RESTORING ACTIVE BLANKET BOG IN IRELAND

Project reference: LIFE02NAT/IRL/8490

A REPORT ON THE RESTORATION OF PROJECT SITE No. 18. DERRY, CO. MAYO

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Project Site No. 18 - Derry, Co. Mayo (Extension site)

1. Introduction

Grid reference F 97 17	**Elevation (m)** 80-90	**Bedrock geology** Carboniferous sandstone
SAC Name and number Adjoins Bellacorick Bog Complex (1922)	**Site area (ha)** 196.7	**Main restoration methods** Fell to waste of conifer crop and drain-blocking with peat
Area of conifer cover (ha) 181.4	**Area of open bog/heath (ha)** 15.3	
Noteworthy plant/animal species occurring *Vaccinium oxycoccus, Eriocaulon aquaticum.*		

Derry lies along the southern margins of the Bellacorick Bog Complex Special Area of Conservation. This SAC is one of the largest blanket bog-dominated SACs in the country and thus ranks as one of the most important blanket bog landscapes in Europe. Extensive tracts of high quality, open, blanket bog habitat adjoin the Derry property along its northern, eastern and southern margins. The property is dominated by approximately 181 hectares of poorly productive conifers (Sitka spruce and lodgepole pine) which were planted in the late 1980's. Although the trees have achieved a closed-canopy in places, a well-developed blanket bog flora still persists locally. The site still contains a large number of dystrophic pools and areas with blanket bog pool systems, some of which contain noteworthy plant species such as *Vaccinium oxycoccus* and *Eriocaulon aquaticum*. A well-developed natural drainage channel/flush, dominated by the robust sedge *Carex paniculata*, runs through the eastern half of the site. The conifers on this site were felled to waste during 2007 in order to restore a blanket bog flora. Subsequently, in areas of the site where the cover of felled trees was heavy, the felled conifers were placed into "windrows" by machine, in order to maximise the area of open ground for bog restoration. An excavator was also used to block areas of significant active drains with peat in order to raise the water levels.

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.

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.

An oblique aerial photograph of the site, looking in a westerly direction, taken in late 2005. Photograph by Neil Warner.

A general view of the eastern edge of the site prior to restoration. Most of the trees planted along the edge of the site were lodgepole pine. Note the high quality intact bog adjoining the plantation. Photograph taken in June 2006.

The water levels in this large oligotrophic lake within the site have been seriously lowered by a drain which was inserted in the eastern end of the lake. Photograph taken in June 2006.

A well developed flush system, dominated by the robust sedge *Carex paniculata*, dominates a wide drainage channel in the eastern half of the site. Plant species such as *Myrica gale* and *Juncus effusus* are also frequent. The bog adjoining the flush was planted with conifers but the flush itself was not planted. Photograph taken in June 2006.

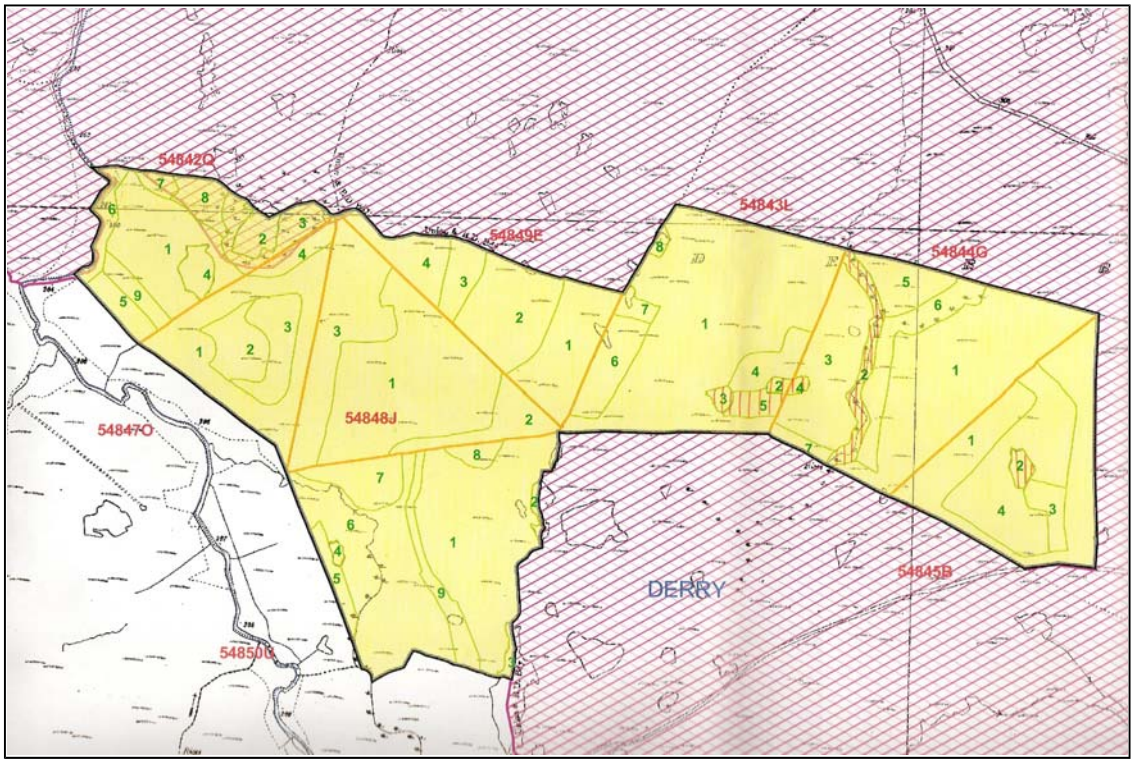
The site contains a number of open bog areas with pool complexes. Most of these are colonized by occasional, self-seeded, lodgepole pine trees which have been felled to waste. Photograph taken in June 2006.

A general view of conifers which were felled to waste. Note the largely intact surrounding bog flora. In areas such as this, where conifer cover was not particularly dense, the trees were not windrowed. Photograph taken in February 2007.

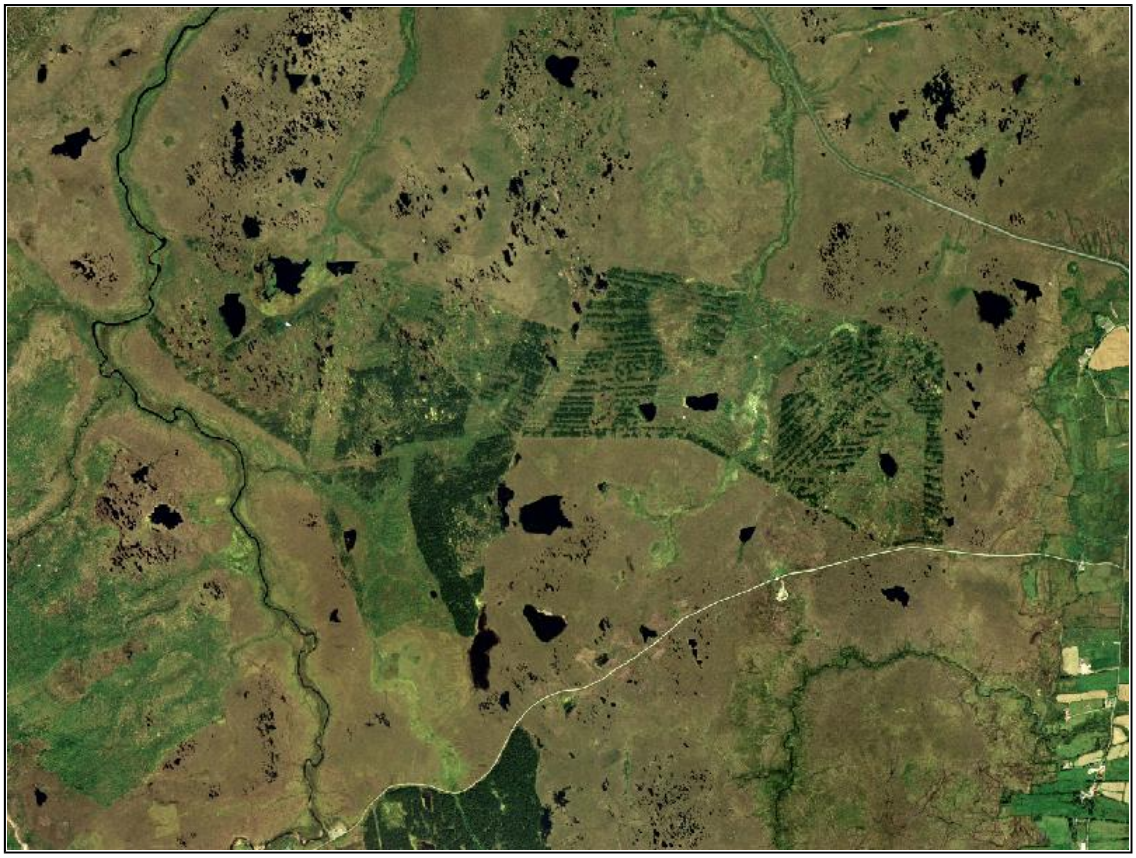
Deep bog drains such as this one were blocked as part of the restoration programme. Photograph taken in February 2007.

Windrowing of felled trees by machine. Photograph taken in November 2007.

A view of peat dams in drains. These dams were inserted by machine. Photograph taken in November 2007.



A map of the Derry restoration site. The yellow colour indicates areas included within the restoration site. The purple hatched areas lie within the Bellacorick Bog Complex SAC.



An aerial photograph of the Derry site prior to restoration work taking place. Aerial photograph taken in the year 2000. No post-restoration aerial photograph is available.

4. Vegetation of the site

The dominant habitat within the site was conifer plantation on lowland blanket bog with the main species lodgepole pine. In areas planted with lodgepole pine the blanket bog vegetation has been largely eradicated due to the relatively good growth of the pine trees, which generally exceeded 8 metres in height. Under the pine canopy the ground was generally dominated by a thick layer of pine needles and living vegetation was very sparse (see permanent quadrat photographs). The main species was the moss *Hypnum cupressiforme* with *Molinia caerulea* the only regularly occurring vascular plant species. As a result of the low cover of blanket bog species such areas will take longer to regenerate a bog flora following tree felling.

Areas of blanket bog planted with Sitka spruce were different to that of lodgepole pine in that the trees grew very poorly in general and, in most areas, the tree canopy had not closed (see permanent quadrat photographs). As a result, quite intact blanket bog vegetation still persists and the dominant species was generally *Molinia caerulea* with *Calluna vulgaris* and *Sphagnum capillifolium* also frequent. The dominance of *Molinia* and *Calluna* demonstrates that drying out of the bog surface has occurred, however as can be seen from the permanent quadrats, many of the typical blanket bog species are also present.

A number of small lowland oligotrophic lakes/dystrophic pools occur throughout the site. These are generally colonised by species such as *Menyanthes trifoliata, Carex rostrata, Eriophorum angustifolium* and *Sphagnum cuspidatum*. At least one of these lakes were drained during site preparation and now have very low water levels, especially in the drier months of the year. In these drained lakes there is generally an expansion of vegetation cover, e.g. *Carex rostrata* swamp, along the margins of the dried-out lake beds.

A well developed bog flush occurs in the eastern half of the site. The flush occupies a natural drainage channel which runs a south to north direction, eventually joining up with the Muing/Owenmore river. The dominant plant species of the flush/channel is the large sedge *Carex paniculata*. Other prominent plant species recorded include *Juncus effusus, Myrica gale, Juncus effusus, Carex rostrata, Potentilla palustris, Sphagnum recurvum* and *Sphagnum cuspidatum*. There are also occasional low shrubs of willow (mostly *Salix aurita*). On the day of survey there was no distinct channel with flowing water observed in the flush however it is likely that diffuse channels are present during very wet periods of the year. Well developed flushed channels in blanket bog such as this are relatively rare in a national context and thus are very important features. Although the adjoining blanket bog was planted with conifers the flush itself was not planted. See Table 1 for a more complete list of plant species growing in the flush.

Table 1. Species list for extensive flush system in the eastern half of the site

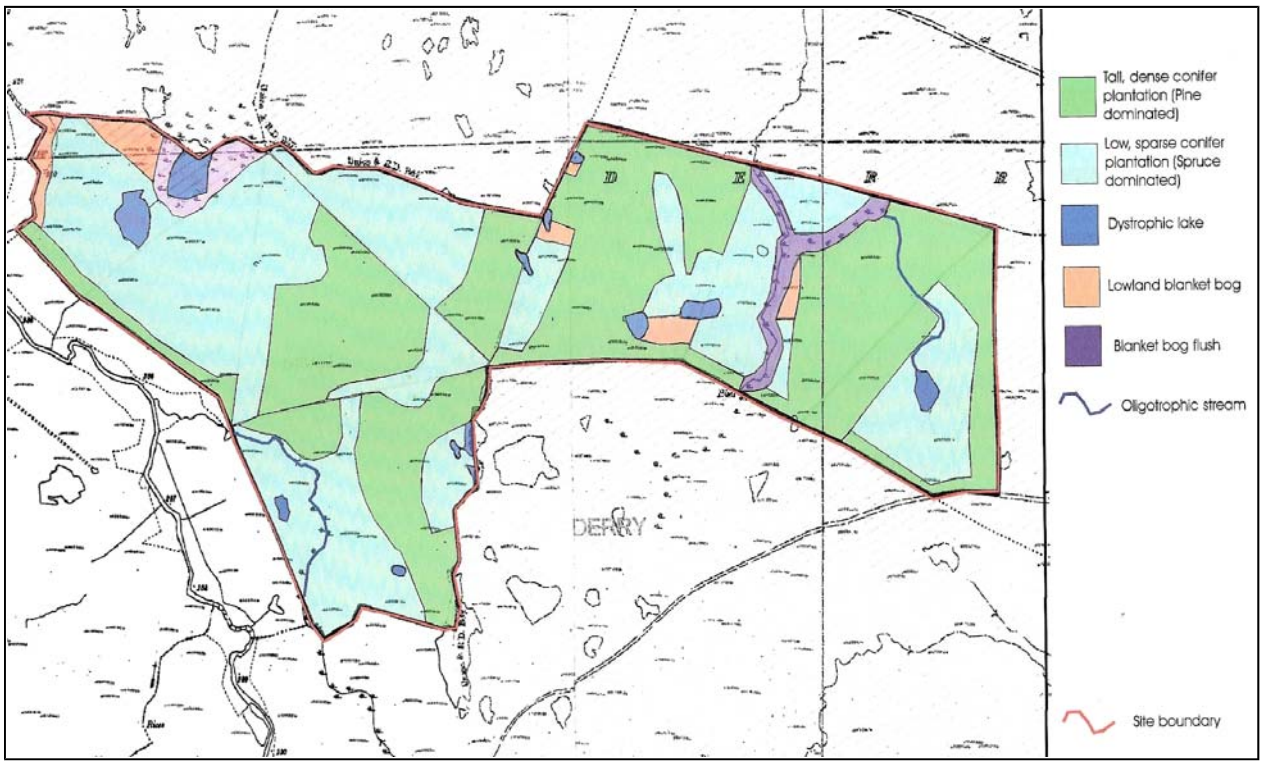
Latin name	English name

Anthoxanthum odoratum	Sweet vernal grass
Calliergon cuspidatum	A moss
Calliergon giganteum	A moss
Caltha palustris	Marsh marigold
Cardamine pratensis	Cuckoo flower
Carex echinata	Star sedge
Carex limosa	Mud sedge
Carex nigra	Common sedge
Carex paniculata	Greater tussock sedge
Carex rostrata	Bottle sedge
Eriophorum angustifolium	Common bog cotton
Eriophorum vaginatum	Hare's tail bog cotton
Galium palustre	Marsh bedstraw
Hydrocotyle vulgaris	Pennywort
Iris pseudacorus	Flag Iris
Juncus bulbosus	Bulbous rush
Juncus effusus	Soft rush
Menyanthes trifoliata	Bog bean
Molinia caerulea	Purple moor-grass
Myrica gale	Bog myrtle
Osmunda regalis	Royal fern
Phragmites australis	Common reed
Pleurozium schreberi	A moss
Potamogeton polygonifolius	Bog pondweed
Potentilla erecta	Tormentil
Potentilla palustris	Marsh cinquefoil
Rumex acetosa	Sorrel
Salix aurita	Eared willow
Salix cinerea subsp. *oleifolia*	Gery willow
Senecio aquaticus	Marsh ragwort
Sphagnum auriculatum	Sphagnum moss
Sphagnum capillifolium	Sphagnum moss
Sphagnum cuspidatum	Sphagnum moss
Sphagnum recurvum	Sphagnum moss
Viola palustris	Marsh violet

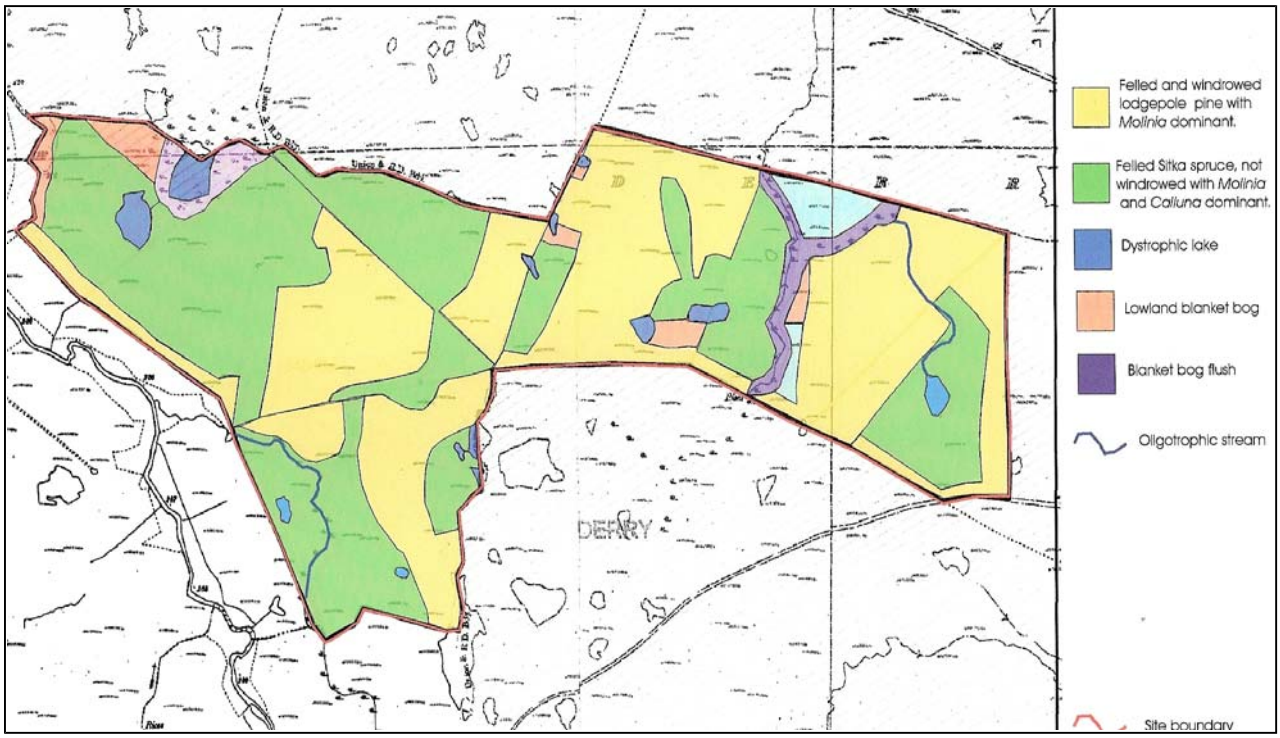
A number of small areas of lowland blanket bog within the site were not planted with conifers due to their very wet nature. A number of small open, pool-studded, areas occur especially in the western half of the site. Such areas are usually surrounded by afforested blanket bog and are subject to invasion by naturally regenerated lodgepole pine. These small areas of open bog still retain a reasonably intact blanket bog flora.

5. Changes in overall vegetation/habitat cover

As the trees have only been felled at this site for less than 1.5 years there has been not enough time to evaluate the changes in vegetation/habitat cover. The main immediate change has been the felling of trees and the follow-up wind-rowing and drain-blocking. This has produced significant areas of blanket bog which have been cleared of conifers or have only a light cover of dead conifers. Blanket bog recover in these areas should be relatively rapid.



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



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

6. Monitoring quadrats

In the following pages the vegetation of 6 permanent quadrats is outlined, along with associated photographs. These quadrats were first surveyed during June of 2006 and as the main body of restoration work took place during 2007 they have not received a post-restoration survey as yet. In order to ensure the future relocation of quadrats the corners were 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 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

Restoration works were carried out during 2007 thus sufficient time has not elapsed for assessing changes in vegetation/habitat cover

Quadrat 1 – June 2006

Quadrat code	D1	Vegetation cover (%)	100	Date – 8/06/06	
Size (m^2)	36	Bare rock cover (%)	0	No. of plant species in quadrat - 25	
Slope (degrees)	0	Bare water cover (%)	0	Grazed? - No	
Aspect (degrees)	0	Open water cover (%)	0	GPS reading – F 98546 17188	
Height of vegetation (cm)	20-30	Tree cover	25	Substrate – Desiccated peat	
Dwarf shrub cover (%)	40	Herb cover (%)	50		
		Bryophyte cover (%)	75		
Calluna vulgaris	5	*Cladonia portentosa*	2	*Diplophyllum albicans*	1
Molinia caerulea	5	*Dicranum scoparium*	2	*Drosera rotundifolia*	1
Sphagnum capillifolium	5	*Erica tetralix*	2	*Eriophorum vaginatum*	1
Picea sitchensis	5	*Hylocomium splendens*	2	*Hypnum cupressiforme*	1
Sphagnum palustre	4	*Pedicularis sylvatica*	2	*Narthecium ossifragum*	1
Sphagnum magellanicum	4	*Potentilla erecta*	2	*Polygala serpyllifolia*	1
Sphagnum papillosum	4	*Rhytidiadelphus loreus*	2	*Salix aurita*	1
Trichophorum	4	*Aulocomium palustris*	1	*Schoenus nigricans*	1

cespitosum					
Polytrichum commune	3				

Comments: Area planted with Sitka spruce in 1985, but trees are were very poor.

Quadrat 2 – June 2006

Quadrat code	D2	Vegetation cover (%)	100	Date – 8/06/06	
Size (m^2)	36	Bare rock cover (%)	0	No. of plant species in quadrat - 6	
Slope (degrees)	0	Bare soil cover (%)	0	Grazed? - No	
Aspect (degrees)	0	Needle litter cover (%)	0	GPS reading – F 98554 17523	
Height of vegetation (m)	8 - 12	Tree cover	90	Substrate – Desiccated peat	
Dwarf shrub cover (%)	0	Herb cover (%)	5		
		Bryophyte cover (%)	5		
Pinus contorta	7	*Hypnum cupressiforme*	3	*Leucobryum glaucum*	1
Molinia caerulea	3	*Eurhynchium praelongum*	1	*Rhytidiadelphus loreus*	1
Comments: Area planted with Lodgepole pine in 1985 and the trees grew quite well.					

Quadrat 3 – June 2006

Quadrat code	D3	Vegetation cover (%)	100	Date – 8/06/06	
Size (m^2)	36	Bare rock cover (%)	0	No. of plant species in quadrat - 23	
Slope (degrees)	0	Bare soil cover (%)	0	Grazed? - No	
Aspect (degrees)	0	Open water cover (%)	0	GPS reading – F 98008 17658	
Height of vegetation (cm)	20-30	Tree cover	10	Substrate – Desiccated peat	
Dwarf shrub cover (%)	30	Herb cover (%)	40		
		Bryophyte cover (%)	85		
Sphagnum capillifolium	6	*Hypnum cupressiforme*	3	*Drosera rotundifolia*	1
Molinia caerulea	5	*Aulocomium palustris*	2	*Pleurozium schreberi*	1
Calluna vulgaris	5	*Eriophorum vaginatum*	2	*Polygala serpyllifolia*	1
Cladonia portentosa	5	*Hylocomium splendens*	2	*Polytrichum commune*	1
Picea sitchensis	4	*Narthecium ossifragum*	2	*Potentilla erecta*	1
Sphagnum papillosum	4	*Schoenus nigricans*	2	*Racomitrium lanuginosum*	1

Erica tetralix	3	*Sphagnum cuspidatum*	2	*Rhytidiadelphus loreus*	1
Eriophorum angustifolium	3	*Sphagnum palustre*	2		

Comments: Area planted with Sitka spruce in 1985, but trees were very poor.

Quadrat 4 – June 2006

Quadrat code	D4	Vegetation cover (%)	100	Date – 8/06/06	
Size (m^2)	36	Bare rock cover (%)	0	No. of plant species in quadrat - 9	
Slope (degrees)	0-5	Needle litter cover (%)	80	Grazed? - No	
Aspect	East	Open water cover (%)	0	GPS reading – F 97657 17509	
Height of vegetation (m)	10-20	Tree cover	90	Substrate – Desiccated peat	
Dwarf shrub cover (%)	0	Herb cover (%)	5		
		Bryophyte cover (%)	40		
Pinus contorta	7	*Cladonia portentosa*	2	*Rhytidiadelphus loreus*	2
Hypnum cupressiforme	5	*Dicranum scoparium*	2	*Dryopteris dilatata*	1
Sphagnum capillifolium	3	*Molinia caerulea*	2	*Thuidium tamariscinum*	1

Comments: Area planted with Lodgepole pine in 1985 and the trees grew quite well.

Quadrat 5 – June 2006

Quadrat code	D5	Vegetation cover (%)	100	Date – 8/06/06	
Size (m^2)	36	Bare rock cover (%)	0	No. of plant species in quadrat - 21	
Slope (degrees)	0	Bare soil cover (%)	0	Grazed? - No	
Aspect (degrees)	0	Open water cover (%)	0	GPS reading – F 97150 17520	
Height of vegetation (m)	1.5 – 2.5	Tree cover	10	Substrate – Desiccated peat	
Dwarf shrub cover (%)	40	Herb cover (%)	50		
		Bryophyte cover (%)	70		
Molinia caerulea	5	*Sphagnum recurvum*	4	*Dicranum scoparium*	1
Calluna vulgaris	5	*Hylocomium splendens*	3	*Drosera rotundifolia*	1
Sphagnum capillifolium	4	*Hypnum cupressiforme*	3	*Juncus effusus*	1
Cladonia portentosa	4	*Erica cinerea*	2	*Liverwort* spp.	1
Erica tetralix	4	*Eriophorum angustifolium*	2	*Narthecium ossifragum*	1

Pleurozium schreberi	4	*Polytrichum commune*	2	*Polygala serpyllifolia*	1
Sphagnum papillosum	4	*Trichophorum cespitosum*	2	*Potentilla erecta*	1

Comments: Area planted with Sitka spruce in 1985, but trees were very poor.

Quadrat 6 – June 2006

Quadrat code	D6	Vegetation cover (%)	100	Date – 8/06/06	
Size (m^2)	36	Bare rock cover (%)	0	No. of plant species in quadrat - 7	
Slope (degrees)	0	Bare soil cover (%)	0	Grazed? - No	
Aspect (degrees)	0	Needle litter cover (%)	80	GPS reading – F 97099 17572	
Height of vegetation (m)	9-12	Tree cover	90	Substrate – Dessiccated peat	
Dwarf shrub cover (%)	0	Herb cover (%)	10		
		Bryophyte cover (%)	25		

Pinus contorta	7	*Sphagnum capillifolium*	3	*Dryopteris dilatata*	1
Hypnum cupressiforme	4	*Polytrichum commune*	1	*Dicranum scoparium*	1
Molinia caerulea	4				

Comments: Area planted with Lodgepole pine in 1985 and the trees grew quite well.

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