RESTORING ACTIVE BLANKET BOG IN IRELAND

Project reference: LIFE02NAT/IRL/8490

A REPORT ON THE RESTORATION OF PROJECT SITE No. 5 EMLAGHDAUROE, CO. GALWAY

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Project Site No. 5 – Emlaghdauroe Co. Galway (Demonstration site)

1. Introduction

Grid reference L 754 497	**Elevation (m)** 120 to 516	**Bedrock geology** Quartzite
SAC Name and number Twelve Bens/Garraun Complex (2031)	**Site area (ha)** 90.3	**Main restoration methods** Commercial removal of conifer crop and drain-blocking
Area of conifer cover (ha) 71.3	**Area of open bog, and rock outcrop heath (ha)** 20.0	
Noteworthy plant/animal species occurring *Arctostaphylos uva-ursi, Juniperus communis* subsp. *nana*, *Daboecia cantabrica*.		

This project area lies on the south-western slopes of Ben Gleninsky, which is a mountain located along the southern edge of the Twelve Bens range in the Connemara region of Co. Galway. The site is completely surrounded by open blanket bog and heath habitats of the Twelve Bens/Garraun Special Area of Conservation.

The site can be divided into two distinct parts. Below an altitude of approximately 200 metres there is a planted area (71.3 ha), dominated by tall lodgepole pine (*Pinus contorta*), while above 200m the land is unplanted, unfenced and dominated by heath vegetation and rock outcrops (20.0 ha). Immediately upslope of the plantation area there is a narrow zone of wet heath vegetation dominated by purple moor-grass (*Molinia caerulea*) and ling heather (*Calluna vulgaris*) and this in turn grades into dry/montane heath dominated by ling heather (*Calluna vulgaris*). This montane heath vegetation also contains a number of unusual plant species such as juniper (*Juniperus communis*) and bearberry (*Arctostaphylos uva-ursi*). Such areas of montane heath habitat are relatively rare in Ireland.

At this site the main restoration measures undertaken were the felling and removal of the conifer crop by machine and the subsequent blocking of any significant artificial drains both with plastic piling and peat. In addition, a small area of conifer plantation on steep slopes at the eastern end of the forestry block, was felled to waste by chainsaw and left on site.

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. Monitoring Photographs

In order to illustrate 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.

A view of the site taken from the road to the south, in 2003.

The same view, taken in December 2007. Note the general improvement to the appearance of the landscape.

A view of the site taken from the road looking east, up towards the mountains. The picture was taken in April of 2003, at the start of conifer felling.

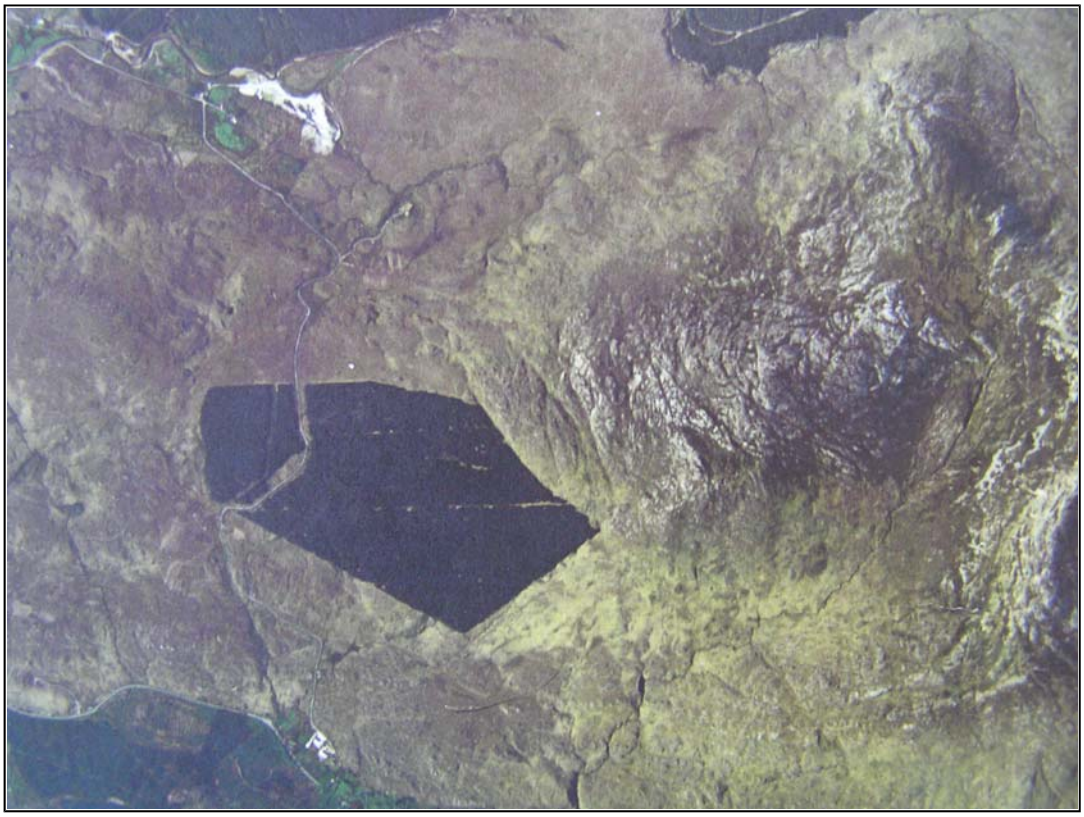
The same view, taken in September 2005, showing the improvement in the scenery.

A long-distance view of the afforested portion of the site, taken from the hillside to the east prior to the start of conifer clearance in 2003. Dry heath vegetation, dominated by *Calluna vulgaris*, is visible in the foreground.

A view along the northern boundary of the site, taken in October 2007. In 2003 a tall conifer crop dominated the ground to the right of the fence.

St. Dabeoc's heath growing along with *Calluna vulgaris* in recently cleared areas towards the eastern edge of the previously planted area. This heather species has a very restricted world distribution, being confined to Ireland (Co.s Galway and Mayo) and parts of north-west Spain and Portugal.

The low-growing shrub/tree species Juniper grows in areas of rocky heath at high elevations within this site.



An aerial photograph of the Emlaghdauroe site prior to the start of restoration activities. Aerial photograph taken in the year 2000.

An aerial photograph of the Emlaghdauroe site following restoration activities. Aerial photograph taken in the year

2004.

4. Vegetation of the site

Prior to the onset of bog restoration activities the vegetation of the afforested portion of this site was dominated by tall conifer plantation (>8 metres tall) with a very species-poor ground layer. The native blanket bog and heath vegetation had either been killed off or extremely modified by tree growth. Narrow strips of *Molinia*-dominated vegetation still persisted in unplanted ride lines throughout however the vegetation was very species-poor in comparison with intact blanket bog/heath. Underneath the tree canopy the ground was dominated by a thick layer of conifer needles with a sparse layer of mosses such as *Hypnum cupressiforme*, *Sphagnum capillifolium* and *Polytrichum commune*. The structure and composition of this vegetation is outlined in the following table.

Table 2. Vegetation of afforested areas within Emlaghdauroe.

	A	A	A	A	B	B	B
Quadrat code	EW5	EW4	EW6	EW3	E3	E11	E13
GPS Grid letter	L	L	L	L	L	L	L
GPS easting co-ordinate	7519	7512	7528	7496	7538	7591	7577
GPS northing co-ordinate	4998	4998	4998	4995	5009	4968	4951
Quadrat size (m^2)	4	4	4	4	4	4	4
Slope (degrees)	5-10	10-15	5-15	<3	<3	c. 5	20-30
Vegetation cover (%)	5	10	10	30	80	90	95
Bare rock (%)	0	0	0	0	0	0	0
Bare soil (%)	0	0	0	0	20	15	8
Needle litter (%)	95	90	90	80	0	0	0
Dwarf shrub cover (%)	0	0	0	0	0	0	1
Herb cover (%)	0	5	3	3	60	80	90
Bryophyte cover (%)	5	10	10	30	80	80	85
Ht. of vegetation (cm)	<3	<5	<3	<5	30	30	40
No. of species	2	5	5	7	9	12	12
Molinia caerulea		3	3	1	8	9	9
Hypnum cupressiforme	4		4	3	1	4	3
Polytrichum commune	2		3	4	3		4
Sphagnum capillifolium		3		2	8	5	
Rhytidiadelphus loreus				4	3	5	4
Dicranum scoparium		3				3	
Hylocomium splendens			1			7	7
Thuidium tamariscinum		1			3		
Sphagnum palustre			3		5		
Sphagnum subnitens		4					
Plagiothecium undulatum				2			
Dryopteris dilatata				1			3
Pleurozium schreberi					3	5	7
Potentilla erecta						3	3
Liverwort species					1	4	3
Eriophorum vaginatum						3	
Lophocolea cuspidata						1	
Diplophyllum albicans						1	
Agrostis canina							4
Hedera helix							1
Calluna vulgaris							1

A = Species-poor conifer forest ground layer prior to tree felling
B = *Molinia*-dominated vegetation of unplanted ride lines within conifer forestry

The unplanted portion of the site consists of open bog and heath habitat which is generally in good condition. Lowland blanket bog, wet heath and dry/montane heath were recorded from within the site. The dry/montane heath habitat occurring at higher elevations within this site is of considerable ecological

interest due to the scarcity of the habitat on a national basis.

Table 3. Vegetation of open heath and bog area within Emlaghdauroe.

	A	A	A	A	B	B	C	C	D	D	D	
Quadrat code	E1	E12	E6	E2	E14	E10	E5	E7	E8	E4	E9	
GPS Grid letter	L	L	L	L	L	L	L	L	L	L	L	
GPS easting co-ordinate	7535	7582	7573	7535	7564	7596	7565	7604	7620	7563	7626	
GPS northing co-ordinate	5013	4947	4996	5012	4940	4972	5002	4995	4997	5003	4996	
Quadrat size (m^2)	4	4	4	4	4	4	4	4	4	4	4	
Slope (degrees)	0	<3	c. 5	<3	<3	c.30	<3	<3	10-20	c.30	30-45	
Vegetation cover (%)	90	98	90	100	100	100	100	85	98	90	85	
Bare rock (%)	0	0	0	0	0	0	0	3	2	0	5	
Bare soil (%)	10	2	15	0	0	0	1	15	0	15	15	
Open water (%)	0	0	0	0	0	0	0	0	0	0	0	
Dwarf shrub cover (%)	20	15	40	10	25	3	60	40	85	60	70	
Herb cover (%)	60	70	70	75	80	90	35	55	15	60	8	
Bryophyte cover (%)	75	90	60	80	80	40	75	65	80	80	70	
Ht. of vegetation (cm)	10	15	25	30	20	50	15	20	10	20	10	
No. of species	22	18	18	23	17	16	25	20	16	20	16	
Erica tetralix	5	5	4	4	5							
Sphagnum papillosum	5	4		3								
Odontoschisma sphagni	3	3		4								
Sphagnum cuspidatum	7	6			3							
Cladonia portentosa	3		3	3				1				
Campylopus atrovirens	4	3	1					2				
Drosera rotundifolia	4	3	1									
Pleurozia purpurea	4		5					5			1	
Rhynchospora alba	4	7										
Schoenus nigricans	3	4										
Narthecium ossifragum	4	4										
Sphagnum tenellum	4		3									
Calluna vulgaris	4		6	3	3	3	7	6	9	8	8	
Nardus stricta								4		4	3	
Festuca ovina									3	4		
Deschamspia flexuosa										3	3	
Carex binervis									1		1	
Breutelia chrysocoma					1				3			
Molinia caerulea	7	6	7	7	8	9	5	6	4	6		
Potentilla erecta	2		3	4	4	3	4	4	4	3	4	
Hylocomium splendens				5	7	5	8	4	5	5		
Hypnum cupressiforme			4	3		5	5	8	8	6	8	
Trichophorum cespitosum	5	3	5	3			4	5	3	3		
Agrostis canina				3	3	5	3	1	3	4	1	
Eriophorum angustifolium	2	3	1	3	3		4	3				
Rhytidiadelphus loreus				2	3	1	3	3	4	1		
Polygala serpyllifolia		1	2	1	2		1			1	1	
Erica cinerea			3				5	5	4	4	5	
Sphagnum capillifolium			5	8	6		4			6		
Pleurozium schreberi				4	5		6		4	1		
Carex panicea			2				3	3		3		
Racomitrium lanuginosum	3		3					3			4	
Cladonia uncialis	1		3					3			4	
Juncus bulbosus				1		1	1					
Polytrichum commune	1			4								
Eriophorum vaginatum	3				5							
Juncus effusus				5		1						
Thuidium tamariscinum				5			1					
Daboecia cantabrica					4				3			
Dicranum scoparium					4				1			
Liverwort species					3	1						
Carex piluifera							3			4		
Anthoxanthum odoratum						1	1					
Frullania tamarisci							3	3				
Huperzia selago								1			1	
Juncus articulatus								1		1		
Blechnum spicant						3				1		
Pinus contorta seedling	1											
Sphagnum auriculatum		8										
Eleocharis multicaulis		4										
Utricularia intermedia		4										

Pinguicula vulgaris	3							
Pedicularis sylvatica	1							
Sphagnum palustre		4						
Carex echinata		3						
Dryopteris dilatata		1						
Galium saxatile			4					
Juncus conglomeratus			3					
Rhytidiadelphus squarrosus			3					
Holcus lanatus			1					
Juncus squarrosus				4				
Diplophyllum albicans				3				
Luzula multiflora				1				
Sorbus aucuparia				1				
Hedera helix				1				
Vaccinium myrtillus					1			
Festuca vivipara						4		
Juniperus communis							3	
Cladonia sp.							3	
Solidago virgaurea							1	

A = Lowland blanket bog

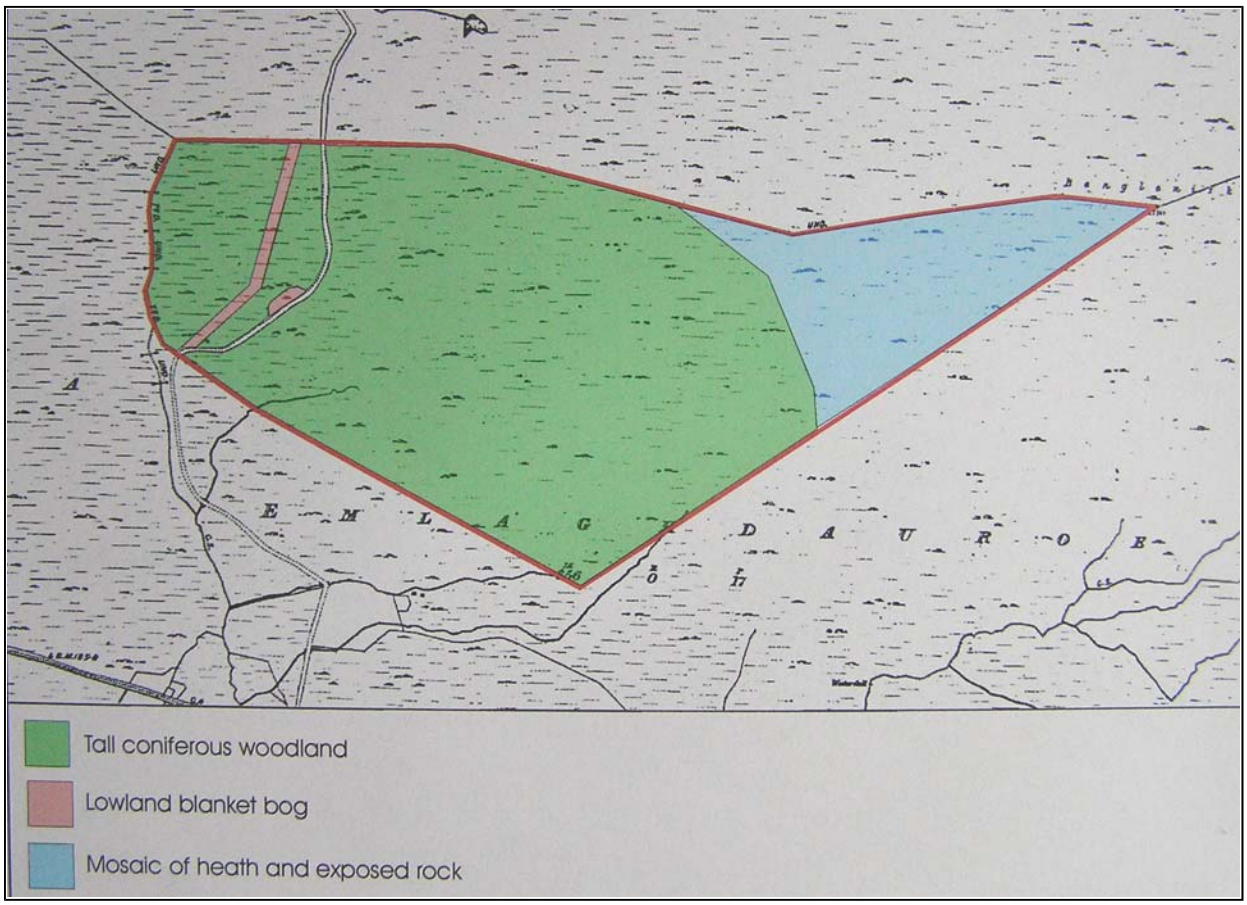
B = Wet heath dominated by *Molinia caerulea.*

C = Moss-rich dry heath.

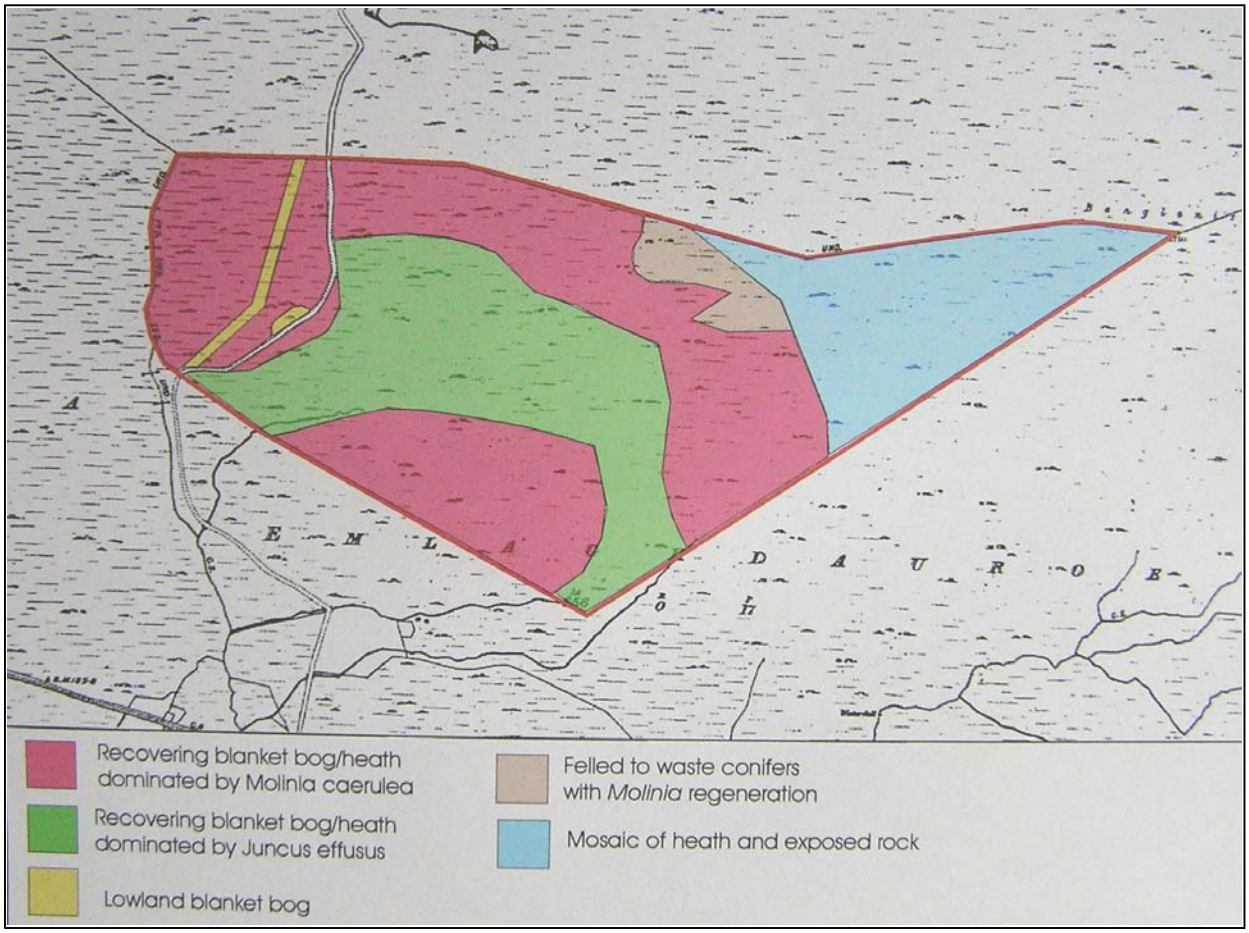
D = *Calluna*-dominated dry heath.

5. Changes in overall vegetation/habitat cover

The main change within this site is the removal of an extensive crop of tall conifers, dominated by lodgepole pine, and its replacement with regenerating blanket bog vegetation. The recolonization of blanket bog vegetation at this site is a relatively slow process due to the fact that the heavy crop of trees had largely killed off the native bog flora. A feature of this site is the extensive development of vegetation dominated by *Juncus effusus* in areas which are sloping and/or subject to flushing by flowing surface waters. In the remainder of the area *Molinia caerulea* and the moss *Hypnum cupressiforme* are the main regenerating plant species.



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



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

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 9 permanent quadrats were described and photographed at this site. In the case of each quadrat photographs and vegetation tables are presented. 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. 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

The rate of recolonization of open ground by peatland vegetation at this site is variable. A feature of the site is the spectacular recolonization of *Juncus effusus*, particularly in areas which are either sloping or are influenced by flushing surface water, e.g. permanent quadrat No. 2. This dominance by *Juncus effusus* is not a natural situation for blanket bog habitats and the widespread cover of this species, and the low-growing *Juncus bulbosus*, is not desireable. However, it is likely that the cover of *J. effusus* will decline over the following years as the peat gets progressively poorer in nutrients. The future monitoring of the permanent quadrats will reveal much important information regarding the persistence of *Juncus effusus* in recently clearfelled areas of blanket bog forestry.

In the flatter, drier areas of the site the recolonization of vegetation has been much slower with mosses, e.g. *Hypnum cupressiforme, Polytrichum commune* and *Campylopus* sp. usually dominating the low-growing vegetation along with a sparse cover of blanket bog species such as *Molinia caerulea*, *Calluna vulgaris* and *Potentilla erecta*.

Permanent quadrat 1 – July 2003

Permanent quadrat 1 – July 2006

Site - Emlaghdauroe			
Code - PQ1			
GPS - L 74963 49755			
Near Walrag? - Walrag 7			
Size (m) - 8x8			
Slope (Degrees) - <3			
Vegetation cover (%)	5	5	50
Dwarf shrub cover (%)	0	1	3
Herb cover (%)	2	1	10
Bryophyte cover (%)	5	3	50
Needle litter cover (%)	40	40	10
Brash cover (%)	60	60	40
No of species present	10	15	19
Date of survey	29/7/03	8/7/04	27/7/06
Hypnum cupressiforme	2	2	4
Dryopteris dilatata	1	1	3
Polytrichum sp.	1	1	4
Luzula multiflora	1	1	1
Hylocomium splendens	1	1	1
Potentilla erecta	1	1	1
Pinus contorta seedlings	2 (>150)	1 (19 counted)	-
Thuidium tamariscinum	2	-	1
Sphagnum capillifolium	1	-	2
Rhytidiadelphus loreus	1	1	-
Campylopus introflexus		2	3
Molinia caerulea		1	2
Carex echinata		1	1
Leucobryum glaucum		1	1
Sphagnum subnitens		1	-
Hedera helix		1	-
Erica cinerea		1	-
Calluna vulgaris			2
Juncus bulbosus			2
Erica tetralix			1
Agrostis canina			1
Juncus effusus			1
Dryopteris sp.			1
Plagiothecium undulatum			1

History – Previously dominated by a Lodgepole pine plantation planted in the mid-1970's. Trees were generally between 8 and 10 metres tall. Ground vegetation dominated by pine needles with scattered mosses (mainly *Hypnum cupressiforme*). Trees felled and removed for sale in summer of 2003. Approximately half of quadrat is dominated by a thick brash mat.

Permanent quadrat 2 – July 2003

Permanent quadrat 2 – July 2006

Site - Emlaghdauroe			
Code - PQ2			
GPS - L 75071 49749			
Near Walrag? - Walrag 8			
Size (m) - 8x8			
Slope (Degrees) - 0			
Vegetation cover (%)	10	40	95
Dwarf shrub cover (%)	0	1	1
Herb cover (%)	2	15	80
Bryophyte cover (%)	10	30	60
Needle litter cover (%)	75	40	0
Brash cover (%)	20	20	5
Water cover (%)	5 (in shallow drains)	0	0
No. of species present	9	17	19
Date of survey	29/7/03	8/7/04	27/7/06
Hypnum cupressiforme	3	4	3
Sphagnum palustre	2	2	2
Juncus bulbosus	1	3	5
Sphagnum capillifolium	1	3	3
Thuidium tamariscinum	1	2	-
Pinus contorta seedlings	1 (c. 120 present)	1 (7 counted)	-
Plagiothecium undulatum	1	1	-
Rhytidiadelphus loreus	1	1	2
Potentilla erecta	1	1	1
Campylopus sp.		3	4
Juncus effusus		2	6
Polytrichum commune		2	5
Sphagnum subnitens		2	1
Agrostis canina		1	3
Molinia caerulea		1	2
Epilobium sp.		1	1
Juncus articulatus		1	-
Eriophorum angustifolium			2
Salix seedling			1
Calluna vulgaris			1
Dryopteris dilatata			1
Erica tetralix			1
Carex echinata			1

story – Previously dominated by tall Sitka spruce planted in the mid-1970's. Trees were generally between 10 and 12 metres tall. Ground vegetation dominated by conifer needles with scattered mosses (mainly *Hypnum cupressiforme*). Trees felled and removed for sale in summer of 2003. Approximately 20% of quadrat is dominated by a brash mat.

Permanent quadrat 3 – July 2003

Permanent quadrat 3 – July 2006

Site - Emlaghdauroe			
Code - PQ3			
GPS - L 75138 49680			
Near Walrag? - Walrag 9			
Size (m) - 8x8			
Slope (Degrees) - 5-10			
Vegetation cover (%)	30	30	75
Dwarf shrub cover (%)	0	1	3
Herb cover (%)	15	12	40
Bryophyte cover (%)	15	25	65
Needle litter cover (%)	60	60	3
Brash cover (%)	5	10	5
Water cover (%)	3 (in shallow drains)	5	5
No of species present	16	15	21
Date of survey	29/7/03	8/7/04	27/7/06
Molinia caerulea	3	3	5
Hypnum cupressiforme	3	3	3
Sphagnum capillifolium	2	2	2
Polytrichum commune	2	2	4
Drypopteris dilatata	1	1	2
Plagiothecium undulatum	1	1	1
Potentilla erecta	1	1	1
Sphagnum palustre	1	-	3
Hylocomium splendens	2	2	-
Rhytidiadelphus loreus	1	2	-
Breutelia chrysocoma	1	-	-
Pleurozium schreberi	1	-	-
Thuidium tamariscinum	1	-	-
Dicranum scoparium	1	-	-
Diplophyllum albicans	1	-	-
Pinus contorta seedlings	1	1 (5 counted)	-
Campylopus sp.		3	5
Calluna vulgaris		1	2
Juncus bulbosus		1	3
Agrostis sp.		1	1
Pteridium aquilinum		1	-
Juncus effusus			2
Sphagnum cuspidatum			2
Erica tetralix			1
Salix seedling			1
Carex echinata			1
Sphagnum subnitens			1
Rubus fruticosus			1
Carex panicea			1
Rhynchospora alba			1

– Previously dominated by Lodgepole pine planted in the mid-1970's. Trees were generally between 8 and 10 metres tall. Ground vegetation dominated by pine needles with scattered mosses

Hypnum cupressiforme). Trees felled and removed for sale in summer of 2003. Drains were blocked by machine in early 2004.

Permanent quadrat 4 – July 2003

No July 2006 photograph available

Site - Emlaghdauroe			
Code - PQ4			
GPS - L 75217 49651			
Near Walrag? - No			
Size (m) - 8x8			
Slope (Degrees) - 5-10			
Vegetation cover (%)	7	7	60
Dwarf shrub cover (%)	0	1	5
Herb cover (%)	2	3	15
Bryophyte cover (%)	7	5	40
Needle litter cover (%)	50	50	5
Brash cover (%)	50	45	35
No of species present	10	13	21
Date of survey	29/7/03	8/7/04	27/7/06
Hypnum cupressiforme	3	3	3
Molinia caerulea	2	2	3
Sphagnum capillifolium	1	1	3
Blechnum spicant	1	1	1
Drypopteris dilatata	1	1	2
Polytrichum commune	1	-	3
Thuidium tamariscinum	1	1	-
Pinus contorta seedlings	1	1 (5 counted)	-
Plagiothecium undulatum	1	-	-
Diplophyllum albicans	1	-	-
Hylocomium splendens		1	-
Campylopus sp.		2	3
Calluna vulgaris		1	2
Luzula multiflora		1	1
Potentilla erecta		1	1
Rhytidiadelphus loreus		1	1
Sphagnum cuspidatum			3
Juncus bulbosus			2
Juncus effusus			1
Erica tetralix			1
Betula pubescens seedlings			1
Erica cinerea			1
Salix sp. seedlings			1
Sphagnum palustre			1
Sphagnum papillosum			1
Pleurozium schreberi			1

– Previously dominated by Lodgepole pine planted in 1975. Trees were generally between 8 and 10 metres tall. Ground vegetation dominated by pine needles with scattered mosses (mainly *Hypnum cupressiforme*). Trees felled and removed for sale in summer of 2003. Drains were blocked by machine in early 2004. Approx. 50% of quadrat is dominated by a thick brash mat.

Permanent quadrat 5 – July 2003

Permanent quadrat 5 – July 2006

Site - Emlaghdauroe			
Code - PQ5			
GPS - L 75183 49981			
Near Walrag? - 5			
Size (m) - 8x8			
Slope (Degrees) – 5 to 10			
Vegetation cover (%)	25	35	80
Dwarf shrub cover (%)	0	1	5
Herb cover (%)	15	15	35
Bryophyte cover (%)	10	20	80
Needle litter cover (%)	60	50	5
Brash cover (%)	15	5	3
Water cover (%)	0	0	0
No of species present	13	16	22
Date of survey	29/7/03	8/7/04	27/7/06
Molinia caerulea	3	3	4
Hypnum cupressiforme	2	3	4
Sphagnum capillifolium	2	2	3
Polytrichum sp.	2	2	5
Rhytidiadelphus loreus	1	2	2
Sphagnum palustre	1	1	2
Dryopteris dilatata	1	1	1
Potentilla erecta	1	1	1
Pseudoscleropodium purum	1	-	1
Thuidium tamariscinum	2	2	-
Sphagnum subnitens	1	1	-
Dicranum scoparium	1	-	-
Leucobryum glaucum	1	-	-
Hylocomium splendens		2	1
Calluna vulgaris		1	2
Agrostis spp.		1	1
Pinus contorta (Seedlings)		1 (3 counted)	-
Pleurozium schreberi		1	-
Aulocomium palustris		1	-
Juncus bulbosus			3
Campylopus sp.			2
Juncus planifolius			1
Erica cinerea			1
Juncus squarrosus			1
Salix sp.			1
Juncus effusus			1
Carex echinata			1
Erica tetralix			1
Eriophorum angustifolium			1

– Previously dominated by a Lodgepole pine crop planted in the mid-1970's. Trees were generally between 8 and 10 metres tall. Ground vegetation dominated by pine needles with scattered mosses (mainly *Hypnum cupressiforme*). Trees felled and removed for sale in summer of 2003.

Permanent quadrat 6 – July 2004

Permanent quadrat 6 – July 2006

Site - Emlaghdauroe		
Code – PQ6		
GPS - L 75149 49720		
Near Walrag? - No		
Size (m) - 8x8		
Slope (Degrees) – 0		
Vegetation cover (%)	30	>95
Dwarf shrub cover (%)	0	0
Herb cover (%)	25	95
Bryophyte cover (%)	10	10
Needle litter cover (%)	15	0
Peaty mud cover (%)	70	5
Water cover (%)	10	0
No of species present	11	5
Date of survey	8/7/04	27/7/06
Juncus effusus	4	7
Hypnum cupressiforme	2	-
Juncus bulbosus	2	2
Campylopus sp.	2	2
Polytrichum commune	2	2
Plagiothecium undulatum	2	-
Agrostis canina	1	-
Juncus articulatus	1	-
Rubus fruticosus	1	-
Callitriche sp.	1	1
Pinus contorta (Seedlings)	1 (3 counted)	-

- Previously dominated by Sitka spruce planted in the mid-1970's. Trees were generally between 8 and 10 metres tall. Ground vegetation dominated by pine needles with scattered mosses (mainly *Hypnum cupressiforme*). Trees felled and removed for sale in summer of 2003. The area is flushed by water from higher ground to the east and much of the ground is covered by peaty mud.

Permanent quadrat 7 – July 2004

Permanent quadrat 7 – July 2006

Site - Emlaghdauroe		
Code – PQ7		
GPS - L 75374 49987		
Near Walrag? - No		
Size (m) - 8x8		
Slope (Degrees) – 10-20		
Vegetation cover (%)	<3	20
Dwarf shrub cover (%)	0	0
Herb cover (%)	1	10
Bryophyte cover (%)	2	15
Needle litter cover (%)	10	5
Felled conifer cover (%)	100	90
No of species present	2	11
Date of survey	8/7/04	27/7/06
Hypnum cupressiforme	2	3
Dryopteris dilatata	1	2
Molinia caerulea		3
Polytrichum commune		2
Sphagnum palustre		2
Plagiothecium undulatum		2
Campylopus sp.		2
Pteridium aquilinum		2
Juncus bulbosus		1
Juncus effusus		1
Blechnum spicant		1

History – Previously dominated by lodgepole planted in the mid-1970's. Trees were generally between 6 and 8 metres tall. Ground vegetation dominated by pine needles with scattered mosses (mainly *Hypnum cupressiforme*). Trees were felled to waste and left in-situ in early 2004.

Permanent quadrat 8 – Sept 2005

Permanent quadrat 8 – Sept 2006

Site - Emlaghdauroe		
Code – PQ8		
GPS - L 74909 49921		
Near Walrag? - No		
Size (m) – 7 x 7		
Slope (Degrees) – <3		
Vegetation cover (%)	50	70
Dwarf shrub cover (%)	5	5
Herb cover (%)	25	35
Bryophyte cover (%)	40	50
Needle litter cover (%)	30	10
Brash cover (%)	20	20
Bare peat cover (%)	5	3
Surface water cover (%)	5	5
No of species present	17	18
Date of survey	20/9/05	27/7/06
Polytrichum commune	4	5
Hypnum cupressiforme	4	4
Liverwort species	3	3
Juncus effusus	3	3
Campylopus spp.	3	3
Juncus bulbosus	3	3
Molinia caerulea	3	2
Calluna vulgaris	2	2
Carex echinata	2	2
Potentilla erecta	2	1
Plagiothecium undulatum	2	-
Sphagnum palustre	2	2
Thuidium tamariscinum	2	1
Dryopteris dilatata	1	1
Salix seedlings	1	1
Sphagnum cuspidatum	1	2
Pinus contorta (Seedlings)	1 (2 counted)	-
Erica tetralix		1
Epilobium sp.		1
Agrostis capillaris		1

History – Previously dominated by Lodgepole pine planted in the mid-1970's. Trees were generally between 8 and 10 metres tall. Ground vegetation dominated by pine needles with scattered mosses (mainly *Hypnum cupressiforme*). Trees felled and removed for sale in early 2004. Quadrat located a few metres west of the boardwalk. Drains have been blocked with plastic piling and the area is quite wet.

Permanent Quadrat 9 – Sept 2005

Permanent Quadrat 9 – Sept 2006

Site - Emlaghdauroe		
Code – PQ9		
GPS - L 74944 50032		
Near Walrag? - No		
Size (m) – 6x6		
Slope (Degrees) – <3		
Vegetation cover (%)	10	15
Dwarf shrub cover (%)	0	0
Herb cover (%)	1	3
Bryophyte cover (%)	10	15
Needle litter cover (%)	0	0
Brash cover (%)	95	90
Bare peat cover (%)	0	0
Surface water cover (%)	0	0
No of species present	5	10
Date of survey	20/9/05	27/7/06
Hypnum cupressiforme	3	4
Polytrichum commune	2	1
Dryopteris dilatata	1	1
Molinia caerulea	1	1
Plagiothecium undulatum	1	1
Juncus effusus		1
Thuidium tamariscinum		1
Agrostis capillaris		1
Sphagnum capillifolium		1
Sphagnum palustre		1

reviously dominated by Lodgepole pine planted in the mid-1970's. Trees were generally ween 8 and 10 metres tall. Ground vegetation dominated by pine needles with scattered sses (mainly *Hypnum cupressiforme*). Trees felled and removed for sale in early 2004. adrat dominated by a brash mat used for timber extraction.

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