

RESTORING ACTIVE BLANKET BOG IN IRELAND

Project reference: LIFE02NAT/IRL/8490

A REPORT ON THE RESTORATION OF PROJECT SITE No. 7 ESKERAGH,
CO. MAYO



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Project Site Nos 7 & 8 – Eskeragh, Co. Mayo (Demonstration site)**1. Introduction**

Grid reference G 050 180	Elevation (m) 55 to 67	Bedrock geology Sandstone
SAC Name and number Bellacorrick Bog Complex (1922)	Site area (ha) 40.6	Main restoration methods Fell to waste of conifer crop, chipping, wind-rowing and drain-blocking.
Area of conifer cover (ha) 37.4	Area of open bog (ha) 3.2	
Noteworthy plant/animal species occurring on site <i>Vaccinium oxycoccus</i>		

Eskeragh is located just south of the main Ballina to Belmullet road, approximately 10 kilometres west of Crossmolina, Co. Mayo. The site occurs in two parts one covering an area of 12.3 hectares (eastern section) with the other covering an area of 28.3 hectares (western section). These forestry-dominated sites lie within the extensive Bellacorrick Bog Complex Special Area of Conservation which is one of the finest examples of a relatively intact lowland blanket bog landscape in Ireland. The SAC is notable for the widespread occurrence of flush and fen vegetation, derived from mineral-rich groundwater seepage areas, which support a range of rare vascular plant and moss species. The Owenboy Nature Reserve lies to the south of the larger forestry sub-site at Eskeragh. The majority of the land within this site is planted however there are also small areas of open blanket bog with pool systems within the larger of the two sub-sites. Throughout most of the afforested areas the coniferous trees have grown poorly and, as a result, the bog vegetation is still present and many drains have infilled with a luxuriant cover of *Sphagnum* moss.

At this site a range of restoration measures were undertaken. The main work involved the manual felling of the conifer crop with chainsaws and the subsequent blocking of any significant artificial drains with plastic piling. On the western section of the site these felled areas were wind-rowed by machine. In addition c. 8 hectares of felled conifers were chipped in the western section of the 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. Site 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 general view of vegetation on the site prior to the start of restoration activities. Note the stunted nature of the conifers and the high cover of *Calluna vulgaris*. Photograph taken in September 2003.



A view of chipped conifers in the west of the site. Note the very clean appearance of the bog surface following chipping. Photograph taken in September 2003.



In the western portion of this site the conifer crop was windrowed after felling in order to produce a tidy bog surface. Note the strong regeneration of *Molinia* between the windrows. Photograph taken in August 2004.



A general view of the western half of the site looking towards the west showing windrowed conifers and regenerating bog vegetation (mostly *Molinia* and *Calluna*). Photograph taken in August 2006.



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



An aerial photograph of the Eskeragh site following restoration activities. Site outline in red. Aerial photograph taken in the year 2004.

4. Vegetation of the site

Prior to the onset of restoration work the vegetation of this site consisted of young/low-yielding conifers planted on lowland blanket bog. These conifers were planted in 1990 and comprised various mixtures of lodgepole pine and Sitka spruce which had generally not grown well. By 2003 the conifer crop had generally attained a height of between 3 and 6 metres with the lodgepole pine much taller than the stunted Sitka spruce. The ground vegetation of the site (see following table) was dominated by varying mixtures of *Calluna vulgaris* and *Molinia caerulea* with *Hypnum cupressiforme*, *Erica tetralix* and *Potentilla erecta* also conspicuous. This dominance of *Molinia* and *Calluna* was caused by the drainage of the blanket peat. In the western subsite there is low hill which has a relatively shallow peat depth, i.e. <1.5 metres, and in this area the natural vegetation consists of heath dominated by *Calluna vulgaris*. Areas of intact, undrained bog tend to be dominated by species such as *Schoenus nigricans*, *Narthecium ossifragum*, *Eriophorum angustifolium*, *Erica tetralix* and the moss *Sphagnum capillifolium*. These small intact areas also contain pools which are colonised by *Sphagnum cuspidatum*, *Eriophorum angustifolium*, *Menyanthes trifoliata* and *Carex limosa* (see following picture).



At Eskeragh there are a small number of open bog areas which contain bog pools. This one is dominated by the aquatic bog moss *Sphagnum cuspidatum*.

Table 2. Vegetation at Eskeragh

Vegetation type	A	B	B	B	B	B	B	B	C	C	
Quadrat code	EW3	EW1	EW2	EW5	EW6?	EW7	EW8	EW9	EW10	EW4	
Quadrat size (m ²)	4	3	4	3	4	4	4	4	4	4	
Slope (degrees)	0	0-3	0	0	0	0	0	0	0	0	
Vegetation cover (%)	100	100	100	100	100	100	100	100	100	98	
Bare rock (%)	0	0	0	0	0	0	0	0	0	0	
Bare soil (%)	0	0	0	0	0	0	0	0	0	2	
Open water (%)	0	0	0	0	0	0	0	0	0	0	
Dwarf shrub cover (%)	60	80	60	65	65	90	70	70	35	30	
Herb cover (%)	85	20	50	35	35	25	25	30	55	50	
Bryophyte cover (%)	8	60	90	60	60	60	60	60	85	90	
Ht. of vegetation (cm)	60	35	30	30	40	50	30	35	20	15	
No. of species	11	9	10	8	10	7	9	11	12	18	
<i>Schoenus nigricans</i>									5	6	
<i>Narthecium ossifragum</i>									6	5	
<i>Eriophorum angustifolium</i>							1		5	3	
<i>Eriophorum vaginatum</i>									4	4	
<i>Rhynchospora alba</i>									4	3	
<i>Sphagnum tenellum</i>									4	3	
<i>Drosera rotundifolia</i>									2	1	
<i>Calluna vulgaris</i>		9	8	8	8	8	8	8	5	5	
<i>Molinia caerulea</i>	8	5	7	6	7	5	5	6			
<i>Erica tetralix</i>	2	3	4		3	2	3	4	5	4	
<i>Hypnum cupressiforme</i>		8	8	6	7	6	5	7		1	
<i>Sphagnum capillifolium</i>		4		4	4		6	5	4	7	
<i>Cladonia portentosa</i>		2	4	5	3		5	4		4	
<i>Potentilla erecta</i>		3	4	4	3	3	2	2			
<i>Picea sitchensis</i>			4		2		2	1			
<i>Pleurozium schreberi</i>			4		4			4			
<i>Succisa pratensis</i>	3		2								
<i>Myrica gale</i>	8					5					
<i>Pseudoscleropodium purum</i>	4		4								
<i>Hylocomium splendens</i>		4				6					
<i>Peltigera sp.</i>		1						1			
<i>Juncus effusus</i>	5										
<i>Holcus lanatus</i>	4										
<i>Agrostis stolonifera</i>	4										
<i>Carex rostrata</i>	4										
<i>Epilobium sp.</i>	2										
<i>Rhytidiadelphus squarrosus</i>	3										
<i>Erica cinerea</i>				5							
<i>Campylopus introflexus</i>					3						
<i>Odontoschisma sphagni</i>								1			
<i>Sphagnum papillosum</i>									8		
<i>Menyanthes trifoliata</i>									4		
<i>Pleurozia purpurea</i>										8	
<i>Trichophorum cespitosum</i>										4	
<i>Carex panicea</i>										4	
<i>Campylopus atrovirens</i>										3	
<i>Cladonia uncialis</i>										1	
<i>Sphagnum subnitens</i>										1	

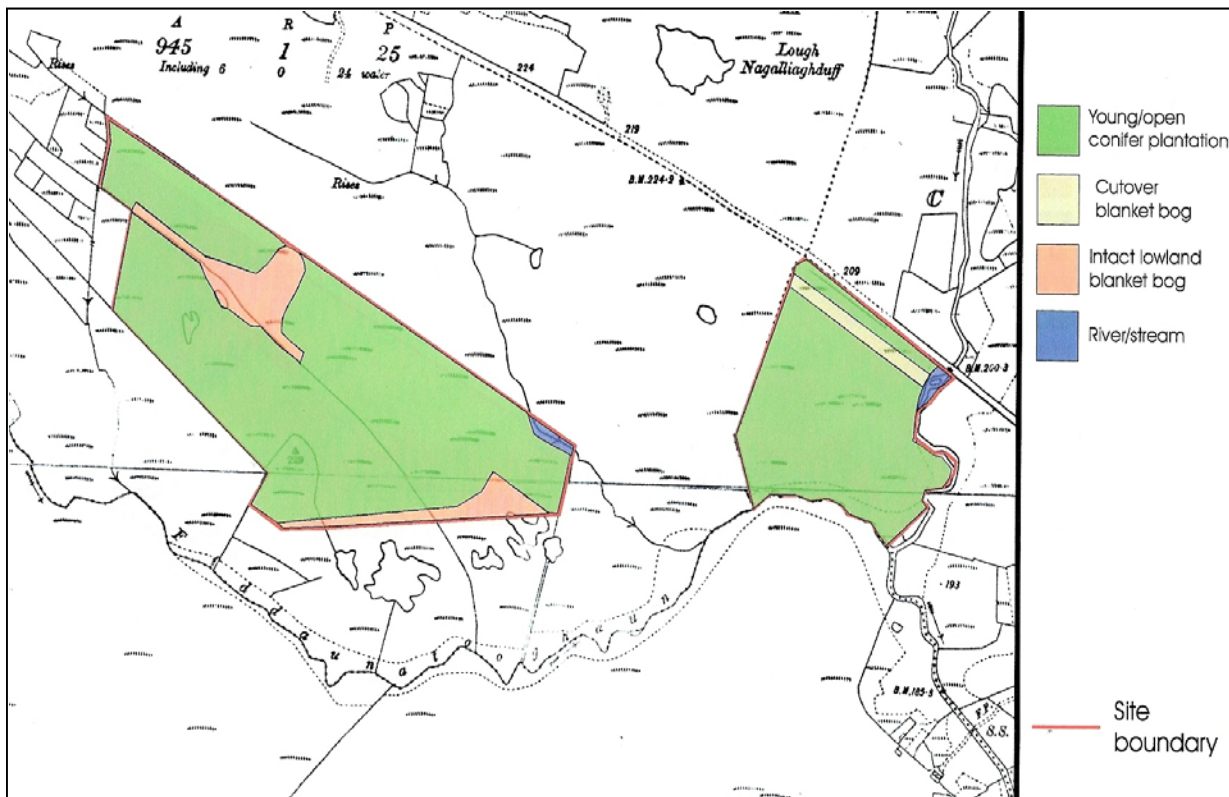
A = Flushed blanket bog dominated by *Myrica gale*

B = Drained blanket bog dominated by *Calluna vulgaris* and *Molinia caerulea*

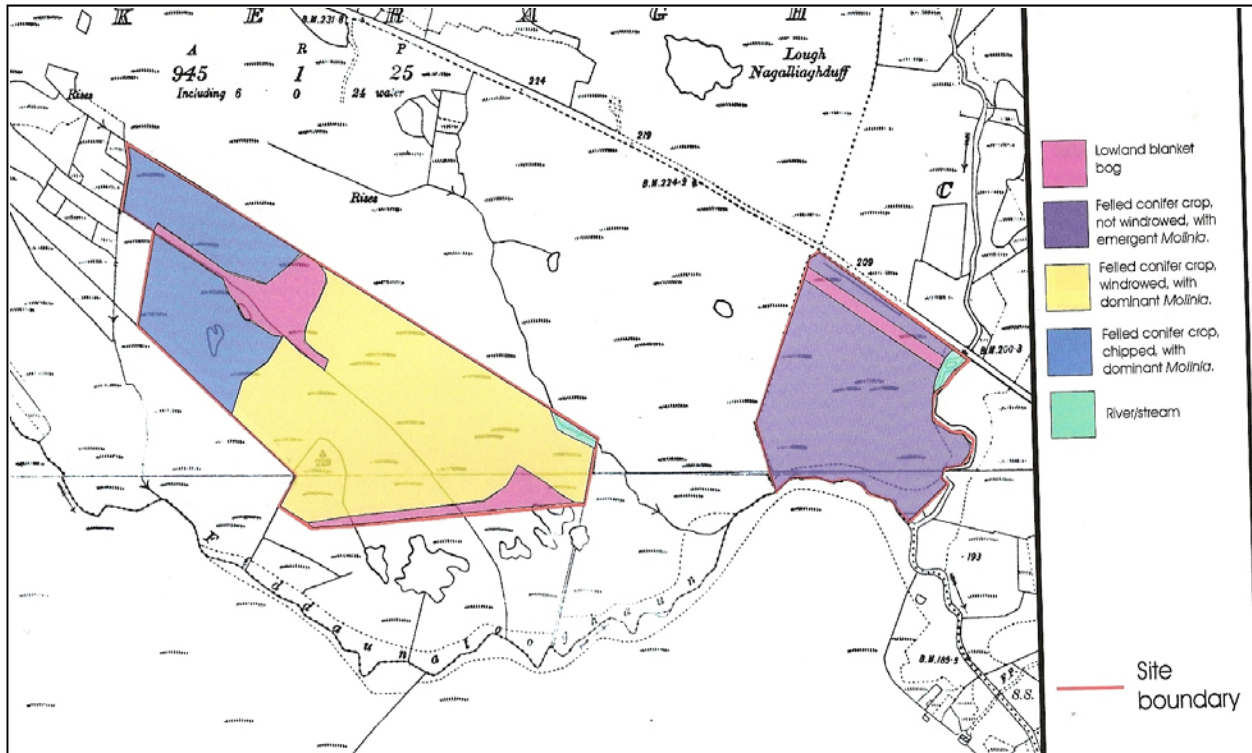
C = Intact lowland blanket bog

5. Changes in overall vegetation/habitat cover

In common with many sites within the project most of Eskeragh is now dominated by regenerating blanket bog vegetation in which *Molinia caerulea* is the dominant species. *Calluna vulgaris* is also frequent, especially on the low hillock with a relatively shallow peat cover. Windrows of felled conifers are frequent in the western sub-site while felled conifers with emergent *Molinia*, dominate the eastern sub-site. In the northern half of the eastern subsite there are numerous shrubs of willow (*Salix* sp.) and downy birch (*Betula pubescens*) present on the bog surface. Many of these shrubs were present prior to the start of the project and have persisted in spite of repeated attempts at clearance. Whilst these shrubs are only occasional at the present time there is a possibility that shrub cover will spread in the future. As these shrubs are largely confined to old cutover areas close to the road it is suggested that developing a small area (c. 2 ha) of the site as bog woodland should be considered.



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



A map of habitat/vegetation cover at Eskeragh at the end of project.

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 6 permanent quadrats were described and photographed. 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. 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 main vegetation change since the start of the project has been the increase in the cover of *Molinia* in most of the permanent quadrats. This increase in cover is particularly pronounced in permanent

quadrats No. 1 and 4 where the species has attained almost 90% cover within three years. Other species which have expanded since the felling of conifers include *Sphagnum capillifolium*, *Campylopus introflexus* and *Polytrichum commune*. On the knoll which dominates the western subsite there has been a spectacular increase in the cover of *Calluna vulgaris*. This is probably due to the shallower peat cover in this part of the site.



Quadrat 1 – September 2003



Quadrat 1 – September 2006

Site - Eskeragh			
Code - PQ1			
GPS – G 04803 18319			
Near Walrag? - No			
Size (m) – 8x8			
Slope (Degrees) – 1-3			
Vegetation cover (%)	50	80	95
Dwarf shrub cover (%)	3	8	10
Herb cover (%)	15	50	70
Bryophyte cover (%)	35	50	60
Needle litter cover (%)	10	10	<3
Brush and wood chips cover (%)	30	10	5
No of species present	15	22	23
Date of survey	2/9/03	20/8/04	14/8/06
<i>Molinia caerulea</i>	4	6	6
<i>Sphagnum capillifolium</i>	4	4	5
<i>Hypnum cupressiforme</i>	3	4	4
<i>Calluna vulgaris</i>	2	2	3
<i>Sphagnum palustre</i>	2	2	3
<i>Cladonia portentosa</i>	2	2	2
<i>Potentilla erecta</i>	1	2	2
<i>Dicranum scoparium</i>	1	1	1
<i>Myrica gale</i>	1	1	1
<i>Rhytidiadelphus loreus</i>	1	1	-
<i>Campylopus introflexus</i>	1	1	3
<i>Salix aurita</i>	1	1	1
<i>Pinus contorta</i> seedling	1	1	-
<i>Diplophyllum albicans</i>	1	-	1
<i>Eurhynchium praelongum</i>	1	-	-
<i>Polytrichum</i> sp.		2	3
<i>Sphagnum papillosum</i>		2	2
<i>Aulacomium palustre</i>		1	1
<i>Erica tetralix</i>		1	2
<i>Hylocomium splendens</i>		1	-
<i>Dryopteris dilatata</i>		1	-
<i>Peltigera</i> sp.		1	1
<i>Juncus</i> spp.		1	-
<i>Epilobium angustifolium</i>		1	-
<i>Cladonia</i> sp.			1
<i>Rubus fruticosus</i>			1
<i>Rhytidiadelphus squarrosus</i>			1
<i>Plagiothecium undulatum</i>			1
<i>Juncus effusus</i>			1
<i>Sphagnum cuspidatum</i>			1
History – Previously dominated by a young Lodgepole pine plantation planted in 1990. Trees were generally between 4 and 6 metres tall. Trees felled in the summer of 2003 and trees in this area were chipped.			



Quadrat 2 – September 2003



Quadrat 2 – August 2006

Site - Eskeragh			
Code - PQ2			
GPS - G 04777 18350			
Near Walrag? - No			
Size (m) - 7x7			
Slope (Degrees) - 1-3			
Vegetation cover (%)	70	80	90
Dwarf shrub cover (%)	20	30	40
Herb cover (%)	20	35	35
Bryophyte cover (%)	60	60	60
Needle litter cover (%)	10	5	<3
Brash cover (%)	20	15	10
Water cover (%)	0	5	0
No of species present	24	27	30
Date of survey	2/9/03	20/8/04	14/8/06
<i>Hypnum cupressiforme</i>	5	5	4
<i>Sphagnum capillifolium</i>	4	4	5
<i>Molinia caerulea</i>	4	4	5
<i>Myrica gale</i>	4	4	4
<i>Calluna vulgaris</i>	3	4	5
<i>Sphagnum palustre</i>	3	3	-
<i>Campylopus introflexus</i>	3	3	1
<i>Dicranum scoparium</i>	2	2	2
<i>Pseudoscleropodium purum</i>	2	1	1
<i>Pleurozium schreberi</i>	2	3	3
<i>Potentilla erecta</i>	2	3	3
<i>Rhytiadelphus loreus</i>	2	3	2
<i>Eriophorum vaginatum</i>	2	2	3
<i>Cladonia portentosa</i>	2	2	2
<i>Aulacomium palustris</i>	2	-	1
<i>Peltigera</i> sp.	1	2	-
<i>Juncus bulbosus</i>	1	2	1
<i>Dryopteris dilatata</i>	1	1	1
<i>Rubus fruticosus</i>	1	1	1
<i>Erica tetralix</i>	1	2	2
<i>Rhytiadelphus squarrosus</i>	1	-	1
<i>Pinus contorta</i> seedlings	1	1 (3 counted)	1 (1 counted)
<i>Sorbus aucuparia</i>	1	1	1
<i>Luzula multiflora</i>	1	-	-
<i>Epilobium angustifolium</i>		1	3
<i>Polytrichum</i> sp.		2	3
<i>Eriophorum angustifolium</i>		1	2
<i>Epilobium</i> sp.		1	1
<i>Sphagnum cuspidatum</i>		1	-
<i>Sphagnum papillosum</i>		1	1
<i>Agrostis canina</i>			3
<i>Juncus effusus</i>			2
<i>Anthoxanthum odoratum</i>			1
<i>Rumex acetosella</i>			1
History – Previously dominated by a young Lodgepole pine plantation planted in 1990. Trees			

were generally between 4 and 6 metres tall. Ground vegetation dominated by a bog vegetation in which *Molinia* was dominant. Trees felled in the summer of 2003 and trees in this area were chipped. Drains blocked at the beginning of 2004.



Quadrat 3 – September 2003

No 2006 photograph available

Site - Eskeragh		
Code - PQ3		
GPS - G 05016 18009		
Near Walrag? - No		
Size (m) - 7x7		
Slope (Degrees) - 0, but undulating		
Vegetation cover (%)	40 +	90
Dwarf shrub cover (%)	25	80
Herb cover (%)	20	25
Bryophyte cover (%)	30	40
Needle litter cover (%)	0	0
Felled tree cover (%)	60	20
Water cover (%)	0	0
No of species present	11	14
Date of survey	2/9/03	14/8/06
<i>Calluna vulgaris</i>	5	6
<i>Hypnum cupressiforme</i>	4	4
<i>Molinia caerulea</i>	4	4
<i>Sphagnum capillifolium</i>	4	4
<i>Pleurozium schreberi</i>	2	2
<i>Hylocomium splendens</i>	2	2
<i>Rhytidiadelphus loreus</i>	2	2
<i>Eriophorum vaginatum</i>	2	2
<i>Cladonia portentosa</i>	2	1
<i>Thuidium tamariscinum</i>	1	1
<i>Potentilla erecta</i>	1	1
<i>Dicranum scoparium</i>		1
<i>Erica tetralix</i>		1
<i>Plagithecium undulatum</i>		1

History – Previously dominated by a young Lodgepole pine plantation planted in 1990. Trees were generally between 6 and 8 metres tall. Ground vegetation dominated by vegetation in which *Calluna vulgaris* was dominant. Trees felled in the summer of 2003 and subsequently windrowed. Peat in area <1 metre in depth.



Quadrat 4 – August 2004

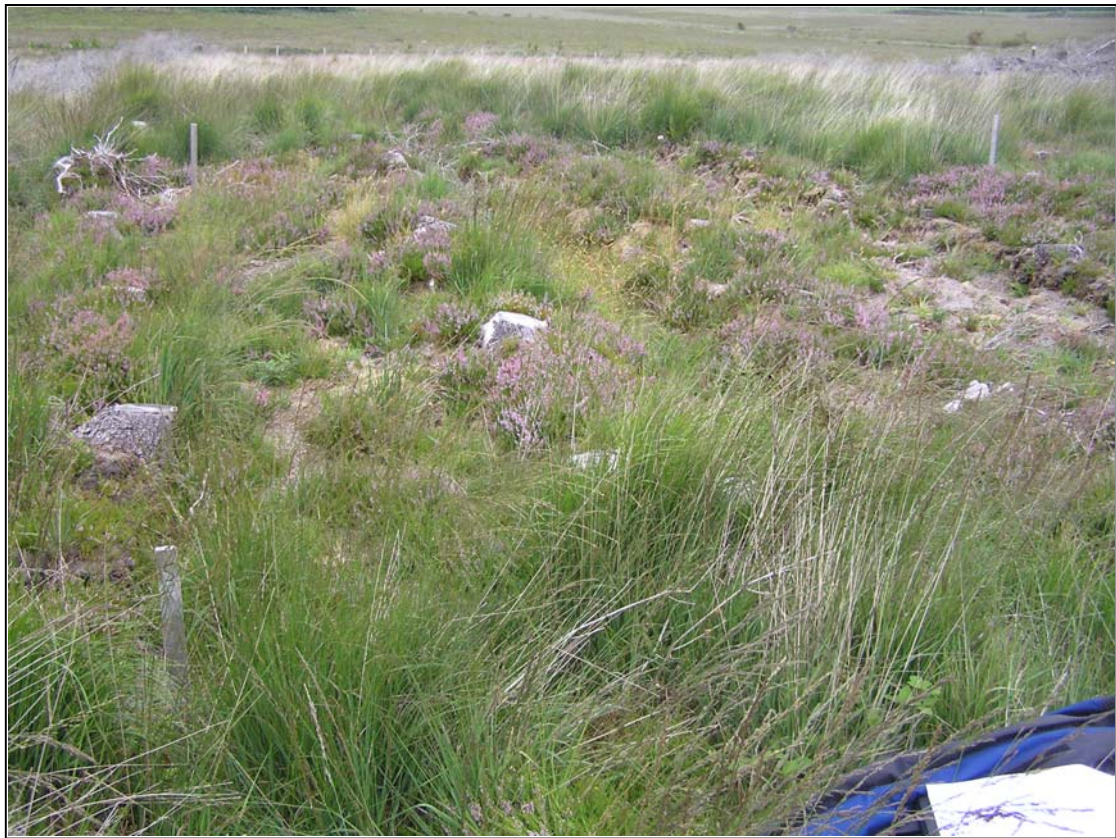


Quadrat 4 – August 2006

Site - Eskeragh			
Code - PQ4			
GPS – G 04752 18248			
Near Walrag? - No			
Size (m) - 6 x 6			
Slope (Degrees) - 0			
Vegetation cover (%)	70	90	100
Dwarf shrub cover (%)	15	25	15
Herb cover (%)	40	80	95
Bryophyte cover (%)	25	50	50
Needle litter cover (%)	20	10	0
Brash cover (%)	10	5	<3
Water cover (%)	0	0	0
No of species present	17	21	24
Date of survey	8/10/03	20/8/04	14/8/06
<i>Molinia caerulea</i>	5	6	7
<i>Calluna vulgaris</i>	4	4	4
<i>Hypnum cupressiforme</i>	4	4	5
<i>Myrica gale</i>	3	2	2
<i>Sphagnum capillifolium</i>	3	4	4
<i>Sphagnum cuspidatum</i>	2	2	2
<i>Aulacomium palustris</i>	2	2	1
<i>Erica tetralix</i>	2	2	2
<i>Hylocomium splendens</i>	2	3	3
<i>Polytrichum commune</i>	2	2	3
<i>Rhytidiadelphus squarrosus</i>	2	-	1
<i>Sphagnum palustre</i>	2	2	3
<i>Blechnum spicant</i>	1	1	1
<i>Cladonia portentosa</i>	1	2	3
<i>Dicranum scoparium</i>	1	-	-
<i>Dryopteris dilatata</i>	1	1	1
<i>Potentilla erecta</i>	1	2	2
<i>Sphagnum papillosum</i>		1	-
<i>Juncus bulbosus</i>		1	1
<i>Rhytidiadelphus loreus</i>		1	-
<i>Peltigera sp.</i>		1	1
<i>Epilobium angustifolium</i>		1	1
<i>Campylopus introflexus</i>		1	-
<i>Drosera rotundifolia</i>			1
<i>Racomitrium lanuginosum</i>			1
<i>Eriophorum vaginatum</i>			1
<i>Salix aurita</i>			1
<i>Sphagnum magellanicum</i>			1
History – Previously dominated by a young Lodgepole pine plantation planted in 1990. Trees were generally between 4 and 6 metres tall. Ground vegetation dominated by vegetation in which <i>Molinia caerulea</i> was dominant. Trees felled in the summer of 2003 and trees in this area were chipped. Drains blocked at the beginning of 2004.			



Quadrat 5 – August 2004



Quadrat 5 – August 2006

Site - Eskeragh		
Code - PQ5		
GPS – G 05110 18054		
Near Walrag? - No		
Size (m) – 8x8		
Slope (Degrees) - 0		
Vegetation cover (%)	15	70
Dwarf shrub cover (%)	3	35
Herb cover (%)	8	40
Bryophyte cover (%)	10	40
Needle litter cover (%)	70	15
Brash cover (%)	3	5
Bare ground cover (%)	10	10
No of species present	15	16
Date of survey	20/8/04	14/8/06
<i>Hypnum cupressiforme</i>	3	4
<i>Molinia caerulea</i>	3	3
<i>Calluna vulgaris</i>	2	5
<i>Carex</i> sp.	2	3
<i>Luzula multiflora</i>	2	3
<i>Cladonia portentosa</i>	1	2
<i>Dryopteris dilatata</i>	1	1
<i>Pseudoscleropodium purum</i>	1	-
<i>Pleurozium schreberi</i>	1	-
<i>Potentilla erecta</i>	1	2
<i>Cerastium fontanum</i>	1	-
<i>Epilobium angustifolium</i>	1	2
<i>Anthoxanthum odoratum</i>	1	4
<i>Agrostis</i> sp.	1	3
<i>Hypochoeris radicata</i>	1	-
<i>Pinus contorta</i> seedling	1 (1 counted)	-
<i>Campylopus</i> sp.		4
<i>Polytrichum commune</i>		4
<i>Rubus fruticosus</i>		1
<i>Erica tetralix</i>		1
<i>Carex panicea</i>		1
<p>History – Previously dominated by a young Lodgepole pine plantation planted in 1990. Trees were generally between 6 and 8 metres tall. Ground vegetation dominated by pine needle litter. Trees felled in the autumn of 2003 and subsequently windrowed. Peat only c. 1 metre deep in this area.</p>		



Quadrat 6 – August 2004



Quadrat 6 – August 2006

Site - Eskeragh		
Code – PQ6		
GPS – G 05337 17927		
Near Walrag? - No		
Size (m) - 7 x 7		
Slope (Degrees) - 0		
Vegetation cover (%)	98	100
Dwarf shrub cover (%)	25	25
Herb cover (%)	85	95
Bryophyte cover (%)	50	50
Needle litter cover (%)	0	0
Brash cover (%)	5	<3
Water cover (%)	5	0
No of species present	13	12
Date of survey	20/8/04	14/8/06
<i>Molinia caerulea</i>	7	7
<i>Hypnum cupressiforme</i>	5	5
<i>Sphagnum capillifolium</i>	4	4
<i>Calluna vulgaris</i>	4	4
<i>Myrica gale</i>	4	4
<i>Cladonia portentosa</i>	3	2
<i>Hylocomium splendens</i>	2	-
<i>Potentilla erecta</i>	2	2
<i>Dicranum scoparium</i>	1	-
<i>Dryopteris dilatata</i>	1	-
<i>Erica tetralix</i>	1	1
<i>Pleurozium scheberi</i>	1	3
<i>Polytrichum commune</i>	1	1
<i>Campylopus</i> sp.		2
<i>Sphagnum palustre</i>		1
<p>History – Previously dominated by a young and poor mixed Sitka/Lodgepole plantation planted in 1990. Trees were generally between 4 and 6 metres tall. Ground vegetation dominated by <i>Molinia caerulea</i>. Trees felled in the autumn of 2003 and subsequently windrowed.</p>		

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