4.92				
Whitethroat	2.08					1.64		0.83		
Treecreeper			2.67							
Wren	12.50	25.00	6.67		33.33	32.79	42.11	21.67		
Blackbird	4.17	4.17	1.33		13.89	6.56	5.26	1.67		
Song Thrush	2.08	8.33				1.64		0.83		
Mistle Thrush								0.83		
Robin	8.33	10.42	8.00		11.11	8.20	5.26	5.83		
Stonechat		2.08				4.92		1.67		1.52
Dunnock	2.08	2.08			2.78	3.28	5.26	5.00		
Pied Wagtail						1.64		0.83		
Meadow Pipit					8.33	13.11	21.05	26.67	69.57	71.21
Chaffinch	8.33	6.25	5.33		11.11	1.64	10.53	1.67		
Siskin			1.33							
Linnet								5.00		
Lesser Redpoll	6.25	4.17	6.67			1.64		11.67		
Reed Bunting		2.08				4.92		6.67		1.52
No. individuals	48	48	75	0	36	61	22	109	46	66
No. species	19	16	13	0	12	16	8	21	4	8

NOTE: Colour denotes status (Red, Amber or Green) on the Birds of Conservation Concern in Ireland (BoCCI) lists (Colhoun & Cummins, 2013)

Rather than evaluating the impacts of management on each species separately (which could only be undertaken for a small number of the most abundant species), it is rather more beneficial to look at groups of species that share similar habitats. Table 3.8 shows the categorisation of species recorded on transects into preferred, broad habitat niches (from knowledge of species' ecology), along with a short description of each habitat niche. Clearly, some species occupy wider habitat niches in the wider countryside (such as grasslands, gardens, etc.), but the categorisation here is limited only to those habitats that were recorded on transects.

Table 3.8 Allocation of species recorded on transects to broad habitat niches based upon species ecology, with a brief description of each habitat niche

Habitat	Description	Species
Bog (specialist)	Species typical of predominantly open and unmanaged landscapes, including bog, heath, fen and wetland habitats	Teal ; Mallard; Snipe ; Curlew ; Cuckoo; Skylark ; Stonechat ; Meadow Pipit ; Reed Bunting
Conifer (specialist)	Species typical of conifer forests (typically commercially planted, non-native stands)	Goldcrest ; Coal Tit; Siskin
Woodland (generalist)	Species typical of broadleaved or mixed woodlands, including understorey and scrubby habitats (such as bramble or gorse)	Pheasant; Woodpigeon; Jay; Blue Tit; Great Tit; Long-tailed Tit; Wood Warbler ; Chiffchaff; Willow Warbler; Blackcap; Whitethroat; Treecreeper; Blackbird; Song Thrush; Mistle Thrush ; Robin ; Dunnock; Chaffinch; Linnet ; Lesser Redpoll
Other (generalist)	Species found in a wide variety of habitats	Sparrowhawk ; Hooded Crow; Wren; Pied Wagtail

NOTE: Colour denotes status (**Red**, **Amber** or Green) on the Birds of Conservation Concern in Ireland (BoCCI) lists (Colhoun & Cummins, 2013)

Figure 3.8 shows the proportion (percentage) of individual birds recorded from transects and allocated to their habitat niche for all four survey sites. Woodland species were the largest group in 2012, accounting for 42.3% of all birds observed, followed by typical bog species (22%), conifer species (21.1%) and generalist (no specific habitat niche) species (14.6%). In 2015, the proportion of woodland species had decreased slightly to 35.6% of all birds recorded, with bog species now accounting for the highest proportion of birds observed, with 43.4% of individuals assigned to this group. The proportion of generalist species had increased slightly to 20.3%, but conifer species had substantially reduced to just 0.7% of individuals recorded.

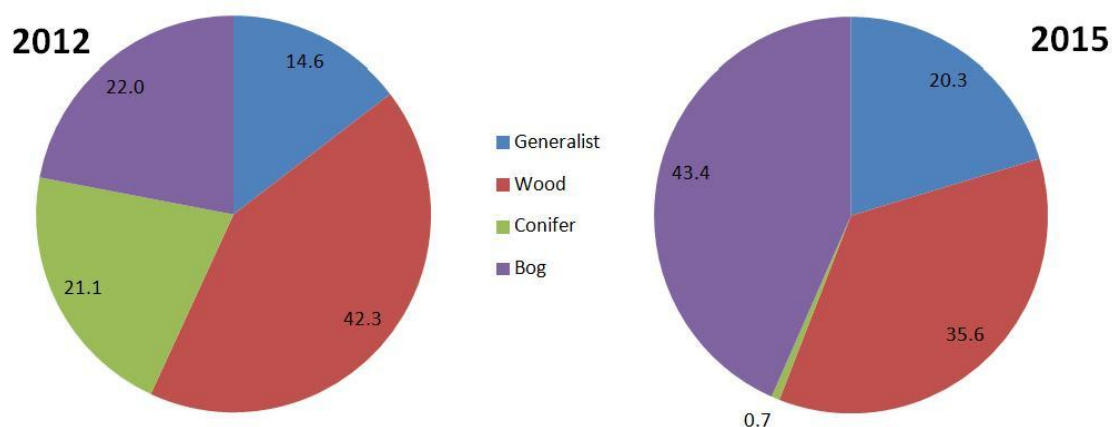


Figure 3.8 Bird community structure (proportion (%) of birds recorded on transects from each habitat niche) for all sites for 2012 and 2015.

Figure 3.9 shows the proportion of birds from each habitat niche recorded from transects for Girley Bog. In 2012, Generalist and Woodland species dominated the avifauna, accounting for 88.6% of all birds recorded, with just 9.1%

of bog species. Although Woodland and Generalist species are still dominant in 2015, bog species now make up one-third (33%) of all individual birds recorded from transects at the site. This is despite the overall habitat classification (a mixture of open and dense clearfell) remaining unchanged between the two survey periods (see Figure 3.2). This would indicate that either more subtle habitat changes are occurring at the site or that the recent clearfell in 2012 did not suit local bog species, which are now adapting to or colonising these relatively new habitats.

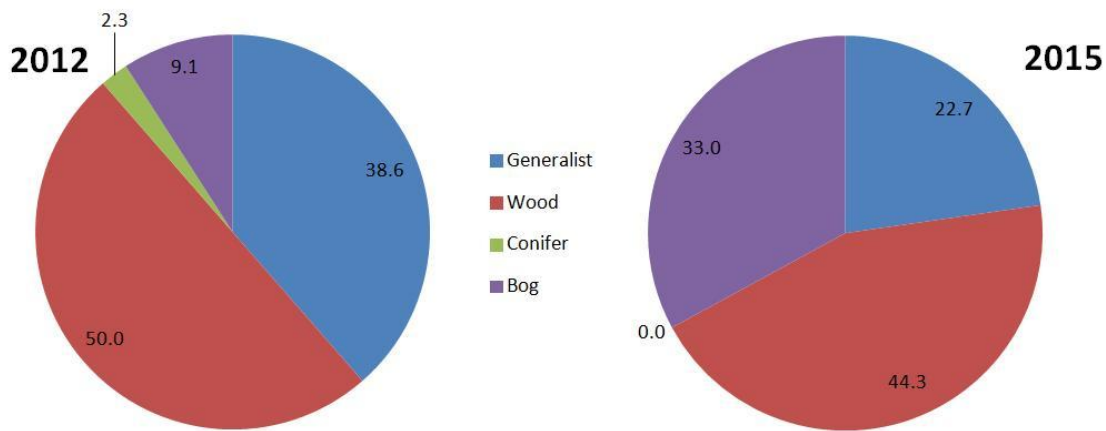


Figure 3.9 Bird community structure (proportion (%) of birds recorded on transects from each habitat niche) for Girley Bog in 2012 and 2015.

The proportion of birds recorded from the various habitat niches at Lough Forbes is shown in Figure 3.10. In 2012, nearly two-thirds (66.4%) of the transect length was through conifer plantation (see Figure 3.2), with 40.9% of all birds recorded specialists in using such habitats. In 2015, with all the conifer habitats removed, no conifer specialists were recorded. Substantial increases were noted for generalist species (an increase from 9.1% to 28.9%) and a slight increase was noted for woodland species, presumably adapting to the increasing clearfell habitats. Also, bog species increased (from 6.8% to 17.8%) indicating that, although the area of bog surveyed from transects did not change, these species were able to utilise some of the clearfell areas.

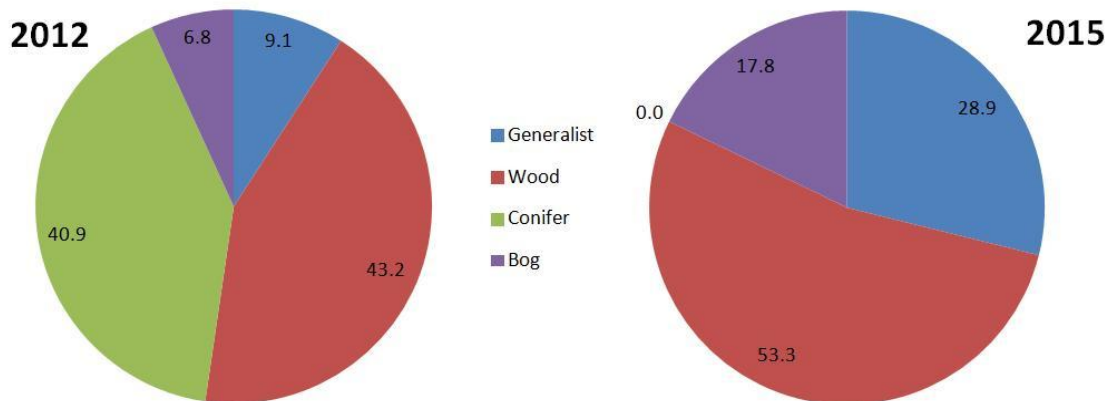


Figure 3.10 Bird community structure (proportion (%) of birds recorded on transects from each habitat niche) for Lough Forbes in 2012 and 2015.

Figure 3.11 shows the proportion of individual birds recorded from transects at Scohaboy Bog according to habitat niche. As with Lough Forbes, the removal of conifers has resulted in a loss of specialist bird species associated with such habitats. The number of bog specialist birds has increased from 60.9% of all birds recorded in 2012 to 79.5% in 2015. Although the length of transects on this site containing bog habitats increased slightly during this period, the main reason for this increase is likely to be the use of clearfell habitats by bog specialists. Furthermore, the removal of trees that were immediately adjacent to the area of bog has probably allowed more complete occupancy of the bog habitats by these species, which typically avoid any tree cover in the vicinity of nesting sites.

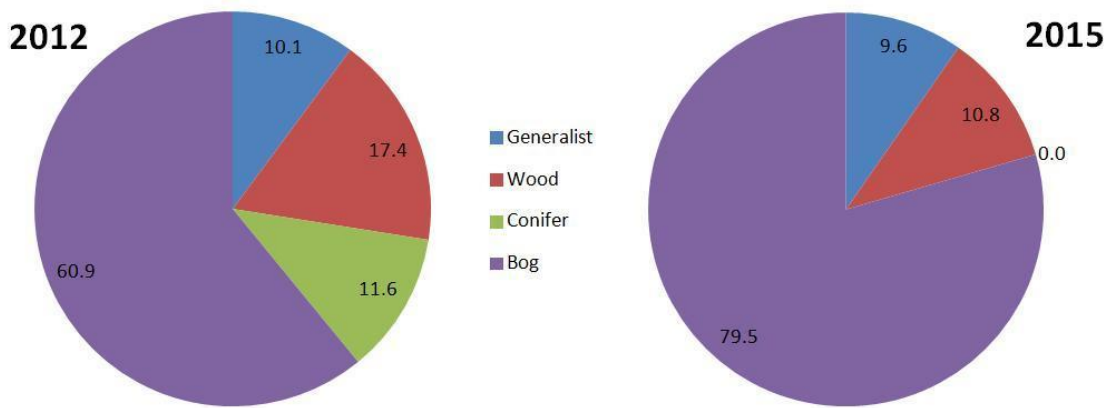


Figure 3.11 Bird community structure (proportion (%) of birds recorded on transects from each habitat niche) for Scohaboy Bog in 2012 and 2015.

The bird communities at Ballygar Bog in 2012 and 2015, allocated to habitat niches, are shown in Figure 3.12. As for all sites, the removal of conifer habitats has resulted in a loss of birds associated with these habitats and, again, the likely increases on bog specialist species is likely linked to increased occupancy of clearfell habitats by these species. The increase of generalist species, and continued large numbers of woodland species, shows that clearfell habitats continue to offer suitable habitats for these types of birds, although overall numbers for these two categories have declined (from 80% in 2012 to 65.9% in 2015) against the increase in bog species.

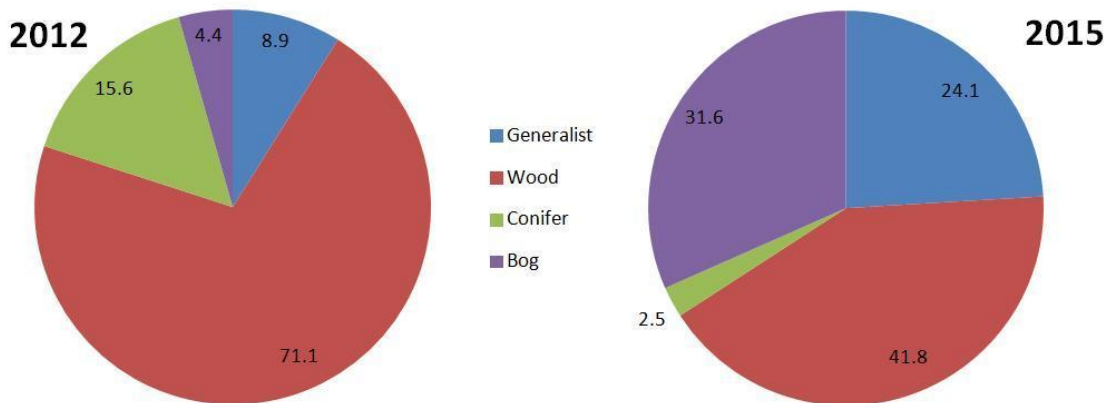


Figure 3.12 Bird community structure (proportion (%) of birds recorded on transects from each habitat niche) for Ballygar Bog in 2012 and 2015.

The overall changes to the bird community structures at the transects lines within the four study sites between 2012 and 2015, combined and individually, according to habitat niche are shown in Figure 3.13. For all four sites, the number of conifer specialists has declined (in many cases to zero). This is to be expected, with the management works removing large areas of conifers. It is very welcome to see that the numbers of bog specialist birds have responded to the habitat management by increasing. The reasons for this are discussed in detail in Section 4, but in brief this is likely due to increased occupancy of existing bog habitats adjacent to areas of trees (and conifer plantations) due to the typical tree-avoidance exhibited by many bog species, as well as the likely adaptation and use of clearfell habitats by these species.

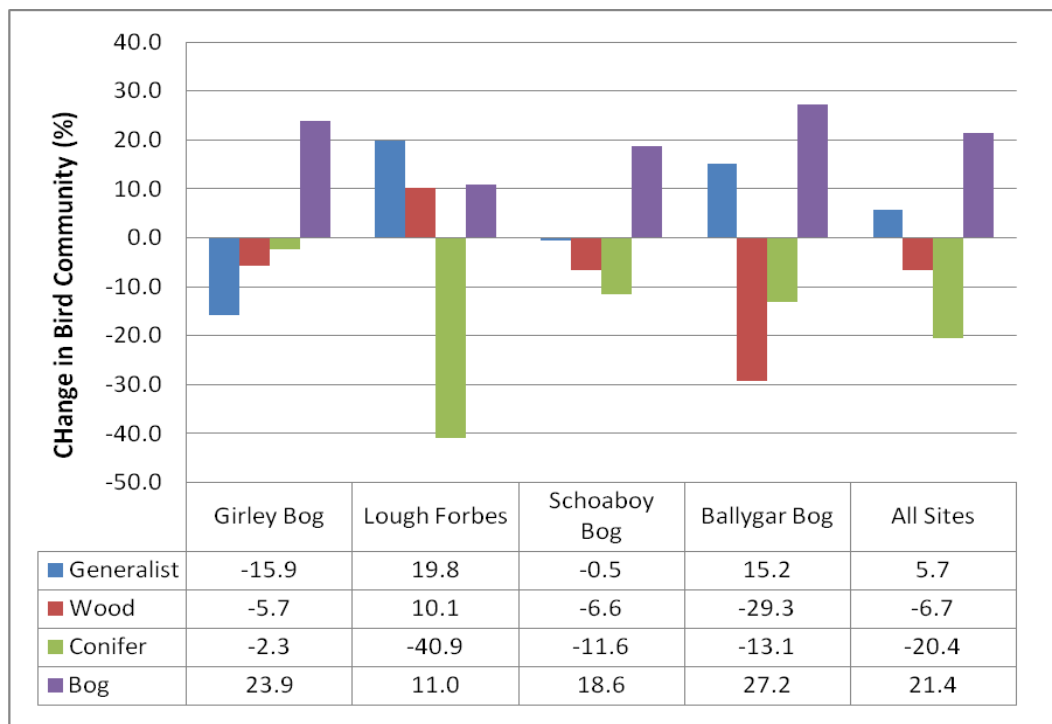


Figure 3.13 Changes in bird community structure at survey sites between 2012 and 2015

Overall declines in woodland species may be linked to the removal of trees, as some of these species were probably using the conifer habitats, whilst generalists (that are able to utilise the large areas of clearfell) have increased.