

# RESTORING ACTIVE BLANKET BOG IN IRELAND

Project reference: LIFE02NAT/IRL/8490

A REPORT ON THE RESTORATION OF PROJECT SITE No. 14.  
CARRICKBARR, CO. DONEGAL



Compiled by: John Conaghan  
11 Dun Ard,  
Craughwell,  
Co. Galway,  
Ireland.  
enviroscope@indigo.ie

-  
-  
-  
-  
-**Table of contents**

	<b>Page No.</b>
<b>1. Introduction</b>	<b>3</b>
<b>2. Methods</b>	<b>4</b>
<b>3. Site Photographs</b>	<b>6</b>
<b>4. Vegetation of the Site</b>	<b>10</b>
<b>5. Changes in overall vegetation/habitat cover</b>	<b>12</b>
<b>6. Monitoring quadrats</b>	<b>14</b>
<b>7. References</b>	

**Project Site No. 14 – Carrick Barr, Co. Donegal****1. Introduction**

<b>Grid reference</b> H 015 745	<b>Elevation (m)</b> 165 to 180	<b>Bedrock geology</b> Schist
<b>SAC Name and number</b> Dunragh Loughs/Pettigo Plateau (1125)	<b>Site area (ha)</b> X ha (Original site area 22.2 ha + extension site area x ha)	<b>Main restoration methods</b> Fell to waste of conifers. Ring- barking and herbicide application.
<b>Area of conifer cover</b> 38.0 ha (Original site area 12.1 ha + extension site area 25.9 ha)	<b>Area of open bog/wet heath</b> X ha (Original site area 10.1 ha + extension site area x ha)	
<b>Noteworthy plant/animal species occurring</b> <i>Listera cordata, Sphagnum fuscum</i>		

Carrick Barr is situated on the western shores of Lough Golagh, near Lough Derg, in the southeastern corner of Co. Donegal. Unplanted portions of the site to the north of Lough Keeran lie within the Dunragh Loughs/Pettigo Plateau Special Area of Conservation while areas of afforested blanket bog adjoin the SAC. This SAC is notable for the large area of good quality, almost undisturbed blanket bog habitat and ranks as one of the best remaining blanket bog landscapes in County Donegal.

The project area includes some very wet intact blanket bog, areas of bog planted with conifers and an area planted with broadleaves (mainly birch and alder). The main area of wet bog within the site is surrounded on three sides by plantation and contains numerous pools which support species such as *Sphagnum cuspidatum*, many-flowered bog-cotton (*Eriophorum angustifolium*) and mud sedge (*Carex limosa*). The small area of planted broadleaves, which occurs within the site, will be retained. Although the trees in this area are not achieving commercial growth rates and are in the main quite stunted, they do provide some woodland habitat in an area where deciduous woodland is generally scarce.

The main restoration measure undertaken at this site was the felling to waste of the conifer crop. In addition, a small area of conifers to the north of Lough Keeran was killed standing by a mixture of ring-barking (with chainsaw) and herbicide application. Any active drains within the site were blocked with plastic dams. Following the completion of the initial restoration work at this site an additional 25.9 ha of conifer crop to the south of Lough Keeran was felled as part of a project extension.

## 2. Methods

Prior to the start of restoration activities at the site the habitats and vegetation occurring were surveyed and described. Habitats occurring were mapped with the aid of a vertical aerial photograph of the site taken in the year 2000 by the Ordnance Survey of Ireland. At the end of the project the habitats present were mapped with the aid of a vertical aerial photograph of the site taken in 2004.

The vegetation occurring at the site was described using the Zurich-Montpellier approach (Mueller-Dombois and Ellenberg, 1979), where the percentage cover of the various vegetation layers and plant species in a defined area is estimated visually. The cover of plant species in relevés was estimated in accordance with the Domin scale which is outlined in the table below.

Table 1. The Domin scale of cover/abundance.

1 = <4% cover with few individuals
2 = <4% cover with several individuals
3 = <4% cover with many individuals
4 = Cover between 4 and 10%
5 = Cover between 11 and 25%
6 = Cover between 26 and 33%
7 = Cover between 34 and 50%
8 = Cover between 51 and 75%
9 = Cover between 76 and 90%
10 = Cover between 91 and 100%

In addition to plant species presence and cover, the following parameters were noted for each relevé:

- (1) Size
- (2) Percentage cover of vegetation, bare soil, water and rock.
- (3) Percentage cover and height of the different vegetation layers, e.g. shrub, dwarf shrub, herb and bryophyte.
- (4) Soil type and depth.
- (5) Slope and aspect.
- (6) Additional details, such as the composition of the surrounding vegetation, degree of grazing and disturbance.

During the initial fieldwork a number of colour photographs of the site and vegetation encountered were taken with a digital camera and a selection of these are presented in this report in order to illustrate the vegetation descriptions and changes in the habitats/vegetation present over time. Mosses, liverworts and higher plants not readily identified in the field were collected and keyed out at a later date using keys in the appropriate publications (see below). During the field survey, particular attention was paid to the possible occurrence of plant and animal species which are considered to be rare in both a national

and local context with particular emphasis on animal species listed in Annex II of the E.U. Habitats Directive and plant species listed in the Irish Red Data Book for vascular plants (Curtis and McGough, 1988), the 1999 Flora Protection Order and Annex II of the E.U. Habitats Directive.

Plant species nomenclature in this report follows Stace (1997) for vascular plant, Smith (2004) for mosses, Smith (1991) for liverworts and Dahl (1968) for lichens.

### 3. Site Photographs

In order to show the restoration activities which have taken place at this site a number of photographs are presented in the following pages. These include both aerial photographs, supplied by the Ordnance Survey of Ireland, and a selection of ground photographs taken by the author.



To the north of Lough Keeran a small area of standing conifers were ring-barked with chainsaw.



A view of conifers to the north of Lough Keeran, taken in April 2003.



The same view taken in September of 2007. Note the die-off of the conifers which were injected with herbicide.





Wet bog to the north of Lough Keeran in the foreground with dead conifers in the background. Photograph taken in September of 2007.



Conifers felled to waste to the north-east of Lough Keeran with standing dead conifers visible in the background. Picture taken in September of 2007. The conifers have been felled for just over 3 years and the heavy cover has suppressed the recovery of bog vegetation.

**The year 2000 photograph of this site is too dark to reproduce.**



An aerial photograph of Carrickbarr, taken in 2004. Site outline, including extension area, in red. Note that not all of the conifer felling has taken place at this site at the time the photograph was taken.



#### 4. Vegetation of the site

The afforested sections of this site were dominated by a mixture of lodgepole pine and Sitka spruce plantation which were established in the early 1980's. The growth of the conifer crop was quite variable with trees attaining a general height of between 5 and 7 metres. The ground vegetation of these afforested areas tended to be dominated by needle litter and mosses with the moss *Hypnum cupressiforme* by far the most abundant species. The locally rare orchid *Listera cordata* is a component of pine plantation at this site.

The small areas of intact blanket bog which occur within the site are generally in good condition with pool areas occasional. The following table shows the variation in vegetation cover that occurs. Pools tend to be dominated by the aquatic mosses *Sphagnum auriculatum* and *S. cuspidatum* with the sedge *Carex limosa* also locally frequent. The adjoining undisturbed blanket bog is dominated by species such as *Racomitrium lanuginosum*, *Calluna vulgaris*, *Sphagnum capillifolium*, *Erica tetralix* and *Narthecium ossifragum* with the lichen *Cladonia portentosa* also locally abundant. Sphagnum cover is high in these areas and includes the locally rare *Sphagnum fuscum*. Close to forestry, where the effects of drainage are evident, the bog vegetation is dominated by a lush cover of *Molinia caerulea* with *Calluna vulgaris* and *Sphagnum capillifolium* also conspicuous.

Table 2. Vegetation at Carrickbarr.

Vegetation type	A	B	B	B	B	B	C	C	D	D	D	D
Quadrat code	C9	C8	C7	C6	C1	C10	C2	C4	C5	C11	C12	C3
Quadrat size (m <sup>2</sup> )	3	4	4	4	4	4	4	4	4	4	4	4
Slope (degrees)	0	0	0	0	0	0	20-30	5-10	5-10	0	3-5	3-5
Vegetation cover (%)	35	85	95	90	75	100	98	100	100	100	100	100
Bare rock (%)	0	0	0	0	0	0	0	0	0	0	0	0
Bare soil (%)	0	15	5	10	30	0	2	0	0	0	0	0
Open water (%)	95	0	0	0	0	0	0	0	0	0	0	0
Dwarf shrub cover (%)	0	35	40	40	40	25	25	25	20	20	30	75
Herb cover (%)	25	55	50	75	70	75	65	65	95	65	75	60
Bryophyte cover (%)	15	85	95	80	55	85	85	80	40	70	80	65
Ht. of vegetation (cm)	25	13	25	20	10	30	30	18	25	40	35	50
No. of species	4	19	15	19	15	14	17	14	17	11	11	12
<i>Sphagnum cuspidatum</i>	5	.	.	.	.	.	.	.	.	.	.	.
<i>Sphagnum auriculatum</i>	4	.	.	.	.	.	.	.	.	.	.	.
<i>Carex limosa</i>	3	1	.	.	.	.	.	.	.	.	.	.
<i>Racomitrium lanuginosum</i>	.	8	8	7	6	7	1	.	1	6	.	.
<i>Narthecium ossifragum</i>	.	5	5	5	5	3	.	.	2	.	.	.
<i>Cladonia uncialis</i>	.	3	4	4	3	.	.	.	.	.	.	.
<i>Drosera rotundifolia</i>	.	1	.	1	.	.	.	.	.	.	.	.
<i>Odontoschisma sphagni</i>	.	2	3	.	.	.	2	.	.	.	.	.
<i>Drosera anglica</i>	.	1	1	.	.	.	.	.	.	.	.	.
<i>Cladonia portentosa</i>	.	5	5	4	5	5	8	8	4	.	4	1
<i>Molinia caerulea</i>	.	.	.	5	5	8	6	5	9	8	9	8
<i>Calluna vulgaris</i>	.	5	6	3	4	5	5	6	3	5	5	8
<i>Sphagnum capillifolium</i>	.	5	5	4	3	6	5	5	6	7	8	4
<i>Erica tetralix</i>	.	5	5	6	7	5	5	5	5	3	.	1
<i>Eriophorum angustifolium</i>	5	4	3	3	3	1	3	5	3	.	.	.
<i>Sphagnum tenellum</i>	.	.	3	4	4	4	4	4	4	4	5	.
<i>Potentilla erecta</i>	.	.	.	1	1	1	3	3	2	1	3	3
<i>Hypnum cupressiforme</i>	.	1	4	4	.	3	3	1	5	.	.	8
<i>Eriophorum vaginatum</i>	.	5	4	4	.	5	3	.	.	2	4	.
<i>Trichophorum cespitosum</i>	.	5	5	7	6	.	5	5	5	.	.	.
<i>Pleurozia purpurea</i>	.	1	.	4	5	2	3	.	3	.	.	.
<i>Sphagnum papillosum</i>	.	4	1	.	.	4	.	.	.	1	3	.
<i>Polygala serpyllifolia</i>	.	.	.	1	1	.	1	.	1	.	.	.
<i>Erica cinerea</i>	.	.	.	.	.	.	3	4	.	.	2	3
<i>Carex panicea</i>	.	.	.	.	.	.	1	2	3	.	.	.
<i>Scapania gracilis</i>	.	.	.	.	.	.	.	2	.	1	.	4
<i>Diplophyllum albicans</i>	.	.	.	.	.	.	.	.	1	2	.	.
<i>Sphagnum fuscum</i>	.	3	.	.	.	.	.	.	.	.	.	.
<i>Sphagnum magellanicum</i>	.	1	.	.	.	.	.	.	.	.	.	.
<i>Rhynchospora alba</i>	.	.	.	3	.	.	.	.	.	.	.	.
<i>Leucobryum glaucum</i>	.	.	.	1	.	.	.	.	.	.	.	.
<i>Cladonia coccifera</i>	.	.	.	.	3	.	.	.	.	.	.	.
<i>Sphagnum subnitens</i>	.	.	.	.	.	.	.	3	.	.	.	.
<i>Campylopus atrovirens</i>	.	.	.	.	.	.	.	.	1	.	.	.
<i>Calypogeia sp.</i>	.	.	.	.	.	.	.	.	.	.	1	.
<i>Sphagnum palustre</i>	.	.	.	.	.	.	.	.	.	.	1	.
<i>Dicranum scoparium</i>	.	.	.	.	.	.	.	.	.	.	.	3
<i>Polytrichum commune</i>	.	.	.	.	.	.	.	.	.	.	.	1
<i>Vaccinium myrtillus</i>	.	.	.	.	.	.	.	.	.	.	.	1

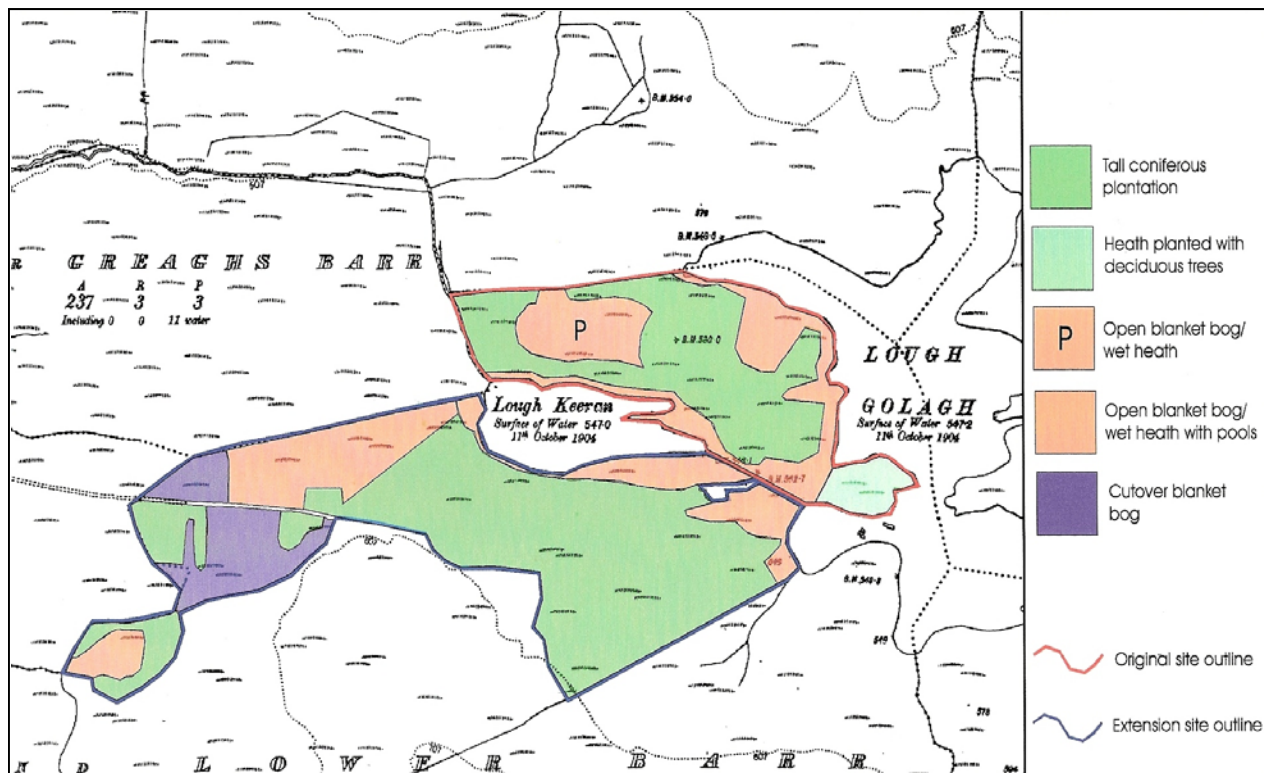
A = Blanket bog pools

B = Typical Blanket bog with high cover of *Racomitrium lanuginosum*C = Typical Blanket bog with high cover of *Cladonia portentosa*D = Dried out blanket bog close to conifer cover dominated by *Molinia caerulea*.



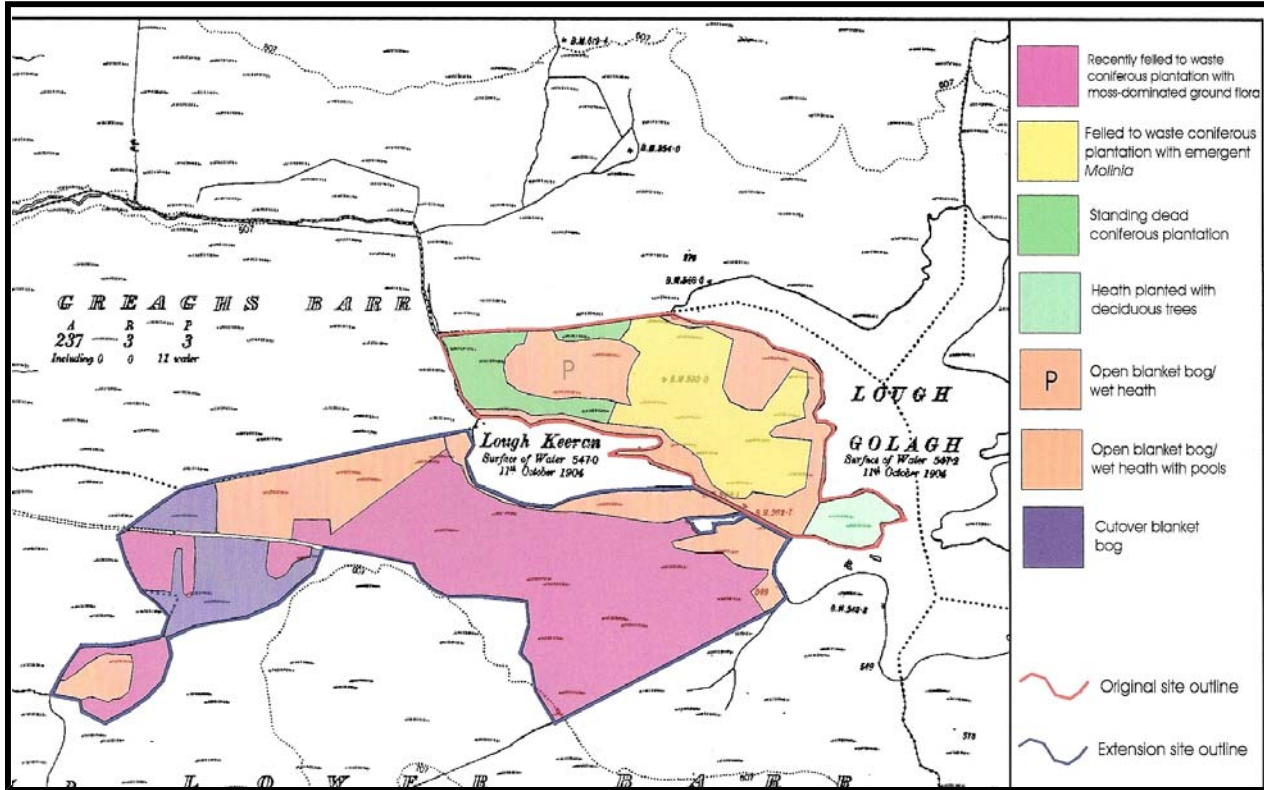
## 5. Changes in overall vegetation/habitat cover

The main operation at this site has been the felling of most of the conifer crop areas to waste which has resulted in extensive areas of felled conifers covering the ground surface. Vegetation recovery has been slow in these areas, due to the shading effect of dead conifers, and tends to be dominated by mosses (mainly *Hypnum cupressiforme* and *Sphagnum capillifolium*) and sparse *Molinia caerulea*. Although the ring-barking and herbicide application, trialled on a small area of the conifer crop, has resulted in the death of conifers at the site there has been little significant vegetation change in the ground layer of these areas even three years after the initial treatments (see monitoring quadrats). The spread of moss and fern species is evident in some of the quadrats however these changes are comparatively small.



A map of habitat/vegetation cover at Carrickbarr prior to the start of restoration.





A map of habitat/vegetation cover at Carrickbarr at the end of restoration.

## 6. Monitoring quadrats

In the following pages the vegetation changes which have taken place within the site over the period of the restoration project are shown by means of observed changes in permanent quadrats. A total of 4 permanent quadrats were described and photographed at this site. In order to ensure the future relocation of quadrats the corners have been marked with short sticks and a 10-figure GPS reading was also recorded. In the case of each quadrat photographs and vegetation tables are presented in the following pages. The cover of plant species within the quadrats is presented in accordance with the scale outlined in the following table.

Cover of species in quadrat	Cover in presented quadrat tables
<1%	1
1 to 5%	2
5 to 10%	3
10 to 25%	4
25% to 50%	5
50 to 75%	6
75% to 100%	7

Vegetation monitoring at this site was concentrated on areas where a standing dead crop of conifers (Lodgepole pine) was left following ring-barking and herbicide application. The death of the trees has resulted in much higher light levels reaching the ground and this is due to needle drop after tree death. Although there has been a gradual increase in the number of species occurring in the ground layer over time there has been very little change in the overall vegetation cover and the cover of the main species such as *Hypnum cupressiforme*, *Eurhynchium praelongum* etc. The future survey of these plots will reveal the timescale for the re-establishment of a blanket bog flora in these areas and the species involved.



Permanent quadrat 1 – September 2004



Permanent quadrat 1 – September 2007



Site - Carrickbarr			
Perm. Quadrat No. - 1			
Near Walrag? – Close to W.5.			
GPS – H 01426 74620			
Size – 6m x 4m			
Slope – 3 to 5 degrees			
Vegetation Height (m)	10 to 12	10-12	10-12
Vegetation cover (%)	100	80	60
Needle litter cover (%)	80	80	70
Brash cover (%)	2	2	2
Bare ground cover (%)	0	0	0
Tree cover (%)	90	60	50
Dwarf shrub cover (%)	0	0	<1
Herb cover (%)	3	3	8
Bryophyte cover (%)	20	20	40
No. of plant species	16	13	18
Survey date	17/9/04	9/9/05	13/9/07
<i>Pinus contorta</i> trees	7	6	6
<i>Hypnum cupressiforme</i>	4	4	4
<i>Hylocomium splendens</i>	3	3	2
<i>Sphagnum capillifolium</i>	2	2	2
<i>Eurhynchium praelongum</i>	2	2	3
<i>Dryopteris dilatata</i>	2	2	3
<i>Lophocolea bidentata</i>	2	1	3
<i>Blechnum spicant</i>	1	-	-
<i>Dicranum scoparium</i>	1	-	-
<i>Molinia caerulea</i>	1	1	2
<i>Listera cordata</i>	1	1	1
<i>Polytrichum commune</i>	1	1	1
<i>Pleurozium schreberi</i>	1	-	-
<i>Plagiothecium undulatum</i>	1	1	2
<i>Rhytidiadelphus loreus</i>	1	1	1
<i>Thuidium tamariscinum</i>	1	1	-
<i>Campylopus atrovirens</i>			2
<i>Sorbus aucuparia</i> seedling			1
<i>Epilobium angustifolium</i>			1
<i>Calluna vulgaris</i>			1
<i>Sphagnum palustre</i>			1
<i>Potentilla erecta</i>			1
<p>History – An area of Lodgepole pine plantation planted in the early 1980's. Trees were generally between 10 and 12 metres tall. Ground vegetation dominated by conifer needles. Trees treated with herbicide during the summer of 2004. Ground conditions notably brighter in 2005/2007 due to needle fall after tree death.</p>			





Permanent quadrat 2 – September 2004



Permanent quadrat 2 – September 2007



Site - Carrickbarr			
Perm. Quadrat No. - 2			
Near Walrag? – No			
GPS – H 0153 7460			
Size – 6m x 5m			
Slope – 1 to 3 degrees			
Vegetation Height (m)	10 to 12	10-12	10-12
Vegetation cover (%)	90	70	60
Needle litter cover (%)	90	90	80
Brash cover (%)	1	1	1
Bare ground cover (%)	0	0	0
Tree cover (%)	80	50	40
Dwarf shrub cover (%)	1	0	1
Herb cover (%)	2	2	3
Bryophyte cover (%)	10	10	15
No. of plant species	9	14	20
Survey date	17/9/04	9/9/05	13/9/07
<i>Pinus contorta</i> trees	7	6	5
<i>Eurhynchium praelongum</i>	3	3	3
<i>Hypnum cupressiforme</i>	3	3	3
<i>Dryopteris dilatata</i>	1	1	1
<i>Listera cordata</i>	1	1	1
<i>Molinia caerulea</i>	1	1	2
<i>Plagiothecium undulatum</i>	1	1	1
<i>Mnium hornum</i>	1	1	1
<i>Vaccinium myrtillus</i>	1	-	1
<i>Drosera rotundifolia</i>		1	-
<i>Dicranum scoparium</i>		1	-
<i>Sphagnum capillifolium</i>		1	1
<i>Polytrichum commune</i>		1	1
<i>Pinus contorta</i> seedling		1 (1 counted)	1
<i>Menyanthes trifoliata</i>		1	-
<i>Epilobium angustifolium</i>			2
<i>Calluna vulgaris</i>			1
<i>Campylopus atrovirens</i>			1
<i>Picea sitchensis</i> seedlings			1
<i>Galium saxatile</i>			1
<i>Rhytidiadelphus loreus</i>			1
<i>Sorbus aucuparia</i> seedling			1
<i>Hedera helix</i>			1
<p>History – An area of Lodgepole pine plantation planted in the early 1980's. Trees were generally between 10 and 12 metres tall. Ground vegetation dominated by conifer needles. Trees treated with herbicide during the summer of 2004. Ground conditions notably brighter in 2005/2007 due to needle fall after tree death.</p>			





Permanent quadrat 3 – September 2004



Permanent quadrat 3 – September 2007

Site - Carrickbarr			
Perm. Quadrat No. - 3			
Near Walrag? – No			
GPS – H 0136 7468			
Size – 6m x 6m			
Slope – c. 5 degrees			
Vegetation Height (m)	10 to 12	10 to 12	10-12
Vegetation cover (%)	95	70	70
Needle litter cover (%)	90	90	50
Brash cover (%)	1	1	1
Bare ground cover (%)	0	0	0
Tree cover (%)	90	70	60
Dwarf shrub cover (%)	0	0	1
Herb cover (%)	1	1	1
Bryophyte cover (%)	15	15	50
No. of plant species	9	13	14
Survey date	17/9/04	9/9/05	13/9/07
<i>Pinus contorta</i> trees	7	6	5
<i>Hypnum cupressiforme</i>	4	4	4
<i>Hylocomium splendens</i>	3	2	3
<i>Thuidium tamariscinum</i>	2	1	2
<i>Dicranum scoparium</i>	1	1	1
<i>Lophocolea bidentata</i>	1	1	4
<i>Sphagnum capillifolium</i>	1	1	1
<i>Dryopteris dilatata</i>	1	1	1
<i>Plagiothecium undulatum</i>	1	1	1
<i>Drosera intermedia</i>		1	-
<i>Listera cordata</i>		1	1
<i>Rhytidiadelphus loreus</i>		1	-
<i>Polytrichum commune</i>		1	1
<i>Eurhynchium praelongum</i>			4
<i>Epilobium angustifolium</i>			1
<i>Vaccinium myrtillus</i>			1
<p>History – An area of Lodgepole pine plantation planted in the early 1980's. Trees were generally between 10 and 12 metres tall. Ground vegetation dominated by conifer needles. Trees treated with herbicide during the summer of 2004. Ground conditions notably brighter in 2005/2007 due to needle fall after tree death.</p>			



Permanent quadrat 4 – September 2004



Permanent quadrat 4 – September 2007

Site - Carrickbarr			
Perm. Quadrat No. - 4			
Near Walrag? – No			
GPS – H 0138 7464			
Size – 6m x 5m			
Slope – 5-10 degrees			
Vegetation Height (m)	10 to 12	10 to 12	10 to 12
Vegetation cover (%)	90	60	50
Needle litter cover (%)	90	90	75
Brash cover (%)	0	0	3
Bare ground cover (%)	0	0	0
Tree cover (%)	80	50	40
Dwarf shrub cover (%)	0	0	1
Herb cover (%)	1	1	5
Bryophyte cover (%)	15	15	35
No. of plant species	12	12	17
Survey date	17/9/04	9/9/05	13/9/07
<i>Pinus contorta</i> trees	7	6	5
<i>Hypnum cupressiforme</i>	4	4	4
<i>Eurhynchium praelongum</i>	3	4	4
<i>Lophocolea bidentata</i>	2	2	4
<i>Dicranum scoparium</i>	2	1	1
<i>Dryopteris dilatata</i>	1	1	2
<i>Molinia caerulea</i>	1	1	2
<i>Listera cordata</i>	1	1	1
<i>Plagiothecium undulatum</i>	1	1	1
<i>Polytrichum commune</i>	1	1	1
<i>Sphagnum capillifolium</i>	1	2	2
<i>Thuidium tamariscinum</i>	1	1	2
<i>Campylopus atrovirens</i>			2
<i>Epilobium angustifolium</i>			1
<i>Vaccinium myrtillus</i>			1
<i>Potentilla erecta</i>			1
<i>Sorbus aucuparia</i> seedling			1
<p>History – An area of Lodgepole pine plantation planted in the early 1980's. Trees were generally between 10 and 12 metres tall. Ground vegetation dominated by conifer needles. Trees treated with herbicide during the summer of 2004. Ground conditions notably brighter in 2005/2007 due to needle fall after tree death.</p>			



## REFERENCES

- Curtis, T.G.F. & McGough, H.N. (1988). *The Irish Red Data Book. 1: Vascular Plants*. The Stationery Office, Dublin.
- Dahl, E. (1968). *Analytical Key to British Macrolichens* (2<sup>nd</sup> ed.). British Lichen Society, London.
- Mueller-Dombois, D. & Ellenberg, H. (1974). *Aims and Methods in Vegetation Ecology*. Wiley, New York.
- Smith, A.J.E. (2004). *The Moss Flora of Britain and Ireland* (2<sup>ND</sup> edition). University Press, Cambridge.
- Smith, A.J.E. (1990). *The Liverworts of Britain and Ireland*. University Press, Cambridge.
- Stace, C. (1997). *New Flora of the British Isles* (2<sup>ND</sup> edition). University Press, Cambridge.